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Bushfire preparedness of rural-residents in selected Southeast Queensland Shires

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Abstract

Severe bushfire events in Southeast Queensland over recent seasons have highlighted significant risks and potential impacts from this hazard faced by rural and rural-urban fringe properties. Although levels of preparedness are a known key component of vulnerability assessment and hazard management, there has been little research to date that investigates perceptions of these risks and actual preparedness behaviours by households in this geographical area. The present research addresses this gap by documenting the preparedness levels of rural-residents in several districts of the Brisbane Valley and eastern Darling Downs regions that contain areas of at least medium risk of bushfire hazard.

Surveys were distributed to properties in the target area and residents were asked a range of questions related to: bushfire risk perception; access to communications; evacuation strategies; access to fire-fighting resources and knowledge of appropriate skills to cope with bushfire. Preliminary results indicate that a range of appropriate measures were being undertaken by respondents; for example, formulation of evacuation plans, provision around the home of basic fire-fighting equipment and local fuel reduction. On the other hand, many reported storing flammable liquids in inappropriate proximity to homes and were concerned about the lack of personal resources and skills to deal with a severe bushfire incident. Some respondents raised wider issues that affect preparation for bushfire hazard within the context of broader land-management policy.

Keywords: bushfire; Southeast Queensland; bushfire preparedness

Introduction

Over the past two decades, the major population growth in Southeast Queensland has been towards the zones surrounding the metropolitan area (McKenzie, 1996; Stimson *et al*. 1999). Corridors to the north, west and south of Brisbane have been experiencing, and are expected to maintain, continuing significant population growth (Queensland Government, 2005). Many of the new residential areas being opened up are in the peri-urban and rural-urban fringe zones where the "bush lifestyle", relatively close to city services and amenities, is a key attraction. This pattern of development has dramatically increased the exposure of people to bushfire hazard in these areas. Although bushfire risk in Australia is usually associated with the southern states over summer, bushfire is not uncommon in Southeast Queensland. Here, the bushfire season occurs during the period from mid-late winter through to early summer, which corresponds to the low-rainfall season. Granger *et al*. (2001) list major bushfire events in Southeast Queensland from 1926-2000, noting 16 seasons during this period which particularly featured numerous moderate to severe bushfire events.

Meanwhile, there has been a recognition by emergency managers that fire services are unlikely to be able to provide protection to every property during major incidents (Enders, 2001; Rhodes, 2003). This is now the position of the Australasian Fire Authorities Council (AFAC, 2005). As a result, emergency management organisations have shifted their focus in addressing community safety towards encouraging greater *community preparedness* and *self-reliance* (AFAC 2005; Enders, 2001; Hodges, 1999). The ultimate objective is to enhance the capacity of the community itself to respond to hazards more effectively, that is, to increase resilience.

Given the population increases, the geography of settlement, and the need for self-reliance in the face of hazard risk, how prepared are Southeast Queensland communities for bushfire? This paper reports the initial results from a survey aimed at documenting the preparedness levels of rural-residential households in the peri-urban / rural zone west of Brisbane (Fig.1).

Preparedness for bushfire

Differential levels of preparedness and coping capacities within communities have critical implications for emergency services in actual hazard events. Rhodes and Reinholtd (1999) suggested that the role of risk perception is critical in terms of shaping people's approach to preparedness. Rhodes (2003) further advocated that the choices that people make about how to use their skills and resources in response to hazard depend upon how they perceive and understand the risk. However, Beringer (2000) reported that although a significant proportion of residents in a Melbourne rural-urban fringe case study were aware that they lived in a high bushfire-risk zone, their levels of preparedness were low. Most recently, Paton *et al.* (2006) delineated personal characteristics and decision-making processes common to adopters of proactive measures against fire hazard, identifying that living in a high-risk fire region was not enough to motivate mitigation being undertaken. Given the uncertain links between risk perception and preparedness, it is necessary to document actual measures being undertaken by residents, as well as investigating their risk perception, in order to gauge preparedness levels.

