

Review

Protective Decision-Making in Bushfire Part 1: A Rapid Systematic Review of the ‘Wait and See’ Literature

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Abstract: Delaying protective action decision making in wildfire is inconsistent with fire authorities’ advice and is associated with fatalities. A comprehensive understanding of why at-risk residents wait and see whether they will evacuate from a wildfire or remain to shelter or defend can better inform wildfire safety policy and practice. This systematic review reports the findings of 40 papers selected from 255 identified through a search of papers in Scopus, Science Direct and Google Scholar published between 1995 and December 2020 in English. This review establishes the extent of wait and see behaviour; grounds for concern for such behaviour; reasons protective action is delayed; the influence of information and warnings; relevance of gender and other characteristics; delay by those who defend their property; and policy implications. This review also details 11 seminal studies that capture much of the evidence on the delay of protective action in wildfire.

Keywords: wildfire; bushfire; systematic review; ‘wait and see’; delay; evacuation; protective action; decision making; policy



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1. Introduction

Globally, bushfires (in Australia, wildfire in North America, and forest fire in Europe) pose a substantial and growing threat to individuals [1–3], communities and assets, including homes, property and infrastructure [4]. The Black Saturday bushfires in Victoria, Australia in 2009 resulted in 173 fatalities and the destruction of more than 2000 homes in numerous towns and villages, including Kinglake, Marysville, Narbethong, Flowerdale and Strathewen [5]. Significant bushfires have continued to result in human deaths and destruction in Australia, Europe and North America in many subsequent years. In California, the Tubbs wildfire (2017) killed 22 people and destroyed over 5000 structures; and the Camp Fire (2018) killed 86 people and destroyed almost 19,000 structures including the town of Paradise. The 2019–2020 Australian bushfires burnt approximately 18.6 million hectares, destroyed over 5900 structures (including 2779 homes) and killed at least 34 people. The vast area affected encompassed the south coast of New South Wales (NSW), the Blue Mountains near Sydney, East Gippsland in Victoria and Kangaroo Island off South Australia [6,7].

Consensus has been building among environmental and wildfire researchers that wildfires are likely to be more destructive, extreme and frequent in the immediate future because of three factors: considerable population growth in peri-urban or wildland/urban interface areas (WUI) globally; the impact of climate change; and policy and resource constraints on land management and local government vegetation management programs [8]. First, expanding urbanization of populations into bushfire-prone areas, especially on the urban/rural interface [9], is significantly increasing populations in high-wildfire-risk areas, where people and their properties interface with highly flammable bushland vegetation [9]. In North America, wildfires frequently burn houses in peri-urban areas [10] and this is where they are often human caused [11,12]. Second, a growing body of evidence suggests that climate change will increase the frequency and severity of bushfire [13–15] in many

locations within Australia including rural/urban interface areas [16–18] as a consequence of reduced rainfall and higher average temperatures [16]. Third, limited development and implementation of adaptive land management practices and increasingly tightened budgets have constrained effective vegetation management [19,20].

This report begins by describing Australian bushfire safety policy as enabling Australian householders living in bushfire-prone areas a choice of remaining and defending their property or evacuating in advance of the threat. The policy strongly advocates definite decisions to remain or leave, well in advance of a bushfire, and that these are implemented before a threat is imminent. However, this is not always the case. Many householders delay their decision to remain and defend or evacuate, for a range of reasons including to assess the circumstances of the bushfire and determine an appropriate course of action. There is much to be learned from the literature about how and why some people are decisive about their decision to leave before a bushfire becomes a threat to their personal safety and why others delay this decision.

To extract these learnings, a rapid systematic review of the wait and see literature has been undertaken and is reported here. Wait and see is defined. A process of systematic review is described, including databases searched and inclusion and exclusion criteria; review of papers, reports, and other materials and assessment of their quality; and synthesis of all materials in a narrative review.

The emergency services understanding of peoples' protective action behaviour in bushfire is central to enhanced community education policies and programs that promote community safety through better preparation and planning, as well as more effective and safer response during a bushfire event. This review contributes to understanding why some people delay or 'wait and see' how the bushfire develops before they make a protective decision. The purpose of the rapid systematic review of literature is to: address research gaps in the emergency services' understanding of 'wait and see' and in how to develop approaches that better reflect the way people are likely to behave during a bushfire; and extend the body of evidence that drives the development of new and existing community safety programs, and inform decision making (targeting and tailoring programs and meeting community needs). The research question is:

Why do people at threat from a bushfire/wildfire, delay the protective decision to stay and defend their property or leave to a safer place, by waiting to see how the bushfire develops, waiting for emergency service advice or direction, or remaining to protect their property but leaving if they feel threatened?

Unpublished data collected in CFA post-season bushfire research (n = 2642) over the three years between 2018 and 2020 have confirmed the importance of addressing this question. An unweighted average of 45.1% of respondents intend to delay, 11.4% intend to stay and defend their property and 34.3% would leave as soon as they were aware of a bushfire threatening their town or suburb. The remainder would have left in advance of any fire on a day of high fire danger or did not know what they would do (9.2%).

The review draws on identified peer-reviewed papers and materials, and reports in the grey literature, including qualitative, quantitative, and mixed-methods studies, to establish why people behave in this way in the face of a bushfire threat.

Australian Bushfire Safety Policy and Protective Response

Following the 2009 Black Saturday bushfires in Victoria, in which 173 people perished and more than 2000 homes were destroyed [5], substantial changes were made to bushfire safety policy and practice framed around the message Prepare, Act, Survive (PAS) [5,21]. The aim of the Australian bushfire safety policy is both greater predictability of bushfire risk and enhanced capability for responding in ways that will increase safety and survival. The policy promotes a decision to evacuate, well before a bushfire becomes a threat, as the safest option, and encourages comprehensive planning to support those actions. Fire Danger Ratings (FDRs) are issued forecasting levels of bushfire danger at least 24 h in advance. For the most dangerous forecast fire danger days, people are advised in advance

to leave even if a bushfire is not in progress in that area [22]. The policy advises close monitoring of bushfire, including being alert to official bushfire warnings and to avoid dangerous late evacuation [23]. Acting in a manner consistent with the advice of the emergency authorities is part of householder's shared responsibility for their safety. At the same time, the authorities have a responsibility to understand and take account of individual needs and responses within their operational and education and engagement policies and programs [24–26]. Householders are responsible for making critical decisions about whether to remain and defend or evacuate in the face of a bushfire threat [8,21,24]. Evidence suggested that an adequately prepared dwelling provides a safe refuge from bushfire and that physically and emotionally capable householders who were appropriately equipped can defend their property from ember attack and save a building that could be otherwise destroyed [27]. This was challenged by the extreme fire behaviour experienced in the Black Saturday bushfires in Victoria.

