



# “Should I Stay or Should I Go?”

## Defining the Preparatory Conditions in Support of Active Defence for Different Fire Danger Ratings

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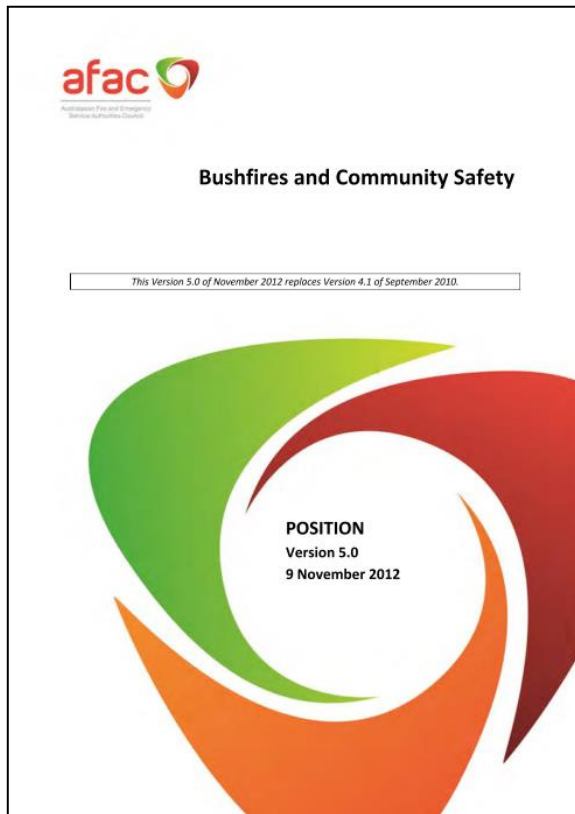
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## Background



*People usually have two safe options when threatened by bushfire: leaving early or actively defending **adequately prepared properties**.*

*Active defence is only safe if the household is prepared to **a sufficient level**.*



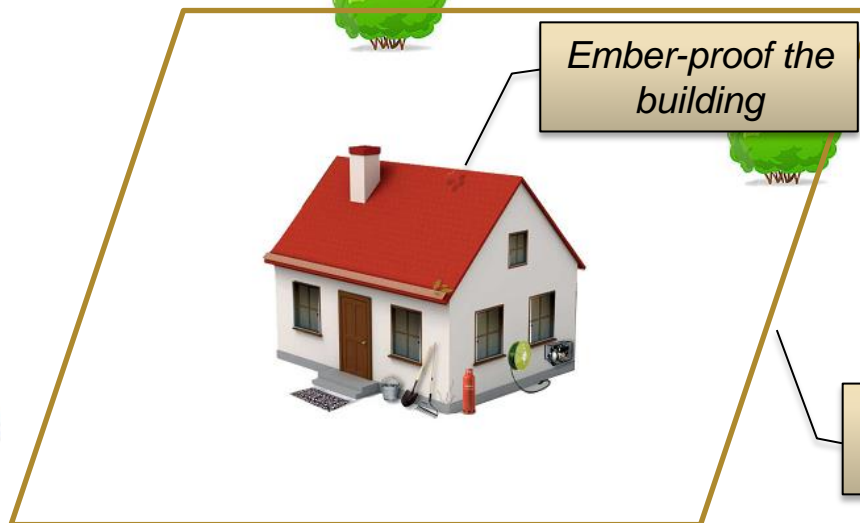
# What are the necessary preparations for staying and defending?

## HOUSEHOLDERS' COMPETENCE IN DEFENDING THEIR HOME

*Be (physically, mentally and emotionally) fit; develop contingency plans*



*Personal protective equipment, adequate water supplies and firefighting equipment*



**HOUSE DEFENDABILITY**





**CHECKLIST PREPARING YOUR PROPERTY** PAGE 1 OF 3

Prepare your home and property for the bushfire season. It is everyone's responsibility. If you live in or near bush take the time to complete and action this checklist.

**STARVE THE FIRE**

Reduce the fuel loads around your home so that embers will have less chance to start a fire when they hit the ground. This will also help reduce the damage caused by the fire.

For at least 20 metres around your home and other buildings:

- Cut long grass and dense scrub. Remove dead material.
- Remove all rubbish and rake up leaf litter, twigs, bark and material that may catch fire.
- Maintain a minimum two metre gap between your house and tree branches. Make sure that no trees overhang the house.
- Prune lower branches (up to two metres off the ground) to stop a fire on the ground spreading to the canopy of the trees.
- Do not clump shrubs, ensure that there is a gap. Shrubs should be planted at a distance of at least three times their height at maturity from buildings.

Other actions you will need to take:

- Keep your gutters free of leaves and other combustible material.
- Create a mineral earth firebreak, with no vegetation along your boundary.
- Build your paths adjacent to the building and have your driveway placed so that it maximises the protection to the house.
- If possible, plan your garden so that your vegetable garden, lawn, pool or patio is on the side of the house likely to face a fire (where the bush is).
- Store firewood away from the building.
- Ensure that your gas bottles are secured and positioned so that it will vent away from the building if it is subject to flame contact or radiant heat.
- Ensure fences are non-combustible so they can help to shield your home from a bushfire and radiant heat.

**FILL THE GAPS**

Houses usually catch fire when embers get into the roof space, a wall cavity, on to ledges or under the house. Prevent sparks from entering your house by blocking all the gaps.

