Natural Hazards Research Australia

Predictions in public: understanding the design, communication and dissemination of predictive maps to the public

Work Package 5 First national community survey

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We acknowledge the Traditional Custodians across all the lands on which we live and work, and we pay our respects to Elders both past, present and emerging. We recognise that these lands and waters have always been places of teaching, research and learning.

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Executive summary

Research in Australia has been conducted on the public's response to risk and warning communication (Dootson et al. 2019, 2021). However, less research effort has focused exclusively on maps, and even less has focused on fire spread prediction maps and the Australian context. The purpose of the research reported here is to assess the extent to which community members use, comprehend, perceive, and act upon maps, including fire spread prediction maps in bushfires. A secondary purpose is to offer jurisdiction-specific feedback to fire agencies on community engagement with their current map products to inform their respective communication strategies and map design. In collaboration with a project Steering Committee, maps currently in use across the states and territories of Australia were tested in a nationwide survey (*N* = 3007). The maps showed a hypothetical bushfire scenario. The sample included over 52% female respondents, with over 51% aged 18 to 44 years old. The sociodemographic characteristics of the sample are provided in Table 1 on page 9. In the overall sample, approximately 11% of the respondents indicated that someone in their household was a member of a state emergency service agency. Just over 42% indicated that they had previously experienced a bushfire, with 34% indicating experience within the past five years. A summary of the results is provided below. The intended audience for this report is the project team, the Steering Committee, and agency people involved in map production and disseminating public information and warnings.

Preferred, trusted sources and platforms. Respondents indicated they typically received information about bushfires from the formal fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS), local government, state government, Bureau of Meteorology, and media. However, when asked about who a trusted source of bushfire information was, media was usually replaced with police services or family and friends.

Comprehension. Respondents for the most part comprehended the purpose of the maps and associated warning messages, as well as the intended prompted action. There were some points of confusion, including when the map contained multiple polygons and warning levels, when the respondent was placed outside the polygon, and when it was hard to locate oneself on the map due to the design of the map (e.g., too many roads and no road names; or the map was too bare, with limited geographical information). Moreover, there was moderate-high self-reported perceived map effectiveness, such as that the maps and associated warning messages were worth remembering, grabbed attention, and were powerful, informative, or meaningful (Davis et al., 2017; Dillard et al., 2007).

Risk perceptions and emotions. Both risk perceptions and negative emotions, overall, tended to increase when the map and associated warning message were visualising and describing a higher level of threat escalation, for example, Map 1 may have been a 'Watch and Act' level of bushfire escalation whereas Map 2 may have then been an 'Emergency Warning' level of bushfire escalation, a higher level of warning in the national Australian Warning System. Map 2 would thus be associated with stronger self-reported risk perceptions and negative emotions, congruent with the higher level of warning escalation.

Protective action intentions. The national sample was largely compliant with the agency-issued instructions (usually stated in the associated warning message). While there were cases of respondents indicating that they would do specific protective actions implied but not explicitly mentioned by the warning message, these were usually aligned with protective behaviour. There were instances, however, where respondents indicated that their top five protective action intentions would include an action that could potentially put the individual (or their property) at risk (e.g., waiting for a firefighter to tell them to evacuate, waiting for police to knock on the door).

Coping appraisal. The maps and associated warning messages had two impacts on coping appraisal, either: (1) the map and associated warning message saw an increased coping appraisal from the initial self-reported general perceived coping appraisal of responding to bushfires; or (2) the more complex, higher escalation of warning (e.g., Emergency Warning) saw a higher coping appraisal assessment by the respondent than the

simple map of lower escalation of warning (e.g., Watch and Act). Pairing a high coping appraisal with high-risk perceptions is helpful to incite protective action over maladaptive decision-making (e.g., wishful thinking, denial, inaction) as per protective motivation theory (Rogers, 1975).

Feedback. Common feedback across the whole sample of respondents on the maps included calls for:

- *Directionality of hazard:* use arrows showing directionality of the bushfire spread.
- *Legend*: use a legend or key to help interpret the information presented on the map.
- *Timing*: indicate when the map was developed and for how long it is valid; time estimates on how fast it is tracking.
- *Landmarks*: show on the map key landmarks, including evacuation centres, to help people locate themselves on the map.
- *Routes*: show clear routes out to help people navigate their evacuation.
- *Interactive capabilities*: provide the ability to engage with the map directly, i.e., zoom functionality.
- *Sizing and legibility*: increase the prominence of hazard markers alongside placenames, roadways, and other landmarks.
- *Colours*: increase contrast of colours to clearly delineate multiple warning areas.

The results from this study combine with the other work packages in the *Predictions in Public* research program to cumulatively underpin the future design of maps for use in the public information and warnings milieu in Australia, under the Australian Warning System. This report should not be read in isolation to other work packages.

End-user statement

Fiona Dunstan, Manager National Community Engagement, Bureau of Meteorology

Maps, including fire spread prediction maps, are a critical tool in public information and warnings, and operational response, during bushfires in Australia. There is limited empirical evidence and corresponding national doctrine guiding the appropriate design and use of maps during bushfire events. As Australia transitions to the nationally standardised Australian Warning System, there is an opportunity to understand what it means for bushfire map design across jurisdictions based on community needs and expectations. To have empirical evidence of how community members use, comprehend, perceive, and act upon bushfire maps and associated warning messages, including bushfire spread prediction maps, is important for us because it helps emergency services agencies tailor the information and warnings it delivers to the community during emergency events. These findings, combined with the other work packages of the *Predictions in Public* research program, will help us develop ways to design and disseminate maps and associated warning messages during bushfires that meet the informational needs of the community, the operational needs of agencies, and the enhancement of community engagement programs that support disaster resilience, and can guide protective action decision-making to prevent loss of property and life. Cumulatively, these findings will be useful in underpinning the development of national doctrine on best practice for map design, communication, engagement, and dissemination, including for fire spread prediction maps in bushfires across Australia.

Introduction

This research is a component of a wider program of research called *Predictions in public: understanding the design, communication and dissemination of predictive maps to the public* (*Predictions in Public* project).[1] The overall aim of the Predictions in Public research program is to optimise predictive map design and dissemination to ensure that these maps will support community protective action decision-making during a bushfire event. The research program objectives are:

- **Objective 1:** To understand how members of the fire and emergency services sector would prefer predictive maps to be distributed and used by members of the public.
- **Objective 2:** To understand how members of the public use, comprehend, perceive, and take-action in response to existing predictive map designs and other types of maps used by agencies across Australia.
- **Objective 3:** To develop a set of evidence-based guidelines/principles for the design and dissemination of predictive maps to the public based on existing research on hazard mapping.
- **Objective 4:** To work with the fire and emergency services sector to develop to practical project outputs to translate the research findings into fire agency policy and practice.

The research program has three phases:

- **Phase One:** Existing agency use and public awareness of predictive service products in public information and warnings
- **Phase Two:** Standardised design, dissemination, and communication for predictive maps
- **Phase Three**: Communication, evaluation, and learning framework

The research reported here is Work Package 5 in Phase One of the program. It addresses Objective 2, assessing the extent to which community members use, comprehend, perceive, and act upon bushfire maps and associated warning messages, including bushfire spread prediction maps. This research also offers jurisdiction-specific feedback to fire agencies on community engagement with their current map products to inform their respective communication strategies and map design. The intended audience for this report is the project team, the Steering Committee, and agency people involved in map production and disseminating public information and warnings.

[1] See https://www.naturalhazards.com.au/research/research-projects/predictions-public-understanding-design-communication-and-dissemination

Brief background

Research in Australia has been conducted on the public's response to risk and warning communication (Dootson et al., 2019, 2021). However, less research effort has focused exclusively on maps and even less has focused on fire spread prediction maps. While some studies have focused on the public's response to general bushfire map design (Cao et al., 2016, 2017; Cheong et al., 2016), currently missing from the literature is a clear understanding of how Australian community members use, comprehend, perceive, and act upon maps, including fire spread prediction maps ('predictive maps'). Foundational research has recently been conducted in New South Wales after the 2019–20 Black Summer Bushfires (Whittaker et al., 2020); however, data for other Australian jurisdictions is currently lacking. The Australia Institute Disaster Resilience (AIDR) *Public Information and Warnings Handbook* (AIDR, 2021), which is national doctrine guiding the design of warnings and public information, is currently limited in its advice on the use of maps. To date, only broad information about what a map needs to include (e.g., location of hazard, route closures, prediction) and the use of a legend and consistent symbols and colours, is recommended. We believe that findings from this research program will cumulatively provide greater detail on how maps, including predictive maps, should be designed, communicated, and disseminated under the new nationally standardised approach to public information and warnings required by the implementation of the Australian Warning System[2].

Maps are just one visual tool in the public information and warnings milieu. Visuals help convince people of the risk associated with a hazard and whether any protective action should be taken (Liu et al., 2020; Morss et al., 2018). Visuals are a critical part of that information mixture, bringing order to the uncertainty the community experiences by documenting the event; communicating the possible risk, impact, and severity of the event; and showcasing the desired action(s) and action(s) of others (Liu et al., 2020; Morss et al., 2018). Often paired with text-based content, visual media help anchor text meaning and make the relevant information more salient, trusted, and easier to interpret and remember (Mortensen et al., 2017; Zhao et al., 2018). Photographic visuals can effectively capture 'the totality of the event' (Mortensen et al., 2017, p. 221), with users perceiving visuals to be a truthful representation of reality in that moment (Feldman & Hart, 2018).

Maps are a specific type of visual that offer a representation of an emergency or hazard event, such as a bushfire, to assist agency planning and/or response operations (cf. Fiedrich & Zlatanova, 2013) and community sense-making and protective action decision-making (cf. Cova, 1999). Where maps are not provided or are indeed inaccurate, they can put emergency management workers as well as those in the community that they are assisting in harm's way (Dwyer, 2022). While reliance on maps used for emergency communication has increased, studies suggest that the format, content, and accuracy of emergency maps vary, which implies that there is scope for improvement in the development, design, and dissemination of these maps (Cao et al., 2016; MacPherson-Krutsky et al., 2020).

Previous work in this research program has developed a series of map design and dissemination principles that will be iteratively tested and revised throughout the life of the project. A critical element to good practice map design and dissemination, however, is to consider the recipient's cognitive processes and comprehension when viewing and interpreting a map (Cao et al., 2016; Lindell, 2020). To do so, we draw on the protective action and decision-making model (Lindell & Perry, 2012) to examine the extent to which the community are exposed to maps in use across Australia during bushfires, how well they grab attention, and the extent to which the community comprehend what the map is communicating about the hazard and the associated risk. Further, the research seeks to understand the extent to which a map can signal threat and inform protective action perceptions. These perceptions then form the basis for decisions about how to respond to an imminent or long-term threat. The outcome of the protective action decision-making process, together with situational facilitators and impediments, produces a behavioural response (Lindell & Perry, 2012, p. 616) comprising further information-searching, emotion-focused coping, and/or protective action.

[2] See https://www.australianwarningsystem.com.au/

Research approach

This research was conducted in Australia for bushfire hazards, one of the deadliest hazards in this jurisdiction (Royal Commission, 2020). Bushfires are events with imminent threat, requiring timely execution of advised protective actions to avoid immediate negative outcomes (AIDR, 2018). To assess the extent to which community members use, comprehend, perceive, and act upon bushfire maps and associated warning messages, including fire spread prediction maps, two types of maps and associated warning messages were tested across each jurisdiction, with one predictive map formally tested in the New South Wales/Australian Capital Territory survey. The two maps and associated warning messages used to test in each jurisdiction were for hypothetical bushfire scenarios developed by the agency responsible for that specific jurisdiction. Only one agency provided a fire spread prediction map for testing (New South Wales RFS) as they had the most experience at the time with producing and disseminating this public information product. Each map and associated warning message are provided in their respective results sections below.

The data were collected over three weeks in November – December 2022. The research was designed in close collaboration with agencies across Australia, including:

- Queensland Fire and Emergency Services (QFES)[3]
- New South Wales Rural Fire Service (NSW RFS)
- Australian Capital Territory Emergency Services Agency (ACT ESA)
- Country Fire Authority Victoria (CFA VIC)
- Emergency Management Victoria (EMV)
- Tasmania Fire Service (TFS)
- South Australia Country Fire Service (SA CFS)
- Western Australia Department of Fire and Emergency Services (DFES)
- Northern Territory Fire and Rescue Service (NTFRS)

Respondents

A total of seven surveys were run on a representative sample of Australians (*N* = 3007) recruited by the Qualtrics market research panel. The sample included over 52% female respondents, with over 51% aged 18 to 44 years. The sociodemographic characteristics of the sample are provided in Table 1. A breakdown of sociodemographic characteristics of respondents from each jurisdiction are also provided separately in the relevant results sections below. In the overall sample, approximately 11% of the respondents indicated that someone in their household was a member of a state emergency service agency. Just over 42% indicated that they had previously experienced a bushfire, with 34% indicating experience within the past five years. Respondents self-reported a low-moderate level of perceived knowledge about bushfire hazards and risk (*M* = 4.0; scale of 0–10).

Gender	Frequency	Percent
Female	1585	52.7
Male	1413	47
Other	7	0.2
Prefer not to disclose	2	0.1
Age		
18–24	391	13
25–34	592	19.7
35–44	569	18.9
45–54	468	15.6
55–64	431	14.3
65–74	363	12.1
75 or older	193	6.4
Prior bushfire experience		
Within the past 12 months	179	6

[3] In July 2024, Queensland Fire and Emergency Services became known as Queensland Fire Department.

1–5 years ago	844	28.1
6–10 years ago	233	7.7
11–15 years ago	127	4.2
16–20 years ago	77	2.6
21–25 years ago	49	1.6
25+ years ago	155	5.2
Never	1221	40.6
Don't know	122	4.1
Prior use of maps during bushfires		
Yes	1284	42.7
No	1723	57.3
Emergency services Involvement		
Yes	326	10.8
No	2681	89.2
Total	3007	100

TABLE 1 NATIONAL SAMPLE CHARACTERISTICS

Design and stimulus

A scenario-based questionnaire was designed to understand the extent to which community members use, comprehend, perceive, and act upon bushfire maps and associated warning messages, including fire spread prediction maps. At the beginning of the study, respondents were assigned to one of seven surveys based on the Australian jurisdiction in which they lived. Each survey comprised three sections. Section 1 captured bushfire experience, exposure to and use of maps, general risk and coping assessment, source and source credibility questions, and self-reported preparatory protective actions. In Section 2, respondents were exposed to one map and associated warning message from their home state/territory, followed by a series of comprehension, emotion, risk perception, map effectiveness, coping appraisal, and protective action intentions questions. This was repeated for a second map with an associated warning message from their home state/territory. Section 3 of the survey covered demographic information, insurance coverage, and experience (i.e., employee or volunteer) in emergency services. See Appendix 1 for stimuli and associated scenarios used across each of the surveys in collaboration with the respective jurisdiction.

Measures

Pre-existing validated items were used to measure the constructs in this study (Table 2). Cronbach's (1951) alpha was used to measure the internal consistency of the scale items.

		Cronbach's alpha						
Construct	**Items**	**Qld**	**NSW/ACT**	**Vic.**	**Tas.**	**SA**	**WA**	**NT**
General risk	5	0.908	0.895	0.885	0.899	0.884	0.898	0.894
Current knowledge	3	0.849	0.879	0.846	0.847	0.835	0.871	0.895
General coping appraisal	2	0.842	0.883	0.88	0.838	0.877	0.861	0.929
Perceived risk (Map 1)	3	0.792	0.805	0.88	0.829	0.787	0.835	0.866
Perceived risk (Map 2)	3	0.895	0.622	0.875	0.895	0.878	0.922	0.942
Negative emotions (Map 1)	3	0.93	0.936	0.938	0.939	0.942	0.936	0.957
Negative emotions (Map 2)	3	0.97	0.965	0.948	0.955	0.953	0.962	0.958
Positive emotions (Map 1)	3	0.85	0.863	0.883	0.845	0.857	0.855	0.852
Positive emotions (Map 2)	3	0.86	0.905	0.897	0.891	0.89	0.902	0.908
Map effectiveness (Map 1)	9	0.95	0.94	0.94	0.95	0.94	0.93	0.935
Map effectiveness (Map 2)	9	0.96	0.96	0.94	0.96	0.95	0.95	0.949
Coping appraisal (Map 1)	3	0.52	0.618	0.618	0.526	0.513	0.632	0.694
Coping appraisal (Map 2)	3	0.70	0.622	0.626	0.528	0.634	0.632	0.627

TABLE 2 MEASURES

Each of the constructs in this paper have an alpha exceeding 0.7, demonstrating reliability in the scale items used except for some of the coping appraisal measures, which tended to perform better as individual items: self-efficacy, response efficacy, and response cost (Grothmann & Reussig, 2006).

General risk perceptions were measured with five items (Ho, Shaw, Lin & Chiu, 2008) on a 7-point scale examining the extent to which bushfires are perceived to threaten the respondent's life, the lives of family members, and quality of life, and to bring financial loss; and a threat appraisal of bushfires generally. General coping appraisal was measured with two items (Grothmann & Reusswig, 2006) on a 7-point scale to examine the extent to which respondents felt generally confident in their ability to protect themselves and their property from a bushfire. Current knowledge was measured with three items (Yang, 2012) on a 10-point scale to ascertain the extent to which respondents felt informed about bushfires as a hazard. Emotions were measured as two constructs: negative emotions and positive emotions using Yang (2012) 10-point scale to examine the extent to which the maps presented in the survey individually triggered feelings of being afraid, anxious, and worried; or hopeful, optimistic, and enthusiastic. Perceived risk associated with a specific map was operationalised as a mean response of three items on a 7-point scale evaluating the perceived risk of the situation visualised in the map, the degree to which the bushfire presented in the map and associated warning message would put the respondent's safety at risk, and how serious the risk was (Eosco, 2015; Rickard et al., 2017). Coping appraisal specific to the actions outlined in the warning message associated with each map was operationalised as a mean response of three items on a 7-point scale examining the extent to which the respondent perceived that they had the ability to perform the protective actions required (i.e., self-efficacy), that their actions would in fact protect themselves (i.e., response efficacy) and that performing the actions would not come at a high cost (i.e., response cost) (Grothmann & Reusswig, 2006). Perceived effectiveness of the map was measured as a mean response of nine items on a 7-point scale ascertaining the extent to which the participant perceived the map was worth remembering, grabbed their attention, and was powerful, informative, or meaningful (Davis et al., 2017; Dillard et al., 2007). Protective action intentions were operationalised as the respondent's intention to perform the protective actions relevant to that specific map and associated emergency services instructions. These actions were codesigned with agencies based on the relevant instructions in the map and associated warning messages.

Data analysis

The data were analysed using SPSS by IBM version 28 and version 29. Descriptive statistics and paired sample *t*-tests were run on the data for each jurisdiction.

Ethics clearance

The QUT ethics approval number for this research project is LR 2022-5724-11822.

Results

National

This section provides a high-level summary of the results that are reported in detail in each jurisdiction's section below. This section serves as additional detail to the Executive Summary.

Preferred, trusted sources and platforms

Descriptive analysis was performed to better understand respondents' preferences for information sources and platforms during a bushfire. Respondents indicated that they typically received information about bushfires from the formal fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS), local government, state government, Bureau of Meteorology, and media. However, when asked about who a trusted source of bushfire information was, media was usually replaced with police services or family and friends. Specific platforms that were commonly used to find information included agency websites, an app (agency-owned or third-party), Google searches, online news, television, radio, and some social media platforms.

Comprehension

Respondents, for the most part, comprehended the purpose of the maps and associated warning messages as well as the intended prompted action. There were some points of confusion, including when the map contained multiple polygons and warning levels, when the respondent was placed outside the polygon, and when it was hard to locate oneself on the map due to the design of the map (e.g., too many roads and no road names or the map was too bare, with limited geographical information).

Overall, there was moderate-high self-reported perceived map effectiveness, such that the maps and associated warning messages were worth remembering, grabbed respondents' attention, and were powerful, informative, or meaningful (Davis et al., 2017; Dillard et al., 2007).

Risk perceptions and emotions

Overall, both risk perceptions and negative emotions tended to increase when the map and associated warning message were visualising and describing a higher level of threat escalation. For example, Map 1 may have been a 'Watch and Act' level of bushfire escalation whereas Map 2 may have then been an 'Emergency Warning' level of bushfire escalation, a higher level of warning in the national Australian Warning System. Map 2 would thus be associated with stronger self-reported risk perceptions and negative emotions, congruent with the higher level of warning escalation.

Protective action intentions

When evaluating the top five actions that respondents indicated they would take in response to viewing a map and associated warning message, the national sample was largely compliant with the agency-issued instructions (usually stated in the associated warning message). Worth noting were the additional actions respondents indicated they may take beyond what was explicitly instructed by the fire agency, which fell into one of three possible categories: (1) a general instruction, e.g., stay informed by emergency services agencies, which was not explicitly mentioned but largely implied by the map and associated warning message; (2) a specific action that was not explicitly mentioned but would still help protect the lives and property of the affected individual; or (3) a specific action that was not explicitly mentioned in the map and or associated warning message and where following that action could potentially put the individual (or their property) at risk (e.g., waiting for a firefighter to tell them to evacuate, waiting for police to knock on the door).

Coping appraisal

The maps and associated warning messages had two impacts on coping appraisal, either: (1) the map and associated warning message saw an increased coping appraisal from the initial self-reported general perceived coping appraisal of responding to bushfires; or (2) the more complex, higher escalation of warning saw a higher coping appraisal assessment by the respondent from the initial self-reported general perceived coping appraisal of responding to bushfires. Pairing a high coping appraisal with high-risk perceptions is helpful to incite protective action over maladaptive decision-making (e.g., wishful thinking, denial, inaction) as per protective motivation theory (Rogers, 1975).

Feedback

Common feedback across the whole sample of respondents on the maps included calls for:

- Directionality of hazard: use arrows showing directionality of the bushfire spread.
- Legend: use a legend or key to help interpret the information presented on the map.
- Timing: indicate when the map was developed and for how long it is valid; time estimates on how fast it is tracking.
- Landmarks: show on the map key landmarks, including evacuation centres, to help people locate themselves on the map.
- Routes: show clear routes out to help people navigate their evacuation.
- Interactive capabilities: provide the ability to engage with the map directly i.e., zoom functionality.
- Sizing and legibility: increase the prominence of hazard markers alongside placenames, roadways, and other landmarks.
- Colours: increase contrast of colours to clearly delineate multiple warning areas.

Comparisons between jurisdictions

Given the individualistic nature of the maps and the bushfire scenarios depicted in them across each jurisdiction, empirical comparisons between jurisdictions have not been made.

Queensland

This section reports the results for the Queensland sample only, including the two Queensland bushfire maps and associated warning messages.

Sample characteristics

Respondents (*n* = 415) from Queensland comprised 58% female, 53.5% aged 18 to 44 years. Respondents predominantly speak English as a primary language (96%), and almost 12% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 3). Reporting is to one decimal place.

Gender	Frequency	Percent
Female	239	57.6
Male	175	42.2
Other	1	0.2
Age		
18–24	61	14.7
25–34	95	22.9
35–44	66	15.9
45–54	52	12.5
55–64	51	12.3
65–74	60	14.5
75 or older	30	7.2
English as a primary language		
Yes	398	95.9
No	17	4.1
Education level		
Left school before Year 10	9	2.2
High school (to Year 10)	42	10.1
High school (to Year 12)	89	21.4
TAFE qualification (e.g., Certificate II, III, or IV)	123	29.6
Bachelor's degree	100	24.1
Postgraduate award	52	12.5
Insurance level		
Fully insured – Vehicle	332	80
Fully insured – House	259	62.4
Fully insured – Contents	247	59.5
Fully insured – Farm	14	3.4
Emergency services involvement		
Yes	49	11.8
No	366	88.2
Total respondents	415	100

TABLE 3 SAMPLE CHARACTERISTICS FOR QUEENSLAND

Experience and exposure

A total of 39% of the sample had previously experienced a bushfire, with over 29% experiencing a bushfire in the past five years. Holistically, the sample reported a moderate likelihood of being exposed to the threat of

bushfire in their current neighbourhood (*M* = 3.6, scale of 1–7). There was a low reported perceived current knowledge about bushfires (*M* = 3.5, scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, almost 30% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire.

Despite a low-moderate perceived knowledge of mitigation activities that could prevent loss during a bushfire, approximately 22% indicated they had made modifications to their home or land to protect themselves from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 15.1% (low risk of bushfire) to 28.6% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 4, based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	45	22	74	35.2
Developed/prepared an emergency kit	40	19.5	72	34.3
Downloaded agency app to stay informed	14	6.8	35	16.7
Followed emergency services instructions	39	19	64	30.5
Had/prepared first aid box	57	27.8	78	37.1
Kept informed via agency website, social media, phone, or radio	39	19	70	33.3
Kept/prepared valuables, medication, pets, and other significant belongings close by	30	14.6	53	25.2
Listened for more information from emergency services sources	50	24.4	76	36.2
Signed up to receive emergency alerts/warnings	49	23.9	74	35.2
Started to evacuate my property and family if/when instructed to do so	16	7.8	33	15.7
None of the above	80	39	44	21
I don't know/don't remember	5	2.4	6	2.9
Total respondents	205		210	

TABLE 4 PREPARATORY ACTIONS FOR QUEENSLAND RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, local governments, Bureau of Meteorology, media, and/or the state government (Table 5). These preferred sources aligned with who the sample indicated they trusted as a source of information about bushfires (Table 6). However, despite police services not ranking in the top five preferred sources, they were in the top five trusted sources, above media, which was a preferred source for bushfire information.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	281	67.7
Local government	206	49.6
Bureau of Meteorology	190	45.8
Media	177	42.7
State government	173	41.7
Family and friends	105	25.3
Police service	98	23.6
Insurance provider(s)	17	4.1
Public transport provider	12	2.9
Private landholders	1	0.2
Not sure	1	0.2
None	3	0.7
Other	15	3.6
Total respondents	415	

TABLE 5 PREFERRED SOURCE FOR BUSHFIRE INFORMATION IN QUEENSLAND

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	341	82.2
Bureau of Meteorology	176	42.4
Local government	172	41.4
State government	135	32.5
Police service	135	32.5
Media	60	14.5
Family and friends	37	8.9
Insurance provider(s)	16	3.9
Public transport provider	14	3.4
ABC radio	1	0.2
Don't know	2	0.2
None	1	0.2
Other	6	1.4
Total respondents	415	

TABLE 6 TRUSTED SOURCE FOR BUSHFIRE INFORMATION IN QUEENSLAND

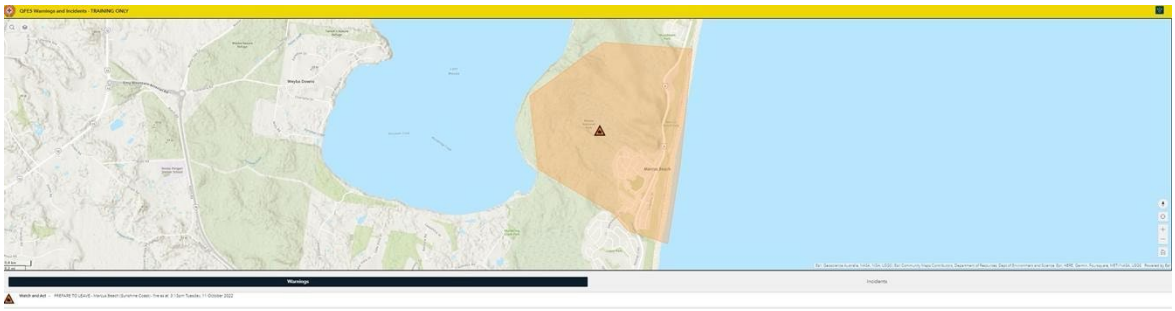
Commonly searched platforms included the local fire agency website, Google, television or radio, or online news sites (Table 7). It is possible that respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use …'.

Select all that apply	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	276	66.5
Google	217	52.3
Television	184	44.3
Radio	180	43.4
Online news sites	167	40.2
Local fire agency app (where available)	148	35.7
Facebook	112	26.9
Instagram	25	6
Print newspapers	23	5.5
YouTube	20	4.8
Twitter	19	4.6
TikTok	10	2.4
Snapchat	8	1.9
Reddit	4	1
Environmental cue (i.e., smoke)	1	0.2
None	1	0.2
Other	7	1.7
Total respondents	415	

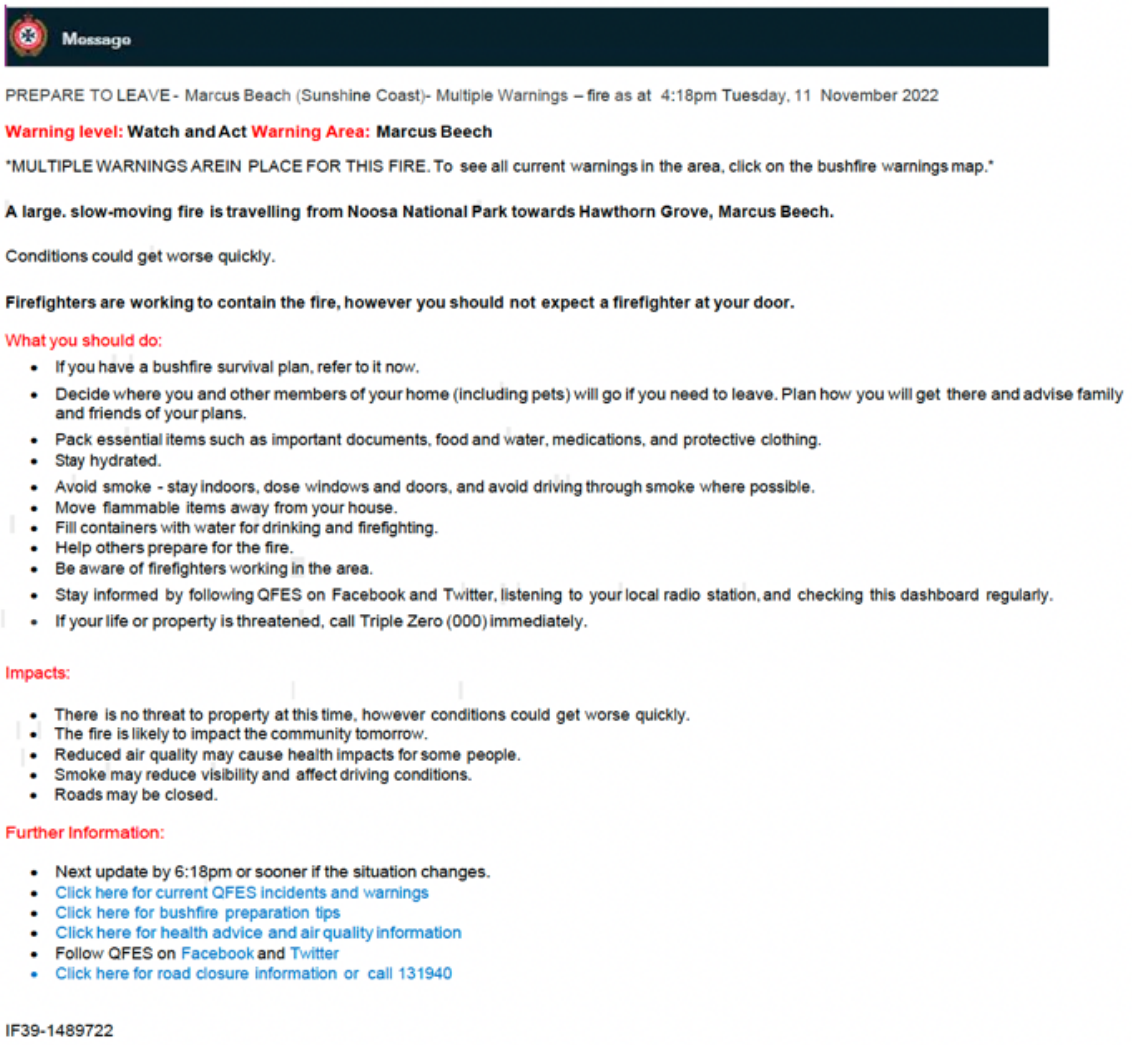
TABLE 7 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN QUEENSLAND

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 1). The scenario that respondents received was: 'Imagine you see this Current Warnings map indicating a warning has been issued for your location in the suburb of Marcus Beach. Please review the map and then answer the questions below.'



PREPARE TO LEAVE - MARCUS BEACH (SUNSHINE COAST)



Message

PREPARE TO LEAVE - Marcus Beach (Sunshine Coast)- Multiple Warnings – fire as at 4:18pm Tuesday, 11 November 2022

Warning level: Watch and Act Warning Area: Marcus Beech

MULTIPLE WARNINGS AREIN PLACE FOR THIS FIRE. To see all current warnings in the area, click on the bushfire warnings map.

A large, slow-moving fire is travelling from Noosa National Park towards Hawthorn Grove, Marcus Beech.

Conditions could get worse quickly.

Firefighters are working to contain the fire, however you should not expect a firefighter at your door.

What you should do:

- If you have a bushfire survival plan, refer to it now.
- Decide where you and other members of your home (including pets) will go if you need to leave. Plan how you will get there and advise family and friends of your plans.
- Pack essential items such as important documents, food and water, medications, and protective clothing.
- Stay hydrated.
- Avoid smoke - stay indoors, dose windows and doors, and avoid driving through smoke where possible.
- Move flammable items away from your house.
- Fill containers with water for drinking and firefighting.
- Help others prepare for the fire.
- Be aware of firefighters working in the area.
- Stay informed by following QFES on Facebook and Twitter, listening to your local radio station, and checking this dashboard regularly.
- If your life or property is threatened, call Triple Zero (000) immediately.

Impacts:

- There is no threat to property at this time, however conditions could get worse quickly.
- The fire is likely to impact the community tomorrow.
- Reduced air quality may cause health impacts for some people.
- Smoke may reduce visibility and affect driving conditions.
- Roads may be closed.

Further Information:

- Next update by 6:18pm or sooner if the situation changes.
- Click here for current QFES incidents and warnings
- Click here for bushfire preparation tips
- Click here for health advice and air quality information
- Follow QFES on Facebook and Twitter
- Click here for road closure information or call 131940

IF39-1489722

FIGURE 1 QUEENSLAND MAP 1 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following:

- Outlined preparatory action plans or provided instructions.
- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).
- Provided instructions on seeking more information.

This was mostly aligned to what the sample had been shown in the map and associated warning message (Table 8).