Studies have shown that householders respond to bushfire in ways that are inconsistent with the advice and warnings [28,29], fire-fighting strategies, and fire ground management of the emergency services [5,21,30]. Householders evacuate at a time and in a manner determined by their unique circumstances and state of mind [21,31,32]. Evidence suggests that many householders do not take protective actions or behave in the manner promoted by bushfire safety policy. Most do not remove themselves from areas of potential disaster risk on days of the highest bushfire danger [4,30,33,34]. Many only undertake easy to do preparations [30,35,36] such as gardening and general property maintenance. Few householders undertake systematic planning of property defence or of their evacuation [31]. Bushfire plans are seldom written, and rarely take account of possible unexpected contingencies, or are practiced by the household [5,30,35,36]. Many householders intend to wait and see how a bushfire develops before deciding whether they will remain or evacuate [4,5,30,35,37–39], including those who wait for direction from the emergency services [5,8,30,37], notwithstanding the strong emphasis of bushfire safety policy on making a clear-cut decision to leave early. Householders who wait and see are of significance and concern because this behaviour is associated with poor decision making [40] and dangerous late evacuation [4,5,38]. Householders who wait and see tend to undertake fewer preparations of their property and for their evacuation, compared to those who make a definite decision in advance to stay and defend or to evacuate [39].

Some of those who plan to stay and defend have only a partial commitment to that course of action and retain late evacuation as an option [5,41]. Householders committed to remaining may decide to leave and those who intend to evacuate remain. Some return even while the fire is a potential threat [27]. Uncertainty about when to leave and the inability to recognize when leaving is no longer safe was a major problem for the previous Prepare, Stay and Defend or Leave Early (PSDLE) policy [5,41] and continues to be a central issue for bushfire safety policy even with its increasing emphasis on planning for unexpected contingencies. Essentially, PSDLE remains at the heart of Australian bushfire safety policy and practice, modified since 2009 to give a greater emphasis on evacuating.

Notwithstanding substantial policy changes following the Black Saturday bushfires, householders must still decide to evacuate from, or to remain and defend their property against, a bushfire. Reforms of bushfire safety policy that have sought to change householders' response to bushfire have had limited effect [28,35,42].

2. Materials and Methods

2.1. Definitions

This review is focused on those who delay their protective decision to either remain and defend their property or to leave as soon as possible when their town or suburb is threatened by bushfire. They delay by waiting to see how the bushfire develops, by doing as much as possible to protect their property but leaving if they feel threatened by the bushfire, or by waiting until they receive advice or direction from the police, fire or other emergency services.

2.2. Inclusion and Exclusion Criteria

Papers were included for review if they addressed bushfire or wildfire disasters and wait and see behaviour, or involved delay, and had been published since 1995 in the English language. Studies were excluded if they had been published before 1995, in a language other than English; concerned primarily with natural disasters other than bushfire or wildfire; or not concerned primarily with human behaviour (e.g., bushfire behaviour/materials/GIS). They were also excluded if they were concerned with simulations such as transport movement, bushfire behaviour, sheltering, utility availability or other simulations; not concerned primarily with individual/household response to bushfire (e.g., government, community, organizational, emergency management, legal or research response); or published in a newspapers or magazine.

2.3. Databases and Sources Searched

Three databases—Google Scholar, Scopus and Science Direct—were searched for both peer-reviewed and grey literature. Within-article references were checked for relevance and a snowballing strategy was used to build the list of papers. Emergency management practitioners and policy makers in Victoria were consulted about reports, presentations and other materials that may not have been identified in the search of databases

2.4. Literature Search, Screening, and Data Extraction

The database search was initially conducted in May 2020 with the search strategy using the following wait and see search string: wait and see OR delay AND bushfire OR wildfire. A further search for papers published since the initial search was conducted in December 2020. Table 1 summarizes the databases and the search strategy applied. One reviewer screened the search results by title and abstract, and papers falling outside the criteria were excluded. The full text of remaining papers was screened by the same reviewer to identify final papers for review and further papers were excluded. Excluded papers included those addressing model simulation such as transport simulation in evacuation; no human behaviour including pet behaviour; organizationally oriented studies including behaviour of Incident Commanders; and other disaster types such as hurricane. A second independent reviewer then examined the inclusion and exclusion decisions and any disagreements were resolved through discussion. Figure 1 is a flow chart summarizing the literature search process.

Table 1. Search string for databases.

Database	Search String 'Wait and See'	Area of Document
Scopus	'Wait and see' OR 'delay' AND (bushfire OR wildfire)	All fields
Science Direct	'Wait and see' OR 'delay' AND (bushfire OR wildfire)	Document
Google Scholar	With the exact phrase: 'Wait and see' OR delay With at least one of the words: bushfire, wildfire	Anywhere in the article

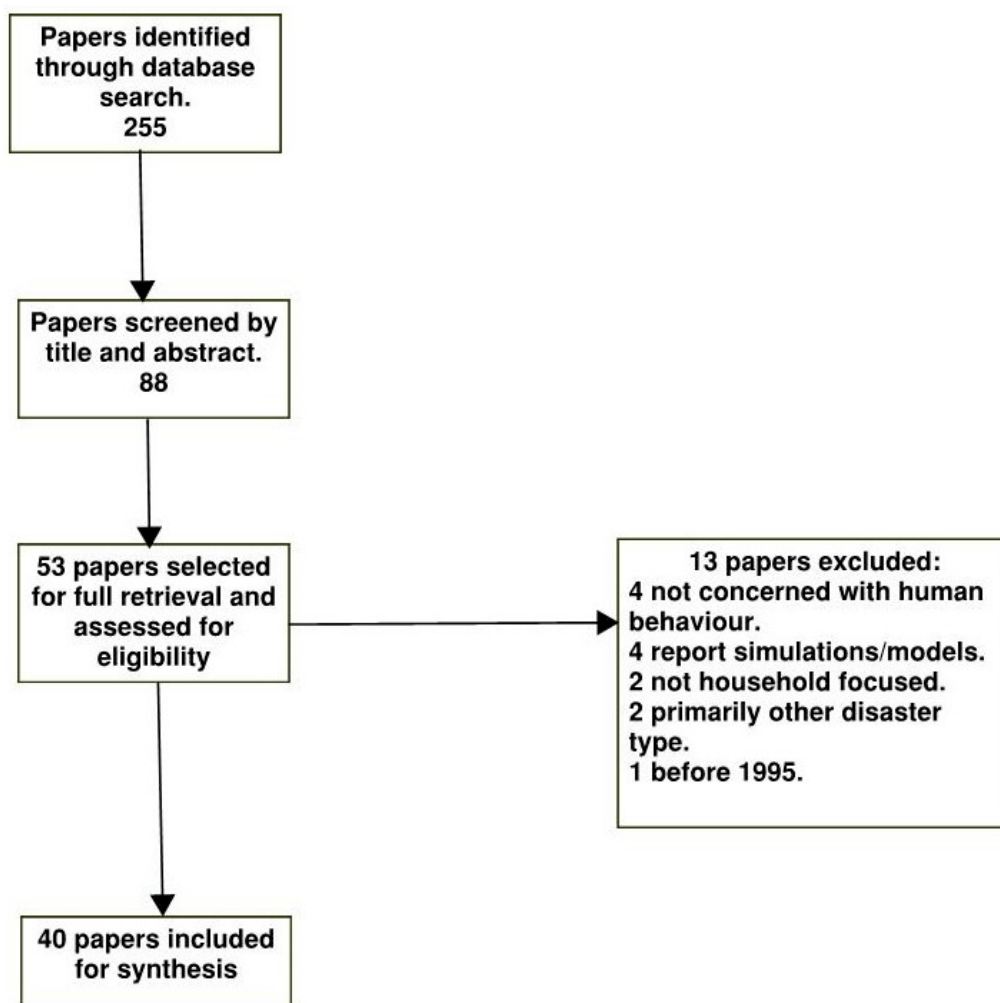


Figure 1. Flow chart showing details of literature search.