- Block any gaps under floor spaces, in the roof space, under eaves, external vents, skylights, chimneys and wall cladding.
- Place metal fly wire mesh on all windows, vents and install an ember protection screen on evaporative air conditioners to keep sparks and embers out.

**FIX THE FIRE TRAPS**

- Do not pile wood against or near the house.
- Remove any timber, rubbish and old junk lying around.
- Move all fuel containers into a shed away from your house and have a firebreak around it.
- Keep gas cylinders on the side of the house furthest away from the likely direction of a fire (where the bush is). Ensure the pressure relief valve is directed away from the house. Store gas cylinders upright and secure them with a metal chain to a secure, non-combustible post to prevent cylinders from falling over.

**PROTECT YOUR ASSET**

- Have a sufficient independent water supply of at least 20,000 litres and a petrol, diesel or a generator powered pump capable of pumping 400 litres per minute.
- Check that your home and contents insurance cover is adequate. Take into consideration renovations, fixtures and additions such as swimming pools, sheds, gazebos, luxury fittings or new appliances.

# What is the 'sufficient level' of household preparedness for staying and defending?



*Is my home sufficiently prepared?*

*Can I stay and defend?*



## Current knowledge

### Australian Fire Agencies:

↘ Checklists of household preparatory items for staying and defending

Providers	Source File Name
Country Fire Authority (VIC)	Prepare. Act. Survive
Queensland Rural Fire Service (QLD)	Prepare. Act. Survive
Department of Fire and Emergency Service (WA)	Prepare. Act. Survive
ACT Fire & Rescue (ACT)	Prepare. Act. Survive
NSW Rural Fire Service (NSW)	Prepare. Act. Survive
Country Fire Service (SA)	Prepare. Act. Survive
Tasmania Fire Service (TAS)	Prepare. Act. Survive
American Red Cross	Wildfire preparedness
Federal Emergency Management Agency	Checklist for Homeowners



**Lack of consistency!**



# Current knowledge

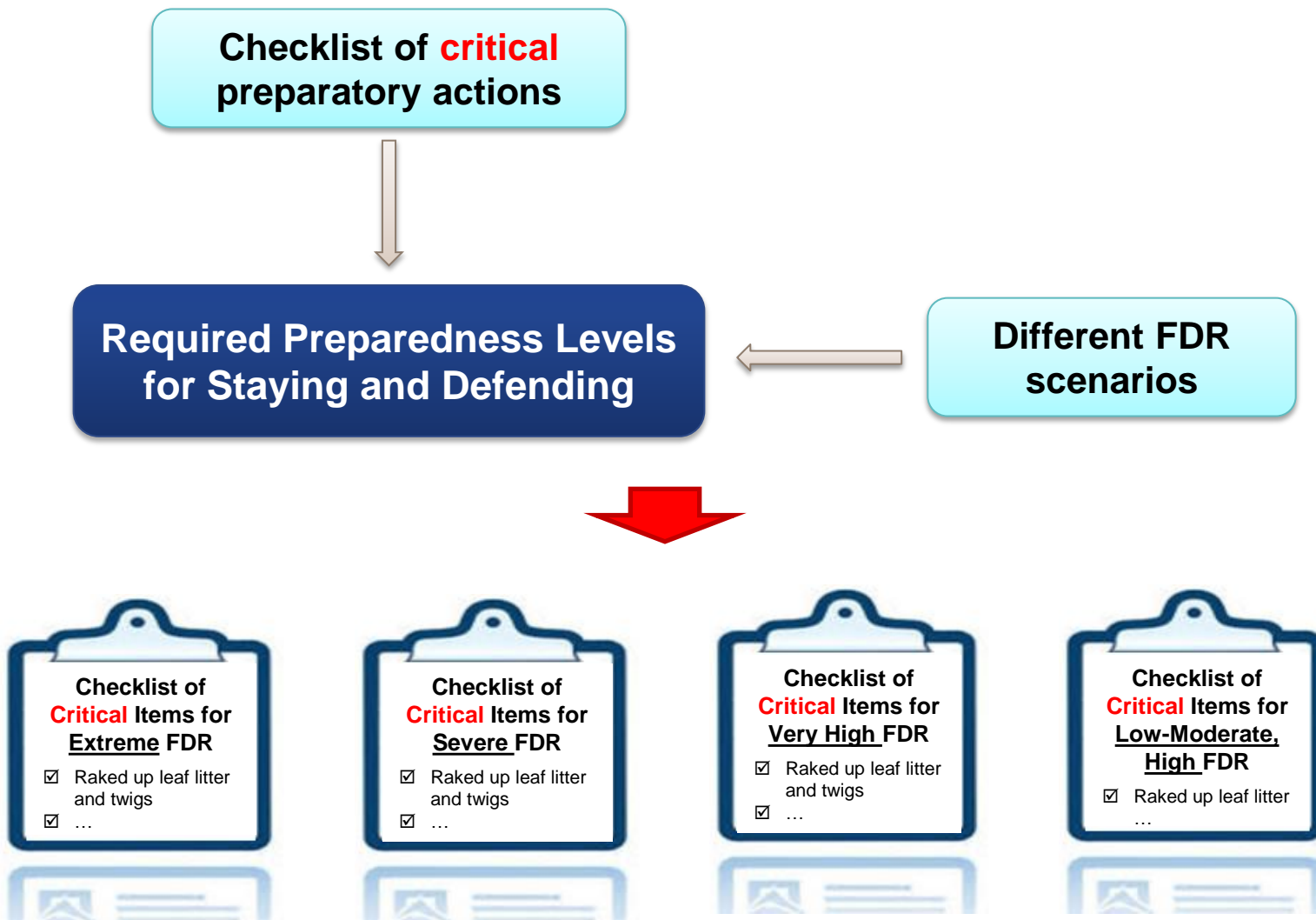
## Australian Fire Agencies:

➤ Required preparedness in relation to **Fire Danger Ratings**



FIRE DANGER RATING	STAYING AND DEFENDING CAN ONLY BE CONSIDERED IF YOUR HOME IS...						
	CFA(VIC)	RFS(QLD)	DFES(WA)	ACT	RFS(NSW)	CFS(SA)	TFS(TAS)
<b>CATASTROPHIC</b>	Never	Never	Never	Never	Never	Never	Never
<b>EXTREME</b>	<i>situated and constructed or modified to withstand a bushfire, prepared to the highest level and can be actively defended</i>	Never	<i>prepared to the highest level with no doubt, constructed to bushfire protection levels and can be actively defended</i>	<i>well prepared, specifically designed and constructed for bushfire and can be actively defended</i>	<i>prepared to the highest level and can be actively defended</i>	<i>prepared to the highest level, constructed to bushfire protection levels and can be actively defended</i>	<i>well-prepared and well-constructed and can be actively defended</i>
<b>SEVERE</b>	<i>well prepared and can be actively defended</i>	<i>well prepared and well-constructed</i>	<i>well-prepared and actively defended</i>	<i>well prepared and can be actively defended</i>	<i>well prepared and can be actively defended</i>	<i>well prepared and can be actively defended</i>	<i>well-prepared and can be actively defended</i>
<b>VERY HIGH</b>	not stated			not stated	not stated	not stated	
<b>HIGH</b>							
<b>LOW-MODERATE</b>		not stated					

**What are the required preparedness levels?**

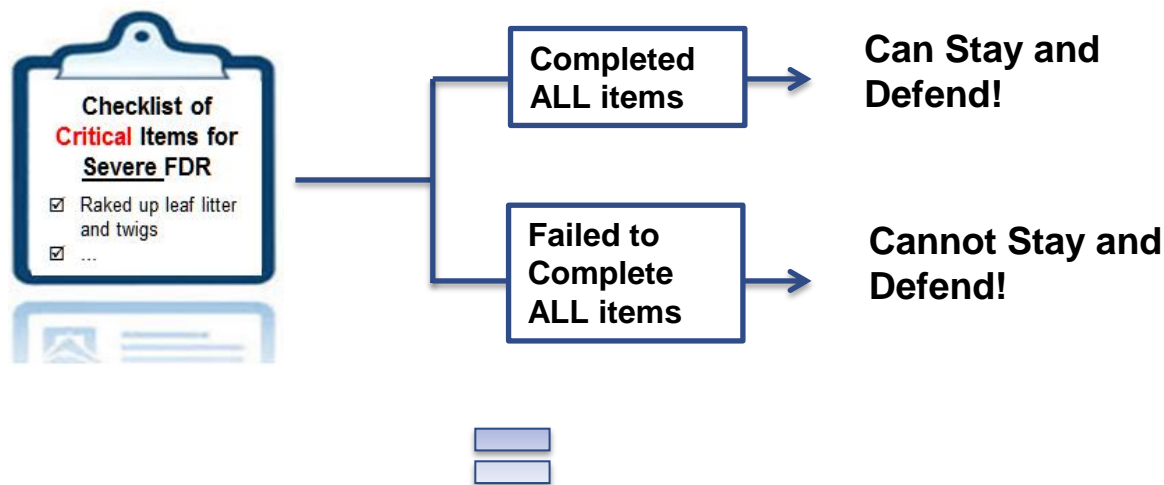




## What does 'critical' mean?

### Example:

When a fire starts and the FDR in the fire district is Severe, for households with a plan to stay and defend their properties...



**A Minimum and Essential Preparatory Condition for Staying and Defending**





## Research Questions

- Are some preparatory actions critical for staying and defending whilst some are not so?
- Is there a relationship between critical preparatory actions for staying and defending and the FDRs?



# Household Preparedness Survey

## Materials:

↘ Collective checklist of 100 preparatory actions

Categories		Code	Number of preparatory actions	
<b>HOUSE DEFENDABILITY</b>	To create defensible space, ...	Create an <i>Outer Zone</i> by managing vegetation and reducing fine fuels.	D1	7
		Maintain vegetation and clear fine fuel within the <i>Inner Zone</i> .	D2	12
		Clear flammable materials within the <i>Inner Zone</i> .	D3	5
		Create fire breaks within the defensible space.	D4	5
	To Ember-proof the house, ...	Clear fine fuels and combustible materials on the building.	D5	4
		Block all gaps in a structure and place metal fly wire mesh on all vents.	D6	13
		Use non-combustible building materials.	D7	9
<b>PEOPLE, RESOURCE AND EQUIPMENT TO ACTIVELY DEFEND</b>	Prepare equipment for actively defending.	D8	10	
	Prepare water resource for actively defending.	D9	5	
	Prepare food and water supply for people who are actively defending the home.	D10	4	
	Prepare survival kit.	D11	7	
	Ensure accessibility for firefighters.	D12	3	
	Ensure coping capacity of those who are staying and defending the home.	D13	6	
	Prepare psychologically for staying and defending.	D14	6	
	Plan for staying and defending.	D15	3	
Prepare a fire shelter or bunker to shelter in home as a last resort.	D16	1		



# Household Preparedness Survey

## Method:

- Rate each household preparatory item to indicate the FDR(s) for which it becomes critical to complete the action in order to be 'well-prepared' for defending.