Previous studies have identified factors associated with preparedness (Russell, *et al*., 1995; Johnston *et al*. 1999; Enders, 2001) and levels of community preparedness in NSW (Odgers & Rhodes, 2002) and Melbourne (Beringer, 2000). Such studies are

useful in providing information as to what is required to increase community capacity to deal with bushfire risk. As Paton *et al.* (2006) have pointed out, because bushfires are seasonal, preparatory activities can, and should, take place every year. Rhodes and colleagues (Rhodes & Reinholtd; 1999; Rhodes, 2003) proposed a model for assessing community preparedness for coping with hazards. This comprised five key dimensions of preparedness:

1. Awareness and recognition of the wildfire risk;
2. Knowledge of fire behaviour and safety measures;
3. Planning for the event of a fire;
4. Physical preparations of property; and
5. Psychological readiness involving confidence and self-reliance.

The present paper uses the main elements of this model as an analytical tool to present the initial results of the bushfire preparedness survey undertaken in rural-residential communities in Southeast Queensland.

The Survey

The present survey was conducted within a selection of rural households in the bushfire-prone shires of Crows Nest, Laidley, Esk and Kilcoy in South East Queensland (Fig.1). These areas have suffered from bushfires and grass fires over recent years, with much property and livestock damage being sustained. Thus, it was postulated that previous experience and awareness levels of bushfire hazard in this region would be fairly high.

Queensland's Rural Fire Service (Queensland Fire and Rescue Service) has modelled bushfire risk throughout the state and defined areas of low, medium and high bushfire risk at a useful resolution for the present study. Rural Southeast Queensland exhibits the range of categories, their extent and spatial patterning associated with variability of vegetation character, slope and aspect. The valley floors and plains of the Brisbane and Lockyer valleys, having been significantly cleared and featuring low slope angles, have a relatively low bushfire risk although grasslands are extensive. Grass fires, rather than intense forest fires pose the more common risk here. In the vicinity of most of the localities surveyed, however, there are at least some areas categorised as having a medium bushfire risk. This generally reflects the local occurrence of bushland fragments and/or increasing slope angles. The highest severity risks are found on the fringing hilly land units where more extensive vegetation stands remain and development (particularly agricultural) has been impeded by terrain, access and/or vegetation protection. The shires in which the present survey took place are all required to assess bushfire hazard, define bushfire management areas, and identify these in planning schemes in accordance with the Queensland State Planning Policy 1/03.

A mail survey was conducted in August-September 2005, distributing a written questionnaire to 4950 rural households in the study area. Participants were invited to contact the researchers by phone or email to discuss the survey. Reply paid return envelopes were supplied with the questionnaires to respondents. More than 600 completed questionnaires were returned, representing a reasonably acceptable response rate of 12.5% for mail out surveys to these areas, considering the distribution problems over the Christmas/ New Year period. In addition, six particularly motivated participants contacted the researchers directly by phone and offered detailed insights into bushfire management issues in their areas. This paper is based on the preliminary results of the 142 surveys analysed to date. Analysis of the remainder is currently underway.