2.5. Quality Assessment of Studies

A recently updated scale for the quality assessment of narrative reviews (SANRA, the Scale for the Assessment of Narrative Review Articles) [43] was used as the basis of quality assessment of all articles, reports and materials reviewed in this paper. A scale of 0 to 2 was used to rate six aspects of quality:

1. Justification of the article's importance for the Readership;
2. Statement of concrete aims or formulation of question;
3. Description of the literature search;
4. The use of referencing to support statements;
5. Scientific reasoning to appropriately present evidence and;
6. Appropriate presentation of data.

Each manuscript was assessed by the reviewer against these six aspects rating its totality including the abstract.

2.6. Data Extraction and Synthesis of Final Papers

The full text of the included papers was imported into NVivo software (QSR NVivo 12) and searched for mentions of the review topic. The reviewer sorted the extracted data from all included studies and coded them into themes and subthemes. These were organized into twelve broad descriptive themes based on the content of the codes and the reviewer's knowledge of factors influencing bushfire protective action decision making. A summary of the coded text was collated and used to identify six analytical themes emerging from the

descriptive themes across the included studies. Not all papers addressed every aspect of interest to the review but all 40 offered data for the synthesis.

The Population, Intervention, Control [Comparison], Outcome and Time (PICOT) framework was used to identify the data elements to be extracted and an extraction form was developed consistent with an approach promoted by the Campbell Collaboration. This framework was used to summarize the key data from the 11 papers which were identified as primarily concerned with the ‘wait and see’ research question addressed by this review. Table 2 provides an overview of these primary studies including study objective, methods, findings’ significance and an assessment of quality.

2.7. Analysis and Interpretation of Data

The summary of coded text from included studies was analysed and interpreted within the six analytical themes previously identified and this constitutes most of the following reporting of the results of the review. Where elements of the summary provided in Table 2 can be used to elaborate particular results, they are discussed in the text.

3. Results

The searches identified 255 papers that met the search criteria. Following title and abstract screening and review of the full text of 53 studies, 40 papers were assessed as including some material relevant to the review of wait and see in bushfire (or wildfire). All of these papers and some of their cited references were used in the narrative synthesis of the topic. Through analysis of the number of codes and mentions generated by the NVivo software through the thematic analysis of the papers, 11 were identified as containing considerable material on wait and see behaviour and were classified as primary studies to be summarized in Table 2.

Of the 11 primary studies, 10 were conducted in Australia (4 by McLennan et al. and 3 by Whittaker et al.) and 1 in North America, totaling 5772 participants. All studies were assessed as good or excellent quality based on the criteria set out in the SANRA measure.

The elements of the primary papers that are summarized in Table 2 are:

1. Author;
2. Study objective or research question;
3. Method or study type;
4. Participants or study context;
5. Outcome or findings of the study;
6. Significance or implications of the study and;
7. A quality rating using the SANRA scale.

The 40 studies focused on a variety of aspects of wait and see behaviour in bushfire (or wildfire) and although they did not all report on every aspect of interest to the review, all included data that could be used in the synthesis. The following discussion synthesizes the findings of the papers by providing an insight into:

1. The extent that people confronting bushfire threat ‘wait and see’;
2. Why delaying protective action is a concern for emergency services authorities, operational practitioners, bushfire safety practitioners and policy makers;
3. Why people chose to delay before deciding on a protective response including their self-evacuation archetypal characteristics;
4. The influence of information and warnings;
5. The influence of gender and other demographic factors;
6. How those who intend to stay and defend their property but leave are, in effect, waiting and seeing and;
7. The policy implications of delaying protective action in bushfire.

3.1. Extent of the Wait and See Issue

An increasing number of people appear to be choosing to wait and see as a first response to a potential bushfire threat. They examine the fire conditions on the day before

deciding what to do, implying the presence of an unspecified contingency that will only become apparent in the midst of the threat. [44].

People choose to wait and see before deciding on a protective response to bushfire but the proportion reported in the literature has varied considerably between studies. Focus group research of bushfire-affected residents of north-east Victoria reported 3% of participants ($n = 73$) who planned to wait and see'. This is the smallest number who intended to delay discovered in the literature although the study concluded that many who intended to remain consciously or unconsciously retain late evacuation as a last-minute option [41]. Studies following the 2009 Black Saturday bushfires concluded that approximately one-quarter (25%) of intended leavers would wait for advice or direction from the emergency services [4]. A further 26% would either stay but leave if the fire threatened (17%), or wait and assess the fire before deciding on their protective response (9%) [5]. Last, 29% [45] and 30% [37], respectively, would wait and see what developed before making a final decision to leave or stay and defend.

Studies that researched bushfires in Western Australia (WA) between 2011 and 2014 reported wide variations in those who wait and see'. At the lower end, 5% (Lake Clifton, 2011) [46] to 7% would wait to see how the fire developed (Parkerville, 2014). At the upper end, 68% intended to delay protective decision making, of which 39% would do as much as possible to protect their property but leave if threatened by fire, 22% would wait to see before deciding to stay or go and 7% would wait for the emergency services to tell them what to do (Kelmscott-Roleystone and Red-Hill Brigadoon, 2011) [47].

Table 2. Primary studies of wait and see in bushfire (or wildfire).

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
Whittaker et al., 2013 [5]	Factors influencing patterns of life and property loss and survival in the Black Saturday bushfires.	Quantitative mail-out surveys.	Fire-affected households.	1314	26% undecided about response to bushfire—17% stay but leave if threatened and 9% wait and see what fire is like before committing to action. - Most late evacuees arrived at destination unharmed and said they would take the same action if there was a similar fire in the future (74%). 38% who stayed to defend left when property was under threat because it was too dangerous (44%), flames (33%), safety of others (26%), failure of utilities/equipment (26%) or house caught fire (18%). - Majority of wait and see leave if threatened (79%), see what fire is like (63%), wait for advice from emergency services (52%). - One-quarter of respondents who adopted the wait and see approach had greatly increased likelihood of dangerous late evacuation or becoming trapped in undefendable shelter.	- Significant minority of people who experience serious bushfire threat delay their protective action decision. - Many say they would delay again in the same circumstances. - Wait and see behaviour associated with dangerous late evacuation. - A large number of those who stay and defend leave for various rational reasons and are therefore also effectively waiting to see how the circumstances develop before finalising their protective actions.	Imp (2) Aims (1) Search (2) Ref (2) Reason (1) Pres (2) Total = 10
McLennan, 2014. [48]	Learnings from Parkerville (2014) bushfire.	Qualitative semi-structured face-to-face interviews.	Fire-affected households.	91	7% intended to wait and see how bad the fire was. 19% did not have a plan/intention. - Those intending to ‘wait and see’ do so because: (i) they believe their bushfire risk is low, (ii) they believe that waiting does not add to their risk, (iii) both leaving unnecessarily and having to defend against a severe bushfire are unappealing options, so (iv) they plan to wait and hope for the best that the fire will not impact their property and they will not have to make a choice. - Residents’ pre-fire bushfire plans (leave; stay and defend; and wait and see) arise from different motivations (avoid danger, protect assets, avoid making an unnecessary decision), so information specifically targeting each type of resident may be more effective than omnibus information about bushfire survival in general.	- Confirms reasons for waiting and seeing as perception of low risk involved, unappealing elements of both leaving or staying and hoping that nothing will happen so a choice will not be necessary. - Identifies different motivations of remainers, leavers and those who wait and see and consequent need to target bushfire safety programs to address these different needs.	Imp (2) Aims (1) Search (1) Ref (2) Reason (1) Pres (2) Total = 9