### *Survey Question Example:*

At which Fire Danger Rating (FDR) level(s) does this preparedness action become critical and therefore need to be completed by the household in order to stay and defend?

- Low-Moderate, High and all levels above
- Very High and all levels above
- Severe and Extreme
- Extreme only
- Not critical at any levels
- Not sure

**Note:** The FDR level of Catastrophic is not included, because according to Australian fire authorities, people should never stay and defend under this circumstance regardless of preparedness.



# Household Preparedness Survey

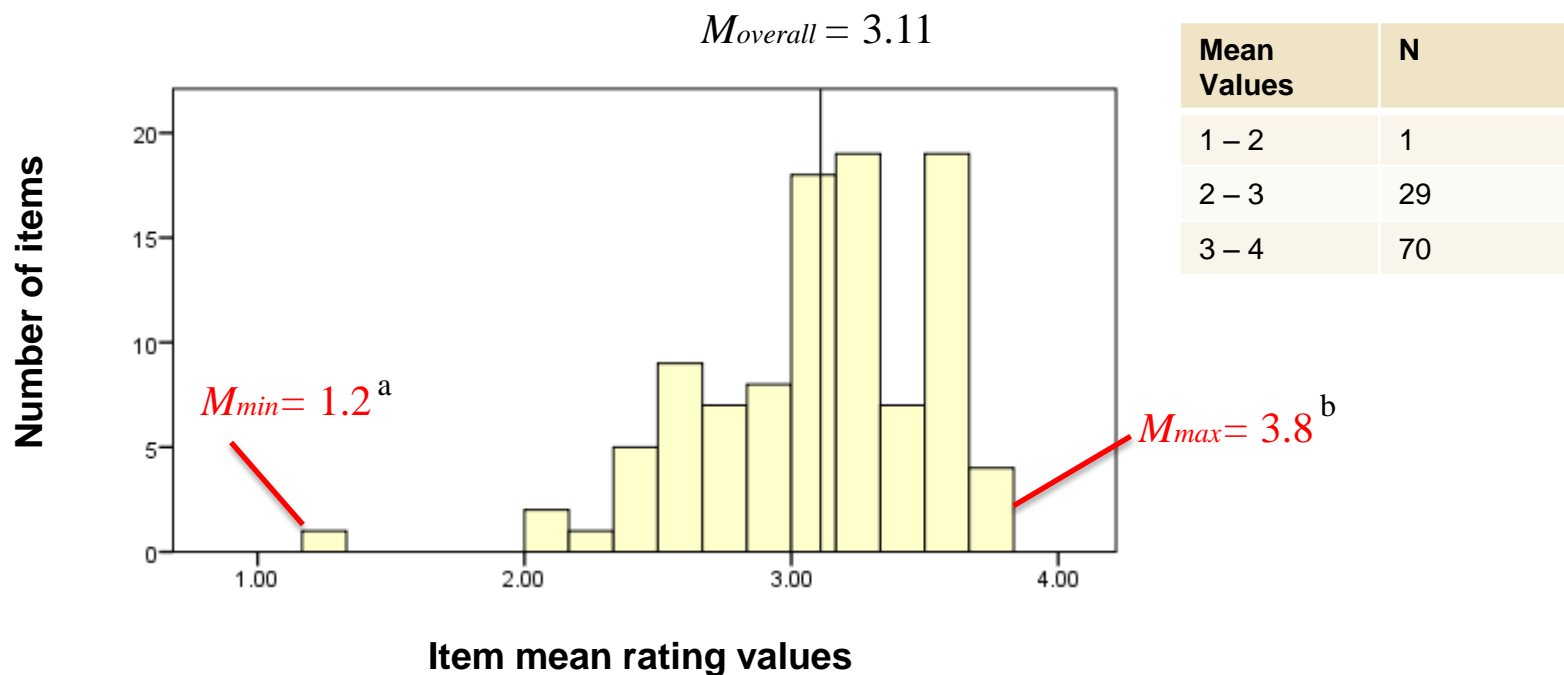
## Results:

Rating results from the survey	Code
<i>The preparatory item is critical at the FDR Levels of ...</i>	
Low-Moderate, High and all levels above	4
Very High and all levels above	3
Severe and all levels above	2
Extreme level only	1
Not critical at any levels	0
Not sure	Missing Value