Response category	Frequency	Percent	Excerpts from participant responses
Preparations/plan/instructions	175	23%	*"Explains that bushfire may be a threat to this area and what to do to prepare."*
Fire-affected area	170	23%	*"A map, and from what I could see, an area being affected by fire."*
Future bushfire-affected area	85	11%	*"A map that shows a bushfire and where it's spreading, along with instructions on how to handle yourself."*
Instructions on information sources	63	8%	*"Warning about fire at Marcus Beach and ways to find more info."*
Alert/warning	57	8%	*"Descriptive warning and information about where the fire is."*
Possible bushfire danger	46	6%	*"Potential bushfire risk in that area."*
Location-specific information	44	6%	*"The fire was moving towards Marcus Beach."*
Clear information/informative/ detailed	26	3%	*"The affected area marked out on a map. Clear description of the potential threat and actions to take."*
Information on emergency services	25	3%	*"Map of affected area and information of the speed and direction of fire. Warning to prepare but not to expect a firefighter at your door. Clicks for further information."*
Evacuate/please leave	18	2%	*"A map with a highlighted affected zone warning people within that area to evacuate as per the recommendations."*
Do not evacuate yet	7	1%	*"A bushfire warning not saying to evacuate but a precautionary warning with tips on what to do."*
Imminent bushfire danger	7	1%	*"A detailed explanation of an imminent bushfire emergency."*
Total respondents	415		

TABLE 8 COMPREHENSION OF QUEENSLAND MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, 58% of respondents indicated it was to show a 'Watch and Act' level of warning escalation, also to show the location of the bushfire, and the level of risk to different parts of the community. This was mostly aligned with the agency's intended purpose (Table 9). However, the reported 47% stating it was an 'Emergency Warning area' and the 41% indicating it was an 'Advice area' were not correct in interpreting the purpose of the map.

Select all that apply	Frequency	Percent	Agency intended purpose
To show a 'Watch and Act' area	242	58.3	X
To show the location of the bushfire	218	52.5	
To show the level of risk to different parts of the community	213	51.3	X
To show an 'Emergency Warning' area	197	47.5	
To show an 'Advice' area	171	41.2	
To show where the bushfire is now	128	30.8	
To show areas that are unaffected by bushfire	112	27	
To show the direction of travel of the bushfire over the coming hours/days	104	25.1	
To identify who needs to take shelter now	101	24.3	
To show the threat of the bushfire to certain areas in the state/territory	101	24.3	X
To show multiple bushfire warning levels	100	24.1	
To show where people can go if they evacuate	57	13.7	
To show where the bushfire has been	45	10.8	
To show people if it's not safe to leave the area	42	10.1	
To show facilities that may be closed because of the bushfire	33	8	
Unsure	12	2.9	
To show the possible affected area	1	0.2	
All of the above	1	0.2	
Other	2	0.5	
Total respondents	415		

TABLE 9 PERCEIVED INTENDED PURPOSE OF QUEENSLAND MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were closely aligned with what the agency had intended to communicate to the public (Table 10). Some of the comments in 'other' made it clear that the map alone was not helpful in signalling the prompted action, e.g., 'If it is just the map it doesn't tell me anything apart from the possible affected area' and 'The map itself is just showing me where the fire is. The words underneath would encourage me to out [sic] a bush fire survival plan together and leave with my pets and family on a sort of watch and act basis'.

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	298	71.8	X
Monitor conditions as they are changing	263	63.4	X
Prepare to evacuate/prepare to leave/prepare to leave the area	248	59.8	X
Enact your bushfire survival plan	231	55.7	X
Prepare to actively defend your home/property	81	19.5	
Evacuate now/leave immediately/leave now/leave the area now	52	12.5	
Shelter indoors immediately/take shelter now	49	11.8	
Unsure	21	5.1	
It is not prompting me to act	14	3.4	
Other	5	1.2	
Total respondents	415		

TABLE 10 PERCEIVED PROMPTED ACTION FOR QUEENSLAND MAP 1

Map effectiveness

Respondents indicated that the map had moderate-high perceived effectiveness (*M* = 5.00, *SD* = 1.3; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate perceptions of risk (*M* = 4.70, *SD* = 1.30; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited low negative emotions (*M* = 3.70, *SD* = 1.80; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). The map also elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 3.00, *SD* = 1.70; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported that they would undertake actions that were closely aligned with what the agency had instructed the public to do (Table 11). Some problematic behaviours were noted in the responses, including ‘wait for a text message to tell me what to do’, ‘wait for police to evacuate you’, and ‘wait for a firefighter to tell me what to do’. This milling behaviour can lead to inaction or late action, potentially harming the lives of the community, especially when police, firefighters, or a text message may not arrive in a timely manner or at all.

Select top five actions you would do	Frequency	Percent
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	143	34.5
Follow emergency services instructions	130	31.3
Listen for more information from emergency services sources	125	30.1
Decide where you and other members of your home (including pets) will go if you need to leave	125	30.1
Keep informed by regularly visiting local fire/emergency agency website to stay informed	114	27.5
Monitor your surroundings	113	27.2
Fill containers with water for drinking and firefighting	108	26
Enact my preprepared bushfire plan	99	23.9
Avoid smoke by staying indoors and closing windows and doors	84	20.2
Follow and keep informed via local fire/emergency agency social media accounts	84	20.2
Move flammable items away from your house	83	20
Prepare an emergency kit	81	19.5
Start to evacuate my property and my family if instructed to do so	80	19.3
Source a first aid box/first aid kit	73	17.6
Sign up to receive emergency alerts/warnings	72	17.3
Create a household emergency plan/a bushfire plan	68	16.4
Search for local fire/emergency agency mobile application to stay informed	66	15.9
Listen to ABC radio	65	15.7
Share this message with other people/tell friends about this information	62	14.9
Share this message with other people	52	12.5
Help others prepare for the fire	45	10.8
Start preparing to defend my property	45	10.8
Tell others to follow emergency services' instructions	38	9.2
Wait for a text message to tell me what to do	38	9.2
Phone local fire/emergency agency to stay informed	32	7.7
Wait for a firefighter to advise me what to do	28	6.7
Wait for police to evacuate you	18	4.3
Total respondents	415	

TABLE 11 PROTECTIVE ACTION INTENTIONS FOLLOWING QUEENSLAND MAP 1

Around 80% of the sample (Map 1 assess: 80.5%; Map 1 decide: 78.8%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. Reporting is to one decimal place. The sources sought out for both the assess and decide protective action functions are outlined in Figure 2.

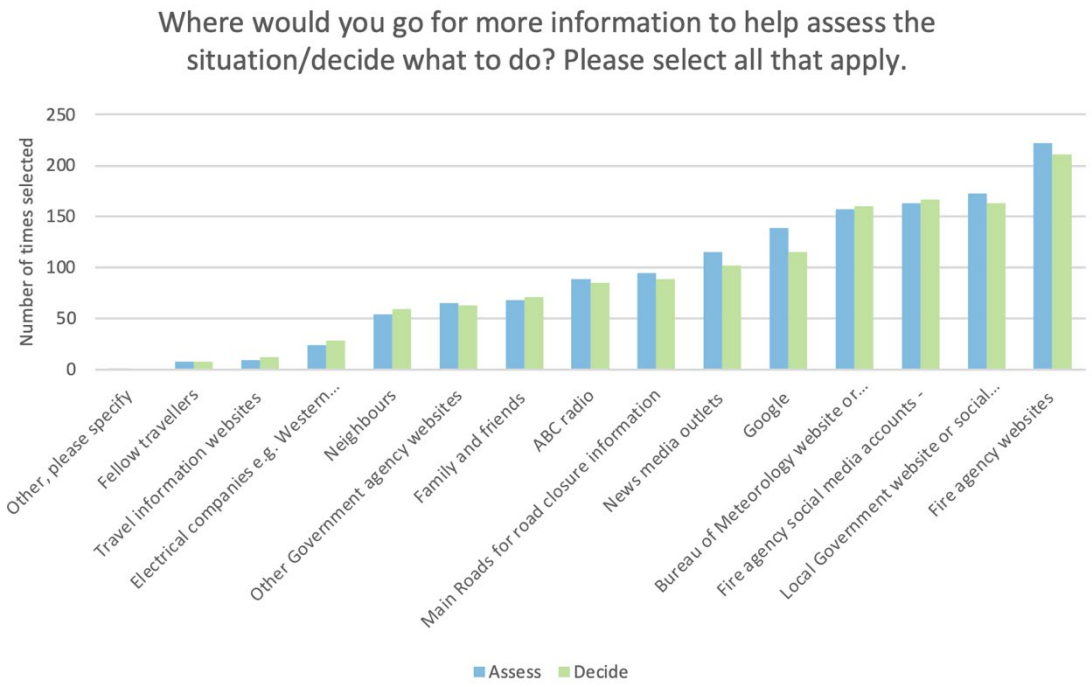


FIGURE 2 INFORMATION-SEEKING FOLLOWING QUEENSLAND MAP 1

Coping appraisal

The map elicited moderate-high perceptions of self-efficacy (*M* = 5.40, *SD* = 1.23; scale of 1–7) and response efficacy (*M* = 5.30, *SD* = 1.3; scale of 1–7), such that respondents perceived that they had the capability to perform the protective actions instructed by the emergency services agency and a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.80, *SD* = 1.5; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive comments. The positive comments were either general (e.g., 'no feedback, this map makes sense') or specific (e.g., 'it had enough key information as too much would make it overwhelming') and represented 40% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, clarity of the information provided, and bushfire direction information (Table 12). For example:

> *"If I needed to evacuate it could show me where I should be headed. This would also depend on where I am exactly on the map and how close I am to the triangle, so it should give directions that would be relevant to my location."*

> *"I wish it included the time it occurred and what time it could possibly spread to ensure evacuation is safe for my family members, however, it grabbed my attention and prompted us to plan future actions."*

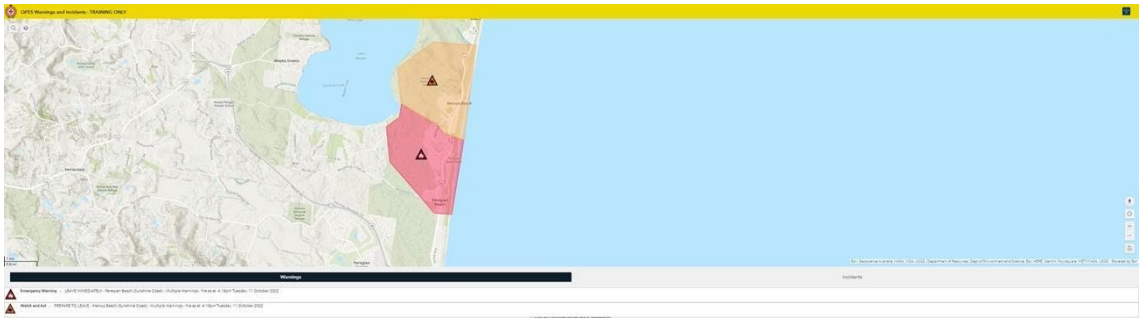
> *"The map was a little small to read and hard to look at. A darker colour for the specific area would be easier to notice. Also, there was a lot of writing, putting more information in a bigger font/different colour would grab more attention."*

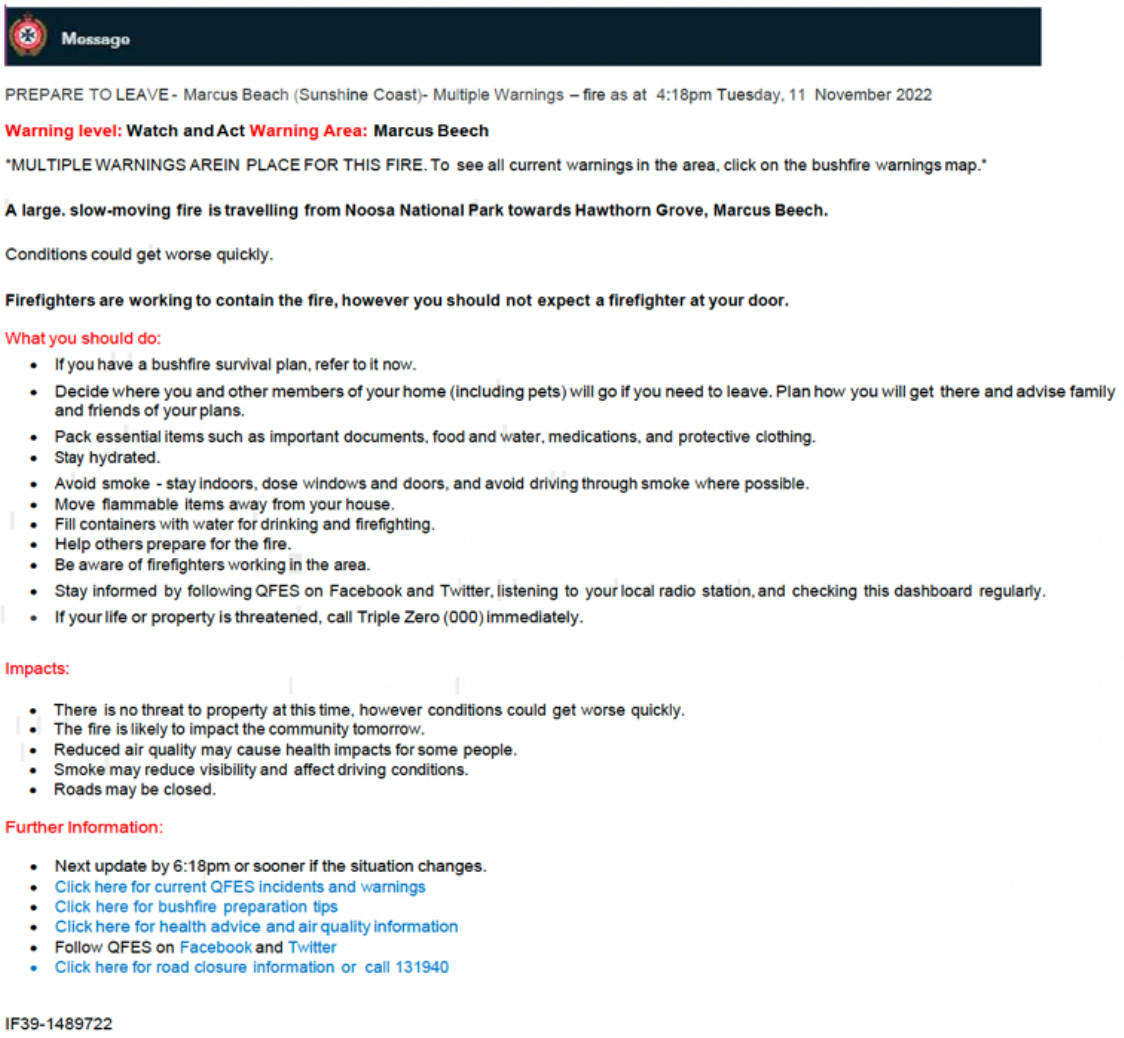
Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	111	40%	*"I found it to be very informative, not sure what else could be done."*
Positive, specific	0	0%	
Constructive responses			
Sizing, legibility, colour choices	57	21%	*"I think the map needs to be larger and possibly colour coded for danger levels."*
Information should be clearer/more concise	27	10%	*"Has a lot of information. People might scan and see a wall of text and not read?"*
Fire direction information	17	6%	*"Arrows showing the direction of the bushfire."*
Clearer instructions	14	5%	*"I wish it said exactly what to do. I was left feeling unsure what to do. I would keep second guessing myself if this was real."*
Ability to interact with map	14	5%	*"It could be slightly clearer or have a link attached to google so it can be enlarged."*
Ensure information is updated frequently	7	3%	*"Making sure the map is updated as there could be multiple changes to the road or layout. Include as much information as possible because you can never be ready enough."*
Clearer place names	6	2%	*"I wish it included more detailed information; street names, etc."*
Text more useful than map	4	1%	*"I think the map was comprehensive enough. In that circumstance, I would be more concerned with reading instructions as to how to prepare myself and would continue to monitor the fire's movements through other platforms anyway, so I don't think the map needs to be very detailed."*
More information needed	4	1%	*"I wish it would include the time it occurred and what time it could possibly spread to ensure evacuation is safe for family members. However, it grabbed my attention and prompted for us to plan future actions."*
Connectivity/general use issues	3	1%	*"It was fairly straightforward. Not sure how elderly people would go."*
Total measurable responses	261		
Total respondents	415		
No specific feedback provided	154		

TABLE 12 FEEDBACK TO IMPROVE QUEENSLAND MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 3). The scenario that respondents received was: 'Imagine you see this Current Warnings map indicating a warning has been issued for your location in the suburb of Marcus Beach. Please review the map and then answer the questions below.'





Message

PREPARE TO LEAVE - Marcus Beach (Sunshine Coast)- Multiple Warnings – fire as at 4:18pm Tuesday, 11 November 2022

Warning level: Watch and Act Warning Area: Marcus Beech

MULTIPLE WARNINGS AREIN PLACE FOR THIS FIRE. To see all current warnings in the area, click on the bushfire warnings map.

A large, slow-moving fire is travelling from Noosa National Park towards Hawthorn Grove, Marcus Beech.

Conditions could get worse quickly.

Firefighters are working to contain the fire, however you should not expect a firefighter at your door.

What you should do:

- If you have a bushfire survival plan, refer to it now.
- Decide where you and other members of your home (including pets) will go if you need to leave. Plan how you will get there and advise family and friends of your plans.
- Pack essential items such as important documents, food and water, medications, and protective clothing.
- Stay hydrated.
- Avoid smoke - stay indoors, dose windows and doors, and avoid driving through smoke where possible.
- Move flammable items away from your house.
- Fill containers with water for drinking and firefighting.
- Help others prepare for the fire.
- Be aware of firefighters working in the area.
- Stay informed by following QFES on Facebook and Twitter, listening to your local radio station, and checking this dashboard regularly.
- If your life or property is threatened, call Triple Zero (000) immediately.

Impacts:

- There is no threat to property at this time, however conditions could get worse quickly.
- The fire is likely to impact the community tomorrow.
- Reduced air quality may cause health impacts for some people.
- Smoke may reduce visibility and affect driving conditions.
- Roads may be closed.

Further Information:

- Next update by 6:18pm or sooner if the situation changes.
- Click here for current QFES incidents and warnings
- Click here for bushfire preparation tips
- Click here for health advice and air quality information
- Follow QFES on Facebook and Twitter
- Click here for road closure information or call 131940

IF39-1489722

FIGURE 3. QUEENSLAND MAP 2 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 13):

- Outlined preparatory action, plans, or provided instructions.
- Demonstrated that multiple warnings were now in place.
- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).

This was mostly aligned to what the sample had been shown in the map and associated warning message. The difference with Map 1 is that the warning message is the same – a 'Watch and Act' – yet the map added an emergency warning polygon. Overall, this heightened the perceived risk of the event and changed the perceived scale of the bushfire.

Response category	Frequency	Percent	Excerpts from participant responses
Preparations/plan/instructions	103	15%	*"A map showing a bushfire and where it's spreading, alongside what to do about it."*
Map displays multiple warnings	102	15%	*"A map clearly showing the areas that are in more of an emergency state than another. It is preparing people in two areas for different things. It is a Watch and Act so encouraging people to take action now and not wait. Showing the urgency of the situation."*
Fire-affected area	85	12%	*"A map of a fire location and looks like there might be a safe zone."*
Future bushfire-affected area	72	10%	*"It was a map that highlighted impact areas by a fire, and likely future impacted areas. It also advised instructions as to what next to do by those in the impacted area."*
Alert/warning	57	8%	*"A warning."*
Evacuate/please Leave	43	6%	*"Map of areas with fire warning and evacuation warning."*
Unclear/unsure	43	6%	*"N/A."*
Situation worsening	42	6%	*"A map with similar information but expressed to leave ASAP."*
Map has changed	28	4%	*"Similar map and instructions as previous one, although this map was more detailed."*
Instructions on information sources	27	4%	*"The map shows where the fire is at present, marked by red and the area that it could possibly move into. There is helpful information on how to protect yourself and home plus road closure info link."*
Possible bushfire danger	22	3%	*"The map where bushfires could happen."*
Unsure what colours/warnings mean	17	2%	*"I don't understand the different colours or symbols on the map."*
Location-specific information	16	2%	*"Showed two colours, red and orange, demonstrating a large slow-moving fire in the Noosa and Marcus beach areas."*
Clear information/informative/ detailed	15	2%	*"A comprehensive summary and synopsis of this fire event with relevant warnings."*
Appears similar to previous	12	2%	*"Pretty much the same map and I'm sure if I actually lived in Marcus Beach, I'd know whether I was in the orange or pink area."*
Do not evacuate	5	1%	*"I am not threatened as the fire is further away, but to be alert.*
Imminent bushfire danger	4	1%	*"Warning of impending fire, to watch and act as this fire could directly impact us tomorrow. The warning advised of steps to take to be prepared."*
Information on emergency services	1	0%	*"Shows where the firefighters are, that the fire is going to be contained before it spreads further and people are not yet to evacuate."*
Total respondents	415		

TABLE 13 COMPREHENSION OF QUEENSLAND MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, respondents indicated its purpose was to show a 'Watch and Act' area, the level of risk to different parts of the community, and the location of the bushfire. While the associated message remained the same as Map 1 – 'Watch and Act' – the map itself showed both a 'Watch and Act' area and an 'Emergency Warning' area, which might have led respondents to believe there were multiple purposes to the communication. This was somewhat aligned with the agency's intended purpose (Table 14).

Select all that apply	Frequency	Percent	Agency intended purpose
To show a 'Watch and Act' area	259	62.4	X
To show the level of risk to different parts of the community	222	53.5	X
To show an 'Emergency Warning' area	207	49.9	X
To show the location of the bushfire	197	47.5	
To show multiple bushfire warning levels	157	37.8	X
To show where the bushfire is now	156	37.6	

To show an 'Advice' area	155	37.3	
To show the direction of travel of the bushfire over the coming hours/days	119	28.7	
To show the threat of the bushfire to certain areas in the state/territory	109	26.3	X
To identify who needs to 'Take Shelter Now'	86	20.7	
To show areas that are unaffected by bushfire	83	20	
To show where the bushfire has been	41	9.9	
To show facilities that may be closed because of the bushfire	33	8	
To show where people can go if they evacuate	30	7.2	
To show people if it's not safe to leave the area	30	7.2	
Unsure	14	3.4	
Other	5	1.2	
Total respondents	415		

TABLE 14 PERCEIVED INTENDED PURPOSE OF QUEENSLAND MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were closely aligned with what the agency had intended to communicate to the public (Table 15).

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	273	65.8	X
Prepare to evacuate/prepare to leave/prepare to leave the area	240	57.8	X
Monitor conditions as they are changing	236	56.9	X
Enact your bushfire survival plan	235	56.6	X
Prepare to actively defend your home/property	91	21.9	
Shelter indoors immediately/Take shelter now	80	19.3	
Evacuate now/leave immediately/leave now/leave the area now	68	16.4	X
It is not prompting me to act	13	3.1	
Unsure	12	2.9	
Other	5	1.2	
Total respondents	415		

TABLE 15 PERCEIVED PROMPTED ACTION FROM QUEENSLAND MAP 2

Map effectiveness

Respondents indicated that the map had moderate-high perceived effectiveness (M = 5.10, SD = 1.40; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (M = 4.90, SD = 1.50; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk, and that the risk was serious.

The map also elicited low-moderate negative emotions (M = 3.90, SD = 1.89; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). On the other hand, the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 3.00, SD = 1.70; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were closely aligned with what the agency had instructed the public to do (Table 16). As seen with the previous map, some problematic behaviours were noted in the responses, including 'wait for a text message to tell me what to do', 'wait for police to evacuate you', and 'wait for a firefighter to tell me what to do'. This milling behaviour can lead to inaction, potentially harming the lives of the community, especially when police, firefighters, or a text message may not arrive in a timely manner or at all.

Select top five actions	Frequency	Percent
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	136	32.8
Follow emergency services instructions	132	31.8
Fill containers with water for drinking and firefighting	119	28.7
Keep informed by regularly visiting local fire/emergency agency website	115	27.7
Enact my preprepared bushfire plan	115	27.7
Decide where you and other members of your home (including pets) will go if you need to leave	109	26.3
Monitor your surroundings	104	25.1
Listen for more information from emergency services sources	101	24.3
Avoid smoke by staying indoors and closing windows and doors	99	23.9
Follow and keep informed via local fire/emergency agency social media accounts	96	23.1
Start to evacuate my property and my family if instructed to do so	83	20
Prepare an emergency kit	81	19.5
Move flammable items away from your house	78	18.8
Listen to ABC radio	74	17.8
Sign up to receive emergency alerts/warnings	57	13.7
Create a household emergency plan/or a bushfire plan	56	13.5
Share this message with other people/tell friends about this information	51	12.3
Source a first aid box/first aid kit	48	11.6
Share this message with other people	45	10.8
Help others prepare for the fire	41	9.9
Phone local fire/emergency agency to stay informed	36	8.7
Search for local fire/emergency agency mobile application to stay informed	35	8.4
Tell others to follow emergency services' instructions	35	8.4
Start preparing to defend my property	34	8.2
Wait for a text message to tell me what to do	33	8
Wait for a firefighter to advise me what to do	26	6.3
Wait for police to evacuate you	26	6.3
None of the above	5	1.2
I don't know/don't remember	2	0.5
Other	2	0.5
Total respondents	415	

TABLE 16 PROTECTIVE ACTION INTENTIONS FOLLOWING QUEENSLAND MAP 2

Around 75% of the sample (Map 2 assess: 78%; Map 2 decide: 71%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The marginally lower reported levels of seeking further

information to assess the situation and decide how to respond than for the previous map signals that there was potentially more certainty in the second map (and associated warning message) on what the threat was and what action needed to be taken than in the first. The sources sought out for both the assess and decide protective action functions are outlined in Figure 4.

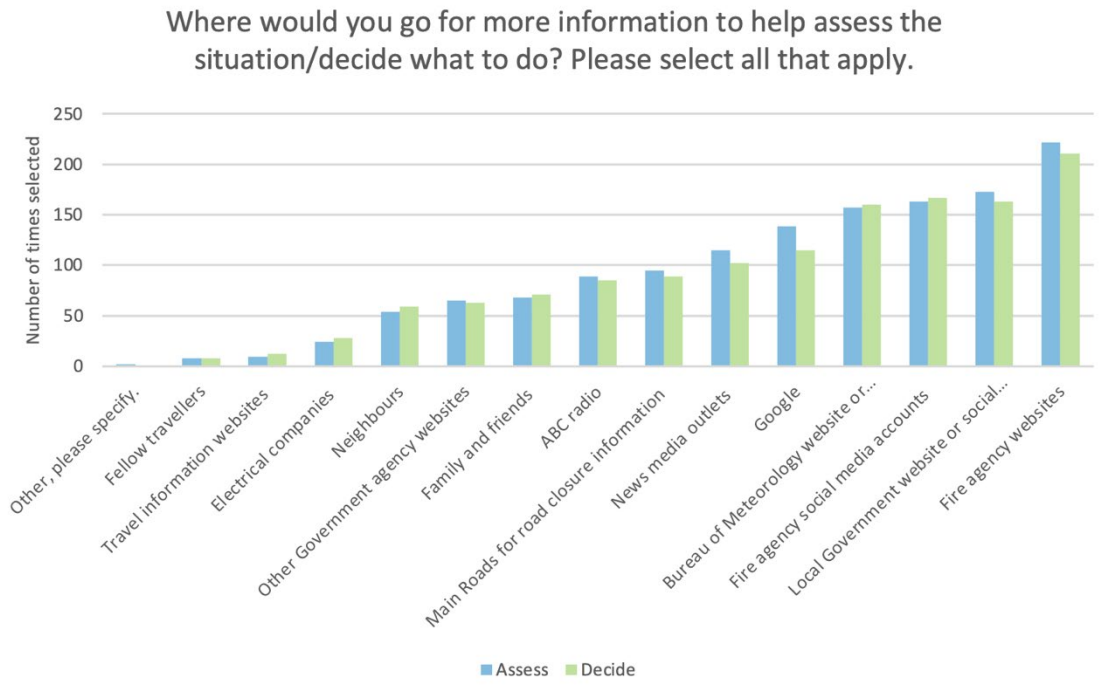


FIGURE 4 INFORMATION-SEEKING FOLLOWING QUEENSLAND MAP 2

Coping appraisal

The map elicited moderate-high perceptions of self-efficacy (*M* = 5.40, *SD* = 1.30; scale of 1–7) and response efficacy (*M* = 5.30, *SD* = 1.30), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, a moderate perceived response cost (*M* = 4.80, *SD* = 1.60; scale of 1–7) was also seen, such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'no feedback, this map makes sense') or specific (e.g., 'I much preferred the two colours to indicate immediate area of danger and the area likely to be impacted in the future') and represented 48% of the feedback responses across the sample. The constructive feedback covered areas such as sizing and legibility choices for text and visual information, providing a clear key or legend for information processing, the ability to interact with the map with zoom capabilities, bushfire direction information, or predictions, and comments on general accessibility to communications should internet access be difficult to maintain (Table 17). For example:

> *"A clear key to the meaning of the various coloured bits."*
>
> *"I think a little more detail on the red and orange is good and maybe clear suburb names and symbols."*

"When designing a warning system, it is essential to remember that many people still do not have access to the internet and/or a smartphone, and even fewer people will be using social media accounts. Consequently, emergency SMS warnings, and up-to-date radio and TV warnings are very important."

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	111	40%	*"Adequate without being confusing."*
Positive, specific	0	0%	
Constructive response			
Sizing, legibility, colour choices	57	21%	*"A clear key to the meaning of the various coloured bits."*
Information should be clearer/ more concise	26	10%	*"Highlight key words since there's a lot of text in the guide."*
Clearer instructions	17	6%	*"Include evacuation centre; information on how to evacuate."*
Ability to interact with map	6	2%	*"Perhaps map would be better if there was dynamic information in the app and people are about to zoom in and get the information by audio and not just read it as a static image."*
Ensure information is updated frequently	3	1%	*"Update the map of the fire situation in real time, evacuate the surrounding population, the dangerous area is prohibited."*
Fire direction information	3	1%	*"The two areas indicated, I'm guessing the red area is where the fire is and the beige one is the threatened area. Glancing at it wasn't obvious. Maybe some arrows on the active burning area showing expected direction of movement and it would also indicate it was the active area."*
Clearer place names	3	1%	*"More suburb names."*
Connectivity/general use issues	3	1%	*"I worry about some elderly people who may get overwhelmed and may not have family."*
Text more useful than map	2	1%	*"Again, I found the instructions more helpful than the map."*
More information needed	0	0%	*"N/A."*
Total measurable responses	240		
Total respondents	415		
No specific feedback provided	175		

TABLE 17 FEEDBACK TO IMPROVE QUEENSLAND MAP 2

Comparisons between maps

The two maps were compared on key variables, including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, there were no significant differences in positive emotions elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 3.90, SD = 1.9; scale of 1–10) elicited higher reported negative emotions than Map 1 (M = 3.70, SD = 1.80; scale of 1–10), $t(414) = -2.84$, $p < 0.01$. This held for risk perceptions such that Map 2 (M = 4.90, SD = 1.50; scale of 1–7) triggered statistically significant higher risk perceptions than Map 1 (M = 4.70, SD = 1.3; scale of 1–7), $t(414) = -4.9$, $p < 0.001$. No statistically significant differences in coping appraisal were seen between the two maps. Finally, there were no statistically significant differences between the maps in their perceived effectiveness.

Again, the difference between the two maps was the addition of an 'Emergency Warning' polygon to the map itself, despite the 'Watch and Act' message associated with the map remaining the same. Incorporating the 'Emergency Warning' polygon appears to have heightened the overall perceived risk of the event and the associated negative emotions of worry, fear, and anxiety.

New South Wales/Australian Capital Territory

This section reports the results for the New South Wales/Australian Capital Territory sample only, including the two bushfire maps and associated warning messages.

Sample characteristics

Respondents (*n* = 421) from New South Wales/Australian Capital Territory comprised 54% female, with 55% aged 18 to 44 years. They predominantly speak English as a primary language (95%), and just over 9% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 18).

State of residence	Frequency	Percent
New South Wales	336	79.8
Australian Capital Territory	85	20.2
Gender		
Female	228	54.2
Male	190	45.1
Prefer not to disclose	2	0.5
Other	1	0.2
Age		
18–24	61	14.5
25–34	92	21.9
35–44	80	19
45–54	62	14.7
55–64	59	14
65–74	41	9.7
75 or older	26	6.2
English as a primary language		
Yes	399	94.8
No	22	5.2
Education		
Left school before Year 10	8	1.9
High school (to Year 10)	35	8.3
High school (to Year 12)	77	18.3
TAFE qualification	119	28.3
Bachelor's degree	115	27.3
Postgraduate award	67	15.9
Insurance level		
Fully insured – Vehicle	346	82.2
Fully insured – House	255	60.6
Fully insured – Contents	247	58.7
Fully insured – Farm	19	4.5
Emergency services involvement		
Yes	41	9.7
No	380	90.3
Total respondents	421	100

TABLE 18 NEW SOUTH WALES /AUSTRALIAN CAPITAL TERRITORY SAMPLE CHARACTERISTICS

Experience and exposure

Approximately 50% of the sample had previously experienced a bushfire, with over 48% having experienced a bushfire in the past five years. Holistically, the sample reported a moderate likelihood of exposure to the threat of bushfire in their current neighbourhood (*M* = 3.87; scale of 1–7). There was low-moderate reported perceived current knowledge about bushfires (*M* = 4.30; scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, 49% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire.

Despite a moderate perceived knowledge of mitigation activities to prevent loss during a bushfire (*M* = 3.75; scale of 1–7), 19% indicated that they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 11.6% (low risk of bushfire) to 23.3% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 19, based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	34	19.8	116	46.6
Developed/prepared an emergency kit	26	15.1	81	32.5
Downloaded agency app to stay informed	30	17.4	84	33.7
Followed emergency services instructions	30	17.4	102	41
Had/prepared first aid box	31	18	94	37.8
Kept informed via agency website, social media, phone, or radio	37	21.5	107	43
Kept/prepared valuables, medication, pets, and other significant belongings close by	22	12.8	86	34.5
Listened for more information from emergency services sources	42	24.4	105	42.2
Signed up to receive emergency alerts/warnings	31	18	103	41.4
Started to evacuate my property and family if/when instructed to do so	16	9.3	50	20.1
None of the above	71	41.3	37	14.9
I don't know/don't remember	8	4.7	8	3.2
Total respondents	172		249	

TABLE 19 PREPARATORY ACTIONS FOR NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from the local fire agency, media, Bureau of Meteorology, state government, and/or local government (Table 20). These preferred sources aligned somewhat with who the sample indicated they trusted as a source of information about bushfires, of which the top five were the local fire agency, Bureau of Meteorology, state government, local government, and police. Despite the media being a top five preferred source of information, it was not in the top five trusted sources (Table 21).

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	320	76
Media	182	43.2
Bureau of Meteorology	175	41.6
State government	167	39.7
Local government	150	35.6
Family and friends	110	26.1
Police service	96	22.8
Insurance provider(s)	19	4.5
Public transport provider	14	3.3
Forestry corporation	1	0.2
Other	11	2.6
Total respondents	421	

TABLE 20 PREFERRED SOURCES FOR BUSHFIRE INFORMATION IN NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	370	87.9
Bureau of Meteorology	166	39.4
State government	143	34
Local government	131	31.1
Police service	116	27.6
Media	76	18.1
Family and friends	56	13.3
Public transport provider	15	3.6
Insurance provider(s)	7	1.7
SES	2	0.4
Forestry corporation	1	0.2
Other	5	1.2
Total respondents	421	

TABLE 21 TRUSTED SOURCES FOR BUSHFIRE INFORMATION IN NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY

Commonly searched platforms included the local fire agency website, Google, the agency app (or third-party app where the agency does not have a formal app available), television, and online news sites (Table 22). It is possible that respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use ...'.