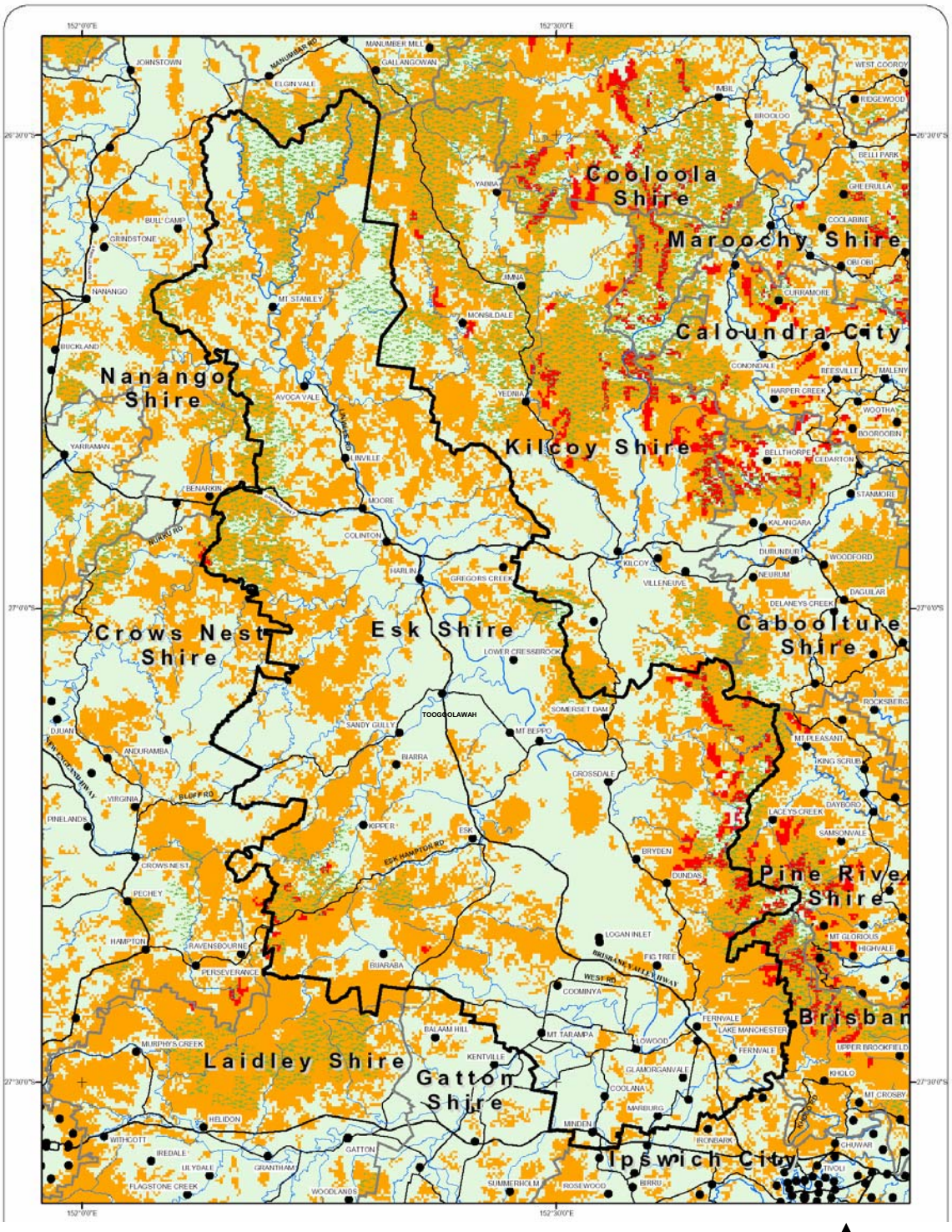

Figure 1. Bushfire risk analysis – rural Southeast Queensland
Adapted from: Rural Fire Service, 2002. (Queensland)

The size of properties surveyed ranged from as small as 0.5 of an acre to as large as 3211 acres. The average size of the properties was 124 acres, and if the median is used to give a different perspective, half of the properties surveyed were less than 15 acres. A profile of respondents is presented in Table 1.

Table 1. Profile of respondents surveyed. Percentage of respondents.

Age	**18-24** 1%	**25-34** 5%	**35-64** 75%	**65-74** 10%	**75+** 9%	
Length of residence in present location	**<12 months** 10%	**<5 yrs** 17%	**>5yrs** 68%	**no response** 5%		
Main land- use on property	**Residential** 63%	**Grazing** 13%	**Crops** 3%	**Orchards** 1%	**Mixed** 14%	**No response** 6%

Thus, the majority of respondents were middle-aged, had lived in the area for more than five years and were not using their properties for any kind of farming activity, that is, they were rural-residential properties.

Results: indications of preparedness

Survey results to date comprise data indicating levels of individual preparedness in terms of: knowledge of emergency information sources; household resources available and measures taken to defend against fire and self-assessment of coping capacity. These results have been organised and interpreted using the framework of the Rhodes (2003) model.