**Importance Scale**

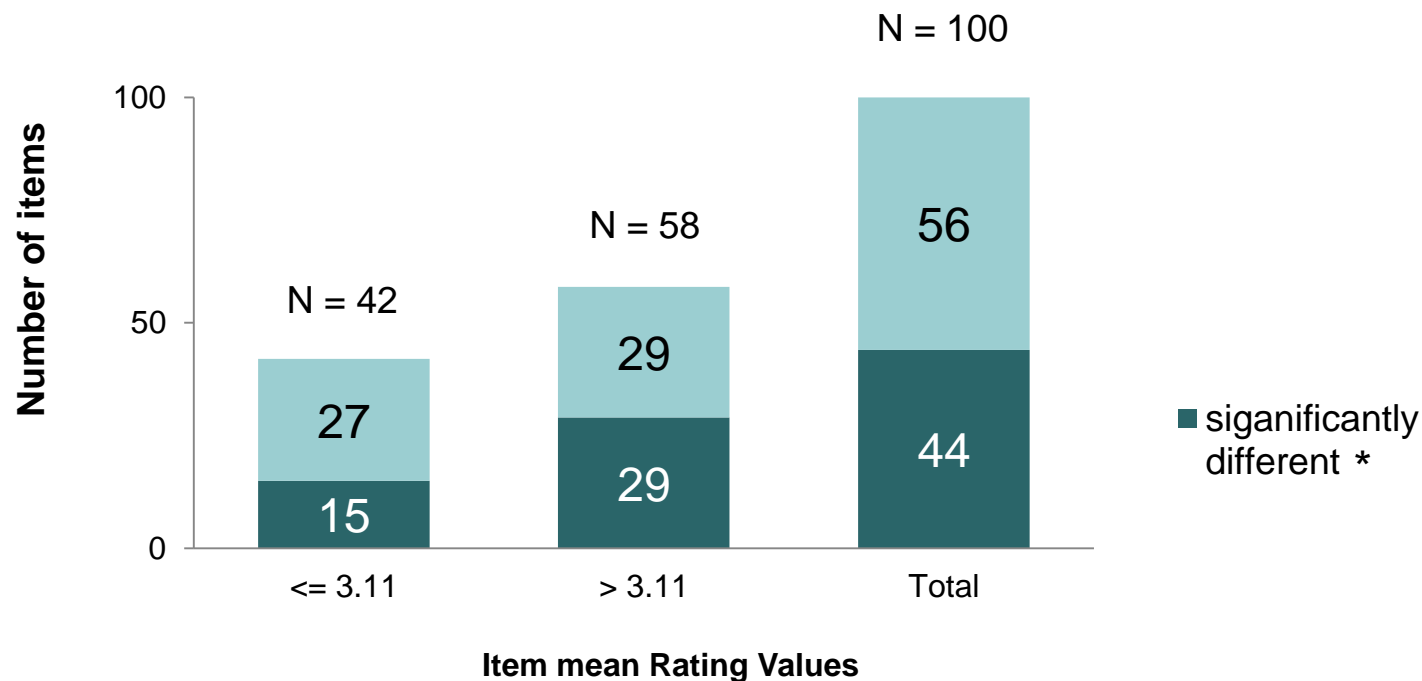
## Average rating values (among all raters for each preparatory item):



- a. 'Have a fire shelter or bunker built in the home which can provide shelter for people. (It must comply with building regulation for private bushfire shelters, regarding things such as accessing and exiting the shelter and tenability of air supply.)'
- b. 'Have prepared full length protective clothing (wool, cotton) for all the family members who are staying to defend, including gloves, eye protection, smoke mask, work boots, and a broad brimmed hat.'



## Average rating values compared to $M_{overall} = 3.11$ :



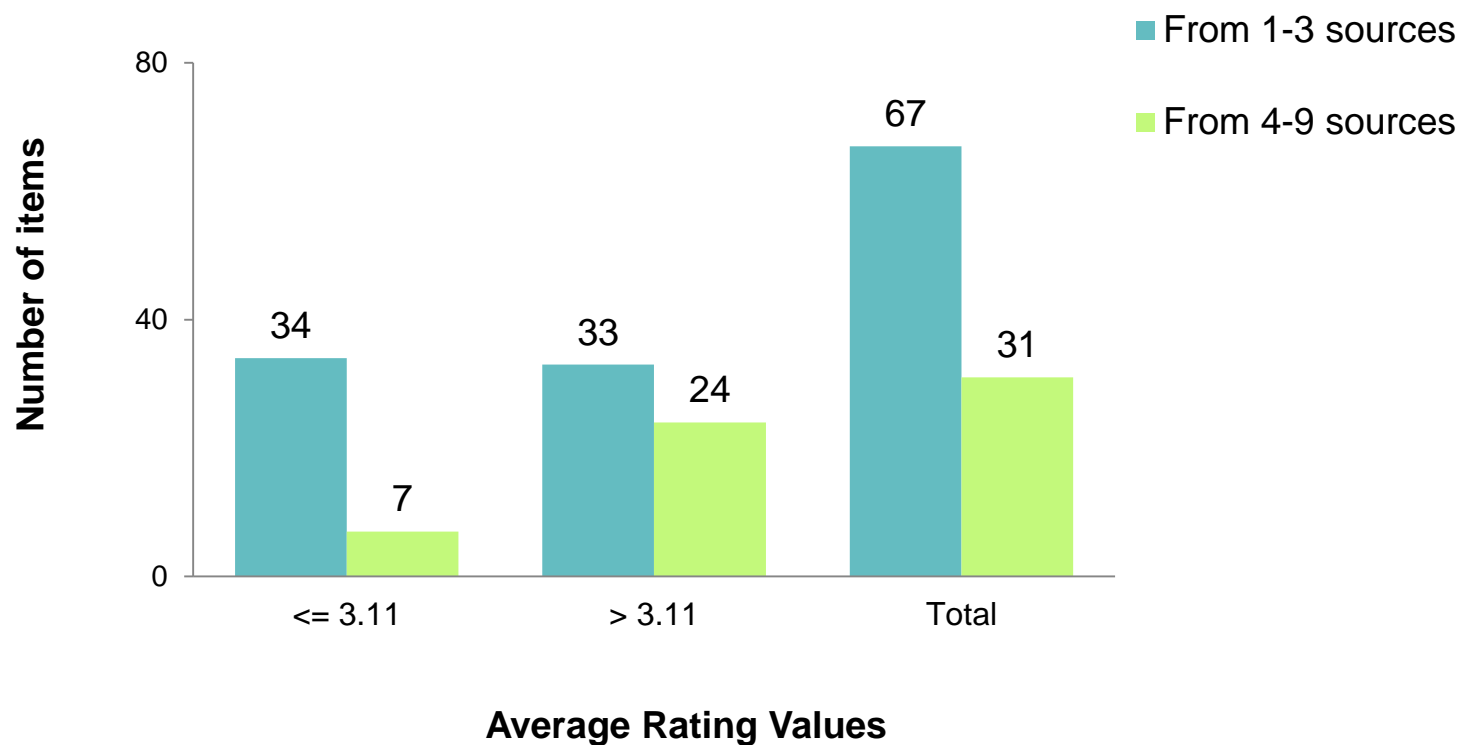
\* Based on one sample t-tests,  $p < .05$