Select all that apply	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	321	76.2
Google	205	48.7
Local fire agency app	197	46.8
Television	172	40.9
Online news sites	167	39.7
Radio	160	38
Facebook	105	24.9
Print newspapers	31	7.4
Instagram	26	6.2
Twitter	19	4.5
YouTube	17	4
TikTok	9	2.1
Snapchat	5	1.2
Reddit	4	1
Other	2	0.5
Total respondents	421	

TABLE 22 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 5). The scenario that respondents received was: 'It is the middle of January in the school holidays. Recent months have been very hot, dry, and windy. You live in a property to the east of Braidwood Road just north of Tarago. Tomorrow will be another dangerous day as hot, dry, and windy conditions have been forecast, with an EXTREME Fire Danger Rating issued. There continues to be significant bushfire activity in the area. Please review the following maps issued by the Rural Fire Service.'

Name **Watch and Act - Mcleods Creek Fire (Goulburn Mulwaree LGA)**

Summary Firefighters are working to control a fire burning between the village of Gundaroo and Lake George. The fire is burning in an easterly direction towards Braidwood Road.

The fire is currently 496 hectares and is out of control.

Body

Residents east of the Federal Highway in the villages of Currawang, Tirrannaville, Springfield, Lake Bathurst and Tarago should enact their survival plan. If your plan is to leave, leave now in a southerly direction along Braidwood Road towards Braidwood or Bungendore. Fire activity across the fireground is increasing.

Make sure you take important items with you such as:

• Important documents and identification • Medications and prescriptions • Food and water for your family and pets • Chargers for electronic devices

There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.

**Actions*

-If your life is at risk, call Triple Zero (000).-If the fire impacts on your location, seek shelter and protect yourself from the heat of the fire.-If your plan is to leave or you are not prepared, consider leaving if it is safe to do so. Go to a safer location away from the fire.-Roads may be dangerous, and could be cut by fire without warning. Only travel if you know it is safe.-Stay up to date on the situation by monitoring local radio, the RFS website, Fires Near Me NSW smartphone app or social media.

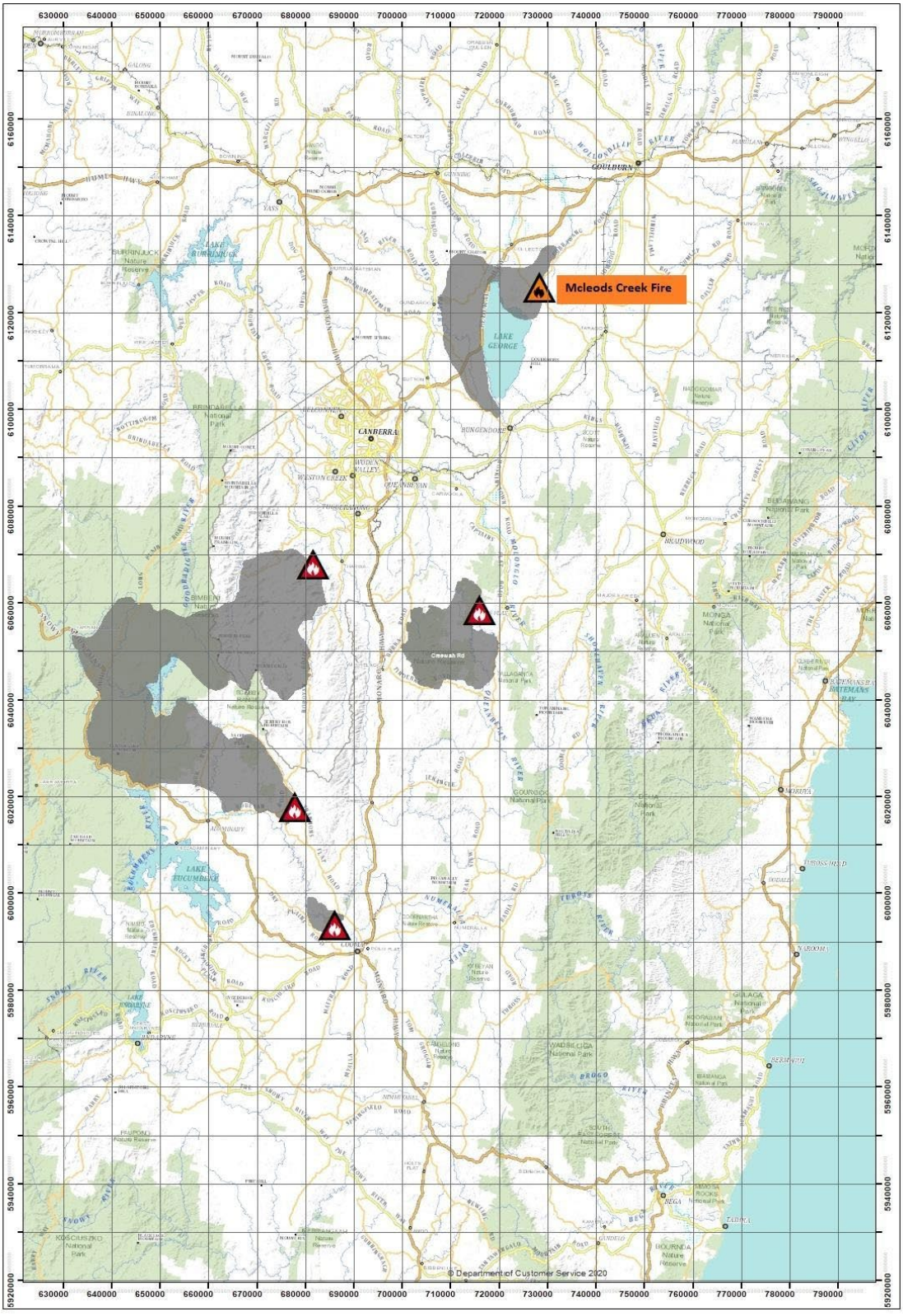


FIGURE 5 NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following:

- Outlined a bushfire-affected area (descriptive).

- Outlined preparatory action, plans, or provided instructions.
- Outlined a future bushfire-affected area (predictive).
- Respondent was able to comprehend location-specific information.
- A few respondents (6%) comprehended this is an evacuation order.

This was mostly aligned to what the respondents had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	309	45%	*"It's a map that shows where the fires are and gives you information on how big and how close they are to communities."*
Preparations/plan/ instructions	90	13%	*"A map showing exactly where the fires are, and a description of what to do if you live in one of the affected areas. The affected areas are listed."*
Future bushfire-affected area	87	13%	*"A map showing active fires and places for potential fires/high risk areas. Also examples of what Is being done about the fires."*
Location-specific information	52	8%	*"A map of Tarago and Lake George."*
Evacuate/please Leave	44	6%	*"That tomorrow has a high risk of bushfire and to prepare to evacuate."*
Alert/warning	36	5%	*"Map showing details of potential bushfires and a fire warning."*
Possible bushfire danger	29	4%	*"Information via a map regarding possible fire dangers."*
Information on emergency services response	10	1%	*"A map of where the fires are and in which direction they are going, it's also letting you know what level the fires are at and if they're under control, out of control or if they're working to get them under control, and also a prepare to act warning as well."*
Unclear/unsure	4	1%	*"Confused."*
Clear Information/informative/ detailed	3	0%	*"It is a map of a fire in the Braidwood area. The instructions from the RFS are specific and informative. It gives residents options as to what they should do."*
Imminent bushfire danger	3	0%	*"There is fire very close."*
Instructions on information sources	2	0%	*"Map showing a fire hazard, its location, instructions on how to stay safe, who to call, and how to further protect yourself."*
Total respondents	421		

TABLE 23 COMPREHENSION OF NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, respondents indicated it was 'to show the level of risk to different parts of the community', 'to show the location of the bushfire', and to show both a 'Watch and Act area' and an 'Emergency Warning area'. This was mostly aligned with the agency's intended purpose (Table 24).

Select all that apply	Frequency	Percent	Agency intended purpose
To show the level of risk to different parts of the community	245	58.2	
To show the location of the bushfire	237	56.3	X
To show a 'Watch and Act' area	207	49.2	X
To show an 'Emergency Warning' area	194	46.1	
To show where the bushfire is now	180	42.8	X
To show an 'Advice' area	168	39.9	
To show multiple bushfire warning levels	146	34.7	
To show areas that are unaffected by bushfire	110	26.1	X
To show the direction of travel of the bushfire over the coming hours/days	109	25.9	
To show the threat of the bushfire to certain areas in the state/territory	108	25.7	
To identify who needs to 'Take Shelter Now'	89	21.1	

To show where the bushfire has been	82	19.5	X
To show where people can go if they evacuate	70	16.6	
To show facilities that may be closed because of the bushfire	45	10.7	
To show people if it's not safe to leave the area	45	10.7	
Unsure	10	2.4	
Total respondents	421		

TABLE 24 PERCEIVED INTENDED PURPOSE OF NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were mostly aligned with what the agency had intended to communicate to the public (Table 25). The 8.4% indicating they are *unsure* or that it *wasn't prompting any action* have not comprehended the map and associated warning message. Reporting is to one decimal place.

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	266	63.2	X
Monitor conditions as they are changing	224	53.2	X
Prepare to evacuate/prepare to leave/prepare to leave the area	189	44.9	
Enact your bushfire survival plan	184	43.7	X
Evacuate now/leave immediately/leave now/leave the area now	71	16.9	X
Prepare to actively defend your home/property	68	16.2	X
Unsure	28	6.7	
Shelter indoors immediately/take shelter now	24	5.7	X
It is not prompting me to act	7	1.7	
Other	6	1.4	
Total respondents	421		

TABLE 25 PERCEIVED PROMPTED ACTION FOR NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Map effectiveness

Respondents indicated that the map had moderate-high perceived effectiveness (M = 4.70, SD = 1.26; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (M = 4.88, SD = 1.27; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk, and that the risk was serious.

The map also elicited low-moderate negative emotions (M = 3.97, SD = 1.75; scale of 1–10), such that respondents indicated that they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). The map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 2.93, SD = 1.64; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they intend to undertake after receiving that specific map and associated warning message, the sample reported that they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 26). Some problematic behaviours were

noted in the responses, including 'wait for a text message to tell me what to do', 'wait for police to evacuate you', and 'wait for a firefighter to tell me what to do'. This milling behaviour can lead to inaction, potentially harming the lives of the community, especially when police, firefighters, or a text message may not arrive in a timely manner or at all.

	Frequency	Percent
Follow emergency services instructions	173	41.1
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	143	34
Start to evacuate my property and my family if instructed to do so	127	30.2
Monitor your surroundings	123	29.2
Listen for more information from emergency services sources	119	28.3
Keep informed by regularly visiting local fire/emergency agency website	113	26.8
Decide where you and other members of your home (including pets) will go if you need to leave	108	25.7
Enact my preprepared bushfire plan	100	23.8
Follow and keep informed via local fire/emergency agency social media accounts	93	22.1
Sign up to receive emergency alerts/warnings	90	21.4
Search for local fire/emergency agency mobile application to stay informed	84	20
Prepare an emergency kit	82	19.5
Fill containers with water for drinking and firefighting	80	19
Avoid smoke by staying indoors and closing windows and doors	76	18.1
Listen to ABC radio	75	17.8
Create a household emergency plan/a bushfire plan	69	16.4
Share this message with other people/tell friends about this information	56	13.3
Start preparing to defend my property	46	10.9
Move flammable items away from your house	45	10.7
Tell others to follow emergency services' instructions	44	10.5
Help others prepare for the fire	44	10.5
Share this message with other people	43	10.2
Phone local fire/emergency agency to stay informed	40	9.5
Wait for a text message to tell me what to do	37	8.8
Source a first aid box/first aid kit	35	8.3
Wait for a firefighter to advise me what to do	32	7.6
Wait for police to evacuate you	24	5.7
Other	4	1
Total respondents	421	

TABLE 26 PROTECTIVE ACTION INTENTIONS FOLLOWING NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Around 78% of the sample (Map 1 assess: 79.6%; Map 1 decide: 76.5%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. Reporting is to one decimal place. The sources sought out for both the assess and decide protective action functions are outlined in Figure 6.

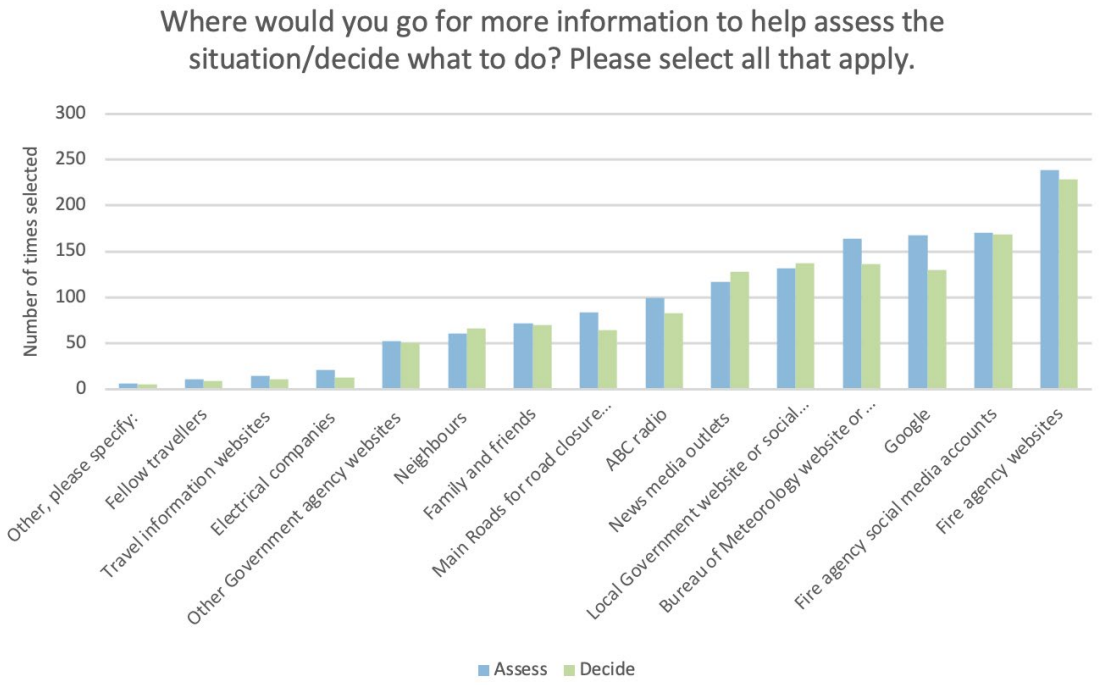


FIGURE 6 INFORMATION-SEEKING FOLLOWING NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.16, *SD* = 1.23; scale of 1–7), and moderate-high response efficacy (*M* = 5.13, *SD* = 1.16; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.66, *SD* = 1.55; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The general positive comments (e.g., 'I thought it was very good') represented 28% of the feedback responses across the sample. The constructive feedback covered topics such as sizing, legibility, and colour choices, requests for more information such as road closures, and advice for specific locations, alongside clearer place names and identifiers (Table 27). For example:

> *"I would love colour coding and a more obvious key. I also found that geographically it was a large map with small font to clearly see the relevant towns/roads/highways."*
>
> *"Easily understood the warning but couldn't make out the town/area names on the map. If I was a local, I wouldn't have any problem identifying locations, but if I was a visitor, I would need the names to be in much bolder typeface to easily find my location on the map."*
>
> *"Road closure and advice on what to do for certain areas. Maybe point out which areas need to take what action."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	89	28%	*"I feel like the map was very good, it was easy to understand, and I feel like everyone would be able to look at it and know what's happening."*
Positive, specific	0	0%	
Constructive responses			
Sizing, legibility, colour choices	108	34%	*"I wish it was clearer (I couldn't really see the names, etc., so I didn't really know where to look) ."*
More information needed	34	11%	*"Maybe a bit more info on the direction you need to go – not everyone is going to understand to go to the southern end. In a panic it will probably be confusing – make it a bit simpler."*
Clearer place names/ identifiers	22	7%	*"Hard to pinpoint my location on the map. Unclear about terrain, could be rivers, forests, grassland, hard to tell without colour coding/mapping."*
Clearer instructions	18	6%	*"Present summary bullet action points."*
Information should be clearer/more concise	13	4%	*"There was probably too much information on it."*
Ability to interact with map	12	4%	*"I think giving more information on the indicated areas affected like if you click or hover over it would help. More comprehensive info."*
Fire direction information	10	3%	*"It should give wind directions and make it clear exactly where you are."*
Connectivity/general use issues	3	1%	*"I wish it had a voice message made especially for drivers who will be busy driving."*
Text more useful than map	3	1%	*"I struggle to read maps of any kind although the written notes were fantastic."*
Ensure information is updated frequently	1	0%	*"Different warning colours depending on fire status, e.g., red shaded area high risk; evacuate now. A fire map is only good if regular data is uploaded to produce it. This did NOT happen in the Nymboida fire ... The 'fires near me' app was not updated for hours and hours."*
Total measurable responses	275		
Total respondents	421		
No specific feedback provided	146		

TABLE 27 FEEDBACK TO IMPROVE NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 7). There was no associated warning message with this map. This represents the predictive map tested in this national survey. The scenario that respondents received was: 'It is the middle of January in the school holidays. Recent months have been very hot, dry, and windy. You live in a property to the east of Braidwood Road just north of Tarago. Tomorrow will be another dangerous day as hot, dry, and windy conditions have been forecast, with an EXTREME Fire Danger Rating issued. There continues to be significant fire activity in the area. The following map provides a prediction of potential fire spread for tomorrow. Please review the map issued by the Rural Fire Service.'

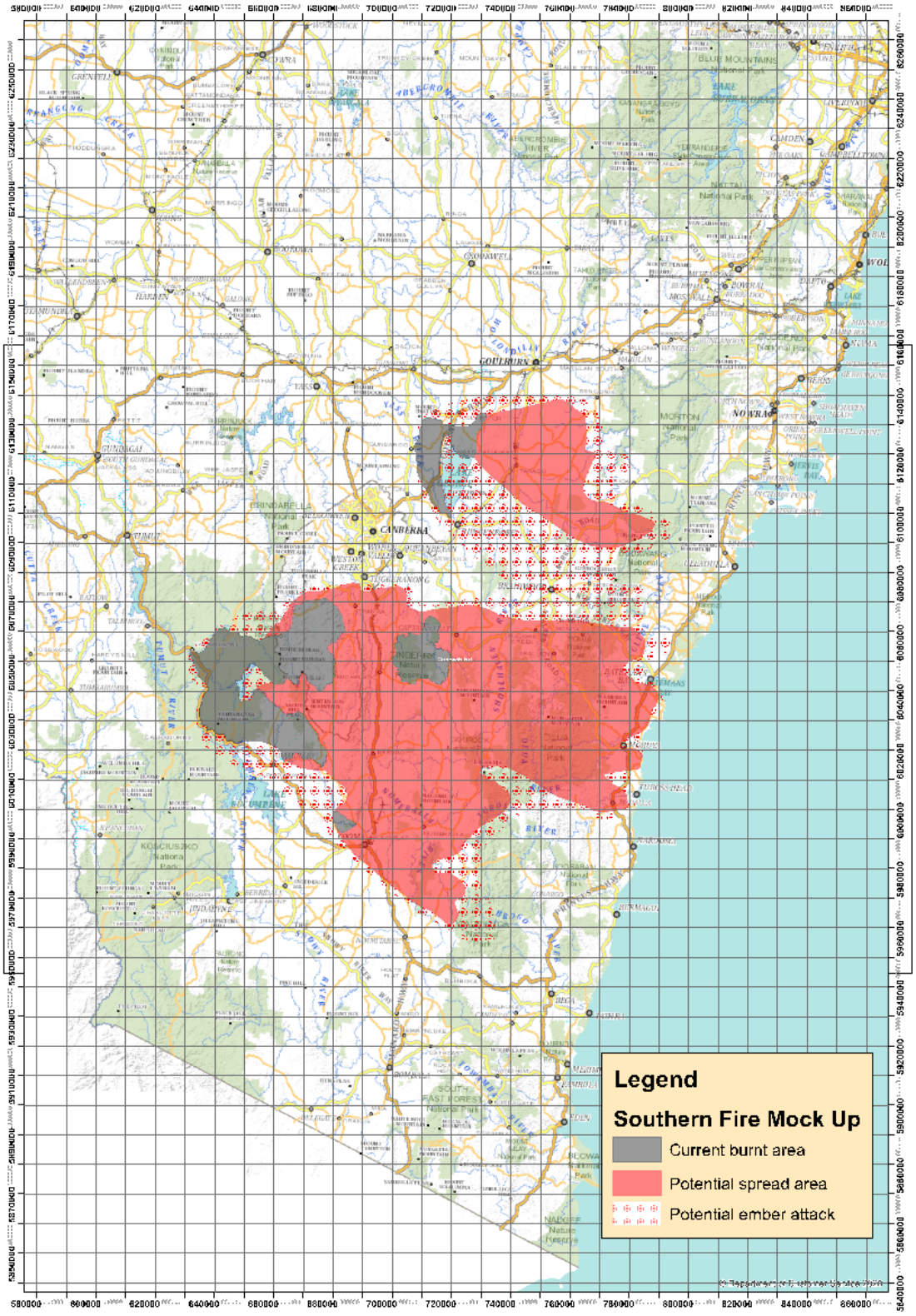


FIGURE 7 NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Comprehension

When asked to describe what they had just seen, after viewing the map, respondents described the map as having told them the following (Table 28):

- Outlined a future bushfire-affected area (predictive).
- Outlined a bushfire-affected area (descriptive).
- Respondent was able to comprehend location-specific information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Future bushfire-affected area	289	41%	*"A map showing where the fire is and the potential spread and possible ember attacks."*
Fire-affected area	266	38%	*"A more detailed map showing where the current fires are, where they could spread, and risk from ember falling."*
Location-specific information	38	5%	*"It was a map of the Braidwood area showing burnt areas, potential, or predicted areas that are going to be affected and area where they are predicting that embers will be in effect."*
Unclear/unsure /no data	37	5%	*"I just see a big map with little red dots, heaps of little red dots."*
Possible bushfire danger	21	3%	*"Where bushfire can occur."*
Clear Information/informative/ detailed	14	2%	*"A more detailed map showing where the current fires are, where they could spread and at risk from ember falling."*
Alert/warning	13	2%	*"A really scary warning to get out."*
Preparations/plan/ instructions	12	2%	*"This was a very comprehensive description of what I should do in the case of a fire."*
Evacuate/please leave	5	1%	*"It looks extreme and I would leave."*
Appears similar to previous	2	0%	*"Like the first map, hard to read."*
Unsure what colours/warnings mean	1	0%	*"The red highlighted areas are great, but the writing need to be bolder; not everyone is good at looking at maps and some have poor vision."*
Total respondents	421		

TABLE 28 COMPREHENSION OF NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, respondents indicated it was 'to show the level of risk to different parts of the community' and 'to show the location of the bushfire' and 'where the bushfire is now'. While they accurately identified some purposes of this map, the map's purpose is also 'to show the direction of travel of the bushfire in coming days/hours', which was the fifth most frequently identified intended purpose (Table 29). It is possible that the 46% of respondents' interpretations of purpose was 'To show an "Emergency Warning" area', which, while incorrect, could be because the map used a similar colour to that used for Emergency Warning icons.

Select all that apply	Frequency	Percent	Agency intended purpose
To show the level of risk to different parts of the community	240	57	X
To show the location of the bushfire	231	54.9	X
To show where the bushfire is now	204	48.5	X
To show an 'Emergency Warning' area	196	46.6	
To show the direction of travel of the bushfire over the coming hours/days	174	41.3	X
To show a 'Watch and Act' area	167	39.7	
To show where the bushfire has been	167	39.7	X
To show the threat of the bushfire to certain areas in the state/territory	167	39.7	X
To show multiple bushfire warning levels	146	34.7	
To show an 'Advice' area	134	31.8	
To show areas that are unaffected by bushfire	99	23.5	X
To identify who needs to 'Take Shelter Now'	91	21.6	
To show where people can go if they evacuate	34	8.1	
To show people if it's not safe to leave the area	31	7.4	
To show facilities that may be closed because of the bushfire	25	5.9	
Unsure	17	4	
Other	2	0.5	
Total respondents	421		

TABLE 29 PERCEIVED INTENDED PURPOSE OF NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported a spread of actions across the options available in the survey (Table 30). As predictive maps are largely informational rather than warnings with instructions, the most relevant prompted actions would be to stay informed and monitor conditions. It is likely a predictive map like this would be disseminated within an ecosystem of regular maps and associated warnings that would more clearly articulate a prompted action.

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	245	58.2	X
Monitor conditions as they are changing	221	52.5	X
Prepare to evacuate/prepare to leave/prepare to leave the area	193	45.8	X
Enact your bushfire survival plan	174	41.3	X
Prepare to actively defend your home/property	95	22.6	
Evacuate now/leave immediately/leave now/leave the area now	90	21.4	
Shelter indoors immediately/take shelter now	45	10.7	
Unsure	32	7.6	
It is not prompting me to act	23	5.5	
Other	4	1	
Total respondents	421		

TABLE 30 PERCEIVED PROMPTED ACTION FOR NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Map effectiveness

Respondents indicated that the map had a high perceived effectiveness (*M* = 5.40, *SD* = 1.25; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (*M* = 5.29, *SD* = 1.44; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (*M* = 4.36, *SD* = 1.92; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). The map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.92, *SD* = 1.83; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, respondents reported they would undertake a spread of actions available to them in the survey (Table 31). As with the intended purpose and action-prompted questions, for a predictive bushfire map, it is likely that this would be disseminated as public information alongside traditional maps and associated warning messages with clear agency instructions. It is worthwhile noting that most respondents saw it as an opportunity to engage in 'Watch and Act' type behaviours or to monitor the situation and start to prepare whether and how they may evacuate should the situation change.

Select top five actions	Frequency	Percent
Follow emergency services instructions	149	35.4
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	128	30.4
Start to evacuate my property and my family if instructed to do so	126	29.9
Keep informed by regularly visiting local fire/emergency agency website	120	28.5
Monitor your surroundings	119	28.3
Listen for more information from emergency services sources	113	26.8
Enact my preprepared bushfire plan	106	25.2
Decide where you and other members of your home (including pets) will go if you need to leave	103	24.5
Follow and keep informed via local fire/emergency agency social media accounts	89	21.1
Listen to ABC radio	79	18.8
Search for local fire/emergency agency mobile application to stay informed	67	15.9
Sign up to receive emergency alerts/warnings	66	15.7
Create a household emergency plan/or a bushfire plan	65	15.4
Prepare an emergency kit	60	14.3
Share this message with other people/tell friends about this information	58	13.8
Move flammable items away from your house	57	13.5
Fill containers with water for drinking and firefighting	56	13.3
Start preparing to defend my property	53	12.6
Avoid smoke by staying indoors and closing windows and doors	49	11.6
Phone local fire/emergency agency to stay informed	46	10.9
Share this message with other people	46	10.9
Tell others to follow emergency services' instructions	41	9.7
Help others prepare for the fire	34	8.1
Wait for a text message to tell me what to do	34	8.1
Wait for police to evacuate you	27	6.4

Wait for a firefighter to advise me what to do	26	6.2
Source a first aid box/first aid kit	25	5.9
Other (please specify)	7	1.7
None of the above	6	1.4
I don't know/don't remember	2	0.5
Total respondents	421	

TABLE 31 PROTECTIVE ACTION INTENTIONS FOLLOWING NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Around 76% of the sample (Map 2 assess: 77%; Map 2 decide: 75%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The marginally lower reported levels of seeking further information to assess the situation and decide how to respond, compared to the previous map, signals that there was potentially more certainty in the second map (and associated warning message) on what the threat was and what action needed to be taken than in the first. The sources sought out for both the assess and decide protective action functions are outlined in Figure 8.

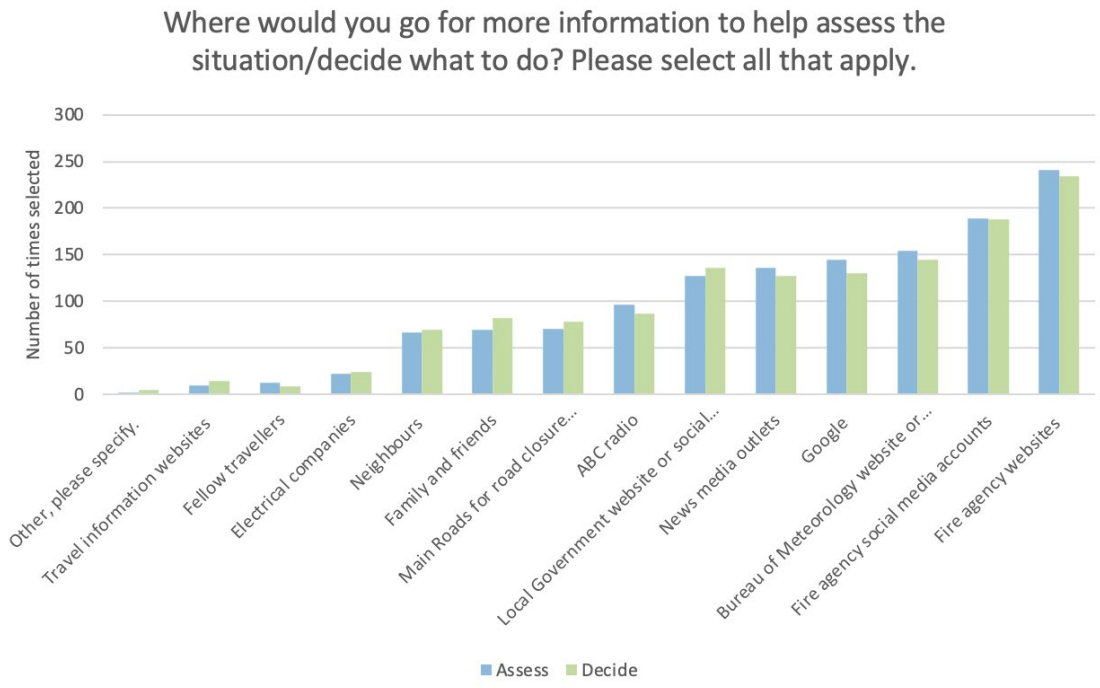


FIGURE 8 INFORMATION-SEEKING FOLLOWING NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.33, *SD* = 1.22; scale of 1–7), and moderate-high response efficacy (*M* = 5.26, *SD* = 1.21; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency, and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.74, *SD* = 1.56; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'clear and easy to understand') or specific (e.g., 'this map is much better than the first one'), with specific feedback representing 60% of the feedback responses across the sample. The constructive feedback again covered areas such as sizing, legibility, and colour choices, requests for more information, such as bushfire road closure and advice/instructions for certain areas, clearer place names and identifiers, alongside general map interactivity such as zoom capabilities. (Table 32). For example:

> *"It needs to show the actual fire front and whether it is safe to evacuate through the ember attack zone or the forecast burn area. Possibly to show any road closures. Also, a stay or leave suggestion."*

> *"I wish it had clearer instructions about what is recommended if you're in a red area or ember area and written information about the areas affected. And as I already said previously – I've always thought it would be amazing if the fire maps could be laid over Google Maps."*

> *"While I love the visual representation of the fire, I fear that a majority of people would be unable to translate this into a plan of action without specific instructions on what to do ... I also think the map could be simpler and the instructions much larger with added accessibility options for people with visual impairments and other barriers to understanding the information given."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	126	41%	*"Excellent information."*
Positive, specific	59	19%	*"Excellent map to understand exactly where the fire is and potential areas of spreading. Much easier to comprehend that the 1st you asked about."*
Constructive responses			
Sizing, legibility, colour choices	36	12%	*"A bit confused as to why the red was just a potential spread rather than the actual area where the fire is. Needs to show the current fire location better and highlight it."*
More information needed	26	8%	*"I wish it included information about places where I get help."*
Clearer place names/ Identifiers	18	6%	*"I still can't read the names of towns or roads, so I can't tell where the property is."*
Clearer instructions	14	5%	*"I wish it had clearer instructions about what is recommended if you're in a red area or ember area and written information about the areas affected. And as I already said previously – I've always thought it would be amazing if the fire maps could be laid over Google maps."*
Fire direction information	10	3%	*"I think the map was effective but maybe would help if there were indicators of fire trajectory."*
Ability to interact with map	9	3%	*"Again, zooming feature would be handy."*
Information should be clearer/more concise	2	1%	*"It was a bit much. A lot of information that can become confusing to some people."*
Text more useful than map	2	1%	*"I do not like maps to comprehend information, I prefer text warnings."*
Connectivity/general use issues	1	0%	*"While I love the visual representation of the fire, I fear that a majority of people would be unable to translate this into a plan of action without specific instructions on what to do ... I also still think the map could be simpler and the instructions much, much larger. Also need accessibility options for people with visual impairments and other disabilities/barriers to understanding the information given."*
Ensure information is updated frequently	0	0%	*"N/A."*
Total measurable responses	269		
Total respondents	421		
No specific feedback provided	152		

TABLE 32 FEEDBACK TO IMPROVE NEW SOUTH WALES/AUSTRALIAN CAPITAL TERRITORY MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, there were no significant differences in positive emotions elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 4.36, SD = 1.93; scale of 1–10) elicited higher reported negative emotions than Map 1 (M = 3.97, SD = 1.75; scale of 1–10), $t(420) = -6.12$, $p < 0.001$. This significant difference held for risk perceptions such that Map 2 (M = 5.29, SD = 1.44; scale of 1–7) triggered statistically significant higher risk perceptions than Map 1 (M = 4.88, SD = 1.27; scale of 1–7), $t(420) = -6.54$, $p < 0.001$. There were also statistically significant differences in coping appraisal between the two maps such that Map 2 elicited higher perceptions of coping appraisal (M = 5.11, SD = 1.01; scale of 1–7) than Map 1 (M = 4.98, SD = 1.00; scale of 1–7), $t(420) = -3.30$, $p = 0.001$. Finally, there was a statistically significant difference between the maps in their perceived effectiveness, such that Map 2 was perceived to be more effective (M = 5.40, SD = 1.25; scale of 1–7) than Map 1 (M = 4.70, SD = 1.26; scale of 1–7), $t(420) = -12.60$, $p < 0.001$.

Victoria

This section reports the results for the Victorian sample only, including the two bushfire maps and associated warning messages.

Sample characteristics

Respondents (*n* = 417) from Victoria comprised 65.7% female, with 54.6% aged 18 to 44 years. Respondents predominantly speak English as a primary language (94%), and 9.6% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 33). Reporting is to one decimal place.

