Assessing Risk to a Neighbourhood in the Wildland-Urban Interface from Bushfire Attack

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Introduction

Wildfire risk assessments can be made for a number of different purposes. They can be made in relation to biodiversity, environmental, economic or property values, physical features or processes.
The focus of this research is to look at wildfire risk assessment from a property perspective at a neighbourhood scale, in a Wildland Urban Interface (WUI) zone.

Risk Assessment

The Australian Standard for Risk Management (AS/NZS 4360: 1999) states that the level of risk is a combination of likelihood and consequence. In the context of this research where the focus is the potential risk to a house under attack from a bushfire, the terms likelihood and consequence have been defined. Blanchi et al, (2006) state that likelihood considers the persistence, nature or magnitude of the attack mechanism (embers, radiant heat, flame contact) and the chance of it occurring. Consequence as defined by the Australian Standard for Risk Management is the outcome of the event, in this case what effect does the bushfire have on the house. Consequence is largely determined by the vulnerability of the house, which considers its design, building materials, surrounding vegetation, nearby structures (eg. fence or shed) and the actions taken by home owners and fire Departments before, during and after an attack (Blanchi et al, 2006)
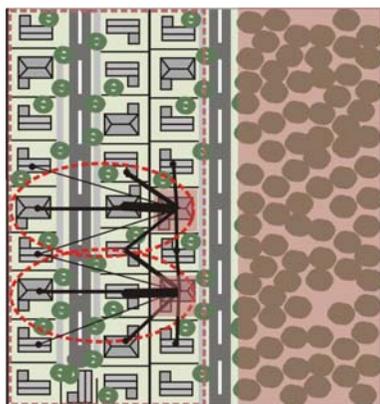

Figure 1: Fire spread through a WUI

Figure 1 above shows how a residential area may come under attack from a bushfire. Unlike a normal wildland fire, fire spread through a built up area is expected to occur through a non-uniform fuel pattern and therefore a non-continuous flame front will result (Cohen, 1994). In this example the red dotted lines show ember distribution, from both the forest and the ignited houses. As houses are ignited from the initial ember attack, they become a source of the embers themselves. Along with radiant heat and flame contact, the ignited houses and surrounding elements change from initially blocking the path of the fire to becoming a source of the attack.

(AS/NZS 4360) (1999), 'AS 4360, Risk Management' Standards Australia, Sydney
Cohen, J. D. **(1994).** Structure Ignition Assessment Model (SIAM). The Biswell Symposium: Fire Issues and Solutions in Urban Interface and Wildland Ecosystems, Walnut Creek, California, USA, Pacific Southwest Research Station.
Blanchi, R. M. and J. E. Leonard (2006). Bushfire risk at the rural/urban interface. Australasian Bushfire Conference, Brisbane.
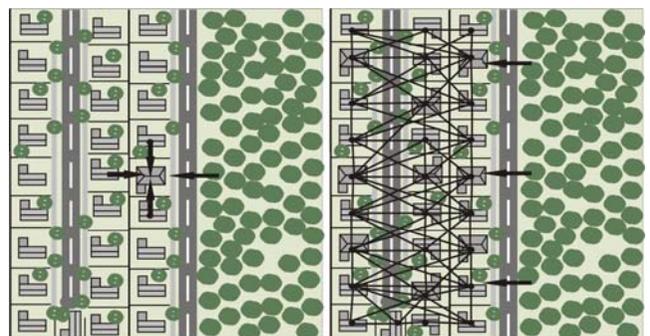
Neighbourhood Risk Assessment

Figure 2: Single House Risk Assessment (left) Neighbourhood Risk Assessment (right)

Both risk assessments consider the hazard (arrow coming from forested area) where embers and radiation attack the house and surrounding elements (trees, sheds, wood heaps, etc) which effect the house's probability of destruction.

Single House Risk Model
- Predict probability of destruction of a single target house
- Takes into account elements which are immediately adjacent to the target house
- Assumed probability of ignition of a generic adjacent house which impacts on the target house

Neighbourhood Risk Model
- Assumes all objects (houses, trees, fences, sheds, etc) within the spatial extent of the neighbourhood can have an effect on house survival
- Acknowledges the interdependency of house loss risk
- Determines relative risk for all houses and then resolves risk for a whole neighbourhood

Results

The primary outcome of this project will be a GIS-based toolbox coupled with a high-resolution spatial database of a specific WUI zone, that can assist the prediction of fire destruction in a WUI area, in probabilistic terms, under different weather conditions and taking into account alternative human intervention scenarios.
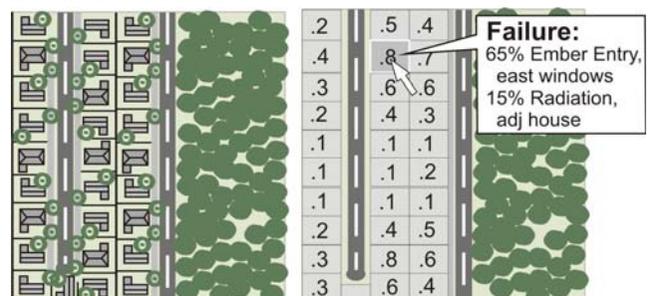

Failure: 65% Ember Entry, east windows 15% Radiation, adj house

Figure 3: Neighbourhood Risk Assessment

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