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
McNeill et al., 2015 [49]	What predicts fire response decision delay.	Quantitative mail-out surveys (T1 and T2).	Fire-prone urban, peri-urban and rural communities.	182	66.2% of respondents (T2 data) said they would delay by staying to protect property but leave if threatened (47.1%), wait to see what the fire is like before deciding (11.6%) and wait for the emergency services to tell them what to do (8.5%). - Selection difficulty was the single unique predictor of delay. If defending and evacuating are equally attractive, the likelihood of delaying both increases. - Bushfire safety policy and programs need to (i) establish the factors defending vs. evacuating are based to enable better targeting; and (ii) promote contingency planning to establish decisional triggers.	- Two thirds of respondents in the study would delay protective action decision making. - Protective action delay is predicted by resident’s inability to differentiate the value of remaining vs. evacuating. - Residents are caught between leaving and remaining because these actions serve competing high-valued protective outcomes (protecting property vs. protecting personal safety). - Bushfire safety policy should recognize the importance of planning protective response and establishing triggers for action.	Imp (2) Aims (2) Search (2) Ref (2) Reason (1) Pres (2) Total = 11
Whittaker et al., 2009 [50]	Human behavioural factors affecting personal safety and property protection during the Black Saturday bushfires.	Qualitative semi-structured, face-to-face interviews.	Fire-affected households.	301	10% of households wanted to defend their property but were not fully committed or confident in all conditions so would ‘wait and see’ increasing the risk of dangerous late evacuation. - Late evacuees experienced dangers including flames, embers smoke, airborne debris, fallen trees and traffic. - Reasons for late evacuation were seeing smoke and flames, being told to leave, seeing others leave, losing confidence in ability to defend and failing to defend.	- Primary reason for ‘waiting and seeing’ associated with lack of confidence in defence. - Triggers for late evacuation were immediate environmental cues, failure to defend and direction from emergency services.	Imp (2) Aims (2) Search (1) Ref (1) Reason (1) Pres (2) Total = 9

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
Handmer et al., 2016 [51]	How the ‘stay or go’ bushfire safety policy performed in the Black Saturday bushfires.	Analysis of police and coronial records.	Civilian fatalities of the Black Saturday bushfires.	172	42% of fatalities delayed—26% intended to ‘wait and see’ before committing to a course of action and 16% waited for an inadequate or vague trigger. - Many were surprised by the existence of the fire or its arrival sooner than expected; had an inadequate trigger to implement plans; and inadequate planning or changed circumstances. - Last-minute disagreement between men and women substantially wanting to remain or leave (respectively), meant women delayed evacuation. - High proportion of fatalities apparently sheltering passively suggest that this is an extremely dangerous choice.	- By ‘waiting and seeing’, people place themselves at risk of being surprised by and not being able to respond quickly enough to an extreme bushfire event and likely to be forced into a dangerous late evacuation or inadequate shelter. - Gender inequalities need to be addressed by informing women about bushfire risk and their protective options; and supporting evacuation planning for women and children with clear triggers.	Imp (2) Aims (2) Search (1) Ref (2) Reason (2) Pres (1) Total = 10
McLennan et al., 2013 [8]	Examine protective action decisions taken by householders under bushfire threat.	Qualitative semi-structured, face-to-face interviews.	Fire-affected households.	496	25.2% of respondents intended to ‘wait and see’ or had no/unclear plan. - Householders unlikely to understand what is required to leave safely ahead of bushfire threat so it is inevitable that there will be a period of waiting before leaving for all except those who intend to stay and defend.	All except people who remain and defend will ‘wait and see’ before taking protective action.	Imp (2) Aims (1) Search (1) Ref (2) Reason (2) Pres (2) Total = 10
Whittaker et al., 2020, [52]	How people threatened and affected by bushfire, understood, interpreted and acted on warning messages.	- Qualitative semi-structured, face-to-face interviews. - On-line survey.	Fire-threatened and -affected households.	113 interviews 549 surveys.	- Many people wait until they are directly threatened by bushfire before taking protective action. - People attempt to confirm warnings by surveying the environment or communicating with others. - After receiving warnings, people discuss the bushfire with family, friends, and neighbours; seek local information; prepare equipment for defence; and begin preparing to leave. - After notification, many seek visual confirmation of warning information and make their own assessment of the threat. - Where warning information does not align with a person’s assessment, this delays response. - People delay to avoid unnecessary evacuation and associated costs (time, effort, and distress). - Responsibility for pets and animals delays response to warnings. - Delay appears purposeful as part of confirming the extent of bushfire threat.	- Many people delay their protective response to bushfire warnings to: (i) Discuss it with others. (ii) Survey the environment. (iii) Reject the warning because it does not align with their assessment. (iv) Deal with pets and animals. These actions that cause delay are undertaken as part of avoiding unnecessary evacuation and associated costs of time, effort and emotional stress/distress. - These actions that cause delay are undertaken as part of avoiding unnecessary evacuation and associated costs of time, effort and emotional stress/distress. - Delay results from a purposeful process of confirming warning information.	Imp (2) Aims (1) Search (2) Ref (2) Reason (2) Pres (2) Total = 11

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
McLennan et al., 2013 [45]	Better understand the factors influencing the choice of protective action in bushfire.	Postal and on-line survey.	Fire-prone urban, peri-urban and rural communities.	584	29% of respondents intend to ‘wait and see’. - Some people who intend to leave early may delay and not leave in a timely manner due to (i) concern about their house being destroyed and (ii) anxiety about dangers while evacuating. - People who ‘wait and see’: - Are motivated not to make a wrong decision under conditions of uncertainty by (i) leaving and losing their house, being exposed to danger while evacuating and dealing with inconvenience of disrupting normal life; or (ii) staying and being exposed to danger from the bushfire. - Perceive limited risk of impact from bushfire. Measured on high optimistic outcome of warning and longer expected time window for safe evacuation. - Believe they would have the time to safely evacuate late. - Believe (7%) emergency authorities will warn them when to leave and protect them from threat. - Are less engaged with bushfire safety issues than those who leave early or stay and defend. - Have weaker strength of commitment than those who intend to leave or stay and defend. - Predictors of strength of intention to wait and see are Subjective Norms, Self-Determination, Anticipated Affect and Moral Norms. (Outcome Efficacy is absent), suggesting that concern about making a wrong decision is the main driver of choosing to ‘wait and see’.	- People who delay protective decisions want to both protect their personal safety and their property and do not want to leave unnecessarily and put their property at risk. At the same time, they do not want to leave too late and face dangerous fire conditions. They feel they can wait because the risk is limited, they can evacuate safely if need be and expect that the fire authorities will warn and protect them. - Few of those who wait and see prepare a bushfire plan.	Imp (2) Aims (1) Search (2) Ref (2) Reason (2) Pres (2) Total = 11