Gender	Frequency	Percent
Female	274	65.7
Male	142	34.1
Age		
18–24	64	15.3
25–34	91	21.8
35–44	73	17.5
45-54	64	15.3
55–64	53	12.7
65–74	50	12
75 or older	22	5.3
English as a primary language		
Yes	392	94
No	25	6
Education level		
Left school before Year 10	10	2.4
High school (to Year 10)	30	7.2
High school (to Year 12)	75	18
TAFE qualification (e.g., Certificate II, III, or IV)	136	32.6
Bachelor's degree	106	25.4
Postgraduate award	60	14.4
Insurance level		
Fully insured – Vehicle	330	79.1
Fully insured – House	292	70
Fully insured – Contents	275	65.9
Fully insured – Farm	28	6.7
Emergency services involvement		
Yes	40	9.6
No	377	90.4
Total respondents	417	100

TABLE 33 SAMPLE CHARACTERISTICS FOR VICTORIA

Experience and exposure

Approximately 34% of the sample had previously experienced a bushfire, with 24% having experienced a bushfire in the past five years. Holistically, the sample reported a low-moderate likelihood of exposure to the threat of bushfire in their current neighbourhood (*M* = 3.42; scale of 1–7). There was low-moderate reported perceived current knowledge about bushfires (*M* = 3.8; scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, 45% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire.

Despite low-moderate perceived knowledge of mitigation activities to prevent loss during a bushfire (*M* = 3.4; scale of 1–7), 19% of respondents indicated that they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 10.8% (low risk of bushfire) to 27.5% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 34, based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Response	Frequency	Percent	Frequency	Percent
Created a household emergency plan	39	18.3	75	36.8
Developed/prepared an emergency kit	24	11.3	59	28.9
Downloaded agency app to stay informed	26	12.2	72	35.3
Followed emergency services instructions	36	16.9	73	35.8
Had/prepared first aid box	50	23.5	56	27.5
Kept informed via agency website, social media, phone, or radio	40	18.8	79	38.7
Kept/prepared valuables, medication, pets, and other significant belongings close by	21	9.9	47	23
Listened for more information from emergency services sources	45	21.1	72	35.3
Signed up to receive emergency alerts/warnings	44	20.7	87	42.6
Started to evacuate my property and family if/when instructed to do so	10	4.7	36	17.6
None of the above	92	43.2	26	12.7
I don't know/don't remember	7	3.3	6	2.9
Total respondents	213		204	

TABLE 34 PREPARATORY ACTIONS FOR VICTORIA RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, Bureau of Meteorology, media, state government, and/or family and friends (Table 35).

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	286	68.6
Bureau of Meteorology	189	45.3
Media	181	43.4
State government	170	40.8
Family and friends	139	33.3
Local government	123	29.5
Police service	84	20.1
Public transport provider	29	7
Insurance provider(s)	22	5.3
Other	18	4.3
Total respondents	417	

TABLE 35 PREFERRED SOURCES OF INFORMATION FOR BUSHFIRE IN VICTORIA

These preferred sources aligned somewhat with who the sample indicated they trusted as a source of information about bushfires (Table 36). Two critical differences were identified. Despite police services not ranking in the top five preferred sources, they are in the top five most trusted sources, above media, which was a preferred source for bushfire information. Further, local government was not in the top five preferred sources but was considered a top five trusted source, above family and friends.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	335	80.3
Bureau of Meteorology	181	43.4
State government	133	31.9
Local government	119	28.5
Police service	118	28.3
Media	80	19.2
Family and friends	56	13.4
Public transport provider	25	6
Insurance provider(s)	9	2.2
Other	6	1.4
Total respondents	417	

TABLE 36 TRUSTED SOURCES OF INFORMATION FOR BUSHFIRE IN VICTORIA

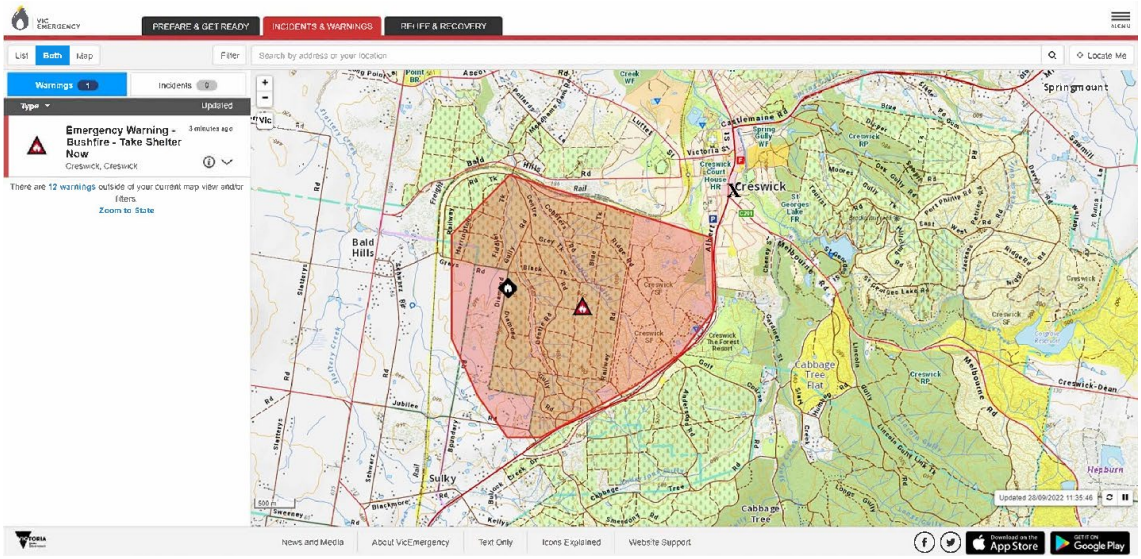
Commonly searched platforms included the local fire agency website, Google, television or radio, online news sites, and or the fire agency app (or third-party fire app where no agency app is available) (Table 37). It is possible respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use ...'.

Select all that apply	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	282	67.6
Google	213	51.1
Television	178	42.7
Local fire agency app (where available)	175	42
Radio	172	41.2
Online news sites	165	39.6
Facebook	90	21.6
Print newspapers	50	12
Instagram	37	8.9
YouTube	21	5
TikTok	17	4.1
Twitter	17	4.1
Snapchat	12	2.9
Reddit	8	1.9
Other	2	0.5
Total respondents	417	

TABLE 37 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN VICTORIA

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 9). The scenario that respondents received was: 'It's a typical summer's day in February. It is very hot and dry. You and your family live in the township of Creswick (marked as X on map). You see smoke in the air. You pull up Victoria's official emergency information app, VicEmergency, and see the following map and warning.'



EMERGENCY WARNING - BUSHFIRE - Take Shelter Now
Incident Location: Creswick
Issue Date:
Next Update:

More details at http://emergency.vic.gov.au/respond/#!/warning/12395/moreinfo

This Emergency Warning is being issued for Creswick.
- There is a bushfire at Creswick that is out of control.
- The bushfire is travelling from Diamond Gully Road in a north-easterly direction towards the Creswick township. The fire started near Diamond Gully road and Greys Road road.
- This message is for people along Hyde park Street and Bald Hill Road, Creswick and the bushfire could impact anytime within the next 30 minutes.

You are in danger and need to act immediately to survive.

The safest option is to take shelter indoors immediately. It is too late to leave.

FIGURE 9 VICTORIA MAP 1 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 38):

- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).
- Respondent was able to comprehend location-specific information.
- Respondent comprehended shelter in place/too late to leave orders.
- Outlined preparatory action, plans, or provided instructions.

This was somewhat aligned to what the respondents had been shown in the map and associated warning message. Some respondents interpreted the map and warning as if they were located inside the polygon,

despite the scenario stating they were located by the X on the map, which is outside the polygon. The feedback comments (section below) noted the need to use a clear map to help people locate themselves on it.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	194	22%	*"I see on the map where the fires are, and to stay away from the areas."*
Future bushfire-affected area	135	16%	*"A fire zone on the map showing the areas that are at risk of being affected by an active fire."*
Location-specific information	119	14%	*"There's a bushfire in the vicinity of my town and I must evacuate immediately."*
Too late to leave/shelter in place	103	12%	*"A map of an affected area and advice to take shelter as it is too late to leave."*
Preparations/plan/ instructions	99	11%	*"A map highlighting where the danger is and rules to follow on how to be safe."*
Evacuate/please Leave	51	6%	*"There's a bushfire in the vicinity of my town and I must evacuate immediately."*
Imminent bushfire danger	51	6%	*"A fire warning, indicating that it is life threatening and to act immediately as it appears the fire has spread."*
Alert/warning	36	4%	*"A map of emergency warnings and fire risk."*
Clear information/informative/ detailed	20	2%	*"Map of area and danger area. Detailed description of what to do."*
Possible bushfire danger	19	2%	*"The x is out of the danger zone however it is very close, and I would still be careful."*
Unclear/unsure	10	1%	*"Unsure."*
Information on emergency services	7	1%	*"The map indicated that there was a large area affected by the bushfire south-west of the township of Creswick. The information provided reported the fire was moving towards Creswick, emergency services recommended seeking shelter immediately as it was too late to leave."*
Instructions on information sources	6	1%	*"A map showing where there are bushfires and details of warnings, what to do and a website for more details."*
Total respondents	417		

TABLE 38 COMPREHENSION OF VICTORIA MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 50% of the respondents' selections included 'to show an Emergency Warning area', 'location of the bushfire', and 'different levels of risk to different parts of the community'. The latter is important as the scenario the respondent read before viewing the map and associated warning message was that the respondent was to place themselves at the X on the map, which was outside of the Emergency Warning polygon, signalling different levels of risk for different parts of the community. The responses were mostly aligned with the agency's intended purpose (Table 39).

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	249	59.7	X
To show the location of the bushfire	241	57.8	
To show the level of risk to different parts of the community	219	52.5	X
To identify who needs to 'Take Shelter Now'	203	48.7	X
To show where the bushfire is now	184	44.1	
To show an 'Advice' area	136	32.6	
To show a 'Watch and Act' area	136	32.6	
To show people if it's not safe to leave the area	124	29.7	
To show the direction of travel of the bushfire over the coming hours/days	113	27.1	
To show areas that are unaffected by bushfire	100	24	
To show the threat of the bushfire to certain areas in the state/territory	98	23.5	
To show multiple bushfire warning levels	91	21.8	
To show where the bushfire has been	63	15.1	
To show where people can go if they evacuate	57	13.7	
To show facilities that may be closed because of the bushfire	47	11.3	
Unsure	8	1.9	
Other	1	0.2	
Total respondents	417		

TABLE 39 PERCEIVED INTENDED PURPOSE FOR VICTORIA MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were not closely aligned with what the agency had intended to communicate to the public (Table 40). If a respondent was in the area marked with an X on the map[4], their prompted actions would not directly align with those outlined in the associated warning message. Instead, they should be staying informed and monitoring the situation in case the bushfire spreads in their direction. They also may be preparing to evacuate in the event of the bushfire spreading.

Select all that apply	Frequency	Percent	Agency intended action
Shelter indoors immediately/take shelter now	215	51.6	
Stay informed	198	47.5	X
Enact your bushfire survival plan	148	35.5	
Prepare to evacuate/prepare to leave/prepare to leave the area	125	30	X
Evacuate now/leave immediately/leave now/leave the area now	117	28.1	
Monitor conditions as they are changing	105	25.2	X
Prepare to actively defend your home/property	92	22.1	
Unsure	15	3.6	
It is not prompting me to act	4	1	
Other	1	0.2	
Total respondents	417		

TABLE 40 PERCEIVED PROMPTED ACTION FOR VICTORIA MAP 1

[4] The X is not a typical feature of the Victorian maps and was added by the researchers.

Map effectiveness

Respondents indicated that the map had high perceived effectiveness (*M* = 5.40, *SD* = 1.14; scale of 1–7).

Risk perceptions and emotions

The map elicited high perceptions of risk (*M* = 5.61, *SD* = 1.34; scale of 1–7), such that respondents perceived that the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (*M* = 4.84, *SD* = 1.74; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.79, *SD* = 1.78; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, respondents reported they would undertake a variety of actions that were somewhat aligned with what the agency had instructed the public to do (Table 41). Issues arose, like in the comments in the intended purpose and prompted action sections above, when the respondent was to place themselves on the X on the map, outside of the Emergency Warning polygon. Respondents were sometimes confused about what the message was asking them to do when they were located outside the polygon but near the bushfire.

Select top five actions	Frequency	Percent
Follow emergency services instructions	182	43.6
Avoid smoke by staying indoors and closing windows and doors	130	31.2
Monitor your surroundings	125	30
Start to evacuate my property and my family if instructed to do so	108	25.9
Listen for more information from emergency services sources	107	25.7
Enact my preprepared bushfire plan	105	25.2
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	104	24.9
Fill containers with water for drinking and firefighting	104	24.9
Keep informed by regularly visiting local fire/emergency agency website	101	24.2
Decide where you and other members of your home (including pets) will go if you need to leave	89	21.3
Listen to ABC radio	88	21.1
Follow and keep informed via local fire/emergency agency social media accounts	81	19.4
Move flammable items away from your house	75	18
Start preparing to defend my property	69	16.5
Share this message with other people/tell friends about this information	65	15.6
Share this message with other people	64	15.3
Prepare an emergency kit	61	14.6
Sign up to receive emergency alerts/warnings	61	14.6
Create a household emergency plan/a bushfire plan	58	13.9
Search for local fire/emergency agency mobile application to stay informed	56	13.4
Tell others to follow emergency services' instructions	50	12
Phone local fire/emergency agency to stay informed	44	10.6
Source a first aid box/first aid kit	40	9.6
Help others prepare for the fire	37	8.9
Wait for police to evacuate you	34	8.2
Wait for a firefighter to advise me what to do	25	6

Wait for a text message to tell me what to do	21	5
Other	1	0.2
Total respondents	417	

TABLE 41 PROTECTIVE ACTION INTENTIONS FOLLOWING VICTORIA MAP 1

Around 76% of the sample (Map 1 assess: 81%; Map 1 decide: 71%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 10. The high percentage of respondents indicating they would seek further information to assess the risk could be due to less certainty about the risk of bushfire affecting them as they are located outside the polygon, and information-seeking being one common way to reduce uncertainty about an emerging threat.

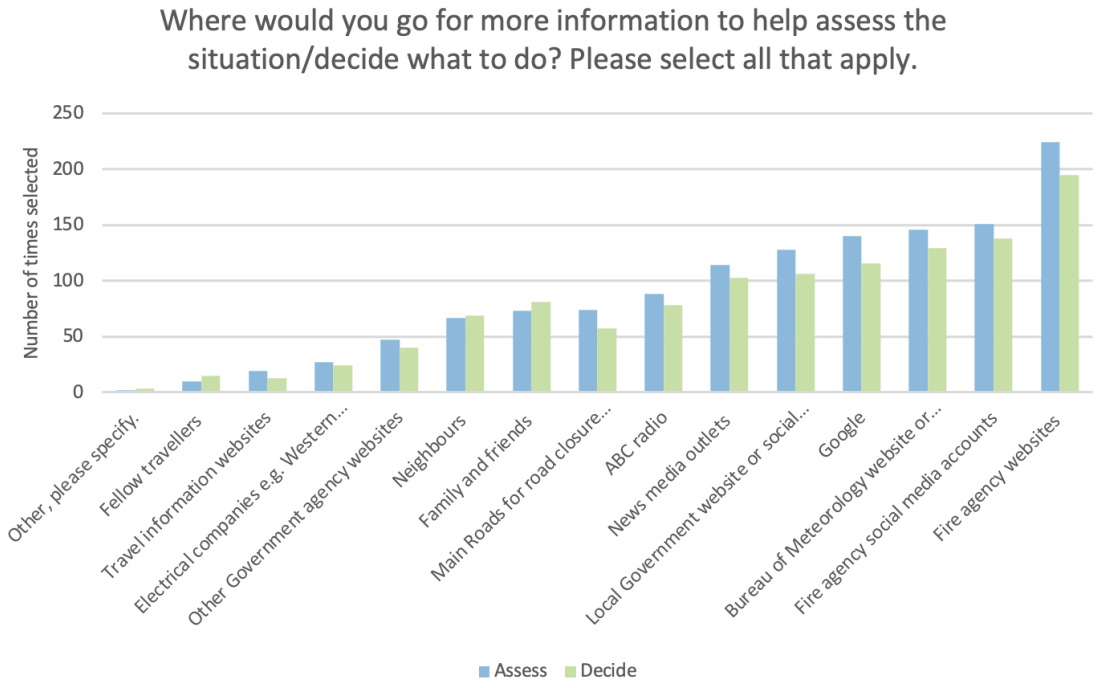


FIGURE 10 INFORMATION-SEEKING FOLLOWING VICTORIA MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.13, *SD* = 1.39; scale of 1–7), and moderate-high response efficacy (*M* = 5.14, *SD* = 1.26; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.63, *SD* = 1.65; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'I think it was clear and simple, easy to understand and intuitive, nothing more to add) or specific (e.g., 'I liked that the map listed streets around the area as this should tell me just where the danger is

right now and just how prepared we must be') and represented 44% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, fire direction information, and requests for more information, such as the frequency of information updates and clearer instructions (Table 42). For example:

> *"Clear arrows showing the direction of the fire with clear markings to show safe zones."*
>
> *"More details and maybe a live update system of where the fire is spreading as wind direction can change[5]. Properties could potentially evacuate and prepare accordingly if there's a live feed of updates."*
>
> *"That warning in the middle should be more visible. As it was covered by the red showing the areas impacted, I could just make out the warning. Maybe the messages below indicating whether it's too late to leave and actions needing to be taken needs to be much more visible and eye catching so people know what to do and what not to do."*

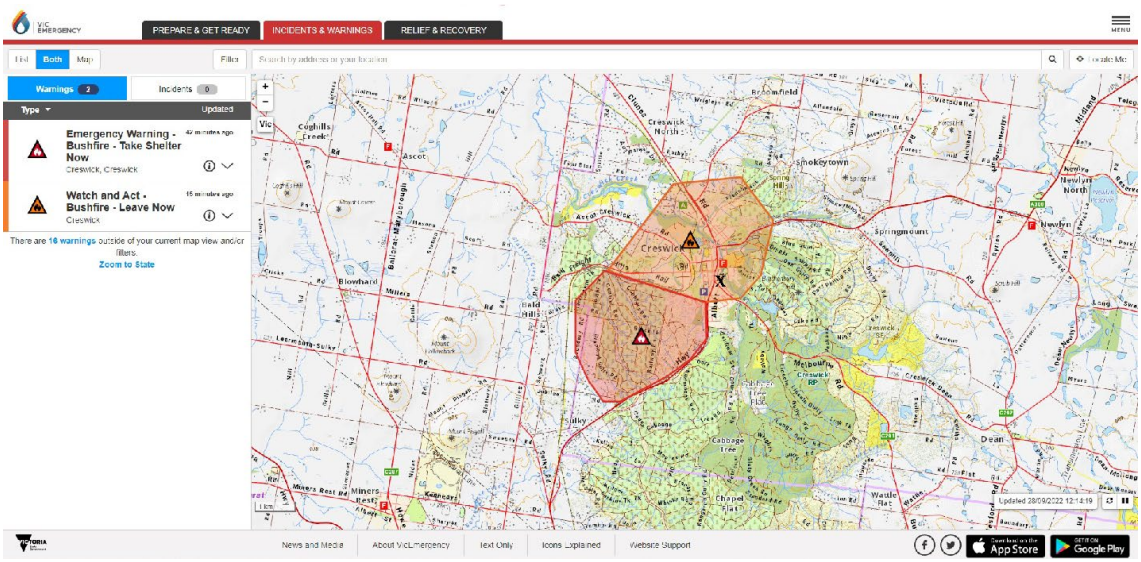
Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	135	43%	*"Found it easy to understand alongside the written information."*
Positive, specific	3	1%	*"I like that the map listed streets around the area as this should tell me just where the danger is right now and just how prepared we must be."*
Constructive responses			
Sizing, legibility, colour choices	49	16%	*"The print needs to be larger and easier to read. Urgent actions need to be highlighted."*
Clearer instructions	23	7%	*"Make it clear and easy to understand. There's a lot to look at. Clear instructions can be beneficial."*
More information needed	18	6%	*"It was very detailed and easy to understand, but maybe add more information on what to do and who to contact/contact information."*
Fire direction information	17	5%	*"Map should reflect current situation including immediate updating if the direction of the fire changes. Too late to leave warnings do seem to be a bit late in some situation. Local fire commanders should have that authority if they don't already. All media broadcasting fire warnings should be required to be right up to date with no ads and egos getting in the way. People are trusting that media source which needs to step up."*
Information should be clearer/more concise	15	5%	*"More info to be written as dot spots instead of lines. To be colour coded too."*
Connectivity/general use issues	13	4%	*"Needs to be a bit better to understand for older people."*
Clearer place names/ identifiers	9	3%	*"I cannot imagine trying to see where this map actually covered on a mobile phone screen. It would be clearer to state the boundaries, i.e., roads or street names."*
Ability to interact with map	7	2%	*"The ability to zoom in and out would be useful."*
Text more useful than map	6	2%	*"To be honest on reflection, I'm not sure I really understood the map. Help to have some more writing – if you live in the area bounded by x and y streets."*
Ensure information is updated frequently	5	2%	*"More details and maybe a live update system of where the fire is spreading as wind direction can change and certainly properties could still potentially evacuate and or prepare accordingly if there's a live feed of updates."*
Total measurable responses	271		
Total respondents	417		
No specific feedback provided	146		

TABLE 42 FEEDBACK TO IMPROVE VICTORIA MAP 1

[5] This function is available in the EMV App as at February 2023.

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 11). The scenario that respondents received was: 'It's a typical summer's day in February. It is very hot and dry. You and your family live in the township of Creswick (marked as X on map). You see smoke in the air. You pull up Victoria's official emergency information app, VicEmergency, and see the following map and warning.'



WATCH & ACT - BUSHFIRE - Leave Now
Incident Location: Creswick
Issue Date:
Next Update:

More details at http://emergency.vic.gov.au/respond/#!/warning/12394/moreinfo

This Watch & Act message is being issued for Creswick.

- There is a bushfire at Creswick that is out of control.
- The bushfire is travelling from Diamond Gully Road in a north-easterly direction towards the Creswick township. The fire started near Diamond Gully road and Greys Road road.
- Hyde Park Street and Bald Hill Road, Creswick could be impacted by the bushfire anytime within the next 30 minutes.

Don't wait, leaving now is the safest option - conditions may change and get worse very quickly. Emergency Services may not be able to help you if you decide to stay.

By choosing to stay, you and your family may be at risk of serious injury or death.

FIGURE 11 VICTORIA MAP 2 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 43):

- Respondents comprehended this message as an evacuation order.
- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).
- Respondents comprehended a shelter in place/too late to leave order.
- Outlined preparatory action, plans, or provided instructions.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Evacuate/please leave	233	39%	*"Watch and Act warning relating to the fire – leave now or it will be too late."*
Fire-affected area	100	17%	*"A map with information about a fire taking place in Creswick. It had information on what population should do and the risks of making the wrong decisions."*
Future bushfire-affected area	61	10%	*"Map of where the fire would most likely go."*
Too late to leave/shelter in place	49	8%	*"Take shelter fire is coming."*
Location-specific information	45	8%	*"Creswick is now on fire and people are instructed to leave immediately or emergency services may not be able to help them."*
Preparations/plan/instructions	36	6%	*"It shows the areas affected by the fire and the actions to be taken in each area."*
Alert/warning	21	4%	*"A map that shows warnings in a specific area."*
Imminent bushfire danger	18	3%	*"Creswick is about to be engulfed in the fires."*
Unclear/unsure /no data	9	2%	*"Not too sure."*
Appears similar to previous	7	1%	*"Same map."*
Clear information/informative/ detailed	6	1%	*"A map that is easier to take in than the previous one showing all signs and making it more obvious that there is a fire on the way to see you."*
Instructions on information sources	6	1%	*"A map saying leave and where else to get more up info."*
Map has changed	3	1%	*"The same as before but a different warning label next the previous map and different action messages."*
Map displays multiple warnings	1	0%	*"A map showing two areas. One shelter in place and the other to leave now. The x shows where I live."*
Total respondents	417		

TABLE 43 COMPREHENSION OF VICTORIA MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 50% of responses indicated it was to 'show an Emergency Warning area' and 'to show the location of the bushfire'. Approximately 40% of responses indicated that the purpose was also 'to show a Watch and Act area', and over 45% indicated it was to show varying levels of risk to different parts of the community and where the bushfire was at present. These responses mostly aligned with the agency's intended purpose (Table 44).

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	244	58.5	X
To show the location of the bushfire	221	53	
To show the level of risk to different parts of the community	189	45.3	X
To show where the fire is now	188	45.1	
To show a 'Watch and Act' area	169	40.5	X
To show the direction of travel of the bushfire over the coming hours/days	133	31.9	
To show an 'Advice' area	132	31.7	
To identify who needs to 'Take Shelter Now'	115	27.6	
To show the threat of the bushfire to certain areas in the state/territory	106	25.4	
To show multiple bushfire warning levels	102	24.5	X
To show areas that are unaffected by bushfire	78	18.7	
To show people if it's not safe to leave the area	70	16.8	

To show where people can go if they evacuate	61	14.6
To show where the bushfire has been	54	12.9
To show facilities that may be closed because of the bushfire	32	7.7
Unsure	8	1.9
Total respondents	417	

TABLE 44 PERCEIVED INTENDED PURPOSE FOR VICTORIA MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were somewhat aligned with what the agency intended to communicate to the public (Table 45). While some responses such as staying informed and monitoring conditions are always implicitly relevant to a bushfire response, some respondents are indicating they need to 'prepare to leave' or that it 'wasn't prompting them to act', which do not align with what the map and associated warning message were communicating.

Select all that apply	Frequency	Percent	Agency intended action
Evacuate now/leave immediately/leave now/leave the area now	295	70.7	X
Enact your bushfire survival plan	125	30	
Prepare to evacuate/prepare to leave/prepare to leave the area	123	29.5	
Stay informed	111	26.6	X
Monitor conditions as they are changing	75	18	
Prepare to actively defend your home/property	41	9.8	
Shelter indoors immediately/take shelter now	41	9.8	
Unsure	14	3.4	
It is not prompting me to act	9	2.2	
Total respondents	417		

TABLE 45 PERCEIVED PROMPTED ACTION FOR VICTORIA MAP 2

Map effectiveness

Respondents indicated that the map had high perceived effectiveness (M = 5.52, SD = 1.12; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate to high perceptions of risk (M = 5.80, SD = 1.26; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (M = 5.10, SD = 1.69; scale of 1–10), such that respondents indicated that they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). The map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 2.77, SD = 1.90; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake a variety of actions that were mostly aligned with what the agency had instructed the public to do (Table 46).

Select top five actions	Frequency	Percent

Start to evacuate my property and my family if instructed to do so	213	51.1
Follow emergency services instructions	199	47.7
Enact my preprepared bushfire plan	140	33.6
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	123	29.5
Decide where you and other members of your home (including pets) will go if you need to leave	98	23.5
Keep informed by regularly visiting local fire/emergency agency website	91	21.8
Follow and keep informed via local fire/emergency agency social media accounts	82	19.7
Listen for more information from emergency services sources	81	19.4
Monitor your surroundings	71	17
Listen to ABC radio	70	16.8
Share this message with other people/tell friends about this information	67	16.1
Tell others to follow emergency services' instructions	60	14.4
Search for local fire/emergency agency mobile application to stay informed	59	14.1
Prepare an emergency kit	55	13.2
Share this message with other people	52	12.5
Fill containers with water for drinking and firefighting	48	11.5
Avoid smoke by staying indoors and closing windows and doors	44	10.6
Sign up to receive emergency alerts/warnings	44	10.6
Move flammable items away from your house	39	9.4
Source a first aid box/first aid kit	37	8.9
Phone local fire/emergency agency to stay informed	37	8.9
Start preparing to defend my property	34	8.2
Create a household emergency plan/a bushfire plan	28	6.7
Help others prepare for the fire	28	6.7
Wait for a firefighter to advise me what to do	28	6.7
Wait for a text message to tell me what to do	21	5
Wait for police to evacuate you	18	4.3
Other	9	2.2
Total respondents	417	

TABLE 46 PROTECTIVE ACTION INTENTIONS FOLLOWING VICTORIA MAP 2

Around 65% of the sample (Map 2 assess: 66%; Map 2 decide: 65%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 12. This is fewer self-reported intentions to seek further information than the previous map, indicating that being located inside the polygon potentially offered more certainty about the bushfire risk and what protective actions to take.

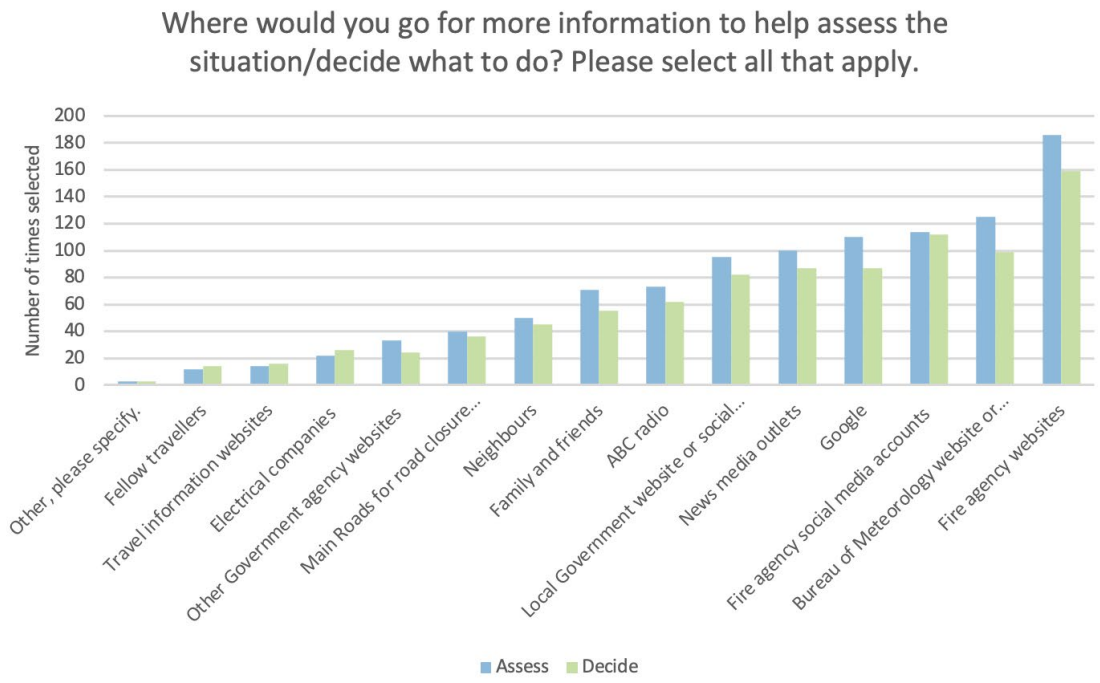


FIGURE 12 INFORMATION-SEEKING FOLLOWING VICTORIA MAP 2

Coping appraisal

The map elicited high perceived self-efficacy (*M* = 5.49, *SD* = 1.33; scale of 1–7), and high response efficacy (*M* = 5.47, *SD* = 1.26; scale of 1–7), such that respondents perceived that they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.71, *SD* = 1.67; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'I thought it was informative and told me everything I need to know') or specific (e.g., 'it was good to see the clearly delineated areas') and represented 60% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, requests for more information, and concerns over the clarity of information provided, in both text and visual formats (Table 47). For example:

> *"I think it can be confusing trying to work out what the instructions are when the colour is the same for both areas and the symbols are fairly similar."*
>
> *"I wish the orange zone was a more clearer shade from the red. Perhaps the red could be darker too to highlight the urgency and intensity of the bushfire."*
>
> *"Don't have two completely different directive above/below each other. Normally, a new message will come at the top of a feed, not beneath, so I was struggling to understand what I was reading and what the orders were. Also, is the whole area on fire, or is that the fire danger area map? That is confusing me."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	137	57%	*"The map was good, informative, and effective."*

Positive, specific	7	3%	*"This one was much clearer in terms of what I should do, it was obvious that I should evacuate."*
Constructive responses			
Sizing, legibility, colour choices	40	15%	*"More contrast of colours used it was hard to see red and orange."*
More information needed	21	8%	*"More direction on the safe areas and where to escape too* [sic] *for those who do not have a safe spot in mind."*
Clearer instructions	10	4%	*"Don't have two completely different directives above/below each other. Normally, a newer message will come at the top of a feed, not beneath, so I was struggling to understand what I was reading and what the orders were. Also, is the whole area on fire, or that the fire danger area map? That is confusing me."*
Information should be clearer/more concise	9	3%	*"A bit too much detail."*
Connectivity/general use issues	9	3%	*"This map may not be good for elderly or those with poor eyesight. It's too small. You need to highlight the important things like urgent, you must leave your house immediately only take your family members and Pets. Possible translation for others where English is their second language would be useful."*
Fire direction information	7	3%	*"I wish it included information about where the embers could be heading and where to be on the lookout."*
Ability to interact with map	6	2%	*"The ability to zoom in and out, making the individual receiving the warnings' location stand out more."*
Ensure information is updated frequently	4	1%	*"The feedback would be the same as last time would just to keep a live updated feed on the situation so surrounding properties are informed efficiently."*
Text more useful than map	4	1%	*"The evacuate now and prepare to fight fire were very close to each other on the map. The map was therefore slightly confusing (text said leave now though) ."*
Clearer place names/ identifiers	2	1%	*"A bit clearer detail on boundaries of the two area i.e., road names clearly labelled, etc."*
Total measurable responses	240		
Total respondents	417		
No specific feedback provided	177		

TABLE 47 FEEDBACK TO IMPROVE VICTORIA MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, no significant differences in positive emotions were elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 5.10, SD = 1.70; scale of 1–10) elicited higher reported negative emotions than Map 1 (M = 4.83, SD = 1.74; scale of 1–10), $t(416) = -3.98$, $p < 0.001$. This significant difference held for risk perceptions such that Map 2 (M = 5.80, SD = 1.26; scale of 1–7) triggered statistically significantly higher risk perceptions than did Map 1 (M = 5.61, SD = 1.34; scale of 1–7), $t(416) = -3.28$, $p = 0.001$. There were also statistically significant differences in coping appraisal between the two maps, such that Map 2 elicited higher perceptions of coping appraisal (M = 5.22, SD = 1.08; scale of 1–7) than Map 1 (M = 4.97, SD = 1.09; scale of 1–7), $t(416) = -6.18$, $p < 0.001$. Finally, there was a statistically significant difference between the maps in their perceived effectiveness, such that Map 2 was perceived to be more effective (M = 5.52, SD = 1.12; scale of 1–7) than Map 1 (M = 5.38, SD = 1.14; scale of 1–7), $t(420) = -4.19$, $p < 0.001$.

Tasmania

This section reports the results for the Tasmanian sample only, including the two bushfire maps and associated warning messages.

Sample characteristics

Respondents (*n* = 243) from Tasmania comprised 55% female, with 43% aged 18 to 44 years. Respondents predominantly speak English as a primary language (97.9%), and 12.8% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 48). Reporting is to one decimal place.