**The criticality of the preparatory actions should vary at different FDRs**

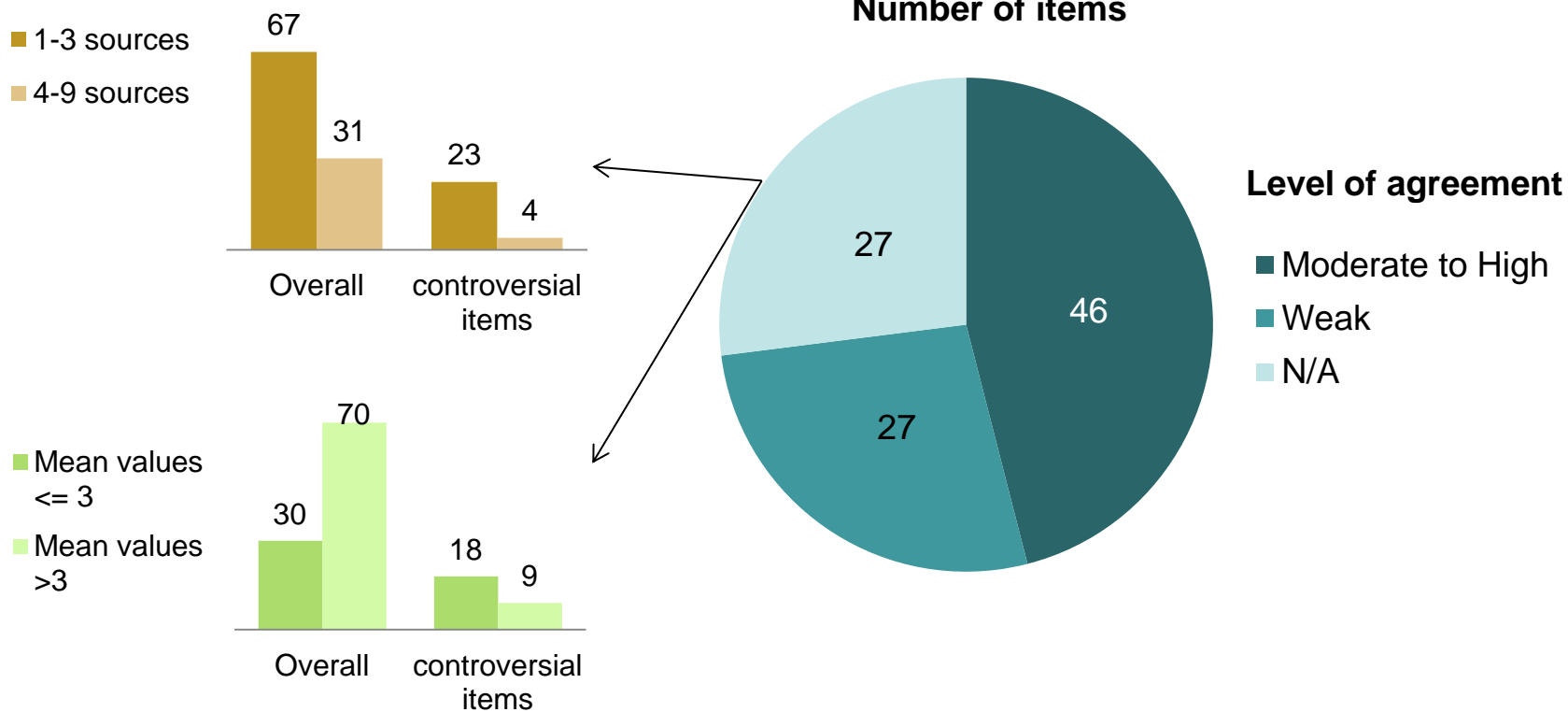


## Average rating values vs. Number of sources





## Interrater agreement ( $r_{wg}$ )









## Observation

Low mean score → Less referenced

Controversial → Less referenced

 Less referenced items are less important and more controversial

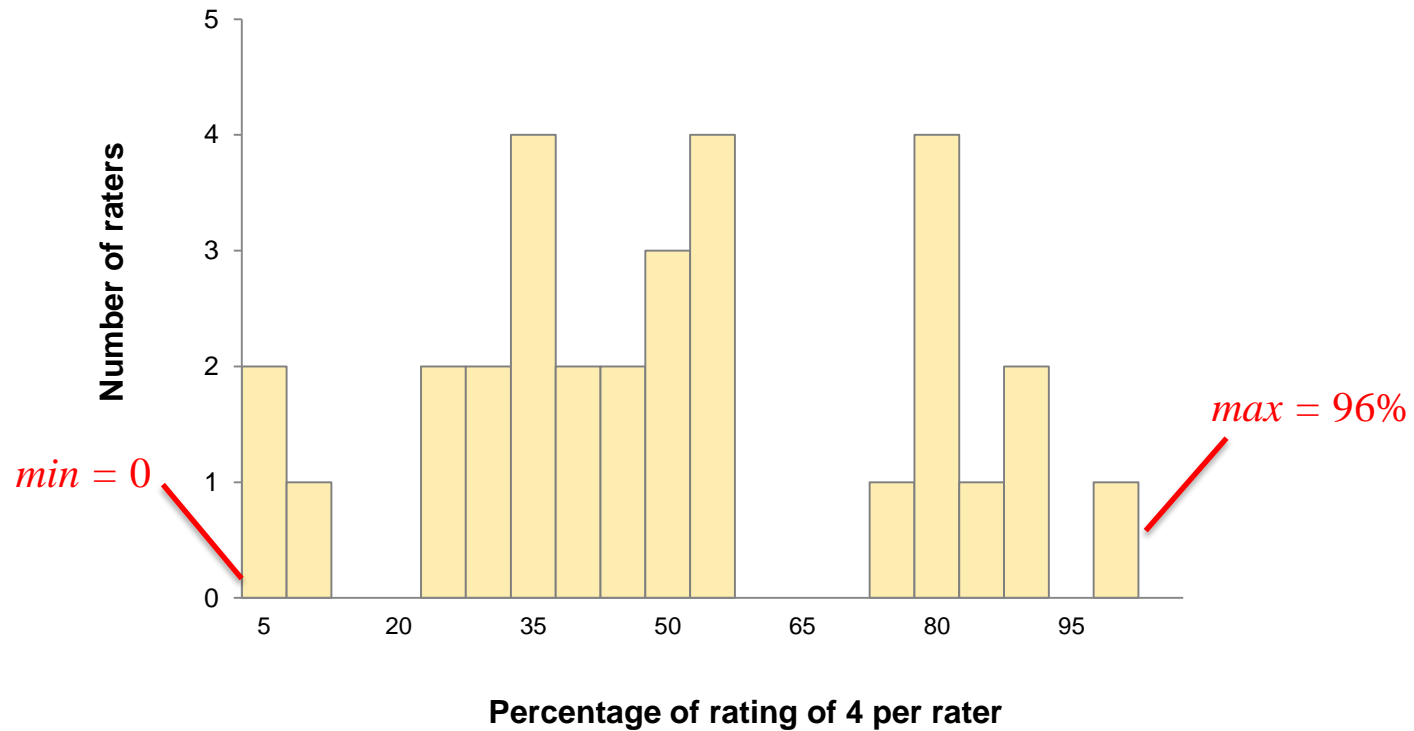
Controversial → Low mean score

 Discrepancy mostly happens when a group of experts provide an item with low rating scores



## Different rating approaches adopted by raters:

↘ Conservative vs. radical



### *Controversial Items. Example 1*

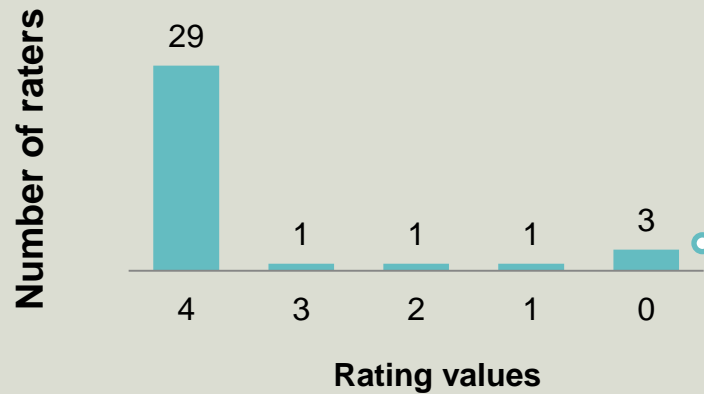
‘Install wire mesh screens 1.5mm (not aluminium) over all external doors.’





### Controversial Items. Example 2

‘Ensure that smoke alarms are fitted on every level of the house.’



*‘Will not provide reliable warning of fire in the home due to presence of bushfire smoke’*



## Results for checklist refinement:

Rewording of 8 items

Additional preparatory items:



refined checklist of 104 items

- 'Ensure the areas around gas cylinders near to the house are clear of ground fuel'.
- 'Conduct controlled burning on your property to reduce the fuel load within the last 6 months'.
- 'Have decided beforehand under which specific conditions (e.g. the fire danger rating, whether or not there are visitors over) they will defend and under which they will evacuate'.
- 'Ensure your neighbours know about your household's intended fire plan'.



## Conclusion of the survey

- Not all preparatory items are critical for making the decision of staying and defending.
- The criticality of the preparatory actions should be examined in relation to FDRs.
- There is promise to obtain experts' consensus on at least half of the checklist.
- Diverse approaches were adopted during the individual rating process, and thus a more explicit study should be undertaken.