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
McLennan et al., 2012 [37]	Explores reasons why people wait and see and implications for bushfire safety policy.	Postal and on-line survey.	Fire-prone urban, peri-urban and rural communities.	164	5. 80% of those who would wait and see had previously received a threat warning. 6. Those who wait and see tend not to be involved in Community Fireguard (13%) vs. 19% leave early and 38% stay and defend. 7. Men and women are almost equally likely to ‘wait and see’. 8. People living on farms were least likely to wait and see. 9. 24% of those who would wait and see prepared a plan for extreme or worse FDR (35% for leave and 56% for stay and defend). 10. Bushfire policy and programs should attempt to switch the mindset of those who ‘wait and see’ to leaving, rather than further delaying their protective decision. Programs need to promote more active, detailed, and meaningful consideration of triggers for safe evacuation.		
					1. People wait and see because they believe it is a safe choice based on: a) perception of low risk involved in waiting (52%); (b) belief that others would warn or protect them if danger threatened (19%); (c) self-reliant confidence of ability to survive (16%); and (d) reluctance to leave because of associated potential costs and risks (9%). 2. People who wait and see do not intend to leave early for similar reasons as above but focused more on the costs and dangers of leaving including inconvenience of deviating from normal routines. 3. The reasons those who wait and see chose not to stay and defend indicate they understood that bushfires are dangerous, suggesting their intentions were NOT based on lack of awareness of the threat.	1. See above. 2. And they wait and see because they want to avoid the perceived costs of evacuating including time, effort, disruption of normal activities and stress. 3. Waiting and seeing may be a rational response given the circumstances of the resident in relation to the bushfire.	Imp (2) Aims (1) Search (2) Ref (2) Reason (2) Pres (2) Total = 11

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
Edgeley and Paveglio, 2019 [53]	Explores the influence of pre-fire preparation and event-based cues on intended protective behaviour.	Drop off and pick up, mail and on-line surveys.	Three zones: 1. Urban area excluding downtown. 2. Buffer 1.5 miles from city boundary. 3. Buffer further 1.5 miles from Zone 2.	1349	4. People who wait and see (i) understand bushfire is a risk and do not intend to defend, (ii) believe waiting does not expose them to significant risk, and (iii) see waiting as appropriate to their circumstances. 5. Wait and see may be appropriate depending on circumstances so focus of bushfire safety should be on resident’s response once seeing is complete. 6. Bushfire safety policy needs to focus on reducing delay and late evacuation or dangerous sheltering by: a. Improving warnings but emphasising they may not be available b. Reinforce significant risks of late evacuation. c. Encourage and support bushfire evacuation planning including identification of triggers. 7. Address reluctance to leave due to likelihood home will be destroyed.	4. Emergency authorities may enhance the effectiveness of their policies and programs by accepting that many people faced with a bushfire threat will delay their protective response. 5. Research and policy should be directed at extending understanding of the views and needs of those who wait and see and developing and targeting programs to address these.	Imp (2) Aims (1) Search (2) Ref (2) Reason (2) Pres (2) Total = 11
					1. 61.8% of respondents would ‘wait to see how bad the fire is and evacuate if I think it is too dangerous’ (24.6% strongly agree and 37.2% moderately agree). 2. 48% of people who evacuate would return shortly after to defend their property. 3. 21.9% would stay and defend and of these would ‘wait and see how bad the fire is and evacuate if I think it is too dangerous.’ 4. DK/SIP group (which by default are classified as wait and see) compared to evacuate or leave group: a. Do not know what to do during a fire. b. More likely to consider staying at home and safely sheltering without putting out spot fires. c. Less likely to plan an escape route. d. Less likely to remove branches lower than 10 feet in defensible (HIZ) zone. e. More likely to consider fire fighters ability to protect their property in considering whether to leave. f. Less likely to be influenced by in-person evacuation notices.	1. North American research on ‘wait and see’ behaviour may not be extrapolated to other international contexts due to the system of voluntary and mandatory evacuation orders. 2. High levels of ‘wait and see’ intentions are reported across all protective action behaviours.	

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
Strahan 2020, [54]	Links decisions to delay protective action in wildfire with attitudes and behaviour related to seven self-evacuation archetypes	Quantitative telephone survey.	Fire-affected households.	457	5. Wait and see intentions expressed to some extent by all residents—those who would leave, stay and defend, and do not know/SIP. 6. All residents consider protective response contingent on preparation and event-based cues which may change given timing and circumstances of fire event. 7. Research and policy need to consider how long and why people wait. DK/SIP group least likely to perform mitigation, more reliant on their assessments of firefighting and warnings in making protective decisions, give least consideration to emergency planning and least responsive to event-based cues such as evacuation warnings.	DK/SIP group least likely to perform mitigation, more reliant on their assessments of firefighting and warnings in making protective decisions, give least consideration to emergency planning and least responsive to event-based cues such as evacuation warnings.	Imp (2) Aims (1) Search (1) Ref (2) Reason (2) Pres (2) Total = 10
					1. 51% waited to see how the bushfire developed before deciding on a course of action. 2. Significantly more Experienced Independents and Threat Deniers remained; Community Guided evacuated; and Considered Evacuators, Dependent Evacuators and Responsibility Deniers waited to see. 3. Delay is considered to be a central component of householder’s decision-making process which is influenced by their attitudes and responses to bushfire as reflected in their archetypal characteristics as follows: a. Threat Deniers believe there will be no threat and no need to take action. They delayed until the fire reached their town.	1. Decisions to delay protective action during bushfire are related to self-evacuation archetypal attitudes and responses. 2. Delay reflects purposeful behaviour rather than indecisiveness. Reasons for delay identified in other research can be better understood and generalised through the application of an archetypal lens.	

Table 2. Cont.

Author/Citation	Study Objective	Method/Study Type	Participants/Context	Sample Size	Outcome/Findings on ‘Wait and See’	Significance/Implications Regarding ‘Wait and See’	Quality Rating (max =12)
					b. Dependent Evacuators and Responsibility Deniers rely on others to protect their safety and property, the former because they feel incapable, the later because they believe others should take responsibility for them. Both delayed until the fire reached their town. c. Community Guided delay to consult and cooperate with family, neighbours, and informed others. They delayed until the fire reached their town and to defend although the fire failed to arrive. d. Worried Waverers cannot choose between remaining or leaving to protect their property or their personal safety (respectively) both of which they are invested heavily in. e. Considered Evacuators want to leave to protect personal safety and are delayed by confirming information and warnings, confirming safe evacuation routes and finalising evacuation logistics. They delayed until they felt it was too dangerous to remain to protect property and because the fire failed to arrive. f. Experienced Independents may not be totally committed to defence, leaving if danger is too great or defence too difficult. They delayed until the fire reached their town and when defending became too dangerous.		

In a study with a similar outcome, 67.8% of respondents would delay decision making, of whom, 45.6% to protect their property but leave if their property was threatened by fire, 15.9% to wait to see what the fire was like before deciding, and 8.5% to wait for emergency services to tell them what to do (Gelorup, Stratham, College Grove, Gidgegannup, Brigadoon, Red Hill, Roleystone and Kelmscott, 2012) [49].