Gender	Frequency	Percent
Female	135	55.6
Male	107	44
Other	1	0.4
Age		
18–24	27	11.1
25–34	39	16
35–44	39	16
45–54	47	19.3
55–64	42	17.3
65–74	27	11.1
75 or older	22	9.1
English as primary language		
Yes	238	97.9
No	5	2.1
Education level		
Left school before Year 10	11	4.5
High school (to Year 10)	37	15.2
High school (to Year 12)	47	19.3
TAFE qualification (e.g., Certificate II, III, or IV)	81	33.3
Bachelor's degree	40	16.5
Postgraduate award	27	11.1
Insurance level		
Fully insured – Vehicle	194	79.8
Fully insured – House	165	67.9
Fully insured – Contents	165	67.9
Fully insured – Farm	14	5.8
Emergency services involvement		
Yes	31	12.8
No	212	87.2
Total respondents	243	100

TABLE 48 SAMPLE CHARACTERISTICS FOR TASMANIA

Experience and exposure

A total of 47.7% of the sample had previously experienced a bushfire, with over 33% having experienced a bushfire in the past five years. Reporting is to one decimal place. Holistically, the sample reported a moderate likelihood of them being exposed to the threat of bushfire in their current neighbourhood (*M* = 3.90; scale of

1–7). There was a low-moderate reported perceived current knowledge about bushfires (*M* = 3.80; scale of 1–10) across the sample. When asked about their prior exposure to bushfire maps, 40% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire. Despite moderate perceived knowledge of mitigation activities to prevent loss during a bushfire (*M* = 3.70; scale of 1–7), approximately 25% indicated that they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 17.5% (low risk of bushfire) to 30% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 49 and are based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	22	21.4	57	40.7
Developed/prepared an emergency kit	8	7.8	31	22.1
Downloaded agency app to stay informed	9	8.7	13	9.3
Followed emergency services instructions	20	19.4	49	35
Had/prepared first aid box	20	19.4	50	35.7
Kept informed via agency website, social media, phone, or radio	27	26.2	38	27.1
Kept/prepared valuables, medication, pets, and other significant belongings close by	16	15.5	38	27.1
Listened for more information from emergency services sources	23	22.3	48	34.3
Signed up to receive emergency alerts/warnings	18	17.5	33	23.6
Started to evacuate my property and family if/when instructed to do so	10	9.7	23	16.4
None of the above	42	40.8	29	20.7
I don't know/don't remember	5	4.9	11	7.9
Total respondents	103		140	

TABLE 49 PREPARATORY ACTIONS FOR TASMANIA RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, local governments, Bureau of Meteorology, media, and/or the state government (Table 50).

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	192	79
Media	106	43.6
Police service	102	42
Bureau of Meteorology	99	40.7
State government	76	31.3
Family and friends	74	30.5
Local government	73	30
Insurance provider(s)	8	3.3
Other	7	2.9
Total respondents	243	

TABLE 50 PREFERRED SOURCES OF INFORMATION FOR BUSHFIRE IN TASMANIA

These preferred sources aligned with who the sample indicated they trusted as a source of information about bushfires (Table 51). However, despite the local government not ranking in the top five preferred sources, they were in the top five trusted sources, above media, which was a preferred source for bushfire information.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	207	85.2
Police service	110	45.3
Bureau of Meteorology	93	38.3
State government	66	27.2
Local government	56	23
Media	49	20.2
Family and friends	30	12.3
Public transport provider	5	2.1
Total respondents	243	

TABLE 51 TRUSTED SOURCES OF INFORMATION FOR BUSHFIRE IN TASMANIA

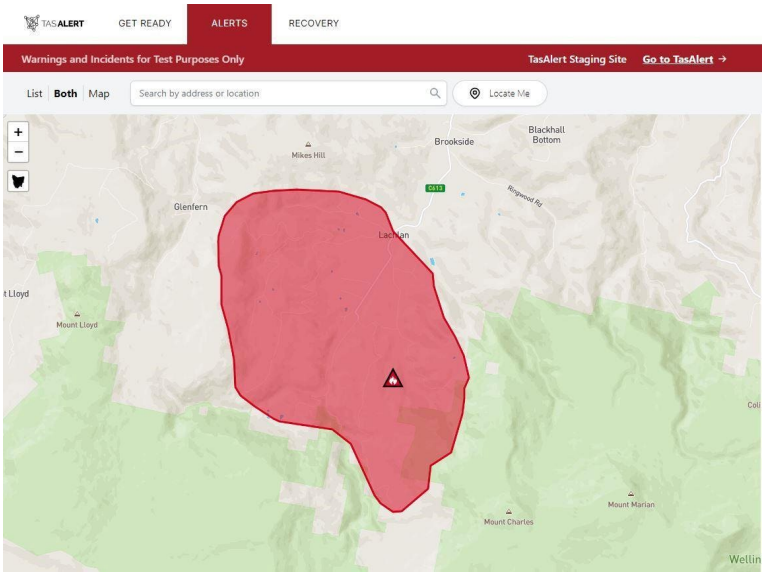
Commonly searched platforms included the local fire agency website, Google, television or radio, online news sites, and/or the fire agency app (or third-party fire app where no agency app is available) (Table 52). It is possible respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use …'.

	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	197	81.1
Radio	133	54.7
Television	108	44.4
Google	95	39.1
Online news sites	95	39.1
Local fire agency app (where available)	94	38.7
Facebook	89	36.6
Print newspapers	22	9.1
Instagram	15	6.2
YouTube	12	4.9
TikTok	11	4.5
Snapchat	10	4.1
Twitter	10	4.1
Other, please specify	2	0.8
Total respondents	243	100

TABLE 52 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN TASMANIA

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 13). The scenario that respondents received was: 'Imagine you see this map about a bushfire threatening and impacting your immediate location of Lachlan and surrounding roads. Please review the map and then answer the questions below.'



OFFICIAL

Emergency Warning

FURTHER EMERGENCY WARNING – MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS – EVACUATE NOW

This is a bushfire emergency warning message for MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS.

There is a bushfire near MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS that is out of control.

MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS is expected to be at extreme risk as early as 2.00pm.

The fire is travelling towards Lachlan.

Burning embers may threaten your home before the main fire arrives.

Smoke and ash may make it difficult to see and breathe.

Tasmania Fire Service and Tasmania Parks and Wildlife Service is attending. Conditions are expected to worsen.

What to do:

If your home is built using contemporary bushfire design standards, is well prepared and you can actively defend it, it may provide shelter.

If your home is unprepared, go to a safer location now only if the path is clear.

There is a nearby safer place at Gleeson Park, Lachlan.

If you have made a bushfire plan, use it now.

If you don't live near Lachlan, stay away.

For fire updates, listen to ABC Local Radio or visit TasALERT.com

Community Information:

For information on current road closures, visit the Tasmania Police website: police.tas.gov.au/community-alerts/

People at higher risk from the effects of smoke, including those with medical conditions, are advised to have a personal plan for avoiding smoke and managing their health. Advice is available from the Department of Health health.tas.gov.au/health-topics/environmental-health/air-quality or Asthma Australia asthma.org.au/about-asthma/triggers/bushfires-and-smoke/

If there is a fire and your plan is to evacuate or leave, the best option is to stay with family or friends.

Alert Level:	EMERGENCY WARNING
Type:	Bushfire
First Reported:	
Location:	Cyclone Ridge, Ruckland
Status:	Going
Size:	Not reported
Last Updated:	21/11/2022 11:48am
Agency:	Tasmania Fire Service

Issued At: 21/11/2022 11:48am

Incident number: 20022246

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FIGURE 13 TASMANIA MAP 1 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 53):

- Outlined a bushfire-affected area (descriptive).
- Outlined preparatory action, plans, or provided instructions.
- Outlined a future bushfire-affected area (predictive).
- Various respondents comprehended this as an evacuation order.
- Some respondents comprehended specific location information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	169	35%	*"Map of fire location, what to do, where to seek help."*
Preparations/plan/ instructions	87	18%	*"Map of a region well away from where we live giving details of actions residents in that area should take."*
Future bushfire-affected area	81	17%	*"A detailed outline of where the bushfire is and where it is heading, and if you have emergency plans, what the best course of action to take for your area."*
Evacuate/please leave	36	7%	*"A bushfire is burning and is threatening properties, leave if you can't defend your property."*
Location-specific information	32	7%	*"I saw the map of the fire approaching Lachlan. I saw all the warnings and information too."*
Alert/warning	27	6%	*"Area warnings, actions to take."*
Instructions on information sources	16	3%	*"Map of fire location, what to do, where to seek help."*
Information on emergency services	11	2%	*"Shows the area well as to where the evacuation is shown. Explains clearly what to do and where to go. Explains who issued the warning as being legitimate."*
Clear information/informative/ detailed	6	1%	*"A map of a bushfire zone and detailed information."*
Possible bushfire danger	6	1%	*"Just a big red area near a few places that may be in danger."*
Total respondents	243		

TABLE 53 COMPREHENSION OF TASMANIA MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 63% of responses indicated it was 'to show an Emergency Warning area'. This was aligned with the agency's intended purpose (Table 54). The 39.1% of responses indicating the purpose was to show a Watch and Act area did not accurately comprehend the intended purpose of the map and associated warning message. Reporting is to one decimal place.

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	154	63.4	X
To show the location of the bushfire	145	59.7	X
To show the level of risk to different parts of the community	131	53.9	X
To show where the bushfire is now	104	42.8	X
To show a 'Watch and Act' area	95	39.1	
To identify who needs to 'Take Shelter Now'	81	33.3	
To show the threat of the bushfire to certain areas in the state/territory	77	31.7	X

To show an 'Advice' area	76	31.3	
To show where people can go if they evacuate	73	30	
To show areas that are unaffected by bushfire	68	28	X
To show the direction of travel of the bushfire over the coming hours/days	62	25.5	
To show multiple bushfire warning levels	45	18.5	
To show people if it's not safe to leave the area	36	14.8	
To show where the bushfire has been	30	12.3	
To show facilities that may be closed because of the bushfire	28	11.5	
Unsure	5	2.1	
Total respondents	243		

TABLE 54 PERCEIVED INTENDED PURPOSE FOR TASMANIA MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were not closely aligned with what the agency had intended to communicate to the public (Table 55). Generic, largely implied actions received the most selections, including to 'stay informed' and 'monitor conditions'. However, the instructions in the associated warning message with the map told map users to evacuate, stay and defend, or enact their bushfire plan.

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	138	56.8	X
Prepare to evacuate/prepare to leave/prepare to leave the area	138	56.8	X
Enact your bushfire survival plan	135	55.6	X
Monitor conditions as they are changing	113	46.5	X
Evacuate now/leave immediately/leave now/leave the area now	86	35.4	X
Prepare to actively defend your home/property	81	33.3	X
Shelter indoors immediately/take shelter now	33	13.6	
Unsure	10	4.1	
Other	5	2.1	
Total respondents	243		

TABLE 55 PERCEIVED PROMPTED ACTION FOR TASMANIA MAP 1

Map effectiveness

Respondents indicated that the map had a moderate-high perceived effectiveness (M = 5.32, SD = 1.23; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (M = 5.35, SD = 1.24; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (M = 4.23, SD = 1.72; scale of 1–10), such that respondents indicated that they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 2.92, SD = 1.63; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported that they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 56).

	Frequency	Percent
Start to evacuate my property and my family if instructed to do so	97	39.9
Follow emergency services instructions	95	39.1
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	83	34.2
Listen to ABC radio	77	31.7
Keep informed by regularly visiting local fire/emergency agency website to stay informed	70	28.8
Enact my preprepared bushfire plan	70	28.8
Listen for more information from emergency services sources	69	28.4
Decide where you and other members of your home (including pets) will go if you need to leave	64	26.3
Follow and keep informed via local fire/emergency agency social media accounts	60	24.7
Monitor your surroundings	52	21.4
Move flammable items away from your house	44	18.1
Share this message with other people	41	16.9
Fill containers with water for drinking and firefighting	40	16.5
Sign up to receive emergency alerts/warnings	38	15.6
Share this message with other people/tell friends about this information	35	14.4
Prepare an emergency kit	32	13.2
Start preparing to defend my property	32	13.2
Phone local fire/emergency agency to stay informed	31	12.8
Avoid smoke by staying indoors and closing windows and doors	29	11.9
Create a household emergency plan/a bushfire plan	28	11.5
Tell others to follow emergency services' instructions	28	11.5
Help others prepare for the fire	22	9.1
Search for local fire/emergency agency mobile application to stay informed	20	8.2
Wait for a text message to tell me what to do	17	7
Wait for police to evacuate you	16	6.6
Source a first aid box/first aid kit	15	6.2
Wait for a firefighter to advise me what to do	10	4.1
Total respondents	243	

TABLE 56 PROTECTIVE ACTION INTENTIONS FOLLOWING TASMANIA MAP 1

Around 81% of the sample (Map 1 assess: 85%; Map 1 decide: 77%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 14.

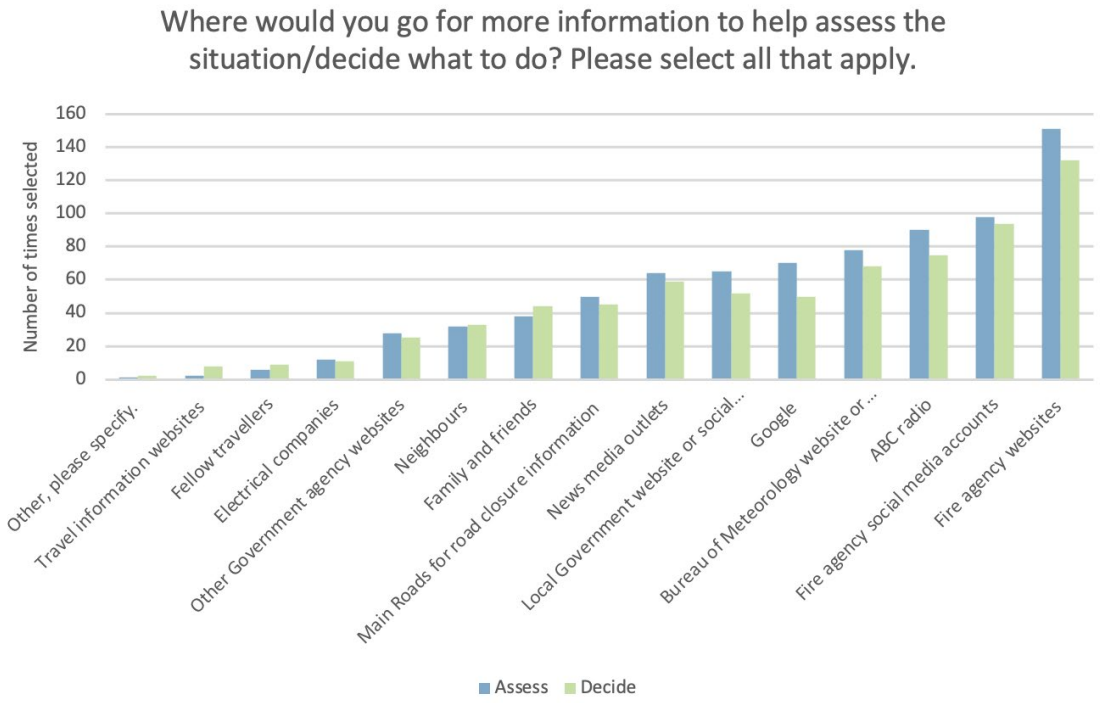


FIGURE 14 INFORMATION-SEEKING FOLLOWING TASMANIA MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.37, *SD* = 1.15; scale of 1–7), and moderate-high response efficacy (*M* = 5.31, *SD* = 1.12; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.67, *SD* = 1.62; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were predominantly general (e.g., 'I thought it was very clear') and represented 50% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, bushfire direction information, and requests for more information or clearer instructions (Table 57). For example:

> *"The map should contain a starting point and an end point (where it was situated at 11:45am), that would help people make a decision on leaving or staying. The information given at the bottom of the map should also contain wind conditions."*

> *"Needs contours so we can see which way the fire will draw and also the area which has burnt, otherwise it is only giving an area that maybe affected. For a map to be useful it needs detail of terrain such as roads, bush, streams, north point–- otherwise, it is not of much use to compare with Bureau of Meteorology reports of the area."*

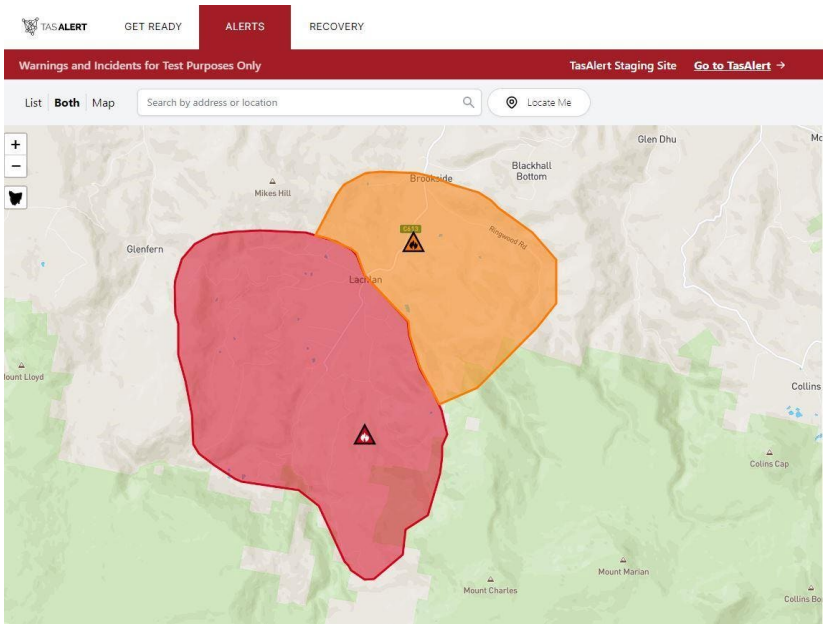
Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	89	50%	*"I think the map included ample information and visuals."*
Positive, specific	0	0%	

Constructive responses			
Sizing, legibility, colour choices	24	14%	*"Cartographically speaking ... it is difficult to read, lettering is too small and indistinct, difficult to see where the roads are, and other than there being a spot where the fire is and presumably where the fire is likely to go it is pretty useless. Work out what is needed and what is not and only show that. 1 Make sure all the wording is clear and can be read. 2 Show the current wind conditions and direction. 3 Show the roads clearly. 4 Give the time and date of the information provided in the map."*
Fire direction information	17	10%	*"Direction of travel of the fire and rate of travel. Could easily done with appropriate length arrows."*
More information needed	13	7%	*"I think it conveys the seriousness of the situation and gives you all the information needed from the map. Obviously, you may need more information about what to do re: evacuation, packing essentials, etc., but it's outside the scope of the map."*
Information should be clearer/more concise	12	7%	*"If the writing was bigger any the information was summarised to be a little less information."*
Clearer instructions	6	3%	*"Wish it had a more walk-through process of what the info means."*
Clearer place names/ identifiers	5	3%	*"The place names need to be in larger type."*
Ability to interact with map	3	2%	*"Not sure if the map is designed to be zoomed in for more detail, but it should be."*
Ensure information is updated frequently	2	1%	*"I have utilised the map on the Tas Fire website when there have been bushfires in our area. I have always found it informative but when conditions change quickly the map isn't as useful. It does help you to be prepared for possible conditions in the area."*
Connectivity/general use issues	2	1%	*"More detailed for people who might not be able to read maps."*
Text more useful than map	0	0%	*"N/A."*
Total measurable responses	157		
Total respondents	243		
No specific feedback provided	86		

TABLE 57 FEEDBACK TO IMPROVE TASMANIA MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 15). The scenario that respondents received was: 'Imagine you see this map about a bushfire threatening and impacting your immediate location of Lachlan and surrounding roads. Please review the map and then answer the questions below.'



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Watch and Act

BUSHFIRE WATCH AND ACT – LACHLAN AND SURROUNDS – MONITOR CONDITIONS AS THEY ARE CHANGING

This is a bushfire watch and act message for Lachlan.

There is an uncontrolled bushfire in the Wellington Range near Lachlan.

This fire is expected to put Lachlan at high risk by 4.00pm.

The fire is travelling towards Lachlan.

Embers, smoke, and ash may fall on Lachlan and threaten you and your home before the main fire arrives.

Tasmania Fire Service and the Tasmania Parks and Wildlife Service are attending. Conditions are expected to worsen.

What to do:

If you have prepared your home and can actively defend it, it should provide shelter.

If you are going to leave, make sure you have a clear path to a safer place.

There is a nearby safer place at the Gleeson Park, Lachlan.

If your family has made a bushfire plan, use it now.

If you do not live near Lachlan, stay away. The roads could be very dangerous.

For fire updates, listen to ABC Local Radio or visit TasALERT.com

Community Information:

For information on current road closures, visit the Tasmania Police website: police.tas.gov.au/community alerts/

People at higher risk from the effects of smoke, including those with medical conditions, are advised to have a personal plan for avoiding smoke and managing their health. Advice is available from the Department of Health health.tas.gov.au/health-topics/environmental-health/air-quality or Asthma Australia asthma.org.au/about-asthma/triggers/bushfires-and-smoke/

If there is a fire and your plan is to evacuate or leave, the best option is to stay with family or friends.

Alert Level:	WATCH AND ACT
Type:	Bushfire
First Reported:	
Location:	Wellington Range, Lachlan
Status:	Going
Size:	Not reported
Last Updated:	21/11/2022 11:48
Agency:	Tasmania Fire Service

Issued At: 21/11/2022 11:48am

Incident number: 20022246

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FIGURE 15 TASMANIA MAP 2 WITH ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 58):

- Outlined a future bushfire-affected area (predictive).
- Outlined a bushfire-affected area (descriptive).
- Demonstrated that multiple warnings were now in place.
- Outlined preparatory action, plans, or provided instructions.
- Some respondents were unable to comprehend the meaning of the multiple coloured warnings.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Future bushfire-affected area	113	27%	*"A map with red zone which is where the fire is and an orange zone which is the at-risk area."*
Fire-affected area	109	26%	*"Affected area of the fire and possibly surroundings if the fire moves."*
Map displays multiple warnings	45	11%	*"There were two coloured areas next to each other. I assume the red meant high danger and the yellow approaching danger, but it was not clear what they represented to me."*
Preparations/plan/ instructions	44	10%	*"A map detailing current and immediate bushfire threats and advice on what to do."*
Unsure what colours/warnings mean	43	10%	*"A similar chart but with an orange area. It is unclear what the orange area is."*
Alert/warning	15	4%	*"Watch and act and fire alert."*
Location-specific information	15	4%	*"A map of the local area around and in Lachlan, Southern Tasmania. It was basically showing already effected areas as well as threatened areas as well."*
Unclear/unsure/no data	15	4%	*"Several different maps a little confusing to comprehend."*
Evacuate/please leave	9	2%	*"A large fire heading towards Lachlan and I should prepare to leave."*
Information on emergency services	5	1%	*"There has been a 'Watch and Act' alert posted for the Lachlan area in the Wellington Ranges, the alert time was 11:48 am. The fire is expected to peak at 4:00 pm. People in the Lachlan area should take precautions of instigating their emergency plans and/or leaving their homes and take shelter at the emergency site at Barossa Park, Lachlan. People should contact Tas. Police to ensure roads are not closed."*
Appears similar to previous	4	1%	*"It's very similar to the first map; not the easiest to work out."*
Instructions on information sources	3	1%	*"There is an emergency fire warning in the Wellington Ranges near Lachlan. It is a watch and act warning. People are required to prepare to enact their emergency plans, including evacuation to Gleeson Park, Lachlan. People need to switch on their radios to the ABC or contact Emergency Services for more information. The fire path indicated that Lachlan is in danger."*
Clear information/informative/ detailed	2	0%	*"A very detailed description of what is happening with the fire and what actions you should take and who to listen to for updates."*
Do not evacuate	1	0%	*"Bush fire alert, watch and be prepared, you can stay at home."*
Possible bushfire danger	1	0%	*"A map to help in case of bushfire."*
Situation worsening	1	0%	*"A more serious fire situation."*
Total respondents	243		

TABLE 58 COMPREHENSION OF TASMANIA MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, the top six most selected responses were aligned with the agency's intended purpose of showing multiple warning levels and where the bushfire was currently located (Table 59). The remaining options, however, did not closely align with

the intended purpose of the map, including options like 'show an "Advice" area', or 'show direction of travel of the bushfire', and so forth down the table.

Select all that apply	Frequency	Percent	Agency intended purpose
To show a 'Watch and Act' area	167	68.7	X
To show the level of risk to different parts of the community	155	63.8	X
To show the location of the bushfire	135	55.6	X
To show an 'Emergency Warning' area	113	46.5	X
To show where the bushfire is now	89	36.6	X
To show multiple bushfire warning levels	84	34.6	X
To show an 'Advice' area	83	34.2	
To show the direction of travel of the bushfire over the coming hours/days	74	30.5	
To show where people can go if they evacuate	65	26.7	
To show the threat of the bushfire to certain areas in the state/territory	63	25.9	X
To identify who needs to 'Take Shelter Now'	59	24.3	
To show areas that are unaffected by bushfire	55	22.6	X
To show where the bushfire has been	32	13.2	
To show people if it's not safe to leave the area	29	11.9	
To show facilities that may be closed because of the bushfire	26	10.7	
Unsure	10	4.1	
Other	1	0.4	
Total respondents	243		

TABLE 59 PERCEIVED INTENDED PURPOSE FOR TASMANIA MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were mostly aligned with what the agency had intended to communicate to the public (Table 60). While the more generic, implied actions were selected more frequently, the primary four actions prompted by the map and associated warning message were selected by respondents.

Select all that apply	Frequency	Percent	Agency intended action
Monitor conditions as they are changing	153	63	X
Stay informed	152	62.6	X
Prepare to evacuate/prepare to leave/prepare to leave the area	143	58.8	X
Enact your bushfire survival plan	125	51.4	X
Prepare to actively defend your home/property	99	40.7	X
Evacuate now/leave immediately/leave now/leave the area now	46	18.9	X
Shelter indoors immediately/take shelter now	42	17.3	
Unsure	12	4.9	
It is not prompting me to act	5	2.1	
Other	3	1.2	
Total respondents	243		

TABLE 60 PERCEIVED PROMPTED ACTION FOR TASMANIA MAP 2

Map effectiveness

Respondents indicated that the map had a moderate-high perceived effectiveness (*M* = 5.20, *SD* = 1.30; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (*M* = 5.22, *SD* = 1.33; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (*M* = 4.29, *SD* = 1.78; scale of 1–10) such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.83, *SD* = 1.74; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions that they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 61). It is worthwhile noting that the selection of specific actions that precede successful evacuation, such as preparing valuables and listening for information as the situation evolves, are useful protective actions, though not explicitly mentioned in the associated warning message.

Select top five actions	Frequency	Percent
Follow emergency services instructions	88	36.2
Keep informed by regularly visiting local fire/emergency agency website	83	34.2
Monitor your surroundings	82	33.7
Listen to ABC radio	80	32.9
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	76	31.3
Start to evacuate my property and my family if instructed to do so	74	30.5
Listen for more information from emergency services sources	72	29.6
Enact my preprepared bushfire plan	68	28
Decide where you and other members of your home (including pets) will go if you need to leave	65	26.7
Follow and keep informed via local fire/emergency agency social media accounts	56	23
Start preparing to defend my property	50	20.6
Share this message with other people/tell friends about this information	38	15.6
Avoid smoke by staying indoors and closing windows and doors	33	13.6
Move flammable items away from your house	33	13.6
Fill containers with water for drinking and firefighting	29	11.9
Create a household emergency plan/a bushfire plan	29	11.9
Search for local fire/emergency agency mobile application to stay informed	29	11.9
Prepare an emergency kit	27	11.1
Sign up to receive emergency alerts/warnings	27	11.1
Share this message with other people	23	9.5
Source a first aid box/first aid kit	18	7.4
Wait for a text message to tell me what to do	16	6.6
Tell others to follow emergency services' instructions	15	6.2
Help others prepare for the fire	14	5.8
Phone local fire/emergency agency to stay informed	13	5.3

Wait for a firefighter to advise me what to do	11	4.5
Wait for police to evacuate you	10	4.1
None of the above	1	0.4
Total respondents	243	

TABLE 61 PROTECTIVE ACTION INTENTIONS FOLLOWING TASMANIA MAP 2

Around 78% of the sample (Map 2 assess: 81.5%; Map 2 decide: 75%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. Reporting is to one decimal place. The sources sought out for both the assess and decide protective action functions are outlined in Figure 16.

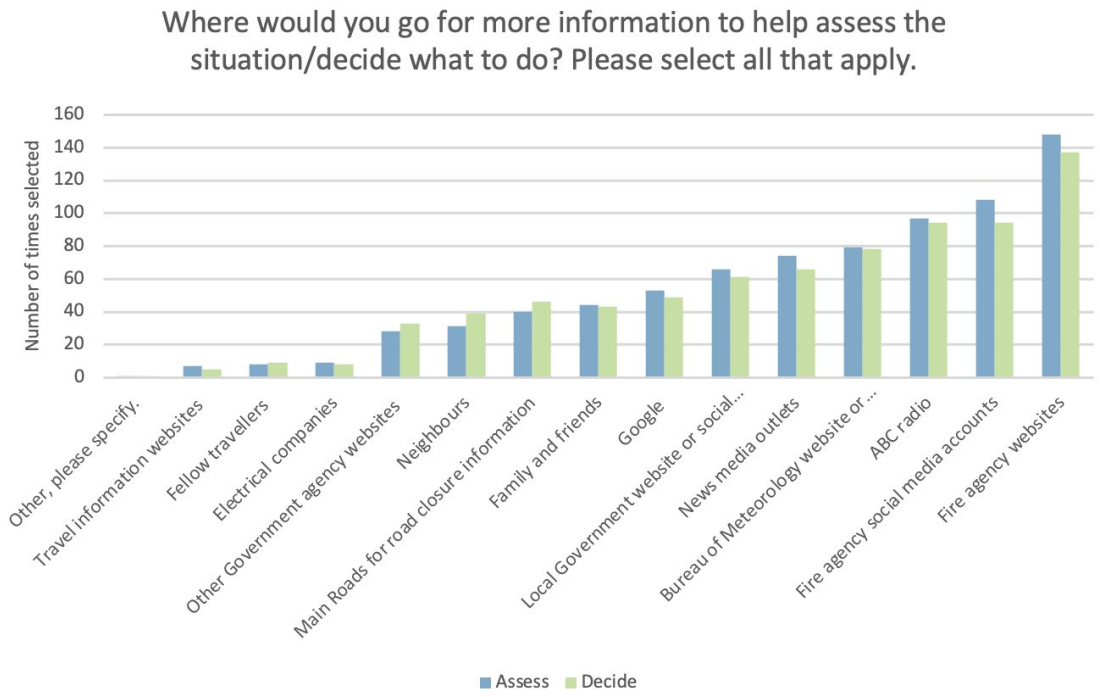


FIGURE 16 INFORMATION-SEEKING FOLLOWING TASMANIA MAP 2

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.41, *SD* = 1.14; scale of 1–7), and moderate-high response efficacy (*M* = 5.35, *SD* = 1.17; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.57, *SD* = 1.62; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'I found this map really comprehensive and informative') or specific (e.g., 'I like the second map, it gave more information which is important') and represented 49% of the feedback responses across the sample. The constructive feedback covered areas such as requesting clearer information/instructions, clearer

place names/identifiers, and general requests for more information on the meaning of the coloured areas (Table 62). For example:

> *"I wasn't really sure what the meaning of the two different colours were on the map – why some were red and some orange. I assume the red area is more imminent danger, but I'm not sure what the orange area is supposed to do – just stay aware?"*
>
> *"There needed to be clearer information re the two colour alert areas."*
>
> *"Arrows to specify the direction the fire is travelling. I just assumed it is travelling from the emergency warning area towards the watch and act area. The roads probably should be clearer on the map because I would be planning my escape when it becomes an emergency warning."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	74	44%	*"I found this map really comprehensive and informative."*
Positive, specific	9	5%	*"I think the colours allowed the different stages to be understandable."*
Constructive responses			
Information should be clearer/more concise	31	18%	*"The coloured zones needed a legend – it wasn't clear what orange and red meant. Also, direction of window, and time."*
More information needed	16	9%	*"Places available for evacuating to would be helpful."*
Clearer place names/ identifiers	11	7%	*"The map needed more detail like roads, landmarks, etc.*
Sizing, legibility, colour choices	7	4%	*"It's a useful map, but the print is a bit too small."*
Fire direction information	7	4%	*"Arrows to specify the dirt the fire is travelling. I just assumed it is travelling from the emergency warning area towards the Watch and Act area. The roads probably should be clearer on the map because I would be planning my escape."*
Clearer instructions	4	2%	*"A bit confusing with the two colours as to when evacuation is needed. I would probably evacuate if I lived in either area, I think. I would also be in contact with close family to advise."*
Ability to interact with map	4	2%	*"As it was only a screen shot of the map I don't know if the actual map would have a key showing the warning levels if you hover over the icons. If the actual map doesn't have these options, I think it should be included to make it super clear."*
Ensure information is updated frequently	1	1%	*"Live map that's free to use."*
Connectivity/general use issues	1	1%	*"Who is your audience? Is it written so everyone in your audience understands and knows what to do. Is it too wordy? Not everyone has a good grasp of the language."*
Text more useful than map	0	0%	*"N/A."*
Total measurable responses	148		
Total respondents	243		
No specific feedback provided	95		

TABLE 62 FEEDBACK TO IMPROVE TASMANIA MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, no significant differences in positive or negative emotions were elicited from viewing the maps. There was a statistically significant difference in risk perceptions, such that Map 1 (M = 5.35, SD = 1.24; scale of 1–7) triggered statistically significant higher risk perceptions than Map 2 (M = 5.22, SD = 1.33; scale of 1–7), $t(242) = 2.10$, $p < 0.05$. There was no statistically significant difference in coping appraisal between the two maps. Finally, there was a statistically significant difference between the maps in their

perceived effectiveness, such that Map 1 was perceived to be more effective (M = 5.32, SD = 1.23; scale of 1–7) than Map 2 (M = 5.19, SD = 1.30; scale of 1–7), $t(242) = 2.54$, $p < 0.05$.

Tasmania's map comparison was the opposite to other jurisdictions (i.e., Map 1 > Map 2 on each metric) because the Emergency Warning (Map 1) was shown before the Watch and Act message (Map 2), suggesting a de-escalation in warning levels against the national Australian Warning System.

South Australia

This section reports the results for the South Australian sample only, including the two bushfire maps and associated warning messages provided.

Sample characteristics

Respondents (*n* = 404) from South Australia comprised 59% female, with 43% aged 18 to 44 years. Respondents predominantly speak English as a primary language (96%), and 9.7% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 63). Reporting is to one decimal place.

