

Home Retrofits and Preparation

Introduction

A large proportion of existing houses in bushfire-prone areas within Australia were designed to outdated bushfire safety standards, or with no provisions for bushfire safety at all. These ‘legacy’ buildings often feature exposed combustible materials and other building elements that are vulnerable to bushfire attack.

By upgrading, or ‘retrofitting’, existing homes, their chances of surviving future bushfires can be substantially improved. Such home retrofits can be an essential tool to assist efforts to build more bushfire-resilient communities. However it remains a challenge to motivate residents to retrofit their homes, and to empower them to retrofit in effective ways.

This document is one of several *Bushfire Research Briefs* that summarise research findings by the University of Wollongong (UOW) on the Kangaroo Valley community’s

activities and perspectives regarding bushfire-resilience. This study was particularly focussed on community preparations and responses to, and recovery from, the impact of the Currowan Bushfire on Kangaroo Valley, NSW, in January 2020.

In-depth interviews with residents, community leaders, businesses, emergency agencies and local government were undertaken, and detailed site assessments were conducted, to record details of houses that survived the fire, as well as those that were destroyed.

This particular *Bushfire Research Brief* focuses on techniques that can be employed to retrofit and prepare bushfire-prone buildings. It is not a ‘how to’ guide, rather it explains the findings of the Kangaroo Valley study that are relevant to people retrofitting and preparing for future bushfires, and to those providing guidance to residents on how to retrofit their homes.



Clearing dense scrub from around the home.



Temporary fibre cement shutters.



Before the fire.



House that withstood the intense impact of the Currowan Fire in Kangaroo Valley and (above) preparations before the fire (photos – Mark Bugden).



Currowan Fire about to impact a Kangaroo Valley home looking towards the pyrocumulonimbus cloud (photo – Paul Cooper).

Common vulnerabilities that retrofits can address

For a house to survive a bushfire, the fire must be prevented from taking hold indoors or on the outer surfaces of the building. There are three primary vulnerabilities that need to be addressed.

1. Gaps and openings that could allow airborne embers to be blown indoors, e.g. gaps under doors, around windows or between roof sheets/tiles, etc.
2. Fragile building elements that could be broken by extreme winds, heat or flying debris during a bushfire. Examples include glass doors and windows, as well as poorly fastened roof sheets, fascia, etc.
3. External building elements that can catch fire. For example: flammable timber decking or posts can allow flames to spread to walls and windows; timber joists/bearers under a suspended floor can burn through the floor; and flammable cladding can ignite, due to radiant heat or direct flame contact, and then set fire to other building components, such as eaves.

In the Kangaroo Valley study, the following building vulnerabilities were most common.

- Unprotected standard windows and doors (i.e. not toughened glass) were found on 89% of properties.

- Timber decking or timber verandah posts (79% of properties).
- Combustible fascia or bargeboards at the edges of roofs (63% of properties).
- Combustible wall cladding (47% of properties).

Vulnerable features that were less common (found on 15–40% of properties) included: gaps larger than 3 mm in walls, around doors and around steel roof sheets; unenclosed subfloor spaces with timber supports; and exposed plastic water pipes.



Metal mesh retrofitted over kitchen exhaust vent (left) and fire resistant sealant used to fill small gap.



Temporary steel sheets window shutters (photo Paul Cooper).

Experiences in Kangaroo Valley

The lived experience of people in Kangaroo Valley brings into stark relief just how dangerous small vulnerabilities in a building can be. Residents from three properties described how they had extinguished burning verandah posts on the morning after the Currowan Fire, for example.

One resident saved a neighbour's house by dragging burning curtains outdoors. The curtains appeared to have ignited after a glass door shattered.

ONE YEAR BEFORE FIRE



JUST BEFORE FIRE IMPACT



Vegetation clearance and mitigation measures adjact to a house immediately prior to Currowan Fire (photos – Paul Cooper).

Vulnerabilities that were typically overlooked, and why

Even the residents who retrofitted their buildings extensively were not able to address every vulnerability. Unprotected windows, timber decks/verandahs, timber posts and timber fascia/bargeboards were often not addressed.

