



Householders' safety-related decisions, plans, actions and outcomes during the 7 February 2009 Victorian (Australia) wildfires



J. McLennan^{a,*}, G. Elliott^a, M. Omodei^a, J. Whittaker^b

^a School of Psychological Science, La Trobe University, Kingsbury Drive, Bundoora, VIC 3086, Australia

^b National Climate Change Adaptation Research Facility, RMIT University, 124 La Trobe Street, Melbourne, VIC 3000, Australia

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ABSTRACT

This study examined decisions made by households under wildfire threat. Data were obtained from interviews with survivors of severe wildfires in Victoria (Australia) on 7 February 2009 which killed 172 civilians and destroyed more than 2000 homes. Prior to this, Australian fire agency community wildfire safety policy was that residents should: 'Prepare, stay and defend or leave early'. Most of the 223 interviewees who stayed and defended did so because this was their wildfire safety plan, and they believed that they would be successful despite the predicted extreme fire danger weather. In 79% of cases, defence was successful; for the remaining 21% the house was destroyed and several lives were imperilled. Of the 216 who left for a safer location only 39% said that this was their wildfire safety plan; for most, the action of leaving was triggered by realisation of the imminent threat posed by the fire; 36% self-evacuated under hazardous conditions. The findings suggest that community wildfire safety programs should emphasize: (a) the risks associated with staying to defend a property; and (b) how households should prepare in order to leave safely if a fire threatens.

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1. Introduction

Because of its climate, vegetation types, and land use and human settlement patterns, the south-eastern Australian State of Victoria has a long history of disastrous bushfires associated with periods of drought and days of extreme fire danger weather—high maximum temperatures, low relative humidities, and strong winds. Over the period 1900–2008 there were 296 recorded civilian deaths caused by bushfires [1]. In this paper we use the term 'bushfire' when discussing the Australian context, and the synonym 'wildfire' when discussing trans-national safety issues.

Following investigations into multi-fatality bushfires in Victoria, South Australia and Tasmania 1967–1983, Australasian fire agencies concluded that (a) civilians were most likely to die because of either the effects of radiant heat or as a result of a motor vehicle accident while fleeing at the last moment, and (b) suitably prepared homes could be defended against bushfires while providing a safe refuge for people during the passage of the main fire front [2]. These conclusions informed the Australasian Fire Authorities Council's (AFAC) 2005 community safety position that able-bodied people should be encouraged to remain on their property so as to defend their home when threatened by a bushfire: "...By extinguishing small initial ignitions, people of

adequate mental, emotional, and physical fitness, equipped with appropriate skills, and basic resources, can save a building that would otherwise be lost in a fire...People should decide well in advance of a bushfire whether they will stay to defend them or leave if a bushfire threatens" [3, p. 6]. This position came to be summarised as 'prepare, stay and defend or leave early' [4] and was adopted as community bushfire safety policy by Australasian fire agencies. Such a policy differs from that adopted in most North American fire jurisdictions where evacuation of residents threatened by a wildfire is the preferred community safety strategy [5]. However, following the 2009 Victorian bushfires (described below) Victoria Police reports that 113 people had perished in their homes [6] resulted in the policy coming under intense critical scrutiny [7].

Recent trends suggest that wildfires will increasingly pose threats to communities in Australia and other countries (notably the United States, Canada, Spain, and Greece) largely because of (a) climate change, (b) fuel and land management practices, and (c) increasing numbers of dwellings in or adjacent to wildland areas [8]. Improving community wildfire safety thus seems likely to challenge the capabilities of fire and land management agencies in these and other countries in the foreseeable future. More frequent serious wildfires and more households in at-risk locations requires fire agency personnel to better understand residents' safety-related decisions about staying and defending homes or evacuating, and factors likely to determine the outcomes of such decisions.

* Corresponding author. Tel. +61394795363; fax +61394791956.

E-mail address: j.mclennan@latrobe.edu.au (J. McLennan).

In the remainder of this paper we first note the limited research published so far about householders' decisions and actions during wildfires. We describe the disastrous bushfires which affected many communities in Victoria on 7 February 2009. We present findings from post-fire field interviews with a sample of survivors and relate these to householders' decisions to either stay and defend their homes or leave, and we discuss possible implications of these findings for community wildfire safety policy and practice.

1.1. Community wildfire safety research

Considerable research investigating aspects of community wildfire safety has been reported. Arguably, the largest thread of wildfire social science research has focussed on reducing vulnerability of dwellings to wildfire attack and has employed householder surveys inquiring about their wildfire mitigation intentions and actions (such as vegetation clearing and using fire-resistant building materials). The findings, overall, suggest that major determinants of householders' willingness to undertake mitigation activities include: (a) perception of bushfire risk; (b) knowledge of mitigation options; (c) acceptance of some responsibility for property protection; (d) expectations that mitigation actions will be effective; and (e) beliefs that the costs of mitigation activities are acceptable in relation to other household priorities [9–14]. Other research findings suggest the likely importance of factors such as householder gender [15]; residents' attachment to place [16,17]; and informal social community interaction networks [18].