A 2013 study that included the Western Australian fires discussed above but included others, reported plans to wait and see in two bushfires in New South Wales (NSW) as 29% and 14% and in Tasmania, 15%. Significant numbers also had no plan—8%, 32% and 12%, respectively—suggesting that a person without clear direction is not likely to take decisive action and would most appropriately ‘wait and see’. This is supported by the paper’s conclusion that a substantial minority of householders . . . had planned to wait and see how the threat developed before making a decision to leave or stay; and many of those who left subsequently described a period in which they waited to see if their property was going to be threatened [30]. McLennan et al.’s 2019 review paper [55] included those fires just discussed and those in Western Australia outlined in the previous paragraph, adding two South Australian studies (2014, 2015). The paper found that 17% (unweighted average) intended to wait and see, but in addition some intended to wait and stayed (4%) or evacuated (6%) or waited after warnings (10%). Importantly, a further 18% perceived no bushfire risk, an issue to do be addressed in the discussion of the characteristics of those who wait and see.

Five studies conducted in NSW, Victoria and South Australia between 2002 and 2007 were reported to have found that 28–55% of respondents intended to wait before being told what to do (11–23%) or wait but leave if they feel threatened by the bushfire (17–32%) [56]. Analysis of a number of Victorian studies conducted by the Country Fire Authority (CFA) in 2005 (n = 718) concluded that 60% of respondents would wait before deciding. A review of CFA studies conducted since the Black Saturday bushfires, over five years to 2014 concluded that 30% to 31% of people intended to wait and see but leave if threatened [35]. A North American study found that 63% of those threatened by a wildfire effectively waited to be told to leave by emergency agencies (16%), to see what happened, or felt safe and stayed (30%) or evacuated when they felt threatened (17%) [57]. An on-line study of people (n = 354) living in South Australia, Tasmania, Victoria, New South Wales or the southern part of Western Australia reported that 73.7% of respondents intended to delay protective action by protecting their property but leaving if the threat was too great (36.4%), staying or leaving depending on what the situation on the day of the fire was like (24.3%) or waiting for emergency services to tell them what to do (13%) [58]. A more recent on-line study (n = 127) of residents of peri-urban areas of Melbourne, Victoria reported 13% waiting to see how serious the threat is before making a final decision to leave or stay and defend the property [59].

While the numbers reported in the literature as intending to wait and see in a bushfire varied significantly, it appears that between 25% and 30% of those at risk will delay their decision on taking a protective action to assess the circumstances of a bushfire. A further approximately 30% will delay by working to protect their property but leave if threatened and 8–13% will wait until they are given advice or direction by the emergency services. The key conclusion to be drawn from the literature is that delay in protective action decision making is the predominant response in bushfire in Australia.

3.2. *Waiting and Seeing in Bushfire Is of Concern*

Delayed protective decision making may have a detrimental impact on personal safety. The major reason waiting and seeing is viewed as undesirable is that it is associated with late and dangerous evacuation [5,8,50], increasing the likelihood of injury and fatalities [60] or being caught in an undefendable shelter [5,52]. Significantly more fatalities (42%) than survivors (29%) of the 2009 Victorian Black Saturday bushfires planned to wait and see or had no intentions [3].

Waiting and seeing was associated with 26% of the 172 civilian fatalities in the Black Saturday bushfires [37,51,61] and a further 16%, although intending to leave, had waited for an ambiguous trigger [51]. Waiting and seeing placed people in a position where their plans were under pressure from the extreme fire conditions. Fatalities were taken by surprise by the bushfire. They were surprised by the existence of or rapid arrival of the fire [51], its intensity, speed and time taken for the front to pass [5]. A late change in wind direction was a major factor in the surprising behaviour, intensity and speed of the fire experienced by many fatalities [51]. It appears that those who were leaving or waiting to see suffered most from surprise because those defending were more aware of the fire environment [51]. Fatalities also had inadequate plans that failed to respond to life-threatening circumstances and experienced disagreements between household members (generally between men and women) about whether to remain or leave [51].

People were confronted with a multiplicity of hazards when they evacuated late including flames, heavy ember attack, thick smoke, poor visibility strong winds, airborne debris, fallen trees and heavy traffic. [27,50,55]. Late evacuation has been described in the literature as leaving within 20 min of the fire arriving at a person's property, or leaving as the fire arrived [55].

People refer to their uncertainty about the extent of the threat to them, and information on a safe escape route and destination, as the reason for their late evacuation. [55,62]. Some were also unaware of the fire approaching because they had isolated themselves in darkened, airconditioned homes away from the extreme heat [5]. The Black Saturday Royal Commission found that resident uncertainties about the fire resulted from a failure or adequate warnings and destruction of electrical and communications infrastructure [63].

Triggers for late evacuation are reported as: proximity of smoke and flames; advice from the emergency services to leave; observing that others are leaving; and loss of confidence in being able, or failure to defend their property [41,50]. Unfortunately, experience of a successful late evacuation leads many to believe that they can do the same thing again [5].

Those who wait and see, more than those who remain to defend or leave early, tend not to plan for bushfire evacuation and are not logistically organized or psychologically prepared to leave [55], and see their delay as not involving additional danger [21,45,64]. They tend not to be ready to leave once they encounter an immediate bushfire risk [50] or to plan for days forecast as being of extreme or catastrophic fire danger [45,65].

There is also evidence that people who wait and see do not prepare for bushfire as much as those who intend to remain or leave, including creating a defensible space [53] or to organize their safe evacuation [50] including escape routes [53]. This may be due to a lack of salience [66] of bushfire risk in their thinking, resulting in a failure to contemplate the possibility of bushfire threat [55].

3.3. *Reasons People Delay Their Protective Decision Making in Bushfire*

Decisional delay arises out of waiting to see how the bushfire develops, but also not wishing to commit to remaining to defend or to leave early. The literature allows us to consider simple as well as more complex reasons for delay from these perspectives. In the simplest terms, people may perceive waiting but leaving if threatened by bushfire as a strategy to improve the chance of simultaneously better protecting their property and their personal safety [56,67]. People perceived remaining as best for property protection but were concerned about its potential detrimental impact on personal safety, so saw delay to enable assessment of the emerging bushfire circumstances, as a sensible middle way. A wait and see strategy enabled people to reduce decisional errors in conditions of uncertainty [30,45]. The concern not to take the wrong protective action decision is reflected in the factors that predict strength of intention to wait and see. People are strongly committed to wait and see because:

1. Others close to them would prefer that approach (Subjective Norms);
2. They have a moral obligation to wait (Moral Norms);
3. The opinions of others have little influence (Self-Determination);

4. They are not anxious about waiting (Anticipated Affect) [45].

Many at-risk residents confronted with a bushfire think that they can choose to wait and see, and therefore avoid making a mistake, based on the following three factors. First, they feel that by waiting they are at low risk [45,68], that it is a safe choice [30]. This is partially based on a belief that they could leave safely [37,45], that the bushfire is not dangerous or will not confront their property [48,55]. The view that there is little or no risk may be influenced by the lack of recent bushfire history, a perceived ambivalence by the fire authorities toward bushfire risk in the area [69] or their interpretation of environmental and social cues [8,53]. Evidence of low or no risk may be reinforced by experiences of past false-alarm warnings that result in people delaying action until they are convinced that bushfire threat is real [52,55]. Second, they believe that they can delay because they are confident in their capability to survive [37,45]. Third, they expect others will warn and/or protect them [37,45].