Awareness of risk

Generally, respondents were aware of bushfire risk. They had experienced several years of severe bushfires in the area, heightening their awareness of the hazard and giving them an appreciation of the likelihood of occurrence and potential consequences for their properties of bushfire events. Lack of awareness of the hazard was not an issue in this sample group.

Knowledge of fire behaviour

Local knowledge of bushfire hazard has been gained through recent experience. More than two-thirds of residents surveyed had lived in the study area for more than five years and therefore had been exposed to bushfire events in the preceding 3-4 seasons. This included one occasion in October 2004 when Atkinson Dam (near Coominya, see Fig.1), empty of water for many months, caught fire and a five metre high wall of billowing smoke and fire gathered speed with fierce winds behind it, endangering the caravan parks nestled on the shores of the once full lake (Kathryn Gow, Valley FM 95.9, Radio broadcast, October, 2004).

When determining how serious their vulnerability to bushfire hazard was, respondents considered proximity to vegetation to be a critical factor to fire spread. It was reported that 37% of respondents had heavy vegetation within 30 feet of their houses, and 4 homes were located as close as 3 meters to this vegetation, while 43% indicated that it was about 55 metres away and for 10 families they were as far away from it as 1.5 kilometres. While the average distance to vegetation was 495 meters, the median statistic gives us a different perspective. Overall, for half the surveyed respondents, vegetation was less than 100 metres away, well within the distance for potential fire spread through direct contact or spotting.

Physical preparation of property

Practical aspects have been examined as specific criteria for preparedness elsewhere (e.g. Beringer, 2000; Paton, *et al*. 2006). In the present survey, respondents were asked if they had engaged in any of the following actions: clearing gutters of leaf litter; cutting back vegetation around the house; acquiring and reviewing readiness of fire-fighting equipment such as hoses, pumps and buckets; careful location and storage of flammable liquids on the property (see Tables 2-5).

Table 2. Percentage of respondents cleaning of gutters at given frequencies.

3-monthly	6 monthly	12 monthly	never
28%	38%	22%	12%

Table 3. Percentage of respondents having buckets / hoses at various locations.

garage	shed	verandah	Inside house	Under house
23%	51%	20%	16%	6%

Table 4. Percentage of respondents having certain fire-fighting equipment.

shovels	axes	working water pump	hessian bags	pump packs	Fire blankets	fire hoses
86%	64%	50%	36%	36%	21%	18%

Table 5. Percentage of respondents storing flammable liquids at certain locations on properties.

verandah	under house	garage	shed
40%	43%	33%	26%

The sample responses reflected a mixed pattern of preparation with regard to these physical measures. On the positive side, the majority of respondents made attempts to clean gutters of leaf litter each year (Table 2) – a fundamental mitigation measure for bushfire preparation. There was a range of adequate household fire-fighting equipment available within the sample (Tables 3 and 4). In addition, almost 80% of respondents knew the location of water sources that could be accessed for fire-fighting purposes outside their properties in the form of tanks, dams, creeks or bore water. In terms of minimizing the amount of combustible fuel around the house, the storage of flammable

liquids was of concern (Table 5). Furthermore, only 39% of respondents reported the installation of smoke detectors fitted to their houses. This fact is important as one of the first indicators of a serious bushfire occurring at night once the house is locked up, is the seeping of smoke into the house which sets off the smoke alarms.

Planning

An important aspect for property owners in planning for bushfire is that, inevitably, they need to confront the options of whether they would stay and defend their property by attempting to fight the fire, or to leave before the fire threatens personal safety. This issue, the "*stay or go*" question, is currently at the centre of policy debate and on-going research by the Bushfire Cooperative Research Centre (Watson, 2006). Rhodes (2003) states that fire services have advocated that people make this decision *before* a fire threatens as a preparatory and planning phase. In the present survey, 76% of respondents said that they had an evacuation plan.

In terms of preparation, access to information is a significant determinant of behaviour (Reinholtd, 1999). Almost all respondents in the present survey reported knowledge of contacts (see Table 6) for the local emergency services (ambulance and fire brigade).

Table 6. Percentage of respondents knowing selected Emergency Services phone numbers.

