

Defining adequate means of residents to prepare property for protection from wildfire



T.D. Penman^{a,*}, C. Eriksen^{a,b}, R. Blanchi^c, M. Chladil^d, A.M. Gill^e, K. Haynes^f, J. Leonard^c, J. McLennan^g, R.A. Bradstock^a

^a Centre for Environmental Risk Management of Bushfires, Institute of Conservation Biology and Environmental Management, University of Wollongong, NSW 2522, Australia

^b Australian Centre for Cultural Environmental Research, University of Wollongong, NSW 2522, Australia

^c CSIRO Ecosystem Sciences, Urban Systems Program, PO Box 56, Highett, Vic. 3190, Australia

^d Tasmania Fire Service, GPO Box 1526, Hobart, Tasmania 7000, Australia

^e Fenner School of Environment and Society, The Australian National University, Canberra, ACT 0200, Australia

^f Risk Frontiers Natural Hazards Research Centre, Department of Environment & Geography, Macquarie University, North Ryde, NSW 2109 Australia

^g School of Psychological Science, La Trobe University, Bundoora, Vic. 3086, Australia

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ABSTRACT

Wildfire can result in significant loss of property and lives. Evidence shows that residents can decrease the risk of loss when they stay to defend their property. In order to safely defend a property, residents need to be adequately prepared for the wildfire conditions they face. Residents who wish to evacuate prior to the arrival of a wildfire also need to prepare their property and themselves for such an action. Despite the importance of preparation, there are no clear and quantifiable definitions of what it means to be prepared for different exposures to wildfire. Here we develop a model and definitions of what it means to be prepared for wildfire. The model considers the exposure of the property, the ability of the structure to withstand such an exposure and whether the resident(s) are adequately prepared. Preparation considers the physical and mental capacity of the residents, the condition of the grounds and the equipment available to defend the property. The model and definitions presented here focus on identifying points of weakness that should be addressed. An improved model and definitions will provide a benchmark for those residents who do prepare for wildfire, potentially reducing the risk of loss of property and life. However they are unlikely to address the large proportion of the at risk population that elect not to prepare for wildfire.

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1. Introduction

Wildfire, or 'unplanned fire', can result in significant loss of property and lives in many parts of the world [1,2]. Approximately 300,000 people were evacuated and 2223 houses were lost during wildfires in California, USA in

2007 [3]. Wildfires in Greece in 2007 resulted in 76 fatalities and approximately 850 buildings destroyed [4]. In 2009, more than 2000 houses and 173 lives were lost during the Black Saturday fires in Victoria, Australia [5,6]. While fire management agencies deploy suppression resources in an attempt to protect property and lives, there are simply insufficient resources to protect every house from such destructive wildfires [7,8].

Residents can increase the probability of the survival of built structures by 3–6 times when they stay and defend

* Corresponding author. Tel.: +61 2 4298 1232.

E-mail address: tpenman@uow.edu.au (T.D. Penman).

their property from wildfire [9–12]. In Australia, residents have historically been encouraged to stay and defend their property where they are sufficiently prepared [13,14]. This is in contrast to the USA where major evacuations preceding wildfires have been common, with the implication of greater house loss [15]. However, there has been increasing recognition in the USA of the capacity of residents in some areas to actively prepare to stay and defend or shelter in place [3,16–19].

Residents who stay to defend their property from wildfire must be adequately prepared in order to do so safely [12,14]. Residents who have defended their property from wildfire commonly report that the conditions faced were far more difficult than they expected [20–23]. This has, in many cases, resulted in residents attempting to evacuate at the very last minute as the fire front approaches. However, attempting to escape an approaching fire front is extremely dangerous and is one of the primary causes of wildfire fatalities [13,14,24,25]. This points to the importance of residents preparing adequately for wildfire as well as fire management agencies providing adequate advice on how to adequately prepare for a wildfire [26].