One major barrier preventing wider implementation of retrofits was the **relatively low level of knowledge** amongst residents of what makes buildings vulnerable to bushfire and how those vulnerabilities can be addressed. All residents remembered general advice, such as that gutters should be blocked and filled with water. But many reported not having good knowledge of how the building itself could be modified to protect it from bushfire.

Residents who did retrofit generally needed to take a personal initiative to learn about retrofit techniques. This involved seeking out sources of information, evaluating and synthesising advice from multiple sources,

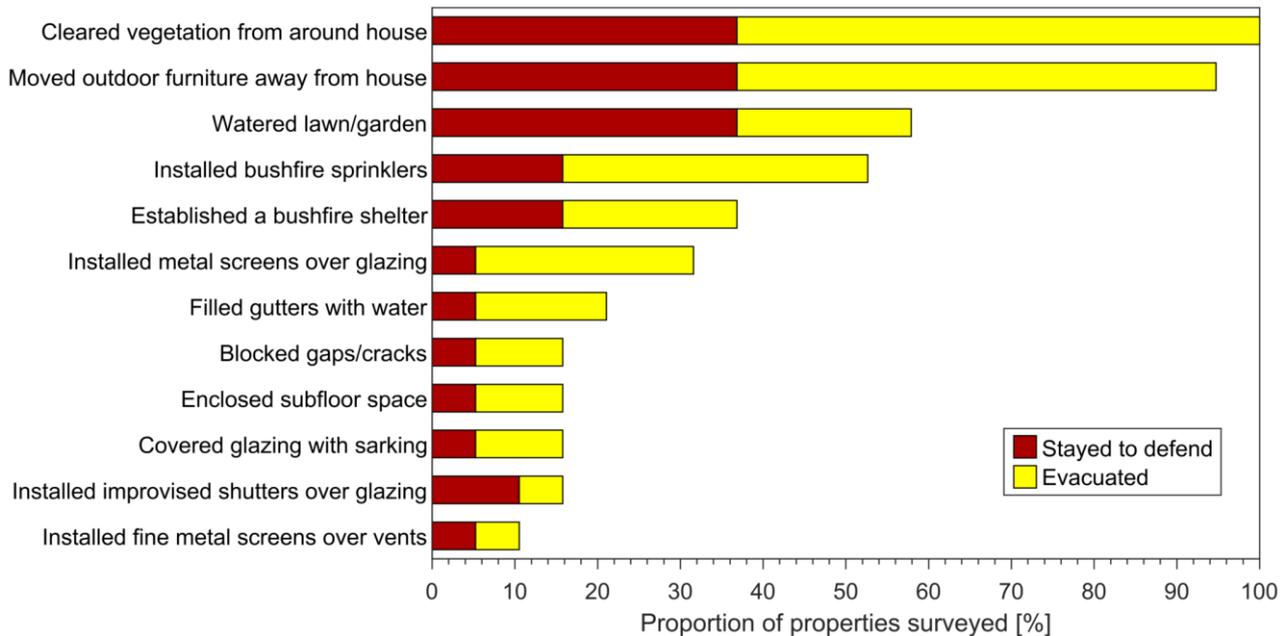
and interpreting how the advice applied to their specific context.

The **perceived cost and complexity** of retrofits was another significant barrier. There was a common sentiment amongst residents that ‘you can only do so much’. While individuals choose to manage and accept risk in a variety of different ways, residents in bushfire-prone areas need to understand the risk they face and what can be done to mitigate it (e.g. retrofits) in order to make informed risk-management decisions. Many residents in Kangaroo Valley reported making decisions around how much preparation was ‘enough’ by weighing up the intangible/unquantifiable reduction in risk that further action would achieve, against their personal impression of how complex and costly those further preparations would be.

The third major barrier preventing residents from retrofitting was their **limited personal capacity** to anticipate what could be done, and to undertake the work themselves. All the residents who undertook extensive

retrofits had some form of technical background, and had previous ‘hands on’ experience in building and/or modifying their houses. Residents without such

experience faced a much more significant challenge, and typically were not able to explore ways to retrofit their homes independently.