Relatively few investigations of experiences of householders affected directly by significant wildfires and what they did in response to warnings or threats, and why, have been reported. Only four such studies were located in the literature.¹ In surveys of three US communities affected by wildfires McCaffrey and Winter [19] found that many of the 551 residents surveyed who had been threatened by a wildfire chose to wait and see what developed before making a final decision about whether the perceived risk warranted evacuation. Cohn et al. [20] interviewed a total of 183 residents of three US communities about their wildfire evacuation experiences and identified several factors which made evacuation problematic for some residents, such as uncertainty about their actual level of risk and expected lack of facilities for evacuees. Proudley [21] interviewed 38 couples affected by a nine-fatality bushfire in South Australia and concluded that a policy of 'prepare, stay and defend or leave early' failed to take into account the complexities of choices facing families – especially mothers' concerns for the safety of their children – under imminent bushfire threat. Tibbitts and Whittaker [22] analysed nine focus group discussions (73 participants) about experiences during bushfires in north-eastern Victoria in 2003, and particularly householders' understanding and actions concerning the 'prepare, stay and defend or leave early' policy. They concluded that while most residents had a good understanding of what was involved in preparing a property and defending it against a bushfire, few had a sound understanding of what was involved in leaving safely (that is, self-evacuating) before a bushfire presented a threat to life.

Taken together, the four studies suggest that the decisions householders make and the actions they take when warned of a possible wildfire threat involve several interrelated factors, such as (a) perceived risk; (b) perceived options and potential costs and benefits of acting on each; (c) household resources and vulnerabilities; and (d) prior plans and preparations. What seems to be lacking from the current literature is data from householders whose properties have been seriously threatened, or impacted, by wildfire. In particular, detailed accounts of householders' survival-related decisions and actions, including major determinants, are needed. The present study aims to contribute to remedying this knowledge gap.

1.2. The 7 February 2009 Victorian bushfires

On 7 February 2009 the State of Victoria experienced Australia's worst single day of bushfires in recorded history. Extreme fire danger weather was predicted by the Bureau of Meteorology six days in advance. Warnings of extreme fire risk expected on the day were broadcast frequently, and reported extensively in daily newspapers during the preceding week, as noted by the 2009 Victorian Bushfires Royal Commission of inquiry [7].

From mid-morning, numerous fires broke out across much of Victoria. As predicted, the weather conditions were extreme, with high temperatures ($> 44^{\circ}\text{C}$), low relative humidities ($< 10\%$), and strong winds ($> 100\text{ kph}$) across most of the State. The rainfall for the previous 12 months was well below the annual average, and this followed a decade of drought conditions. There were 173 bushfire-related fatalities in total;² more than 2000 homes were destroyed; and several communities were devastated; resulting in severe economic, social, and environmental costs, amounting to at least US\$4 billion [7].

In the aftermath of the fires a Royal Commission of inquiry was established, which delivered its Final Report on 31 July, 2010 [7]. Fire agencies were criticised for failures to provide timely warnings to communities under imminent threats. Evidence presented to the Royal Commission suggested that there may have been fewer fatalities and injuries if people had made (and acted upon) decisions more appropriate to their situation in relation to the extreme weather conditions, especially decisions to leave—self-evacuate-early. Table 1 [23] summarizes the circumstances of the 172 civilian deaths attributed directly to events on the day of the fires.

The high percentage of fatalities in or near destroyed homes contributed to subsequent modification of the 'Prepare, stay and defend or leave early' community bushfire safety policy [3] so that the dangers of staying and defending during extreme fire danger weather conditions were emphasised and leaving early was promoted as being the safer option [24]: the new policy was encapsulated as "Prepare Act Survive" [25].

2. Data collection and analysis

Immediately following the 7 February 2009 bushfires senior Bushfire Cooperative Research Centre³ staff organised a multi-agency research task force to investigate aspects of the fires and report to the 2009 Victorian Bushfires Royal Commission. A major

¹ A qualitative analysis of a sample of the Bushfire Cooperative Research Centre 2009 Victorian bushfires task force interview transcripts was reported to the Victorian Bushfires Royal Commission [39]. A preliminary analysis using data from 49 task force interviews with survivors of the Murrindindi Fire complex was reported previously [32]. While less comprehensive than the present study, the findings in both the previous reports were consistent with those reported here. Strawderman et al. [40] conducted a telephone survey of residents affected by the 2007 San Diego wildfires but the focus was on what type of warning was more likely to result in evacuation. Several studies have been reported which investigated householders' reported intentions if threatened by a wildfire [e.g., 16,41,42].

² The official total death toll due to the bushfires is 173:172 civilians and a firefighter killed by a falling tree during ongoing containment operations on 17 February [7]. It has been estimated that during the heatwave in south-eastern Australia 17 January to 8 February 2009 some 374 people died from heat-related causes not associated with bushfires [38].

³ Information about the Bushfire Cooperative Research Centre is available at www.bushfirecrc.com.

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