Gender	Frequency	Percent
Female	240	59.4
Male	164	40.6
Age		
18–24	31	7.7
25–34	74	18.3
35–44	54	13.4
45–54	57	14.1
55–64	81	20
65–74	72	17.8
75 or older	35	8.7
English as primary language		
Yes	388	96
No	16	4
Education level		
Left school before Year 10	7	1.7
High school (to Year 10)	45	11.1
High school (to Year 12)	100	24.8
TAFE qualification (e.g., Certificate II, III, or IV)	121	30
Bachelor's degree	87	21.5
Postgraduate award	44	10.9
Insurance level		
Fully insured – Vehicle	336	83.2
Fully insured – Contents	305	75.5
Fully insured – House	282	69.8
Fully insured – Farm	13	3.2
Emergency services involvement		
Yes	39	9.7
No	365	90.3
Total respondents	404	100

TABLE 63 SAMPLE CHARACTERISTICS FOR SOUTH AUSTRALIA

Experience and exposure

Over 34% of the sample had previously experienced a bushfire, with over 21% having experienced a bushfire in the past five years. Holistically, the sample reported a low-moderate likelihood of being exposed to the threat of bushfire in their current neighbourhood (*M* = 3.30; scale of 1–7). There was a low-moderate reported perceived current knowledge about bushfires (*M* = 3.90; scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, approximately 43% of the respondents indicated they had used a map to inform themselves about the risk of a bushfire.

Despite a moderate perceived knowledge of mitigation activities to prevent loss during a bushfire (*M* = 3.53; scale of 1–7), 17.6% indicated they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 11.3% (low risk of bushfire) to 26.3% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 64, based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	31	13.4	60	35.1
Developed/prepared an emergency kit	31	13.4	50	29.2
Downloaded agency app to stay informed	25	10.8	49	28.7
Followed emergency services instructions	24	10.4	70	40.9
Had/prepared first aid box	35	15.2	66	38.6
Kept informed via agency website, social media, phone, or radio	47	20.3	68	39.8
Kept/prepared valuables, medication, pets, and other significant belongings close by	19	8.2	54	31.6
Listened for more information from emergency services sources	46	19.9	68	39.8
Signed up to receive emergency alerts/warnings	30	13	70	40.9
Started to evacuate my property and family if/when instructed to do so	13	5.6	36	21.1
None of the above	120	51.9	25	14.6
I don't know/don't remember	1	0.4	6	3.5
Total respondents	231		171	

TABLE 64 PREPARATORY ACTIONS FOR SOUTH AUSTRALIA RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, local governments, Bureau of Meteorology, media, and/or the state government (Table 65).

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	319	79
Bureau of Meteorology	187	46.3
Media	178	44.1
State government	141	34.9
Local government	127	31.4
Police service	102	25.2
Family and friends	94	23.3
Public transport provider	13	3.2
Insurance provider(s)	10	2.5
Other	8	2
Total respondents	404	

TABLE 65 PREFERRED SOURCES OF INFORMATION FOR BUSHFIRE IN SOUTH AUSTRALIA

These preferred sources aligned with who the sample indicated they trusted as a source of information about bushfires (Table 66). However, despite police services not ranking in the top five preferred sources, they were in the top five most trusted sources, above media, which was a preferred source for bushfire information.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	356	88.1
Bureau of Meteorology	173	42.8
Police service	147	36.4
State government	129	31.9
Local government	111	27.5
Media	75	18.6
Family and friends	31	7.7
Public transport provider	17	4.2
Other	8	2
Total respondents	404	

TABLE 66 TRUSTED SOURCES OF INFORMATION FOR BUSHFIRE IN SOUTH AUSTRALIA

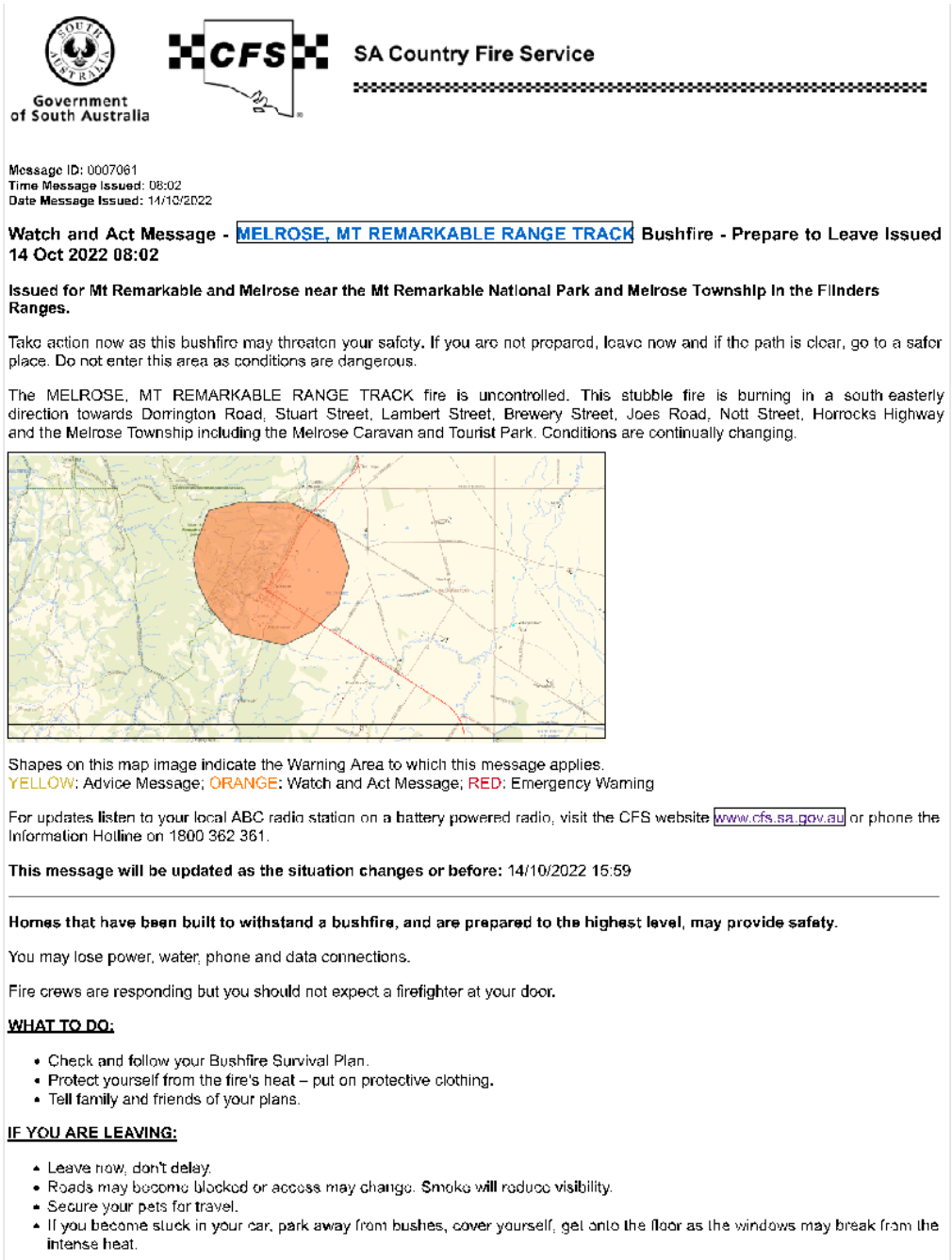
Commonly searched platforms included the local fire agency website, Google, television or radio, online news sites, and/or the fire agency app (or third-party fire app, where an agency app is not available) (Table 67). It is possible respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use ...'.

	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	304	75.2
Radio	205	50.7
Television	187	46.3
Google	170	42.1
Local fire agency app (where available)	158	39.1
Online news sites	151	37.4
Facebook	110	27.2
Print newspapers	36	8.9
Instagram	19	4.7
YouTube	16	4
TikTok	11	2.7
Snapchat	7	1.7
Reddit	5	1.2
Other, please specify	5	1.2
Total respondents	404	

TABLE 67 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN SOUTH AUSTRALIA

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 17). The scenario that respondents received was: 'You live in the town centre of Melrose in the Flinders Ranges and see a map and warning message that shows there is a bushfire burning in Mt Remarkable National Park. Please review the map and answer the questions below.'



Government of South Australia

CFS SA Country Fire Service

Message ID: 0007061
Time Message Issued: 08:02
Date Message Issued: 14/10/2022

Watch and Act Message - MELROSE, MT REMARKABLE RANGE TRACK Bushfire - Prepare to Leave Issued 14 Oct 2022 08:02

Issued for Mt Remarkable and Melrose near the Mt Remarkable National Park and Melrose Township in the Flinders Ranges.

Take action now as this bushfire may threaten your safety. If you are not prepared, leave now and if the path is clear, go to a safer place. Do not enter this area as conditions are dangerous.

The MELROSE, MT REMARKABLE RANGE TRACK fire is uncontrolled. This stubble fire is burning in a south easterly direction towards Dorrington Road, Stuart Street, Lambert Street, Brewery Street, Joes Road, Nott Street, Horrocks Highway and the Melrose Township including the Melrose Caravan and Tourist Park. Conditions are continually changing.

For updates listen to your local ABC radio station on a battery powered radio, visit the CFS website www.cfs.sa.gov.au or phone the Information Hotline on 1800 362 361.

This message will be updated as the situation changes or before: 14/10/2022 15:59

Homes that have been built to withstand a bushfire, and are prepared to the highest level, may provide safety.

You may lose power, water, phone and data connections.

Fire crews are responding but you should not expect a firefighter at your door.

WHAT TO DO:

- Check and follow your Bushfire Survival Plan.
- Protect yourself from the fire's heat – put on protective clothing.
- Tell family and friends of your plans.

IF YOU ARE LEAVING:

- Leave now, don't delay.
- Roads may become blocked or access may change. Smoke will reduce visibility.
- Secure your pets for travel.
- If you become stuck in your car, park away from bushes, cover yourself, get onto the floor as the windows may break from the intense heat.

1 of 2 14/10/2022, 8:05 am

FIGURE 17 SOUTH AUSTRALIA MAP 1 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 68):

- Outlined preparatory action, plans, or provided instructions.
- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).
- Provided information on seeking further information.
- Some respondents comprehended this message as an evacuation order.
- Provided information on emergency services.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Preparations/plan/instructions	228	25%	*"A map of the fire area, the warning accompanying it and instructions/advice on what action to take."*
Fire-affected area	187	20%	*"Location of the bush fire."*
Future bushfire-affected area	127	14%	*"A map showing the location of the fire and its area of potential impact, along with a comprehensive set of directions about how to proceed from here. Contact details for relevant authorities are given."*
Instructions on information sources	80	9%	*"… contacts to call, how to manage what to do, where you should go, basically an action plan for the bushfire."*
Evacuate/please leave	78	8%	*"Telling me not to delay and to leave home ASAP."*
Information on emergency services	77	8%	*"A description of what services are available able and what is affected in my area."*
Alert/warning	45	5%	*"A map of the fire area, the warning accompanying it and instructions/advice on what action to take."*
Location-specific information	40	4%	*"Alert for the area surrounding Melrose and information on how to act and keep up with real time info."*
Clear information/informative/ detailed	35	4%	*"Detailed instructions on how to leave, conditions to expect and what to do if things go wrong. If defending your home, instructions to stay safe (always have 2 exits) ."*
Possible bushfire danger	6	1%	*"A map with local area and potential fire spots."*
Total respondents	404		

TABLE 68 COMPREHENSION OF SOUTH AUSTRALIA MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, around 60% of responses covered 'to show location of bushfire', 'to show a Watch and Act area', and 'to show the level of risk to different parts of the community', which was aligned with the agency's intended purpose (Table 69).

Select all that apply	Frequency	Percent	Agency intended purpose
To show the location of the bushfire	247	61.1	X
To show a 'Watch and Act' area	245	60.6	X
To show the level of risk to different parts of the community	235	58.2	X
To show an 'Emergency Warning' area	214	53	
To show where the bushfire is now	178	44.1	
To show an 'Advice' area	162	40.1	
To show the threat of the bushfire to certain areas in the state/territory	148	36.6	X
To identify who needs to 'Take Shelter Now'	137	33.9	
To show the direction of travel of the bushfire over the coming hours/days	123	30.4	
To show areas that are unaffected by bushfire	112	27.7	
To show multiple bushfire warning levels	102	25.2	

To show where people can go if they evacuate	89	22
To show people if it's not safe to leave the area	69	17.1
To show facilities that may be closed because of the bushfire	53	13.1
To show where the bushfire has been	47	11.6
Unsure	8	2
Other	2	0.5
Total respondents	404	

TABLE 69 PERCEIVED INTENDED PURPOSE FOR SOUTH AUSTRALIA MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were mostly aligned with what the agency had intended to communicate to the public (Table 70).

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	299	74	X
Prepare to evacuate/prepare to leave/prepare to leave the area	262	64.9	X
Enact your bushfire survival plan	259	64.1	X
Monitor conditions as they are changing	243	60.1	X
Prepare to actively defend your home/property	149	36.9	
Evacuate now/leave immediately/leave now/leave the area now	143	35.4	
Shelter indoors immediately/take shelter now	82	20.3	
Unsure	12	3	
Other	11	2.7	
Total respondents	404		

TABLE 70 PERCEIVED PROMPTED ACTION FOR SOUTH AUSTRALIA MAP 1

Map effectiveness

Respondents indicated that the map had a moderate-high perceived effectiveness (M = 5.30, SD = 1.08; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (M = 5.16, SD = 1.18; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk, and that the risk was serious.

The map also elicited low-moderate negative emotions (M = 4.13, SD = 1.82; scale of 1–10), such that respondents indicated that they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 3.06, SD = 1.59; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 71).

Select top five actions	Frequency	Percent
Follow emergency services instructions	164	40.6
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	152	37.6
Listen to ABC radio	129	31.9
Enact my preprepared bushfire plan	129	31.9
Start to evacuate my property and my family if instructed to do so	129	31.9
Decide where you and other members of your home (including pets) will go if you need to leave	124	30.7
Listen for more information from emergency services sources	113	28
Monitor your surroundings	105	26
Follow and keep informed via local fire/emergency agency social media accounts	89	22
Keep informed by regularly visiting local fire/emergency agency website	88	21.8
Sign up to receive emergency alerts/warnings	73	18.1
Move flammable items away from your house	70	17.3
Prepare an emergency kit	66	16.3
Fill containers with water for drinking and firefighting	63	15.6
Avoid smoke by staying indoors and closing windows and doors	58	14.4
Share this message with other people	56	13.9
Create a household emergency plan/a bushfire plan	55	13.6
Share this message with other people/tell friends about this information	55	13.6
Search for local fire/emergency agency mobile application to stay informed	48	11.9
Start preparing to defend my property	46	11.4
Tell others to follow emergency services' instructions	43	10.6
Source a first aid box/first aid kit	41	10.1
Wait for a text message to tell me what to do	34	8.4
Help others prepare for the fire	30	7.4
Phone local fire/emergency agency to stay informed	28	6.9
Wait for a firefighter to advise me what to do	18	4.5
Wait for police to evacuate you	8	2
Other	6	1.5
Total respondents	404	

TABLE 71 PROTECTIVE ACTION INTENTIONS FOLLOWING SOUTH AUSTRALIA MAP 1

Around 80% of the sample (Map 1 assess: 83%; Map 1 decide: 76%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 18.

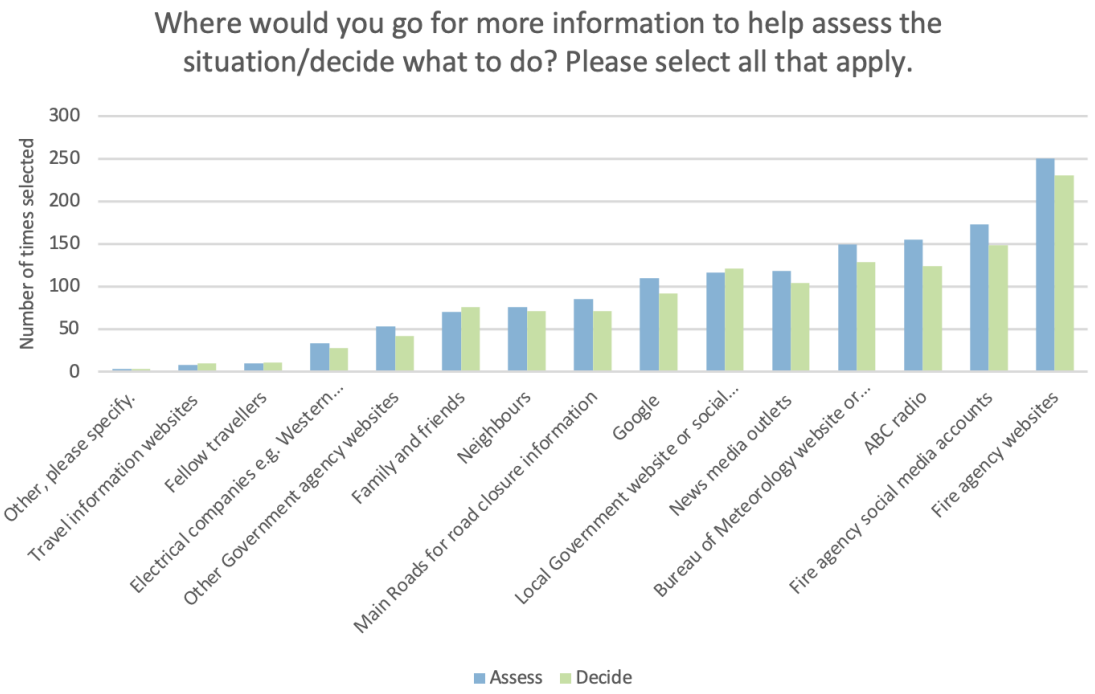


FIGURE 18 INFORMATION-SEEKING FOLLOWING SOUTH AUSTRALIA MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.39, *SD* = 1.27; scale of 1–7), and moderate-high response efficacy (*M* = 5.37, *SD* = 1.10; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.69, *SD* = 1.55; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'the map was very informative') or specific (e.g., 'I found the map to be informative, it gave clear instructions as to what steps to take to protect your home prior to leaving') and represented 45% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility and colour choices, clarity of information/instructions, and bushfire direction information (Table 72). For example:

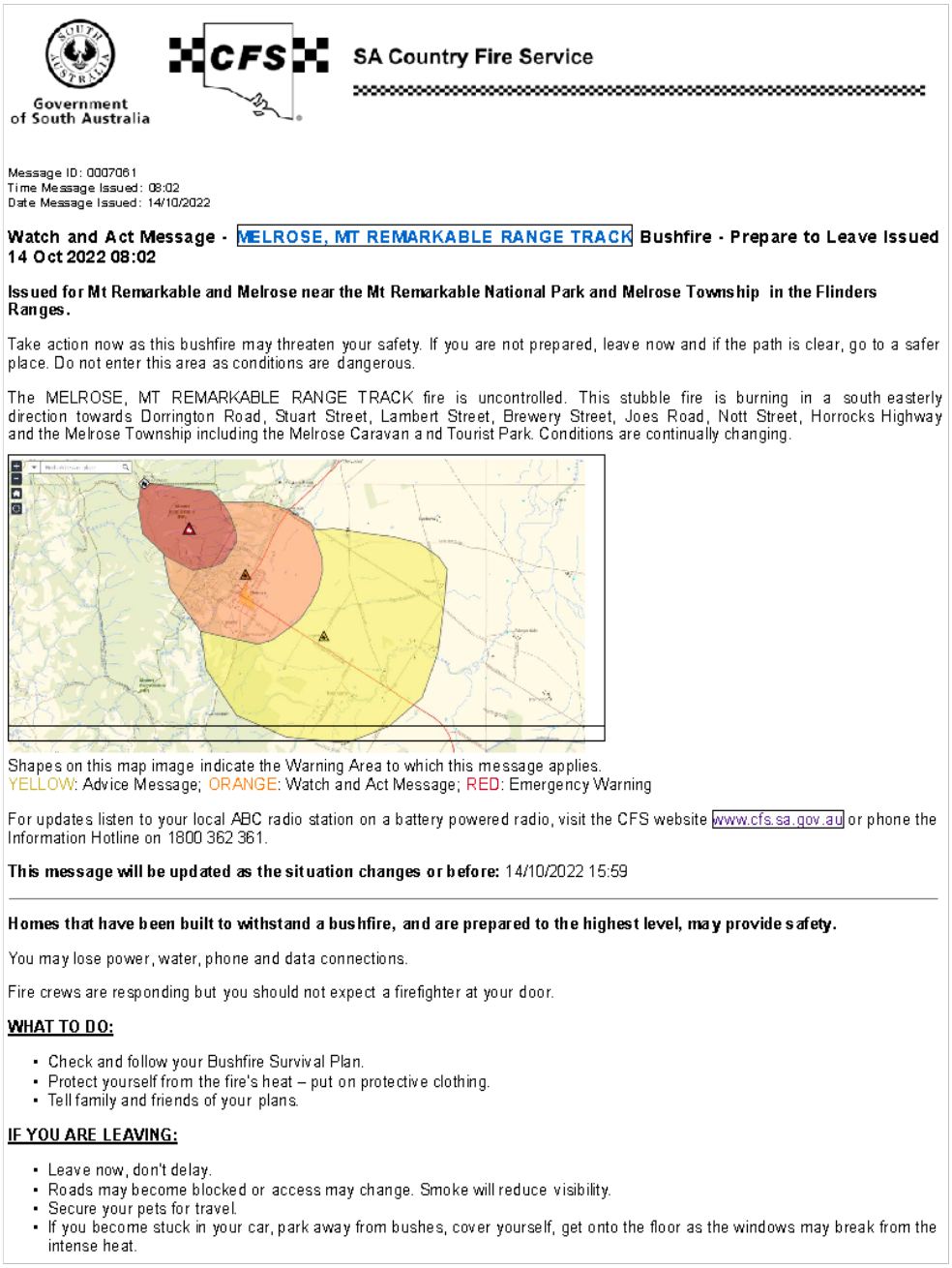
> *"Clearer information, maybe a summary of the most important points, clearer headings. I feel this flier may be a lot of information to digest when you are anxious or worried about the situation."*
>
> *"Indication of direction fire is travelling other than in written form – arrows or something. Clearer road signs on map. Clear indication of safe area to head to. Indication of road closures. Although the colour orange is for high risk and preparedness, it would be more visually effective using fire icons showing the bushfire area. For me personally it makes it seem more real."*
>
> *"I thought it could do with highlighting where it is most advisable to travel to that would be most safe rather than just saying to leave immediately."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	137	43%	*"It was informative and would be a wonderful tool for everyone to be able to utilise."*
Positive, specific	5	2%	*"I found the map to be informative, it gave clear instructions as to what steps to take to protect your home prior to leaving – moving flammable materials, turning on sprinklers, etc. I thought it could do with highlighting where it is most advisable to travel to that would be most safe, rather than just saying to leave immediately."*
Constructive responses			
Sizing, legibility, colour choices	41	13%	*"When viewing the map, I assumed it was an orange code, not red – maybe a colour code could assist those with vision issues. The information was comprehensive. Adding too much can be difficult given that fire is often unpredictable, and the conditions continually change – wind, fuel, firebreaks etc. Locals would know the terrain and how the roads would bend and curve. Identifying a safe area could help visitors or newcomers to the area."*
Information should be clearer/more concise	27	8%	*"Perhaps dot points. Too much information to take in."*
Fire direction information	22	7%	*"Indication of direction fire is travelling other than in written form – arrows or something. Clearer road signs on map. Clear indication of a safe area to head to. Indication of road closures. Although the colour is orange for high risk and preparedness it would be more visually effective using fire pictures showing the bushfire area. For me personally it makes it seem more real."*
Clearer place names/ identifiers	17	5%	*"As above."*
More information needed	17	5%	*"If any road closures are in place this could be useful in planning your evacuation."*
Ability to interact with map	16	5%	*"Interactive map would be helpful so you can look around it more."*
Clearer instructions	15	5%	*"It was comprehensive but a lot of information if I was in a panic (I'd likely be in a bushfire) I'm not sure if process/remember it all."*
Connectivity/general use issues	8	2%	*"I'm not sure how really helpful it would be for elderly people."*
Ensure information is updated frequently	2	1%	*"The map is better than just naming the fire as Mt Remarkable fire. The fire moves and this map must remain dynamic and be constantly updated."*
Text more useful than map	0	0%	
Total measurable responses	268		
Total respondents	404		
No specific feedback provided	136		

TABLE 72 FEEDBACK TO IMPROVE SOUTH AUSTRALIAN MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 19). The scenario that respondents received was: 'You live in the town centre of Melrose in the Flinders Ranges and see a map and warning message that shows there is a bushfire burning in Mt Remarkable National Park. Please review the map and answer the questions below.'



Government of South Australia

CFS SA Country Fire Service

Message ID: 0007061
Time Message Issued: 08:02
Date Message Issued: 14/10/2022

Watch and Act Message - MELROSE, MT REMARKABLE RANGE TRACK Bushfire - Prepare to Leave Issued 14 Oct 2022 08:02

Issued for Mt Remarkable and Melrose near the Mt Remarkable National Park and Melrose Township in the Flinders Ranges.

Take action now as this bushfire may threaten your safety. If you are not prepared, leave now and if the path is clear, go to a safer place. Do not enter this area as conditions are dangerous.

The MELROSE, MT REMARKABLE RANGE TRACK fire is uncontrolled. This stubble fire is burning in a south easterly direction towards Dorrington Road, Stuart Street, Lambert Street, Brewery Street, Joes Road, Nott Street, Horrocks Highway and the Melrose Township including the Melrose Caravan and Tourist Park. Conditions are continually changing.

Shapes on this map image indicate the Warning Area to which this message applies.
YELLOW: Advice Message; ORANGE: Watch and Act Message; RED: Emergency Warning

For updates listen to your local ABC radio station on a battery powered radio, visit the CFS website www.cfs.sa.gov.au or phone the Information Hotline on 1800 362 361.

This message will be updated as the situation changes or before: 14/10/2022 15:59

Homes that have been built to withstand a bushfire, and are prepared to the highest level, may provide safety.

You may lose power, water, phone and data connections.

Fire crews are responding but you should not expect a firefighter at your door.

WHAT TO DO:

- Check and follow your Bushfire Survival Plan.
- Protect yourself from the fire's heat – put on protective clothing.
- Tell family and friends of your plans.

IF YOU ARE LEAVING:

- Leave now, don't delay.
- Roads may become blocked or access may change. Smoke will reduce visibility.
- Secure your pets for travel.
- If you become stuck in your car, park away from bushes, cover yourself, get onto the floor as the windows may break from the intense heat.

1 of 2 14/10/2022. 8:05 am

FIGURE 19 SOUTH AUSTRALIA MAP 2 AND ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 73):

- Demonstrated that multiple warnings were now in place.
- Outlined preparatory action, plans, or provided instructions.
- Outlined a future bushfire-affected area (predictive).
- Outlined a bushfire-affected area (descriptive).
- Some respondents comprehended this message as an evacuation order.
- Provided information on seeking further information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Map displays multiple warnings	186	27%	*"Again, this had very detailed instructions on what actions to take. I much prefer this map as it shows the various levels of danger zones and gives me more accurate directions on how to proceed as I can recognise what danger category I fall into. I also think this gives me a fair idea as to where to travel to that would be deemed a safer area."*
Preparations/plan/ instructions	151	22%	*"An area showing where the bushfire is and how much danger each area is in along with a guide on what to do next."*
Future bushfire-affected area	88	13%	*It was a similar map to last time with instructions on what to do depending on if you are staying or leaving. However, the map itself was more useful in seeing which direction the fire may be going and having different levels of danger in different areas."*
Fire-affected area	74	11%	*"Showed where the fire is, where it is going and its status as uncontrolled. The red, yellow, and orange told the levels of action to take."*
Evacuate/please leave	43	6%	*"Watch and act plan for a bushfire in the Mount Remarkable National Park people within a particular area should now leave immediately."*
Instructions on information sources	34	5%	*"A local map of roads and towns, indicating the area currently implicated by bushfire. The information was relevant – what to do, when to do it, where to listen for up-to-date information, who to advise if staying or if evacuating."*
Information on emergency services	32	5%	*"Warning map, real time information from SACFS, local updates and information."*
Unclear/unsure/no data	30	4%	*"Not sure."*
Clear information/informative/ detailed	22	3%	*"A very detailed plan of action for my area and how to respond during this bushfire."*
Location-specific information	14	2%	*"CFS warning on a bushfire the MT remarkable national park in the Flinders Ranges. It included a map of the areas impacted by the fire."*
Alert/warning	12	2%	*"Different warnings, plus the map and advice as to what to do in certain situations."*
Situation worsening	8	1%	*"There are now extra areas of concern and has shown the direction the fire is heading."*
Map has changed	4	1%	*"Update from previous event."*
Appears similar to previous	2	0%	*"Details on danger zones, and levels of warning. Advice on what area is at highest risk and must leave now. Mostly the same info as the last message."*
Total respondents	404		

TABLE 73 COMPREHENSION OF SOUTH AUSTRALIAN MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, 74% of responses indicated it was 'to show an Emergency Warning area' and 72% indicated it was 'to show a Watch and Act area'. While both were illustrated on the map, the associated warning was labelled as a Watch and Act message. This interpretation was somewhat aligned with the agency's intended purpose (Table 74).

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	299	74	X
To show a 'Watch and Act' area	293	72.5	X
To show the level of risk to different parts of the community	276	68.3	X
To show an 'Advice' area	265	65.6	X
To show the location of the bushfire	237	58.7	X
To show multiple bushfire warning levels	224	55.4	X
To show the direction of travel of the bushfire over the coming hours/days	192	47.5	
To show where the bushfire is now	190	47	X
To identify who needs to 'Take Shelter Now'	151	37.4	
To show the threat of the bushfire to certain areas in the state/territory	150	37.1	X
To show areas that are unaffected by bushfire	95	23.5	
To show people if it's not safe to leave the area	83	20.5	
To show where people can go if they evacuate	81	20	
To show where the bushfire has been	54	13.4	
To show facilities that may be closed because of the bushfire	53	13.1	
Unsure	8	2	
Other	3	0.7	
Total respondents	404		

TABLE 74 PERCEIVED INTENDED PURPOSE FOR SOUTH AUSTRALIA MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were mostly aligned with what the agency had intended to communicate to the public (Table 75).

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	271	67.1	X
Prepare to evacuate/prepare to leave/prepare to leave the area	270	66.8	X
Enact your bushfire survival plan	240	59.4	X
Monitor conditions as they are changing	231	57.2	X
Evacuate now/leave immediately/leave now/leave the area now	196	48.5	X
Prepare to actively defend your home/property	155	38.4	
Shelter indoors immediately/take shelter now	105	26	
Unsure	17	4.2	
Other	7	1.7	
It is not prompting me to act	6	1.5	
Total respondents	404		

TABLE 75 PERCEIVED PROMPTED ACTION FOR SOUTH AUSTRALIA MAP 2

Map effectiveness

Respondents indicated that the map had a high perceived effectiveness (M = 5.52, SD = 1.18; scale of 1–7).

Risk perceptions and emotions

The map elicited high perceptions of risk (*M* = 5.51, *SD* = 1.29; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (*M* = 4.52, *SD* = 1.83; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message). Also, the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.98, *SD* = 1.75; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 76).

Select top five actions	Frequency	Percent
Start to evacuate my property and my family if instructed to do so	163	40.3
Enact my preprepared bushfire plan	156	38.6
Follow emergency services instructions	148	36.6
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	143	35.4
Listen to ABC radio	141	34.9
Keep informed by regularly visiting local fire/emergency agency website	113	28
Listen for more information from emergency services sources	112	27.7
Decide where you and other members of your home (including pets) will go if you need to leave	97	24
Monitor your surroundings	88	21.8
Follow and keep informed via local fire/emergency agency social media accounts	75	18.6
Search for local fire/emergency agency mobile application to stay informed	56	13.9
Fill containers with water for drinking and firefighting	53	13.1
Move flammable items away from your house	51	12.6
Share this message with other people/tell friends about this information	51	12.6
Prepare an emergency kit	47	11.6
Create a household emergency plan/a bushfire plan	46	11.4
Sign up to receive emergency alerts/warnings	46	11.4
Avoid smoke by staying indoors and closing windows and doors	45	11.1
Start preparing to defend my property	45	11.1
Share this message with other people	41	10.1
Phone local fire/emergency agency to stay informed	37	9.2
Tell others to follow emergency services' instructions	37	9.2
Wait for a text message to tell me what to do	33	8.2
Source a first aid box/first aid kit	30	7.4
Help others prepare for the fire	21	5.2
Wait for police to evacuate you	17	4.2
Wait for a firefighter to advise me what to do	14	3.5
Other	6	1.5
Total respondents	404	

TABLE 76 PROTECTIVE ACTION INTENTIONS FOLLOWING SOUTH AUSTRALIA MAP 2

Around 76% of the sample (Map 2 assess: 79%; Map 2 decide: 74%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The marginally lower reported levels of seeking further information to assess the situation and decide how to respond than for the previous map signals that there was potentially more certainty in the second map (and associated warning message) on what the threat was and what action needed to be taken than in the first. The sources sought out for both the assess and decide protective action functions are outlined in Figure 20.

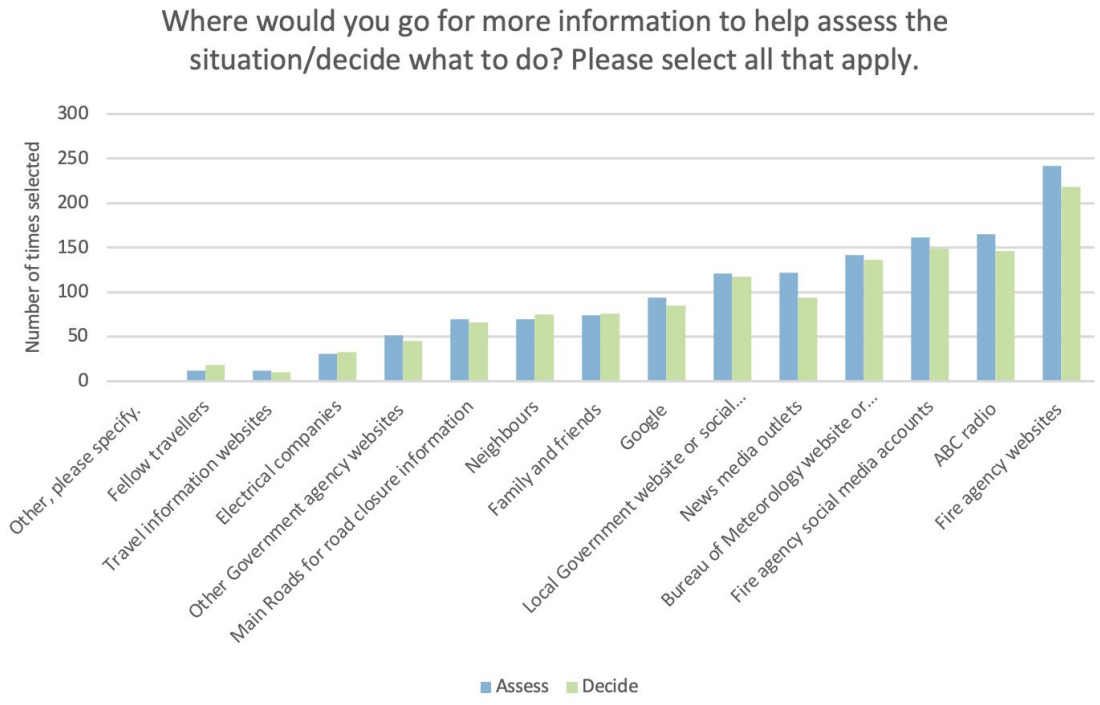


FIGURE 20 INFORMATION-SEEKING FOLLOWING SOUTH AUSTRALIA MAP 2

Coping appraisal

The map elicited high perceived self-efficacy (*M* = 5.50, *SD* = 1.23; scale of 1–7), and high response efficacy (*M* = 5.50, *SD* = 1.14; scale of 1–7), such that respondents perceived that they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.75, *SD* = 1.57; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'clear and concise') or specific (e.g., 'gives a better indication of the direction of the fire') and represented 63% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, requests for more information such as evacuation centres, and clearer place names/identifiers (Table 77). For example:

> *"I liked that it showed all areas and what warnings they could be under but for those who aren't familiar with the area it may be confusing where they fall into which category, maybe more significant landmarks on the map would help."*

"The only thing missing was that I could not see where the evacuation centres marked on the map or in the information section. It was not clear where people should go to shelter if they leave their properties."