Ambulance	Local fire brigade	Energex	Police	SES
97%	96%	76%	0	0

Generally, nearly all those surveyed knew the phone numbers of the fire brigade (96%) and the ambulance (97%). Surprisingly, Energex (power supplier) was not far behind (75%), but no-one ticked the police or SES boxes. This may have been due to the fact that respondents would not consider phoning the police or SES rescue teams personally and /or do not perceive an immediate role for these services in the event of a bushfire.

The most important sources of information about bushfire, however, for respondents in the survey were their neighbours and the radio (Table 7).

Table 7. Percentages of respondents nominating certain sources as information sources on bushfire hazard

neighbours	radio	phone	television	internet
57%	54%	47%	39%	8%

The high reliance on information from neighbours seems to suggest that there may be strong social networks in the area, and that respondents had an idea of where they would obtain information on fires if necessary. This is typical of smaller communities which are not as reliant on emergency authorities for official warnings and which use informal connections with neighbours to keep informed (Reinholtd, 1999). This may result in a lessened expectation that outside emergency services will be present during a bushfire and may reflect a degree of self-sufficiency in preparedness, which is supported by survey results. This sense of community has been noted as a predictor

of hazard preparedness with other types of hazard (e.g. Carver, *et al*., 1989; Bishop *et al*., 2000; Paton, *et al*. 2001).

Only 8% of those surveyed in the survey indicated that they would search the web for information to keep up to date with fire threats. From these results it would seem that it is questionable as to what extent the internet can be utilized in rural communities at present. This may be due to poor service access and quality in the study region and / or a perception by respondents that other sources provide more direct, timely and reliable information.

Knowledge about bushfire and relevant information sources are necessary components of preparedness, but as previous research (Berringer, 2000; Paton, *et al*., 2006; Rhodes, 2003; Sims & Baumann, 1983) has shown, this is not sufficient in itself to ensure that appropriate and adequate preparation occurs before a bushfire season occurs. From the studies in NSW and Victoria (Rhodes, 2003), and studies of other hazards (e.g. Paton, *et al*., 2006) it was concluded that programs that solely focus on delivering information are unlikely to make a significant difference in increasing preparedness.

Psychological readiness

Readiness measures are subjective and influenced by a wide variety of personal and situational factors (Rhodes, 2003). Questions in the present survey, used as indicators of readiness, related to respondents' perception of their own capacity to cope with a fire if one occurred (Table 8).

Table 8. Self-evaluation of own capacity to fight a fire. Percentages of respondents.

Would need assistance	40%
Lacking in skills	43%
Lack necessary equipment	44%
Cost of equipment too high	40%
Competing priorities	42%

From the preliminary results, sample respondents appear to have only a moderate level of confidence in their own abilities and that of their equipment to fight a fire. The severity of bushfire events during the 3-4 seasons prior to the survey may have had a negative impact on respondents' perception of their level of competence.

Gow (2006) has summarised some of the literature on the gap between what we know about the impact of education programs at a cognitive and behavioural level and raised the concept of residents engaging in games of chance in terms of preparedness in hazards and in particular bushfires. While the literature has clearly ascertained that education does not lead to action, this research has confirmed some of the findings reported in the literature that recent exposure to a particular hazard will influence the person to respond to warnings about the hazard and to take appropriate action.

Broader issues for bushfire hazard management

The preliminary results presented here present a picture of people who, while voicing significant concerns about their capacity to face bushfire risk, are moderately well-

prepared for this hazard in some aspects. The fact that many respondents had established information networks, considered their fire-fighting equipment and had an evacuation plan *before* another bushfire event in their district means that they are more likely to confront a bushfire threat more effectively. The findings here are arguably somewhat more encouraging than those of some other studies (e.g. Beringer, 2000) which suggest that property owners in residential rural-urban fringe areas may be less well prepared for this hazard.

Stay or go issue?