They also delay to avoid potential costs, time, effort [52,55] and risk on the road [44,45] associated with leaving, including packing [37]; dealing with animals [70] that may be hard to relocate and become stressed [52]; and the inconvenience and stress of disrupting daily routines [45,52,53,55,71,72]. Delaying is seen as the most effective choice [56] between the high cost of staying (the cost of defending or being threatened by fire) and the low cost of leaving early but potentially losing property. People who did not intend to leave immediately have similar reasons as those who would wait and see but place a greater emphasis on the costs and risks of leaving. People who wait and see perceived remaining as potentially dangerous (depending on fire severity and their age or disability) [45], suggesting that misunderstanding of the risk and the capability required to remain did not underlie their decision to delay [37].

People who delay protective action may lack knowledge of how to evacuate safely [31]. Some also consider needlessly leaving, placing themselves at risk on the road [67] and losing their property when it could have been safely defended, or staying and being exposed to a dangerous fire [45] as equally undesirable [44,48], resulting in a commitment to waiting and hoping that the fire threat does not eventuate [55]. These people are caught between competing actions (leave or remain) that serve highly valued outcomes (protect property or personal safety), and are unable to resolve the dilemma, so delay as a consequence [49,55,73]. This behaviour may be explained by selection difficulty. When defending and evacuating are perceived as almost equally attractive and neither can be selected, the chance of delaying both protective actions increases [49].

Protective decision making may also be delayed by anxiety and fear generated by imminent bushfire threat, which slows decision processes [46,47,55,62]. Anticipatory stress, apprehension, fear, and concern, combined with perceived lack of control, are likely to delay preparations to respond to threat [74].

People's attitudes, perceptions and beliefs about bushfire threat influence their likely protective response to a bushfire event and when action is taken. Seven bushfire self-evacuation archetypes delay their protective actions based on their attitudes toward bushfire threat, and beliefs about appropriate response [75]. They wait and see as part of differing purposive processes [54] to determine their response to the bushfire event. As such, their delay reflects prioritising of action, according to their predominant archetypal attitudes and responses to bushfire, rather than deferring timely action due to indecision [75]. Dependent Evacuators and Responsibility Deniers wait for others to assist them due, respectively, to incapability or perceived entitlement. Considered Evacuators are delayed by planned evacuation processes such as confirming information and warnings, preparing household members and property for leaving and the logistics of safe evacuation. Community Guided are delayed by consulting and cooperating widely with family, neighbours and knowledgeable others and by jointly deciding and acting on bushfire threat. Worried Waverers are stuck between staying to defend their property and leaving to protect personal safety, both of which are highly valued, and they have heavily invested in. Experienced Independents are committed to defend their property but if the fire is too

dangerous, equipment breaks down or injury makes this impossible, remaining becomes a delay. Threat Deniers believe there is no bushfire threat and no need to leave so they are likely to delay till the threat can no longer be disputed. This archetypal lens provides a fresh perspective on the existing research [37,48,49] on the reasons people delay protective actions in bushfire.

3.4. Influence of Information and Warnings on Waiting and Seeing

Protective action decisions may also be delayed by the receipt of information or warnings about bushfire. This may be due to the need to complete a process of information search and assessment [55] or as a result of competing or conflicting formal or informal information or warnings including safe refuge or escape routes [55,76]. Information search and assessment typically involve discussion with influential others such as family and neighbours and confirmation by gathering local information including traveling to observe the fire [52], all of which delay protective action. Those who receive warnings that are inconsistent with their own assessments and expectation of threat also delay action [52]. An inability to adequately confirm a bushfire threat communicated in an official warning often results in delay [52].

Information or warnings that are infrequent, not timely or fail to provide location-specific detail [77] or do not provide vulnerability, likelihood and impact intelligence [78] may create uncertainty, need for more information and result in a failure to act [77,78]. Warnings that do not communicate the level of risk and likely impact clearly, specifically and in detail may lead people to conclude that the risk that is being communicated is not an issue for them and are therefore unlikely to result in protective action [78]. Communication of risk that prompts action requires that the information is understood, believed, trusted and promotes a sense of self-efficacy [78].

The lack of formal warnings to trigger protective action may lead some people to passively wait until other cues such as embers or flames make it clear that danger is imminent [50]. Even when they receive a warning, many people wait to be directly threatened by fire before they take protective action [8,30,38,52,79].

However, desire for more information may not be the cause of delay but a symptom. Rather than the need for further information causing delay, some research suggests that the amount of information people gather is related to their indecisiveness [80].

3.5. Gender and Other Characteristics of People Who Wait and See

Evidence suggests that more men intend to stay and defend their property against bushfire while more women intend to leave, although this is not clear cut as many women also choose to remain [81]. While men (51%) and women (49%) almost equally intend to wait and see [45], there is evidence of disagreement within households confronted by a fire threat or warnings [30,55] in which men wanted to remain and women to leave [50,51,82]. This apparent inconsistency appears to come down to the genders' different risk triggers—when enough has been seen to stop waiting and start leaving. Men (more than women) were more likely to wait for the fire to arrive (11% vs. 7%), whereas women were more likely to stay but leave if they feel threatened (20% vs. 15%) [81]. So, while there may be general agreement between the genders about waiting and seeing, there appears to be disagreement about when it is time to leave.

Few demographic characteristics of those who wait and see during bushfire have been identified. Farmers and people living in isolated rural dwellings (13%) are least likely to wait and see [45] while those living in peri-urban areas (56%) are most likely to delay their protective decision making [65].

For some, taking protective action in a bushfire, whether it is to evacuate or remain, is extremely difficult due to their physical, psychological, or financial circumstances or other disadvantage [55], meaning that, in many cases, their default position is to wait and see.

3.6. Those Who Stay to Defend but Leave

There is considerable evidence that many people who intend to stay and defend their property from bushfire have contingency plans to leave if they are unable to defend [41] and prepare for evacuation to the same extent as those who specifically intend to evacuate [64]. Planning and preparation for evacuation, even when intending to remain, seems sensible given the possibility of complex and rapidly changing circumstances during a bushfire event [49]. Recognizing the uncertainties involved, some who want to stay and defend may not be confident to do so in all conditions, including wind [50] and fire intensity [53].

A significant minority (20% [55] and 38% [5]) of those who stay and defend finish up evacuating from bushfire. They leave because of perceptions of danger [8] (44%), proximity of flames (33%), to move household members to safety (26%), because of utility or equipment failure (26%) or because of failure to protect their home (18%) [5].

Those who intend to defend but leave experience late evacuation in a manner similar to those who wait and see'. During their late evacuation, they encounter smoke (74%), embers (59%), poor visibility (56%), flames (56%) and fallen trees (37%) [5].

3.7. Policy Implications of Wait and See

When confronted by a bushfire threat, many people neither intend to remain to defend their property nor leave immediately but wait and see how the circumstances of the fire develop. This response is inconsistent with the advice of emergency service authorities and has implications for agency's bushfire engagement and education policies. Community bushfire safety policies and programs that take account of this predominant wait and see behaviour are more likely to be effective than requiring acceptable behaviours determined by emergency agencies [37,83]. The Black Saturday Bushfire Royal Commission found that ... people will continue to wait and see and a comprehensive bushfire policy must accommodate this by providing for more options and different advice [63].