"As before, a clearer map and clear information. Better headings with a summary of the most important information at the top. Fire visuals for where the fire is burning. Direction signs showing movement of fire. Clearer road signs. Safe area noted. Indication of road closures."

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	125	46%	*"Again, very comprehensive."*
Positive, specific	47	17%	*"I actually like the three separate areas and advice. I think during the Lobethal fires, that would have made people a little more alert to what was happening."*
Constructive responses			
Sizing, legibility, colour choices	18	7%	*"Higher resolution so that the map detail is not affected when zooming in.*
More information needed	15	6%	*"It wished that it has safe places marked for people who cannot move quickly and easily."*
Clearer place names/ identifiers	14	5%	*"It needs to be bigger and better labelled to indicate roads and their names."*
Information should be clearer/more concise	10	4%	*"Still very busy with information."*
Clearer instructions	9	3%	*"It's a bit unclear on what actions are needed to take for each coloured section of the map."*
Ability to interact with map	5	2%	*"Prefer an app version and more complex interactive functions."*
Fire direction information	5	2%	*"Fire visuals where the fire is burning. Direction signs showing movement of fire. Clearer road signs. Safe area noted. Indication of road closures."*
Connectivity/general use issues	4	1%	*"Please make it more [neurodivergent] and visually impaired friendly."*
Ensure information is updated frequently	3	1%	*"Strongly reinforce the need to monitor for changing conditions."*
Text more useful than map	0	0%	*"N/A."*
Total measurable responses	244		
Total respondents	404		
No specific feedback provided	160		

TABLE 77 FEEDBACK TO IMPROVE SOUTH AUSTRALIA MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, there were no significant differences in positive emotions elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 4.51, SD = 1.82; scale of 1-10) elicited higher reported negative emotions than Map 1 (M = 4.13, SD = 1.82; scale of 1–10), $t(403) = -7.12$, $p < 0.001$. This significant difference held for risk perceptions such that Map 2 (M = 5.51, SD = 1.29; scale of 1–7) triggered statistically significant higher risk perceptions than Map 1 (M = 5.16, SD = 1.18; scale of 1–7), $t(403) = -6.82$, $p < 0.001$. There were also statistically significant differences in coping appraisal between the two maps such that Map 2 elicited higher perceptions of coping appraisal (M = 5.25, SD = 1.01; scale of 1–7) than Map 1 (M = 5.15, SD = 0.94; scale of 1–7), $t(403) = -2.82$, $p < 0.01$. Finally, there was a statistically significant difference between the maps in their perceived effectiveness, such that Map 2 was perceived to be more effective (M = 5.52, SD = 1.18; scale of 1–7) than Map 1 (M = 5.29, SD = 1.08; scale of 1–7), $t(403) = -5.32$, $p < 0.001$.

Western Australia

This section reports the results for the Western Australian sample only, including the two bushfire maps and associated warning messages.

Sample characteristics

Respondents (n = 1015[6]) from Western Australia comprised approximately 41% female, with over 53% aged 18 to 44 years. Respondents predominantly speak English as a primary language (95%), and 10.7% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 78). Reporting is to one decimal place.

Gender	Frequency	Percent
Male	597	58.8
Female	415	40.9
Age		
18–24	137	13.5
25–34	169	16.7
35–44	238	23.4
45–54	173	17
55–64	136	13.4
65–74	104	10.2
75 or older	58	5.7
English as a primary language		
Yes	964	95
No	51	5
Education level		
Left school before Year 10	14	1.4
High school (to Year 10)	82	8.1
High school (to Year 12)	184	18.1
TAFE qualification (e.g., Certificate II, III, or IV)	364	35.9
Bachelor's degree	250	24.6
Postgraduate award	121	11.9
Insurance level		
Fully insured – Vehicle	814	80.2
Fully insured – House	698	68.8
Fully insured – Contents	668	65.8
Fully insured – Farm	42	4.1
Emergency services involvement		
Yes	109	10.7
No	906	89.3
Total respondents	1015	100

TABLE 78 SAMPLE CHARACTERISTICS FOR WESTERN AUSTRALIA

Experience and exposure

Over 43% of the sample had previously experienced a bushfire, with over 37% having experienced a bushfire in the past five years. Holistically, the sample reported a moderate likelihood of being exposed to the threat of

[6] Western Australia funded additional sample count for their jurisdiction hence the variation in sample size.

bushfire in their current neighbourhood (*M* = 3.70; scale of 1–7). There was a low-moderate reported perceived current knowledge about bushfires (*M* = 4.00; scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, over 42% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire.

Despite a moderate perceived knowledge of mitigation activities to prevent loss during a bushfire (*M* = 3.70; scale of 1–7), 22% indicated they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 13.3% (low risk of bushfire) to 30.3% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 79 based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	70	14.6	180	33.9
Developed/prepared an emergency kit	42	8.7	143	26.9
Downloaded agency app to stay informed	32	6.7	119	22.4
Followed emergency services instructions	74	15.4	188	35.4
Had/prepared first aid box	89	18.5	201	37.9
Kept informed via agency website, social media, phone, or radio	90	18.7	199	37.5
Kept/prepared valuables, medication, pets, and other significant belongings close by	53	11	147	27.7
Listened for more information from emergency services sources	107	22.2	219	41.2
Signed up to receive emergency alerts/warnings	75	15.6	184	34.7
Started to evacuate my property and family if/when instructed to do so	32	6.7	100	18.8
None of the above	234	48.6	85	16
I don't know/don't remember	17	3.5	21	4
Total respondents	481		531	

TABLE 79 PREPARATORY ACTIONS FOR WESTERN AUSTRALIA RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, media, Bureau of Meteorology, the state government, and/or local governments (Table 80). These preferred sources aligned with who the sample indicated they trusted as a source of information about bushfires. However, despite police services not ranking in the top five preferred sources, they were in the top five trusted sources, above media, which was a preferred source for bushfire information (Table 81).

Commonly searched platforms included the local fire agency website, Google, television, radio, and/or online news sites (Table 82). It is possible respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use …'.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	741	73
Media	438	43.2
Bureau of Meteorology	364	35.9
State government	344	33.9
Local government	310	30.5
Family and friends	264	26
Police service	207	20.4
Insurance provider(s)	43	4.2
Public transport provider	37	3.6
Other, please specify	23	2.3
Total respondents	1015	

TABLE 80 PREFERRED SOURCES OF INFORMATION FOR BUSHFIRE IN WESTERN AUSTRALIA

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	854	84.1
Bureau of Meteorology	383	37.7
State government	325	32
Police service	324	31.9
Local government	317	31.2
Media	173	17
Family and friends	121	11.9
Public transport provider	43	4.2
Insurance provider(s)	23	2.3
Other	9	0.9
Total respondents	1015	

TABLE 81 TRUSTED SOURCES OF INFORMATION FOR BUSHFIRE IN WESTERN AUSTRALIA

Select all that apply	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	758	74.7
Google	473	46.6
Radio	415	40.9
Television	363	35.8
Online news sites	343	33.8
Local fire agency app (where available)	302	29.8
Facebook	255	25.1
Print newspapers	76	7.5
YouTube	67	6.6
Instagram	58	5.7
Twitter	37	3.6
TikTok	27	2.7
Snapchat	20	2
Reddit	14	1.4
Other	10	1
Total respondents	1015	

TABLE 82 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN WESTERN AUSTRALIA

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 21). The scenario that respondents received was: 'It's January school holidays and you and your family are spending the week at your holiday home in the picturesque town of Eagle Bay in Western Australia's south-west region. It's a typical WA summer, with daily temperatures in the high 30s with hot, gusty afternoon winds. It's late at night when you start to see the distinct glow of a bushfire in the near distance. You look up the state's official emergency information website – Emergency WA – and see the following warnings and maps.'

The following alert has been issued by the Department of Fire and Emergency Services (DFES)

This is a new alert.

Time of issue: 2:45 PM
Date of issue: 15 January 2022

Bushfire WATCH AND ACT for parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON

ALERT LEVEL:

A bushfire WATCH AND ACT is in place for people in the Eagle Bay townsite, Meelup Regional Park and in an area bounded by Cape Naturaliste Road to the north and west, Okapa Rise to the south and Wardandi Drive and Willanup Rise in parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON.

- There is a possible threat to lives and homes as a fire is approaching in the area and conditions are changing.
- The fire started near the intersection of Cape Naturaliste Road and Endicott Loop in DUNSBOROUGH.

WHAT TO DO:

- If you are not prepared or you plan to leave, leave now if the way is clear.
- If you are well prepared and plan to actively defend your home, make final preparations now.
- If you plan to stay and actively defend, do not rely on mains water pressure as it may be affected. You need to have access to an independent water supply, and start patrolling your property to put out spot fires.
- Keep doors and windows closed and turn off evaporative air conditioners, but keep water running through the system if possible.
- If you are not at home, do not try to return as conditions in the area could be very dangerous.

BUSHFIRE BEHAVIOUR:

- The bushfire is moving fast in a north westerly direction.
- It is out of control and unpredictable.
- Burning embers are likely to be blown around your home.

ROAD CLOSURES AND CONDITIONS:

FIGURE 21 WESTERN AUSTRALIA MAP 1 AND ASSOCIATED WARNING MESSAGE (EXCERPT OF TWO PAGES)

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 83):

- Outlined a bushfire-affected area (descriptive).
- Outlined preparatory action, plans, or provided instructions.
- Respondents comprehended this message as an alert or warning.
- Outlined a future bushfire-affected area (predictive).
- Some respondents were able to comprehend location-specific information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	590	30%	*"Map with where the bushfire is happening. What to do & where to go for evacuation."*
Preparations/plan/ instructions	481	24%	*"Amber warning area to put your bushfire plans into action."*
Alert/warning	211	11%	*"I saw the watch and act warning and advice of road closures."*
Future bushfire-affected area	188	9%	*"A map of the bushfire affected area, information that the fire is heading north, information on what to do if you're in the area, information on essentials you will need depending on your situation and the action you plan to take."*
Location-specific information	184	9%	*"Map of Eagle Bay and surrounding areas Dunsborough to Margaret River."*
Evacuate/please leave	96	5%	*"Map of the region showing that the area I am in is under. Watch and Act. Based on the advice. If I am not prepared to defend my property I should leave."*
Information on emergency services	77	4%	*"Apart from the map, everything about the fire was detailed, including what emergency action to take, who was coordinating the firefighting etc."*
Instructions on information sources	75	4%	*"I saw that there was a fire in the area and we were advised to leave and all the information for places to call or websites to visit were there."*
Clear information/informative/ detailed	29	1%	*"Absolutely first-class report of fire, full description, which areas of concern, where to go if evacuated, preparedness, roads to use."*
Possible bushfire danger	21	1%	*"Regions where bushfires may occur."*
Imminent bushfire danger	6	0%	*"A bushfire warning that has an immediate threat to myself and my property."*
Do not evacuate	2	0%	*"Telling me to stay put."*
Total respondents	1015		

TABLE 83 COMPREHENSION OF WESTERN AUSTRALIA MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 55% of respondents indicated it was 'to show the location of the bushfire', 'to show a Watch and Act area', and 'to show the level of risk to different parts of the community'. This was mostly aligned with the agency's intended purpose (Table 84). Indications that it was 'to show an Emergency Warning area' or an 'Advice area' were not accurate interpretations of the purpose of the map and associated warning message.

Select all that apply	Frequency	Percent	Agency intended purpose
To show the location of the bushfire	606	59.7	
To show a 'Watch and Act' area	599	59	X
To show the level of risk to different parts of the community	563	55.5	X
To show an 'Emergency Warning' area	531	52.3	

To show where the bushfire is now	416	41
To show an 'Advice' area	385	37.9
To show the direction of travel of the bushfire over the coming hours/days	323	31.8
To show the threat of the bushfire to certain areas in the state/territory	321	31.6
To show areas that are unaffected by bushfire	301	29.7
To identify who needs to 'Take Shelter Now'	267	26.3
To show where people can go if they evacuate	237	23.3
To show multiple bushfire warning levels	236	23.3
To show where the bushfire has been	187	18.4
To show facilities that may be closed because of the bushfire	183	18
To show people if it's not safe to leave the area	177	17.4
Unsure	25	2.5
Other, please specify	3	0.3
Total respondents	1015	

TABLE 84 PERCEIVED INTENDED PURPOSE FOR WESTERN AUSTRALIA MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were aligned with what the agency had intended to communicate to the public (Table 85).

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	670	66	X
Prepare to evacuate/prepare to leave/prepare to leave the area	640	63.1	X
Monitor conditions as they are changing	531	52.3	X
Enact your bushfire survival plan	456	44.9	X
Evacuate now/leave immediately/leave now/leave the area now	339	33.4	X
Prepare to actively defend your home/property	329	32.4	X
Shelter indoors immediately/take shelter now	90	8.9	
Unsure	32	3.2	
It is not prompting me to act	24	2.4	
Other	9	0.9	
Total respondents	1015		

TABLE 85 PERCEIVED PROMPTED ACTION FOR WESTERN AUSTRALIA MAP 1

Map effectiveness

Respondents indicated that the map had a moderate-high perceived effectiveness (M = 5.30, SD = 1.10; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (M = 5.04, SD = 1.24; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited low-moderate negative emotions (M = 4.03, SD = 1.68; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and

associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 3.02, *SD* = 1.59; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 86).

Select top five actions	Frequency	Percent
Follow emergency services instructions	423	41.7
Start to evacuate my property and my family if instructed to do so	359	35.4
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	355	35
Monitor your surroundings	314	30.9
Decide where you and other members of your home (including pets) will go if you need to leave	310	30.5
Keep informed by regularly visiting local fire/emergency agency website	309	30.4
Listen for more information from emergency services sources	293	28.9
Enact my preprepared bushfire plan	240	23.6
Follow and keep informed via local fire/emergency agency social media accounts	233	23
Listen to ABC radio	193	19
Share this message with other people/tell friends about this information	170	16.7
Search for local fire/emergency agency mobile application to stay informed	168	16.6
Sign up to receive emergency alerts/warnings	165	16.3
Prepare an emergency kit	154	15.2
Fill containers with water for drinking and firefighting	149	14.7
Avoid smoke by staying indoors and closing windows and doors	142	14
Share this message with other people	137	13.5
Create a household emergency plan/a bushfire plan	128	12.6
Start preparing to defend my property	122	12
Tell others to follow emergency services' instructions	114	11.2
Source a first aid box/first aid kit	107	10.5
Move flammable items away from your house	106	10.4
Help others prepare for the fire	94	9.3
Wait for a text message to tell me what to do	81	8
Phone local fire/emergency agency to stay informed	79	7.8
Wait for a firefighter to advise me what to do	66	6.5
Wait for police to evacuate you	53	5.2
Other	11	1.1
Total respondents	1015	

TABLE 86 PROTECTIVE ACTION INTENTIONS FOLLOWING WESTERN AUSTRALIA MAP 1

Around 79% of the sample (Map 1 assess: 82%; Map 1 decide: 76%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 22.

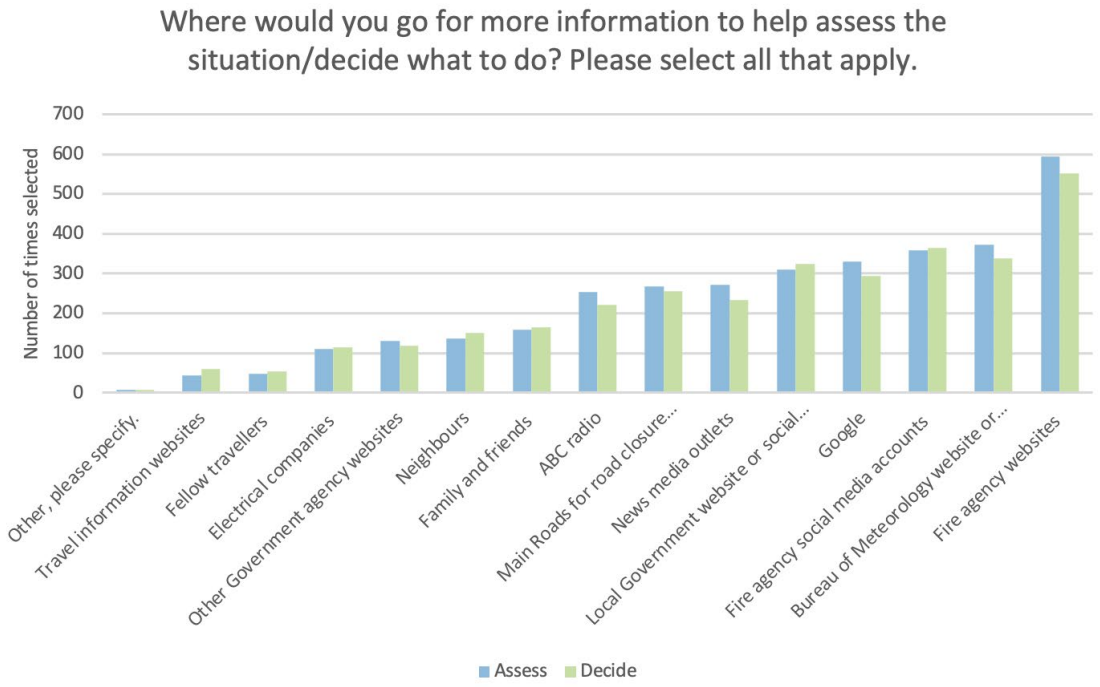


FIGURE 22 INFORMATION-SEEKING FOLLOWING WESTERN AUSTRALIA MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.29, *SD* = 1.23; scale of 1–7), and moderate-high response efficacy (*M* = 5.33, *SD* = 1.18; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.70, *SD* = 1.59; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'it was informative, and I could understand it easily') or specific (e.g., 'I feel the map is basic enough to be understood yet advanced enough to show everything that is currently happening') and represented 47% of the feedback responses across the sample. The constructive feedback covered areas such as requests for more information, sizing, legibility, colour choices, bushfire direction information, and clearer placenames/identifiers (Table 87). For example:

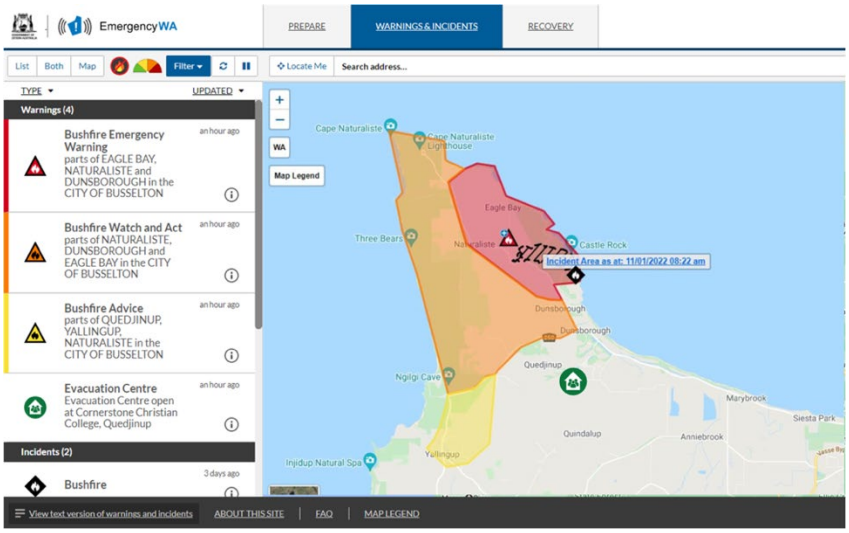
> *"Colour red to increase awareness and level of danger. Compass showing N, S, E, W, as I don't know which way is which this would help me understand which way the winds are blowing, towards me or away thus helping me to decide which way to travel."*
>
> *"I really like the maps that have the heatmap & wind direction overlays. So perhaps it would be helpful to have an optional layer/filter to add those ... I wouldn't mind if they could add little icons or colours where roadblocks have been put in place. Often when they reel off a long list of intersections and street names, I have trouble quickly trying to picture these places in my mind, it would greatly assist me to be able to visually see them indicated on a map."*
>
> *"If a fire was close by, the map and instructions feel like a lot to read if one was panicked. Maybe better eye-catching dot-point instructions/larger font for where & how dangerous the fire is, for people in the immediate area."*

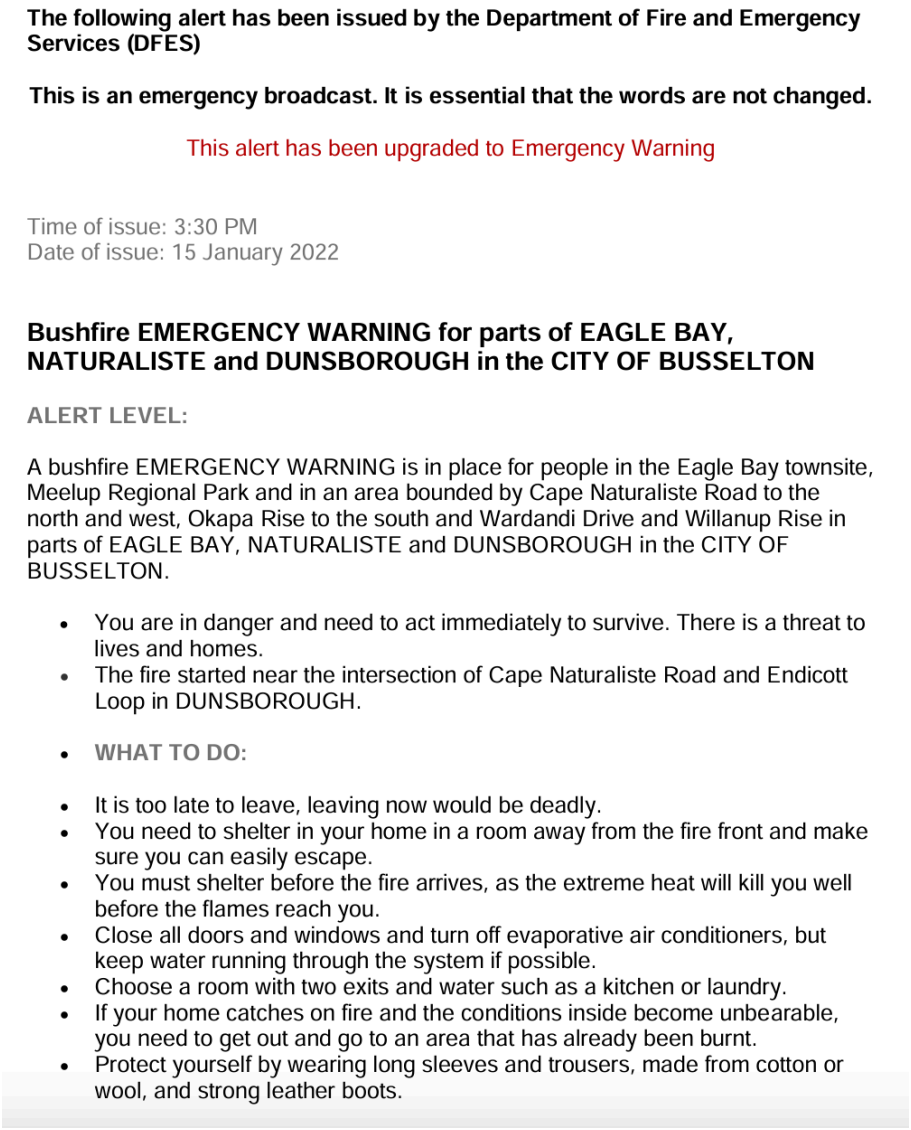
Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	360	46%	*"It was very comprehensive, and I felt if this was released, I would know the local government and emergency services had my safety in mind."*
Positive, specific	9	1%	*"I think that the information was well presented, too much more may affect what people glean from the info supplied, it may overwhelm them to the point that they miss crucial information."*
Constructive responses			
More information needed	78	10%	*"I think more detail could be added to the map. For example, safety locations."*
Sizing, legibility, colour choices	67	8%	*"I think it is still hard for people to gauge the seriousness of the situation - perhaps a colour code system to accompany the level of risk similar to how fires having colour code ratings of severity."*
Fire direction information	64	8%	*"An arrow showing the path the fire is travelling could be a useful feature."*
Clearer place names/ Identifiers	62	8%	*"A few more of the towns or landmarks included would be useful."*
Information should be clearer/more concise	46	6%	*"I think some more visual aids and simpler instructions would be helpful - when people start to panic, they lose the ability to process complex information."*
Clearer instructions	32	4%	*"Fairly clear and self-explanatory. Maybe, to-do items could be high level bullet points so that they stand out (with clearer instruction details underneath) ."*
Ensure information is updated frequently	18	2%	*"Make it have live updates for people to track how it's moving."*
Ability to interact with map	17	2%	*"As you zoom in more details of the area shows, best exit route."*
Connectivity/general use issues	7	1%	*"Needs to be a bit more distinctive, especially for older people who have bad eyesight."*
Text more useful than map	3	0%	*"I don't know. I barely glanced at the map. I used it to ascertain the basic areas, to see if I was in/near it, but nothing more. The written information was far more informative."*
Total measurable responses	676		
Total respondents	1015		
No specific feedback provided	339		

TABLE 87 FEEDBACK TO IMPROVE WESTERN AUSTRALIA MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 23). The scenario that respondents received was: 'It's January school holidays and you and your family are spending the week at your holiday home in the picturesque town of Eagle Bay in Western Australia's south-west region. It's a typical WA summer, with daily temperatures in the high 30s with hot, gusty afternoon winds. It's late at night when you start to see the distinct glow of a bushfire in the near distance. You look up the state's official emergency information website – Emergency WA – and see the following warnings and maps.'





The following alert has been issued by the Department of Fire and Emergency Services (DFES)

This is an emergency broadcast. It is essential that the words are not changed.

This alert has been upgraded to Emergency Warning

Time of issue: 3:30 PM
Date of issue: 15 January 2022

Bushfire EMERGENCY WARNING for parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON

ALERT LEVEL:

A bushfire EMERGENCY WARNING is in place for people in the Eagle Bay townsite, Meelup Regional Park and in an area bounded by Cape Naturaliste Road to the north and west, Okapa Rise to the south and Wardandi Drive and Willanup Rise in parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON.

- You are in danger and need to act immediately to survive. There is a threat to lives and homes.
- The fire started near the intersection of Cape Naturaliste Road and Endicott Loop in DUNSBOROUGH.

- **WHAT TO DO:**

- It is too late to leave, leaving now would be deadly.
- You need to shelter in your home in a room away from the fire front and make sure you can easily escape.
- You must shelter before the fire arrives, as the extreme heat will kill you well before the flames reach you.
- Close all doors and windows and turn off evaporative air conditioners, but keep water running through the system if possible.
- Choose a room with two exits and water such as a kitchen or laundry.
- If your home catches on fire and the conditions inside become unbearable, you need to get out and go to an area that has already been burnt.
- Protect yourself by wearing long sleeves and trousers, made from cotton or wool, and strong leather boots.

FIGURE 23 WESTERN AUSTRALIA MAP 2 AND ASSOCIATED WARNING MESSAGE (EXCERPT OF FOUR PAGES)

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 88):

- Outlined preparatory action, plans, or provided instructions.
- Outlined a bushfire-affected area (descriptive).
- Demonstrated that multiple warnings were now in place.
- Outlined a future bushfire-affected area (predictive).
- Some respondents comprehended shelter in place/too late to leave orders.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	354	17%	*"An app that showed current affected areas and alert level legend. What to do where to go. What each sign means and some helpful information."*
Preparations/plan/ instructions	354	17%	*"A description of what you should do in each of the areas named, comply with recommendations."*
Map displays multiple warnings	248	12%	*"It's a map describing bushfire alert warnings. The colours are different according to severity! There are preparation steps advised."*
Alert/warning	195	9%	*"Emergency alert, leave now."*
Future bushfire-affected area	188	9%	*"I saw a map which clearly indicated what area was currently on fire and what areas were in the high-risk area where I may need to be ready to evacuate if the fire spreads or changes direction."*
Too late to leave/shelter in place	146	7%	*"Unsafe to evacuate seek a safe area in your home away from the front where you can exit if required."*
Location-specific information	134	6%	*This map is much scarier. We are staying right in the middle of it all and we are under threat."*
Evacuate/please leave	116	6%	*"An area for people to be evacuated to for their safety."*
Situation worsening	83	4%	*"I see a worsening situation compared to the previous map. Some areas are now a bushfire emergency where you are unable to leave."*
Clear information/ informative/detailed	66	3%	*"Clear separation of areas as to the intensity of the situation and advice on appropriate levels of action to undertake."*
Instructions on information sources	43	2%	*"Emergency warning of bush fire, what to do and where to go for more update information.".*
Imminent bushfire danger	40	2%	*"Detail on the immediate threat to life and safety."*
Information on emergency services	30	1%	*"The area of the bushfire & it's actual locations. It also advises areas that it's too late to evacuate & also advises what actions to take to stay safe. It also gives locations of evacuation centres & road closures. It also gives sources for people to monitor so as to keep up to date with emergency warnings & actions to be taken."*
Map has changed	28	1%	*"A different description of a slightly different event."*
Appears similar to previous	15	1%	*"Once again, the instructions were very much the same as the first map but also added instructions as where to go if you left your home, but pets would not be allowed inside. It mentioned that you should move to the opposite side of the house away from the oncoming fire and keep house doors and windows closed."*
Possible bushfire danger	10	0%	*"Fire prone area."*
Unsure what colours/ warnings mean	7	0%	*"A fire map of hot days during school holidays."*
Total respondents	1015		

TABLE 88 COMPREHENSION OF WESTERN AUSTRALIA MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 74% of responses indicated it was 'to show an Emergency Warning area', which was aligned with the agency's intended purpose (Table 89).

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	758	74.7	X
To show the location of the bushfire	592	58.3	
To show the level of risk to different parts of the community	585	57.6	X
To show a 'Watch and Act' area	521	51.3	X
To identify who needs to 'Take Shelter Now'	501	49.4	X
To show multiple bushfire warning levels	495	48.8	X
To show an 'Advice' area	459	45.2	X
To show where the bushfire is now	459	45.2	
To show people if it's not safe to leave the area	350	34.5	X
To show the threat of the bushfire to certain areas in the state/territory	338	33.3	
To show the direction of travel of the bushfire over the coming hours/days	310	30.5	
To show where people can go if they evacuate	304	30	X
To show areas that are unaffected by bushfire	225	22.2	
To show where the bushfire has been	214	21.1	X
To show facilities that may be closed because of the bushfire	179	17.6	
Unsure	32	3.2	
Other, please specify	3	0.3	
Total respondents	1015		

TABLE 89 PERCEIVED INTENDED PURPOSE FOR WESTERN AUSTRALIA MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were somewhat aligned with what the agency had intended to communicate to the public (Table 90). Having multiple warning levels, while noted in the feedback section by respondents as helpful to see the scale and impact of the bushfire, could explain the variety of perceived actions selected in the table below, as it covered different areas with different threats and associated protective actions. While in the scenario the respondents were told they were in Eagle Bay, the area covered by the 'Emergency Warning' polygon, some respondents may not have focused on that part of the associated warning message and instead selected all possible protective actions covered in the long form warning message connected to the map.

Select all that apply	Frequency	Percent	Agency intended action
Enact your bushfire survival plan	505	49.8	
Stay informed	492	48.5	X
Shelter indoors immediately/take shelter now	448	44.1	X
Evacuate now/leave immediately/leave now/leave the area now	445	43.8	
Prepare to evacuate/prepare to leave/prepare to leave the area	435	42.9	
Prepare to actively defend your home/property	400	39.4	
Monitor conditions as they are changing	380	37.4	
Unsure	37	3.6	
It is not prompting me to act	25	2.5	
Other	10	1	
Total respondents	1015		

TABLE 90 PERCEIVED PROMPTED ACTION FOR WESTERN AUSTRALIA MAP 2

Map effectiveness

Respondents indicated that the map had a high perceived effectiveness (*M* = 5.57, *SD* = 1.13; scale of 1–7).

Risk perceptions and emotions

The map elicited high perceptions of risk (*M* = 5.84, *SD* = 1.29; scale of 1–7), such that respondents perceived that the map was representing a situation that would put the respondent at risk and that the risk was serious. The map also elicited moderate negative emotions (*M* = 4.88, *SD* = 1.76; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.90, *SD* = 1.82; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 91).

Select top five actions	Frequency	Percent
Follow emergency services instructions	428	42.2
Start to evacuate my property and my family if instructed to do so	347	34.2
Avoid smoke by staying indoors and closing windows and doors	280	27.6
Enact my preprepared bushfire plan	277	27.3
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	263	25.9
Monitor your surroundings	247	24.3
Fill containers with water for drinking and firefighting	244	24
Listen for more information from emergency services sources	239	23.5
Keep informed by regularly visiting local fire/emergency agency website to stay informed	227	22.4
Decide where you and other members of your home (including pets) will go if you need to leave	211	20.8
Start preparing to defend my property	200	19.7
Follow and keep informed via local fire/emergency agency social media accounts	190	18.7
Listen to ABC radio	174	17.1
Move flammable items away from your house	166	16.4
Prepare an emergency kit	135	13.3
Search for local fire/emergency agency mobile application to stay informed	133	13.1
Share this message with other people/tell friends about this information	124	12.2
Create a household emergency plan/a bushfire plan	116	11.4
Sign up to receive emergency alerts/warnings	111	10.9
Share this message with other people	104	10.2
Source a first aid box/first aid kit	103	10.1
Tell others to follow emergency services' instructions	103	10.1
Phone local fire/emergency agency to stay informed	79	7.8
Help others prepare for the fire	71	7
Wait for a text message to tell me what to do	64	6.3
Wait for a firefighter to advise me what to do	64	6.3
Wait for police to evacuate you	50	4.9
Other	10	1

Total respondents	1015

TABLE 91 PROTECTIVE ACTION INTENTIONS FOLLOWING WESTERN AUSTRALIA MAP 2

Around 69% of the sample (Map 2 assess: 72%; Map 2 decide: 67%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The lower reported levels of seeking further information to assess the situation and decide how to respond than for the previous map signals that there was potentially more certainty in the second map (and associated warning message) on what the threat was and what action needed to be taken than in the first. The sources sought out for both the assess and decide protective action functions are outlined in Figure 24.