Perception of risk and level of preparedness are at the centre of the "stay or go" debate. The decision for property owners to "stay or go" is complex. Studies of bushfire behaviour (e.g. Brennan, 1999; Krusel & Petris,1992; Wilson & Ferguson, 1984) have highlighted the question of whether it was safer to stay in one's house than to attempt a later evacuation. Responses to bushfire range from people deliberately leaving or staying away from their houses / properties on days of high fire danger, to attempts to return home, to remaining at home in the belief that preparations would reduce the impacts of a fire (Reinholtd, 1999). The amount of preparation done before the event is a key factor influencing the decision to stay or go. During the past decade, the Country Fire Authority (CFA) in Victoria has formalised its policy in this domain and has developed a "stay or go" message (Reinholtd, 1999). Residents have been encouraged to consider staying to defend their houses if they, and their houses, are well prepared and if they understand what to expect and do should the fire reach the house (Brennan, 1999). This response and policy has the dual benefits of increasing the chance that houses may be saved, and also reducing demand on over-stretched fire fighting resources. Since 2003, the Queensland Fire and Rescue Service (QFRS) has adopted a similar message to that of Victoria, including provisions for mandatory evacuation (QFRS, 2006).

Watson (2006) reports on research by the Bushfire CRC which reflects the dilemmas of the *stay or go early* approach poses to the community. Results suggest that a high proportion of people may delay decisions on whether to stay or go early when faced with threat of bushfire. That is the "*wait and see*" approach discouraged by emergency managers. Beringer (2000) reported that significant numbers of his sample expected help from fire authorities in the case of a bushfire. In the present study, the moderate levels of confidence in the capacity to fight fires reported may be indicative of indecision in this context. Even though a majority of respondents did report that they had an evacuation plan, of concern are the 40% of respondents who stated that they would need assistance to fight a fire.

Hazard reduction in protected areas

Queensland fire authorities have always supported a regime of fuel management in bush areas under a system of permits issued by local fire wardens. This policy is underpinned by a predominantly volunteer network of fire wardens whose role is to manage the Permit to Light Fire System (Granger *et al.,* 2001). In rural-residential areas, and within the Brisbane metropolitan area, however, there is often significant pressure to minimize hazard reduction. Reasons for this usually revolve around arguments about environmental protection (e.g. Paton *et al*., 2006) and the aggravation of medical conditions brought on by smoke. From respondents' phone comments received, the issue of lack of fuel reduction burns on adjacent properties, often in protected areas, is of real concern. For example:

"There is no government policy on how to manage areas in the public protected areas abutting private property."

"I cannot get any action on the protected bush and scrub which is being allowed to grow right up to my fence."

"Fire risk is higher in the protected areas."

Conclusion and further research

The present survey has revealed a mixed picture in terms of individual respondents' preparedness for bushfire in the study area. There was a basic level of bushfire preparedness, such as having access to fire-fighting equipment, knowledge of emergency information sources and having evacuation plans. However, there appears to be a significant lack of self-confidence expressed in terms of capacity to deal with an actual fire event. This involved a perception of lack of skills and / or resources.

Results presented here are from the initial stage of research into bushfire preparedness in selected areas of rural Southeast Queensland. Directions for future research are suggested by these preliminary results. It became clearly apparent from comments of respondents that there are issues warranting further investigation:

- further examination of perceptions of *stay or go*;
- investigating fuel reduction strategies on a regional basis.

In terms of overall directions for future research, issues to be investigated include:

- changing modes of emergency information communication within growing / changing populations in the peri-urban regions;
- how to motivate residents in bushfire-prone areas to instigate appropriate preparedness action, beyond information seeking.

These factors are in addition to the original overall project aims of recording knowledge of fire hazard (fire behaviour, influences on fire spread, intensity, fuel, weather, etc.) and benchmarking preparedness levels in the region against best practice.

The present paper reflects preliminary results of the survey responses analysed to date. Analysis of the remainder of the data is currently underway. The study focussed on documenting indicators of preparedness, sources of hazard information and personal perceptions of risk and coping capacities. This study is set within the context of a broader investigation into strategies for improving the effectiveness of risk information and education programs by incorporating such dimensions as recent experience, community and individual characteristics. The purpose of this research is to enhance community resilience to this hazard.

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