Policy positions should not be based on the premise that waiting and seeing is an inherently poor option [37] because people are not a blank slate to be directed by emergency services. They make their own judgements about threat, based on their understanding of the local context and circumstances, and their needs and priorities [36,83]. While fire agencies prefer decisive protective action, much of the at-risk community perceive recommended actions of the emergency services, such as evacuating early, as entailing risk and disadvantages [38]. In this context, people undertake appropriate behaviour such as information gathering and monitoring, logistical organization, consultation and communication, and finalising property preparation [75]. The central policy issue for fire agencies appears to be what people do when they wait and see and to ensure it is not simply to wait and hope for the best [37]. It cannot be assumed that people have a sound understanding of safe evacuation in all the bushfire threat circumstances that they could face, and the planning and preparations required [59]. For many who do not intend to stay and defend, leaving will follow a period of waiting and seeing. This needs to be addressed directly by agencies, not simply dismissed as being a dangerous choice [8]. The dual objectives of emergency agency programs should be to reduce the incidence of last-ditch evacuation or dangerous sheltering in place and to promote safe evacuation, after seeing the need to leave.

Improvements to bushfire safety policy and programs that can contribute to the achievement of these dual objectives include [37,55]:

1. Recognizing self-evacuation archetypes [84] and tailoring policies, programs and information [48] toward different individual views and responses [75]. Agencies can better understand the needs and values of community members and adjust their approach accordingly [49].
2. Promoting the identification and application of personal evacuation triggers (as part of a clear contingency plan) [49] for safe evacuation, rather than solely relying on the receipt of official warnings from fire authorities.

3. Programs to assist people to develop sophisticated triggers based on clear identification of an imminent threat requiring immediate evacuation [45].
4. Reducing perceived inconvenience of leaving by providing advice on basic preparation and planning for safe evacuation.
5. Further improving warnings to enable clear understanding and less uncertainty about the extent and immediacy of threat (including enhancing accuracy, timeliness, detail, local specificity, personalisation—not generic) to promote early protective decision making and action.
6. Extending risk education to highlight the extreme danger of late evacuation or sheltering in an unprepared refuge.
7. Addressing the property protection side of the wait and see dilemma by demonstrating the property preparation required for reduced vulnerability and improved likelihood it will survive in the householder's absence. Highlight low effort and cost actions (clearing vegetation and combustibles rather than retrofitting home) to reduce house vulnerability.

4. Discussion

A significant minority, and perhaps a majority, of people facing a bushfire threat choose to delay their protective actions by remaining to protect their property but leaving when they feel threatened, waiting for advice or direction from the emergency services, waiting to see how the bushfire develops before making a final decision and by deciding to reconsider the defence of their property. Overall, the literature indicates that at least one-quarter of residents delay their protective decision making and the weight of the evidence suggests that approximately 45% delay, although some studies report over 60% of respondents delay their protective decisions. As the literature has explored delayed response to bushfire threat and the various ways it is manifest, it has become increasingly clear that it is an extremely important and perhaps predominant response to bushfire threat. Even the naming may have resulted in an underestimation of its importance. Wait and see captured only one aspect of the delaying response, whereas delay can be attributed to seeing how the fire develops, only leaving if the fire threatens, waiting for official direction and failure of defence. Some researchers have suggested that we should accept that, except for those who leave on a high danger day before a bushfire occurs in their area and those who successfully remain and defend, all responses to a bushfire threat will have some element of delay. This delay may be due to actions such as organizing the logistics of evacuation, monitoring and assessing warnings and information, talking to family and neighbours or abandoning a failed attempt at property defence [54,75,85].

Delaying protective decision making during a bushfire is associated with dangerous late evacuation or sheltering, fatalities and injury. People delaying protective decisions are highly vulnerable and exposed to the unpredictable and complex behaviour and effects of bushfire including extreme radiant heat, suffocating smoke, airborne debris, falling trees and traffic accidents. They do not tend to prepare logistically or psychologically for evacuation or plan safe evacuation routes and are not well set up to quickly or safely respond.

People choose to delay because, although they want to be safe from bushfire, they do not want their property to be vulnerable to threats such as falling embers which may be readily extinguished. Delaying allows them to protect both safety and property by staying and assessing the fire and responding to emerging conditions rather than leaving immediately. They see this as a sensible and safe approach because of their low risk perception, optimism about survival and expectation that others will assist. They also avoid the costs, time and effort of evacuating and minimize the disruption to daily lives. Monitoring and assessing bushfire information and warnings delays protective action especially if they are incomplete, conflicting, or inconsistent with people's own assessments. Unsuccessful property defence may be due to lack of commitment, capability or result from a rational risk response but, in any case, translates into delay in protective decision making

and dangerous late evacuation. For all these reasons, delaying action appears to many to be a sensible, reasonable, or necessary response to bushfire, reflecting the underlying theme in the literature that many people will choose or default to this option and the emergency services need to address it rather than discredit it.

There are few demographic factors that are important in decisional delay other than gender. Women and men appear to have a similar assessment of the costs and benefits of delay, and while women are willing to delay protective actions in the same way as men, they appear to prefer to respond to risk sooner than men. Women respond to the feeling of threat, which does not necessarily mean an imminent fire presence, whereas men want to see and feel the fire. Agreement between the sexes on delaying action disappears when this difference between risk response comes into clear focus during a live bushfire event.

With so many people delaying action for what they see as sound and rational reasons, combined with the impact of delay on personal safety, bushfire safety policy and programs should better address the reasons for delay and offer solutions. It is essential that emergency agencies are more adaptable and responsive to individual and local differences and identify, assess and challenge the assumptions that they have made in the past about individual and community needs and responses. Agencies need to better understand and take account of people's needs and values including the archetypal behaviour that may be inherent in their decision to delay protective action. This would include changing people's risk-reward assessments through more targeted: information and warnings on bushfire risk and impact; information on property preparation to reduce vulnerability and enhance survivability; support for evacuation planning including pre-event organization and safe escape routes; development of sophisticated individualized evacuation triggers.

5. Conclusions

Many people delay taking protective action during a bushfire event. It can be expected that bushfires will become more frequent and intense in the future, so a response that was unsafe in a less extreme environment has become even more dangerous. Delaying their response seems sensible and largely safe for many people. It is more convenient and less disruptive of their daily lives and avoids the mistake of leaving when it is unnecessary. It is a logical outcome of collecting and assessing information, talking to family and neighbours, and preparing to leave. All these factors work against the emergency agencies' objective of having people leave as soon as they become aware of a bushfire in the local area. This inability to promote timely evacuation from bushfire is highly significant because research has established that delay is dangerous and potentially fatal. The prevalence of delay in protective action during bushfire requires that emergency authorities consider how bushfire safety policy and programs can be modified and targeted to address the attitudes and needs of the many people who intend to delay in a bushfire. The literature reported in this review identifies at least six areas in which authorities can take more significant action that would enhance community safety, including identifying and targeting individual attitudes and needs, establishing crucial evacuation triggers, and addressing fears of property loss due to unnecessary leaving.

Despite considerable evidence about protective action delay in bushfire, substantial uncertainty remains, and further research is required. Future research may usefully further consider the logistics of evacuation, monitoring and assessment of information and warnings, the role of individual attitudes and perceptions, and household dynamics in decisions to delay, especially the influence of gender.

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