# Household Preparedness Workshop

*March 22<sup>nd</sup>, 2013*

## Objective:

Obtain experts' **consensus & clarification** on the 'criticality' of each preparatory item for defending a home in different Fire Danger Rating (FDR) scenarios.

## Participants:

10 agency experts specialising in bushfire community safety issues from 5 states.



# Household Preparedness Workshop

March 22<sup>nd</sup>, 2013

## Method:

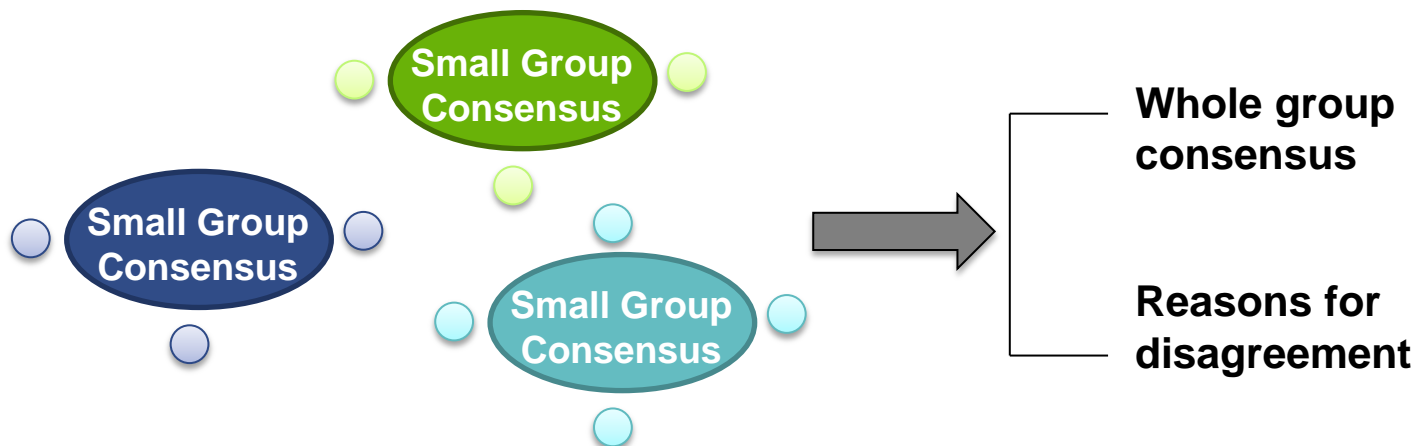
A modified consensus decision-making approach

### Step 1. Small group ratings

Rate, in each small group, at which FDR(s) one item becomes critical to be completed by a household for the goal of successfully defending a home.

### Step 2. Large group discussion

Compare group answers to obtain consensus on the rating results & better understand the controversial items.







# Household Preparedness Workshop

*March 22<sup>nd</sup>, 2013*

## Results:

- ✓ Refined list of 97 preparatory items
- ✓ A checklist of 36 preparatory items rated as critical (regardless of FDRs) by all three small groups
- ✓ A list of 33 preparatory items that were identified as helpful but not critical by all three small groups
- ✓ A list of 28 controversial preparatory items for which consensuses were not obtained among the three small groups



List 1. critical items with consensus (regardless of FDRs)

Preparatory Item		Critical at the FDR of ...	
		Original results	Conservative approach
IV.2	Seal gaps in all joins between external walls and cladding.	<div style="border: 1px solid black; background-color: green; color: white; padding: 2px; display: inline-block;">All FDRs</div> <div style="border: 1px solid black; background-color: yellow; color: black; padding: 2px; display: inline-block;">Very High</div>	<div style="border: 1px solid black; background-color: green; color: white; padding: 2px; display: inline-block;">All FDRs</div>



## List 2. Non-critical items with consensus

Preparatory Item		Critical at the FDR of ...
		Original results
IV.13	Install wire mesh screens 2.0mm (not aluminium) over all external doors.	<div data-bbox="1286 882 1418 933" style="border: 1px solid black; padding: 2px; display: inline-block;">Not Critical</div>



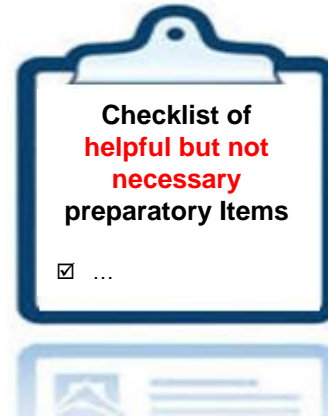
### List 3. Items with no consensus regarding their criticality

Preparatory Item		Critical at the FDR of ...	
		Original results	Conservative approach
1.9	Have taken into account that active defence could last for many hours to days.	<div style="border: 1px solid black; background-color: yellow; padding: 2px; display: inline-block; margin-bottom: 5px;">Severe</div> <div style="border: 1px solid black; background-color: lightgrey; padding: 2px; display: inline-block;">Not Critical</div>	<div style="border: 1px solid black; background-color: yellow; padding: 2px; display: inline-block;">Severe</div>



# Possible Application

## An Average Australian Home



Staying and defending is never 100% safe.

You should always be prepared for the possibility that your home may still be destroyed even if actively defended.

*I should at least prepare for the critical checklist in order to stay and defend in normal fires.*



*YES! I am probably well-prepared to stay and defend for this fire condition!*





## Acknowledgement

Thank all the experts who generously contribute to the survey and workshop!

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