There is considerable confusion regarding what it means to be adequately prepared for wildfires – practically and mentally [27,28]. One of the main difficulties for residents arises when fire management agencies provide checklists regarding how to prepare a property for wildfires [29–31]. Such approaches imply equivalent ratings of factors and rarely discuss mental preparedness [28,32]. Residents believe their property is well prepared, i.e. in good condition, by being able to tick off a large number of factors on the checklist [33]. In such cases, the simplest and cheapest actions (such as mowing lawns or clearing gutters) are more likely to be adopted. However, these actions do not necessarily result in any reduction in risk to the property [34–36].

Information provided by management agencies generally has not accounted for variation in the type of fires a property may be exposed to. Fuel load, fuel structure, weather and topographic features will alter the fire intensity and severity (e.g., [37]), and hence impact on the ability of a resident to safely attempt to defend a structure. Actions which may assist residents in low severity fires are not necessarily going to be sufficient in high severity fires. For example, a 10 m wide fuel break may provide a high level of protection for a structure situated in a grass paddock in the absence of spotting but it is unlikely to provide significant protection for a structure in a contiguous forest with a high level of spotting. Similarly, it is far easier to defend a property under mild conditions compared to extreme fire weather.

Clear and quantifiable definitions of what it means to be prepared for different exposures to wildfire are required to reduce the number of houses and lives lost during wildfires. In this paper we develop a model for determining whether it is safe to stay and attempt to defend a property and provide definitions for each of the components of preparedness. The model and definitions discussed in this paper were developed during a 1-day expert workshop attended by all authors, except JM and

RB who provided additional input prior to and after the workshop. The members of the workshop were selected on the basis that they have published papers regarding fire risk at the urban interface and/or house loss. All participants are professional researchers with specialist fire experience in the fields of engineering, ecology, fire behaviour and human geography. The model and associated definitions were developed through an open discussion to achieve a group consensus supported by published and grey literature.

The model is to be used to *estimate* when it is safe for a resident(s) to *safely* stay and *attempt* to defend a property during a wildfire. It is beyond the scope of the model to predict the probability of a successful defence. The model deals with preparation within a time frame of weeks and months prior to the fire and does not consider in detail the actions of the resident on the day of a wildfire. For example, dehydration can be a major health issue for individuals defending against wildfire. Our model requires the resident to have sufficient drinking water available to combat potential dehydration, but does not provide recommendations regarding the rate of water consumption on the day or the decision to consume diuretics (e.g. alcohol).

2. Conceptual model

A conceptual model was developed to determine whether it is safe to stay and attempt to defend a property (Fig. 1). The ability to safely stay and attempt to defend a property depends on the exposure of the property, the vulnerability (construction, design, material, and siting) of the house [38] and the preparedness of the resident(s). An interaction between construction type and property exposure will determine whether it is safe for the resident to shelter in place. Similarly, an interaction between preparedness and the property exposure will determine if the resident is likely to be capable of attempting to defend the property.

Central to the model structure is the predicted exposure of the property that can be expected from a wildfire.

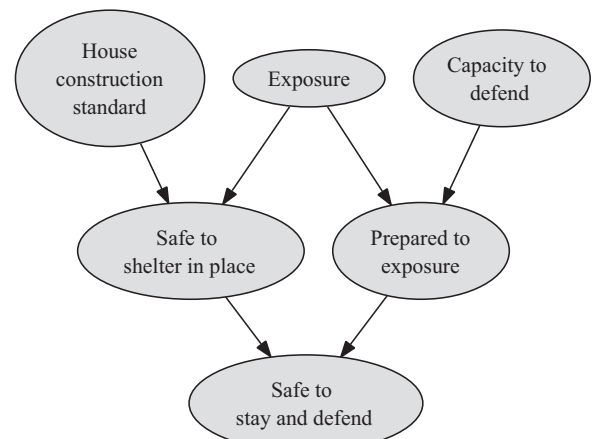


Fig. 1. Conceptual model for determining whether it is safe to stay and attempt to defend.

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