Summary of property preparation and home retrofits undertaken on the properties surveyed.

Challenges and opportunities in the face of future bushfires

To address the large number of vulnerable ‘legacy’ buildings in bushfire-prone areas, residents need to be empowered to make evidence-based decisions when managing the bushfire risk on their property.

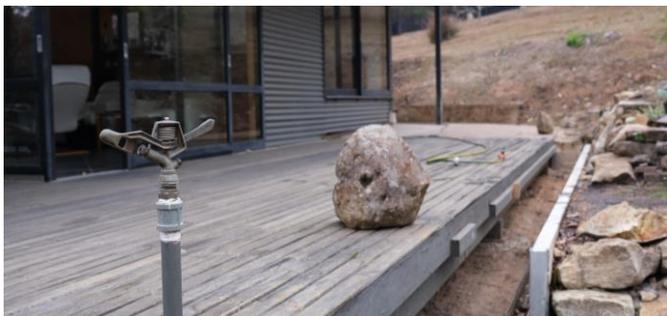
The communication of appropriate guidance on how to retrofit for bushfire is clearly a key challenge. To overcome the three barriers identified in this *Bushfire Research Brief*, retrofit guidance needs to:

1. Be detailed and comprehensive enough to guide a resident through the assessment of their building and the decisions on what retrofit actions to take;
2. Equip the resident to estimate the risk reduction that planned retrofits would achieve, as well as the associated cost and complexity of work; and
3. Cater to residents with little or no prior experience in construction techniques or materials.

It is extremely difficult to develop simple, written sources of guidance that meet all three of these needs. Delivery of guidance in a more versatile way, e.g. through face-to-face conversations, could prove more effective.

There are currently gaps in the scientific evidence on the effectiveness of particular bushfire retrofits. These gaps need to be addressed so that guidance for householders can be developed on the bushfire risk reduction achieved by specific retrofit actions on their homes.

For example, several residents in the Kangaroo Valley study asked whether external bushfire sprinklers are worth installing on their houses, and how to design such sprinkler systems, but the current level of scientific understanding does not allow their effectiveness to be quantified, or compared to the effectiveness of alternative measures, such as window shutters.



*Bushfire sprinkler on a vulnerable timber deck
(photo – Paul Cooper).*

Finally, many of the building retrofits undertaken in Kangaroo Valley involved temporary and ad hoc measures, such as boarding up windows with sheets of fibre cement or steel. A disadvantage of some such measures is that there may not be enough forewarning before future fires to allow them to be installed. However, in many cases these ad hoc retrofit represent a much more cost-effective alternative to commercial products sold for the same purpose (e.g. bushfire-rated window shutters). The further development these kinds of simple, inexpensive retrofits could facilitate much more widespread action by residents in the future.

Additional Resources

The following resources and links provide more details on how buildings can be

retrofitted to improve their resilience to bushfires and how householders can better prepare for bushfire emergencies.

- *Bushfire best practice guide*, CSIRO, <https://research.csiro.au/bushfire/>
- *Essential bushfire safety tips*, by Joan Webster 3rd edition (Melliodora Publishing, 2021).
- *The complete bushfire safety book* by Joan Webster (Random House Australia 2000).
- *Retrofit your home for better bushfire protection*, released by VBA and CFA, www.docplayer.net/176802-A-guide-to-retrofit-your-home-for-better-protection-from-a-bushfire.html.
- www.rfs.nsw.gov.au/plan-and-prepare/prepare-your-property.
- *The RFS Household Assessment on-line tool* <https://assessmyrisk.rfs.nsw.gov.au/>
- *Retrofitting for wildfire resilience: what is the cost?* By Penman et al. (Int. Journal of Disaster Risk Reduction 2017).
- Australian Standard AS 3959:2018, Construction of buildings in bushfire-prone Areas.

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If this document has raised challenging issues for you, Lifeline Australia provides crisis support 24 hours a day: call 13 11 14 or see <https://www.lifeline.org.au>