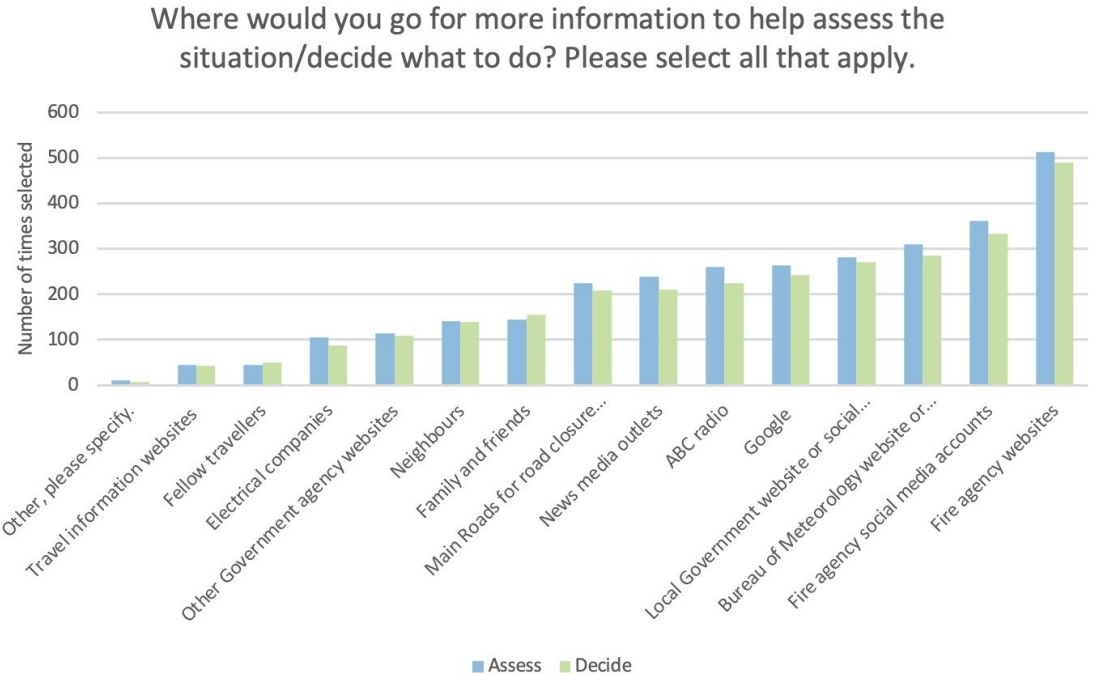


FIGURE 24 INFORMATION-SEEKING FOLLOWING WESTERN AUSTRALIA MAP 2

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.30, *SD* = 1.32; scale of 1–7), and moderate-high response efficacy (*M* = 5.32, *SD* = 1.25; scale of 1–7), such that respondents perceived that they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.70, *SD* = 1.67; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'valuable advice worth remembering') or specific (e.g., 'very comprehensive, particularly the 3 zones and the instructions related to each of them') and represented 66% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, colour choices, clarity of information, and clearer placenames/identifiers (Table 92). For example:

"An optional layer marking current roadblocks would perhaps be useful, and maybe a way to clearly emphasize the black marked area is a HISTORICAL indication of which area has already burnt, not necessarily where the fire front currently is (the current indicator might be a little small or unnoticeable for some people maybe?)."

"Clearer information, maybe a summary of the most important points. Clearer headings. I feel this flier may be a lot of information to digest when you are anxious or worried about the situation."

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	384	58%	*"It is very informative, easy to read and comprehensive."*
Positive, specific	52	8%	*"It was much easier to comprehend than the first. Description was a little lengthy though, considering it was an emergency."*
Constructive responses			
Sizing, legibility, colour choices	38	6%	*"I would make the orange-coloured area a different shade of orange as it looks similar to the yellow."*
Information should be clearer/more concise	38	6%	*"It contained too much information and took too long to read. I would prefer a map showing each different warning level (e.g., 1 for watch and act, 1 for evacuate, etc) or be able to display a map based on my address or street. I could then easily determine which warning level was applicable to me and take the appropriate actions instead of having to read through a long set of instructions, most of which may not be relevant to me."*
Clearer place names/ Identifiers	32	5%	*"Just main roads I think to get a better idea where i was in relation to the fire and also the current wind direction to assess which way you would go if you were to leave."*
Fire direction information	28	4%	*"Possibly a little more detail of the fire front and prevailing winds."*
Clearer instructions	24	4%	*"The information after the map needs to be more concise and give a simple call to action."*
More information needed	19	3%	*"I wish it included more information about escape routes for the Watch and Act and Advice areas."*
Ensure information is updated frequently	11	2%	*"Again, just the frequency in which these maps are reviewed. I understand it is hard to be super specific but even just showing the next update will be in 20 mins rather than 1 hour would help put my mind at ease. Even if the map doesn't change at least, I know it has been reviewed recently and I'm not left guessing."*
Ability to interact with map	10	2%	*"A hover cursor option that displays more information about that specific area, services that you can call or use."*
Connectivity/general use issues	6	1%	*"Consider how it can be interpreted for people who are colour-blind."*
Text more useful than map	4	1%	*"I like the written words more than the map. A visitor to the area may not be able to put it into context."*
Total measurable responses	608		
Total respondents	1015		
No specific feedback provided	407		

TABLE 92 FEEDBACK TO IMPROVE WESTERN AUSTRALIA MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, there were no significant differences in positive emotions elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 4.88, SD = 1.76; scale of 1–10) elicited higher reported negative emotions than Map 1 (M = 4.03, SD = 1.68; scale of 1–10), $t(1014) = -19.37$, $p < 0.001$. This significant difference held for risk perceptions such that Map 2 (M = 5.84, SD = 1.29; scale of 1–7) triggered statistically significant higher risk perceptions than Map 1 (M =

5.04, *SD* = 1.24; scale of 1–7), $t(1014) = -21.27$, $p < 0.001$. There were no statistically significant differences in coping appraisal between the two maps. Finally, there was a statistically significant difference between the maps in their perceived effectiveness, such that Map 2 was perceived to be more effective ($M = 5.56$, $SD = 1.13$; scale of 1–7) than Map 1 ($M = 5.29$, $SD = 1.11$; scale of 1–7), $t(1014) = -10.962$, $p < 0.001$.

Northern Territory

This section reports the results for the Northern Territory sample only, including the two bushfire maps and associated warning messages.

Sample characteristics

Respondents (n = 94[7]) from the Northern Territory comprised over 57% female, with 66% aged 18 to 44 years. Respondents predominantly speak English as a primary language (97%), and 18% reported that they or a family member were involved in some capacity with a state emergency services agency (Table 93).

Gender	Frequency	Percent
Female	54	57.4
Male	40	42.6
Age		
18–24	11	11.7
25–34	32	34
35–44	19	20.2
45–54	13	13.8
55–64	9	9.6
65–74	10	10.6
English as a primary language		
Yes	91	96.8
No	3	3.2
Education level		
Left school before Year 10	1	1.1
High school (to Year 10)	7	7.4
High school (to Year 12)	14	14.9
TAFE qualification (e.g., Certificate II, III, or IV)	31	33
Bachelor's degree	23	24.5
Postgraduate award	18	19.1
Insurance level		
Fully insured – Vehicle	78	83
Fully insured – House	55	58.5
Fully insured – Contents	48	51.1
No insurance – Contents	25	26.6
Fully insured – Farm	4	4.3
Emergency services involvement		
No	77	81.9
Yes	17	18.1
Total respondents	94	100

TABLE 93 SAMPLE CHARACTERISTICS FOR THE NORTHERN TERRITORY

Experience and exposure

A total of 67% of the sample had previously experienced a bushfire, with over 58% having experienced a bushfire in the last five years. Holistically, the sample reported a moderate-high likelihood of being exposed to

[7] Northern Territory was a challenging jurisdiction to reach a representative sample, hence the lower sample size than for other jurisdictions.

the threat of bushfire in their current neighbourhood (*M* = 4.8; scale of 1–7). There was a moderate reported perceived current knowledge about bushfires (*M* = 5.3; scale of 1–10) across the sample.

When asked about their prior exposure to bushfire maps, 63% of the respondents indicated that they had used a map to inform themselves about the risk of a bushfire.

Despite a moderate perceived knowledge of mitigation activities to prevent loss during a bushfire, 47% indicated that they had made modifications to their home or land to protect them from the threat of bushfire. When accounting for self-reported perceived likelihood of bushfire risk in the respondent's local community, self-reported modifications to their home or land varied from 22.2% (low risk of bushfire) to 62.1% (high risk of bushfire). Reporting is to one decimal place. The preparatory protective actions are outlined in Table 94, based on the self-reported perceived likelihood of bushfire risk in the respondent's local community.

	Low risk of bushfire		High risk of bushfire	
Select all that apply	Frequency	Percent	Frequency	Percent
Created a household emergency plan	12	33.3	20	34.5
Developed/prepared an emergency kit	10	27.8	23	39.7
Downloaded agency app to stay informed	7	19.4	16	27.6
Followed emergency services instructions	13	36.1	31	53.4
Had/prepared first aid box	12	33.3	32	55.2
Kept informed via agency website, social media, phone, or radio	13	36.1	30	51.7
Kept/prepared valuables, medication, pets, and other significant belongings close by	8	22.2	23	39.7
Listened for more information from emergency services sources	13	36.1	28	48.3
Signed up to receive emergency alerts/warnings	11	30.6	27	46.6
Started to evacuate my property and family if/when instructed to do so	4	11.1	11	19
None of the above	12	33.3	2	3.4
I don't know/don't remember	4	11.1	1	1.7
Total respondents	36		58	

TABLE 94 PREPARATORY ACTIONS FOR NORTHERN TERRITORY RESPONDENTS

Preferred, trusted sources and platforms

Respondents indicated that before or during a bushfire they would typically seek out information from local fire agencies, Bureau of Meteorology, media, the territory government, and/or family and friends (Table 95).

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	75	79.8
Bureau of Meteorology	46	48.9
Media	42	44.7
Territory government	38	40.4
Family and friends	32	34
Police service	30	31.9
Local government	29	30.9
Other	12	12.8
Insurance provider(s)	5	5.3
Public transport provider	3	3.2
Total respondents	94	

TABLE 95 PREFERRED SOURCES OF INFORMATION FOR BUSHFIRE IN THE NORTHERN TERRITORY

These preferred sources mostly aligned with who the sample indicated they trusted as a source of information about bushfires (Table 96). However, despite police services not ranking in the top five preferred sources, they were in the top five trusted sources, above media, which was a preferred source for bushfire information. Further, local government was identified as a top five trusted source, over family and friends, which appeared as a preferred source of bushfire information.

Select all that apply	Frequency	Percent
Local fire agency (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	80	85.1
Bureau of Meteorology	46	48.9
Police service	36	38.3
Territory government	29	30.9
Local government	24	25.5
Media	18	19.1
Family and friends	13	13.8
Other	9	9.6
Public transport provider	6	6.4
Insurance provider(s)	4	4.3
Total respondents	94	

TABLE 96 TRUSTED SOURCES OF INFORMATION FOR BUSHFIRE IN THE NORTHERN TERRITORY

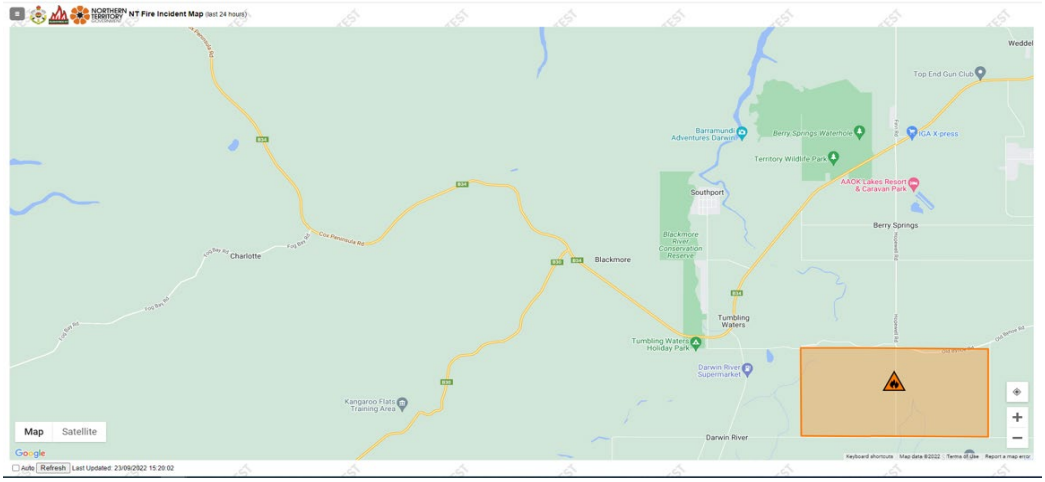
Commonly searched platforms included the local fire agency website, the fire agency app (or third-party fire app where no agency app available), Facebook, Google, and/or the radio (Table 97). It is possible that respondents interpreted this question as which platforms they would be willing to use, as opposed to which ones they currently use, as the phrasing was 'which of the following platforms *would* you use ...'.

Select all that apply	Frequency	Percent
Local fire agency website (e.g., QFES, NSW RFS, ACT ESA, CFA VIC, TFS, SA CFS, WA DFES, NTFRS)	74	78.7
Local fire agency app (where available)	46	48.9
Facebook	46	48.9
Google	43	45.7
Radio	43	45.7
Online news sites	31	33
Television	30	31.9
Instagram	9	9.6
Other	8	8.5
Print newspapers	5	5.3
Snapchat	3	3.2
TikTok	2	2.1
YouTube	2	2.1
Total respondents	94	

TABLE 97 PREFERRED/POTENTIAL PLATFORMS USED TO DISSEMINATE BUSHFIRE INFORMATION IN THE NORTHERN TERRITORY

Map 1 insights

The following results pertain to Map 1, the first of two maps that were tested in this study (Figure 25). The scenario that respondents received was: 'You are living in North Leonino Road in Darwin River (inside the polygon). A fire is heading from North West Darwin River area towards your neighbourhood. Please review the map and then answer the questions below.'



BUSHFIRES NT MESSAGE: WATCH and ACT

LOCATION: Leonino Road, Darwin River (inside the polygon)

ALERT LEVEL: Watch and Act - There is a heightened level of threat. Conditions are changing. Start taking action now to protect your family and your property.

FIRE TYPE: Bushfire. **INFORMATION CURRENT AS AT:** 23/11/2022 14:30:00

STATUS: GOING - A fire which is spreading on one or more fronts. Effective containment strategies are not in place for the entire perimeter.

RISKS FACED BY PEOPLE IN THE AREA: Smoke from this fire may affect visibility, Active fire may occur close to the roadside, Firefighting crews may be working close to the roadside, A bushfire is running or contained under very high to extreme weather conditions, The risk of loss of life or threat to properties is almost certain or has occurred, Bushfires NT is primarily undertaking defensive strategies to protect lives and property.

WHAT TO DO: Enact your bushfire survival plan. Leave immediately (if your property is not safe) if it is safe to leave. Monitor conditions as they are changing.

ADVICE TO THE PUBLIC: For the safety of firefighting crews and other vehicles, drivers in the area are urged to slow down, turn on headlights and drive safely for the conditions. For further information regarding bushfires, visit Fire Incident Map

IT IS EXPECTED THIS SITUATION MAY CONTINUE UNTIL: 23/11/2022 18:30:00

INFORMATION AUTHORISED BY: Duty Officer

RESPONSIBLE AGENCY: Bushfires NT | Northern Territory Department of Environment, Parks and Water Security

*** PLEASE DO NOT REPLY TO THIS E-MAIL ***

FIGURE 25 NORTHERN TERRITORY MAP 1 WITH ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 98):

- Outlined a bushfire-affected area (descriptive).
- Outlined preparatory action, plans, or provided instructions.
- Outlined a future bushfire-affected area (predictive).
- Respondent was able to comprehend location-specific information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	59	30%	*"A map showing where there are currently fires."*
Preparations/plan/instructions	40	21%	*"Instructions as to what is happening where and what to do if you live or are driving in the area."*
Future bushfire-affected area	37	19%	*"I saw map with a small, highlighted box indicating this area was under threat from bushfires that were not under control and because I reside inside that area, I need to be aware of a potential fire line may approach my residence and I need to decide if I am going to leave or stay to protect my residence if the fire approaches."*
Alert/warning	22	11%	*"A map of local area I'm familiar with a fire warning and information below."*
Location-specific information	11	6%	*"I can see it will be starting a bush fire from the Northern Johnston Avenue in Darwin."*
Evacuate/please leave	5	3%	*"An email with a map showing the direction of the fire and impact area. a watch and act warning to leave the area ASAP."*
Information on emergency services	5	3%	*"Media release with a summary of location under warning, current status, recommended actions, date and time of next update. Link to full PFES incident map."*
Instructions on information sources	4	2%	*"Enact your bushfire survival plan. Because fire is spreading on one or more fronts people will need to leave their houses. Advice should be provided to the public for the safety of the firefighting crew and other vehicles. Drivers in the area are urged to slow down and turn the headlights on and drive safely due to the smoke affecting visibility. If conditions continue contact Bushfire NT and the NT Department of Environment Park & Waters."*
Possible bushfire danger	4	2%	*"The main bushfire threat is away from a residential location but it is surrounded by a large amount of forestry, showing a possibility of spreading rapidly if not contained."*
Clear information/informative/ detailed	2	1%	*"A map of a bush fire in a certain area and detailed information regarding the fire."*
Total respondents	94		

TABLE 98 COMPREHENSION OF NORTHERN TERRITORY MAP 1

Intended purpose

When asked about the intended purpose of the map and associated warning message, most responses covered the primary intended purpose, which was 'to show a Watch and Act area', 'location of the bushfire', and the 'varying levels of risk to different parts of the community'. However, there were some issues with comprehension of the map and associated warning message, where respondents selected 'to show an Advice area', or 'to show an Emergency Warning area'. Overall, the responses were somewhat aligned with the agency's intended purpose (Table 99).

Select all that apply	Frequency	Percent	Agency intended purpose
To show a 'Watch and Act' area	63	67	X

To show the location of the bushfire	53	56.4	X
To show the level of risk to different parts of the community	44	46.8	
To show an 'Advice' area	37	39.4	
To show an 'Emergency Warning' area	37	39.4	
To show where the bushfire is now	36	38.3	
To show the threat of the bushfire to certain areas in the state/territory	34	36.2	
To show the direction of travel of the bushfire over the coming hours/days	26	27.7	
To show areas that are unaffected by bushfire	20	21.3	
To show multiple bushfire warning levels	18	19.1	
To identify who needs to 'Take Shelter Now'	16	17	
To show where the bushfire has been	10	10.6	
To show people if it's not safe to leave the area	10	10.6	
To show facilities that may be closed because of the bushfire	9	9.6	
To show where people can go if they evacuate	8	8.5	
Unsure	6	6.4	
Total respondents	94		

TABLE 99 PERCEIVED INTENDED PURPOSE FOR NORTHERN TERRITORY MAP 1

Prompted action

When asked what action the map was prompting the community to take, respondents reported a variety of actions that could be implied by the map and associated warning message (e.g., 'prepare to evacuate') and some that were explicitly mentioned in the warning message (e.g., 'enact bushfire plan', 'leave the area'). Overall, these responses were mostly aligned with what the agency had intended to communicate to the public (Table 100).

Select all that apply	Frequency	Percent	Agency intended action
Stay informed	64	68.1	
Monitor conditions as they are changing	60	63.8	X
Enact your bushfire survival plan	49	52.1	X
Prepare to evacuate/prepare to leave/prepare to leave the area	44	46.8	X
Prepare to actively defend your home/property	20	21.3	X
Evacuate now/leave immediately/leave now/leave the area now	17	18.1	X
It is not prompting me to act	7	7.4	
Unsure	5	5.3	
Shelter indoors immediately/take shelter now	5	5.3	
Other	5	5.3	
Total respondents	94		

TABLE 100 PERCEIVED PROMPTED ACTION FOR NORTHERN TERRITORY MAP 1

Map effectiveness

Respondents indicated that the map had a moderate perceived effectiveness (M = 4.67, SD = 1.33; scale of 1–7).

Risk perceptions and emotions

The map elicited moderate-high perceptions of risk (*M* = 4.67, *SD* = 1.37; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited low-moderate negative emotions (*M* = 3.55 *SD* = 1.94; scale of 1–10), such that respondents indicated they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (*M* = 2.82, *SD* = 1.68; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 101). It is worthwhile noting that the selection of specific actions that precede successful evacuation such as preparing valuables and listening for information as the situation evolves are useful protective actions, though not explicitly mentioned in the associated warning message.

Select top five actions	Frequency	Percent
Follow emergency services instructions	36	38.3
Monitor your surroundings	36	38.3
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	28	29.8
Follow and keep informed via local fire/emergency agency social media accounts	27	28.7
Enact my preprepared bushfire plan	25	26.6
Keep informed by regularly visiting local fire/emergency agency website to stay informed	23	24.5
Share this message with other people	22	23.4
Listen for more information from emergency services sources	21	22.3
Start to evacuate my property and my family if instructed to do so	21	22.3
Start preparing to defend my property	21	22.3
Share this message with other people/tell friends about this information	20	21.3
Decide where you and other members of your home (including pets) will go if you need to leave	20	21.3
Avoid smoke by staying indoors and closing windows and doors	19	20.2
Search for local fire/emergency agency mobile application to stay informed	17	18.1
Listen to ABC radio	17	18.1
Prepare an emergency kit	15	16
Fill containers with water for drinking and firefighting	12	12.8
Source a first aid box/first aid kit	11	11.7
Wait for a firefighter to advise me what to do	11	11.7
Move flammable items away from your house	10	10.6
Wait for police to evacuate you	10	10.6
Create a household emergency plan/a bushfire plan	9	9.6
Tell others to follow emergency services' instructions	8	8.5
Help others prepare for the fire	8	8.5
Phone local fire/emergency agency to stay informed	7	7.4
Sign up to receive emergency alerts/warnings	7	7.4
Wait for a text message to tell me what to do	7	7.4
Other, please specify.	2	2.1
Total respondents	94	

TABLE 101 PROTECTIVE ACTION INTENTIONS FOLLOWING NORTHERN TERRITORY MAP 1

Around 77% of the sample (Map 1 assess: 83%; Map 1 decide: 71%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The sources sought out for both the assess and decide protective action functions are outlined in Figure 26. The higher reported preference for social media could be attributed to the younger sample bias for the Northern Territory than in the other jurisdictions tested.

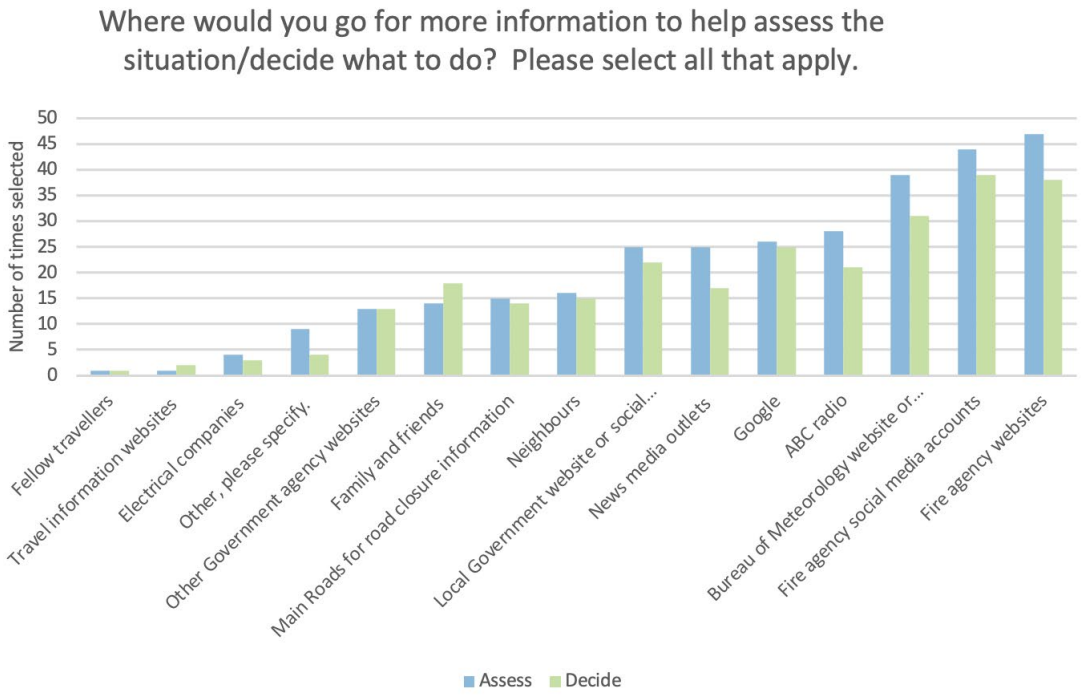


FIGURE 26 INFORMATION-SEEKING FOLLOWING NORTHERN TERRITORY MAP 1

Coping appraisal

The map elicited moderate-high perceived self-efficacy (*M* = 5.49, *SD* = 1.26; scale of 1–7), and moderate-high response efficacy (*M* = 5.38, *SD* = 1.30; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.87, *SD* = 1.53; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 1 was a mix of positive and constructive in nature. The positive comments were predominantly general (e.g., 'I think it covered the situation quite well') and represented 25% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, colour choices, bushfire direction information, and requests for more information alongside concerns over the clarity of information provided (Table 102). For example:

> *"It would be good to have a more accurate outline of where the fire had been, not just a square & information (if available) on the direction the fire is going/roads places etc. that are potentially about to be impacted."*

> *"A GPS point that shows your location, a clear indication of where the fire is, an arrow that*

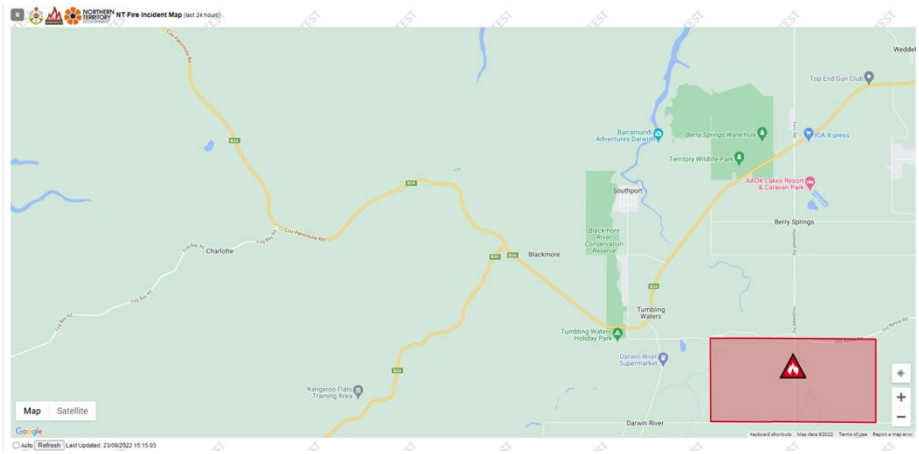
shows the direction the fire is heading in, a traffic light system – colour coded areas on the map, that shows people in a certain area need to leave now or yellow areas – be prepared to move soon etc. NT Cyclone maps are excellent at showing the projected area of the path so it's clear for someone to know what to do – it alleviates stress."

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	25	25%	*"It was very informative."*
Positive, specific	0	0%	*"N/A."*
Constructive responses			
Sizing, legibility, colour choices	16	16%	*"I think it's a factual map, but visually, to comprehend easier I think colour should be used to highlight where it is now, where it's predicted to head, and the span of the area and a predicted timeline."*
Fire direction information	16	16%	*"It was very clear, maybe showing on the map the direction the Fire/wind is going.*
More information needed	15	15%	*"Current fire location and direction, highlights of properties at risk, wind direction, safe places to evacuate to."*
Information should be clearer/more concise	5	5%	*"More information on the meaning of symbols and icons."*
Ability to interact with map	4	4%	*"An option to zoom out and see the potential for it to affect properties further out."*
Clearer place names/ identifiers	4	4%	*"Where the fire is Where safe zones are. Road information."*
Ensure information is updated frequently	3	3%	*"It is not detailed enough, and they are not updated regularly enough. We regularly have bushfire threats to our property and the maps are always so generalised that they are basically useless. We have been stressed SO many times about supposedly imminent threats to then find out the fire is kms away. Also, often the map of fire location is often not even available until after the event."*
Connectivity/general use issues	3	3%	*"The map was small, for older people perhaps making the signage bigger."*
Clearer instructions	2	2%	*"Instructions or where to look for further updates."*
Text more useful than map	0	0%	*"N/A."*
Total measurable responses	69		
Total respondents	94		
No specific feedback provided	25		

TABLE 102 FEEDBACK TO IMPROVE NORTHERN TERRITORY MAP 1

Map 2 insights

The following results pertain to Map 2, the second of two maps that were tested in this study (Figure 27). The scenario that respondents received was: 'You are living in North Leonino Road in Darwin River (inside the polygon). A fire is heading from North West Darwin River area towards your neighbourhood. Please review the map and then answer the questions below.'



BUSHFIRES NT MESSAGE: EMERGENCY WARNING

LOCATION: Leonino Road, Darwin River (inside the polygon)

ALERT LEVEL: Emergency Warning - An Emergency Warning is the highest level of Bushfires Alert. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

FIRE TYPE: Bushfire. **INFORMATION CURRENT AS AT:** 23/11/2022 14:30:00

STATUS: GOING - A fire which is spreading on one or more fronts. Effective containment strategies are not in place for the entire perimeter.

RISKS FACED BY PEOPLE IN THE AREA: Smoke from this fire may affect visibility, Active fire may occur close to the roadside , Firefighting crews may be working close to the roadside , A bushfire is running or contained under very high to extreme weather conditions , The risk of loss of life or threat to properties is almost certain or has occurred , Bushfires NT is primarily undertaking defensive strategies to protect lives and property.

WHAT TO DO: If unsafe to stay, leave immediately. If unsafe to leave, shelter indoors immediately. Protect yourself against the impacts of extreme heat - wear protective clothing, stay indoors. Conditions will change, continue to monitor conditions.

ADVICE TO THE PUBLIC: For the safety of firefighting crews and other vehicles, drivers in the area are urged to slow down, turn on headlights and drive safely for the conditions. For further information regarding bushfires, visit Fire Incident Map

IT IS EXPECTED THIS SITUATION MAY CONTINUE UNTIL: 23/11/2022 20:30:00

INFORMATION AUTHORISED BY: Duty Officer

RESPONSIBLE AGENCY: Bushfires NT Northern Territory Department of Environment, Parks and Water Security

*** PLEASE DO NOT REPLY TO THIS E-MAIL ***

FIGURE 27 NORTHERN TERRITORY MAP 2 WITH ASSOCIATED WARNING MESSAGE

Comprehension

When asked to describe what they had just seen, after viewing the map and associated warning message, respondents described the map (and associated warning message) as having told them the following (Table 103):

- Outlined a bushfire-affected area (descriptive).
- Outlined a future bushfire-affected area (predictive).
- Outlined preparatory action, plans, or provided instructions.
- Some respondents comprehended this message as an evacuation order.
- Some respondents were able to comprehend location-specific information.

This was mostly aligned to what the sample had been shown in the map and associated warning message.

Response category	Frequency	Percent	Excerpts from participant responses
Fire-affected area	48	29%	*"A poster gives useful information about a fire nearby. It gives you instructions on what to do if this bushfire affect your community."*
Future bushfire-affected area	26	16%	*"A map showing where the fire is or likely to affect."*
Alert/warning	22	13%	*"Emergency warning."*
Preparations/plan/ instructions	21	13%	*"Map of advice regarding a bushfire in our property or in the neighbourhood. With the advice of the local deputy regrading what to do next."*
Evacuate/please leave	15	9%	*"Map with fire danger area now need to act and evacuate."*
Location-specific information	8	5%	*"I just saw the map indicating Northern Leonino Road on the map where I live."*
Situation worsening	8	5%	*"This is an all-out alert, much more risk... would not be in the area."*
Appears similar to previous	5	3%	*"Pretty much exactly the same as the first map although the warning had increased to the highest alert and was advising if safe to leave or if not safe, stay indoors (which is probably not a good idea if the house is made of wood) ."*
Information on emergency services	4	2%	*"Serious threat to life and property is eminent. Act now. Leave only if safe, or shelter in place. Monitor conditions and emergency response messages."*
Clear information/ informative/detailed	3	2%	*"It is too far from my location. But so many happen in our location as well. I can see red alert with triangle shaped. It is so easy to understand where bushfire is happening."*
Total respondents	94		

TABLE 103 COMPREHENSION OF NORTHERN TERRITORY MAP 2

Intended purpose

When asked about the intended purpose of the map and associated warning message, over 71% of responses indicated it was 'to show an Emergency Warning area'. The three subsequent identified intended purposes were also closely aligned with the agency's intended purpose (Table 104) of 'to show the location of a bushfire', 'to show the threat of the bushfire to certain areas', and 'to identify who needs to take shelter'.

Select all that apply	Frequency	Percent	Agency intended purpose
To show an 'Emergency Warning' area	67	71.3	X
To show the location of the bushfire	50	53.2	X
To show the threat of the bushfire to certain areas in the state/territory	36	38.3	
To identify who needs to 'Take Shelter Now'	35	37.2	X
To show where the bushfire is now	35	37.2	
To show the level of risk to different parts of the community	34	36.2	
To show a 'Watch and Act' area	22	23.4	

To show an 'Advice' area	21	22.3
To show the direction of travel of the bushfire over the coming hours/days	18	19.1
To show areas that are unaffected by bushfire	16	17
To show multiple bushfire warning levels	15	16
To show people if it's not safe to leave the area	9	9.6
To show where the bushfire has been	8	8.5
To show facilities that may be closed because of the bushfire	6	6.4
Unsure	3	3.2
To show where people can go if they evacuate	3	3.2
Other	1	1.1
Total respondents	94	

TABLE 104 PERCEIVED INTENDED PURPOSE FOR NORTHERN TERRITORY MAP 2

Prompted action

When asked what action the map was prompting the community to take, respondents reported actions that were mostly aligned with what the agency had intended to communicate to the public (Table 105). All four actions explicitly mentioned in the associated warning message were identified by the respondents. 'Preparing to leave', however, was not the desired action being prompted and, as such, could indicate some comprehension issues among the sample.

Select all that apply	Frequency	Percent	Agency intended action
Evacuate now/leave immediately/leave now/leave the area now	54	57.4	X
Enact your bushfire survival plan	43	45.7	X
Prepare to evacuate/prepare to leave/prepare to leave the area	40	42.6	
Shelter indoors immediately/take shelter now	40	42.6	X
Monitor conditions as they are changing	33	35.1	X
Stay informed	33	35.1	
Prepare to actively defend your home/property	25	26.6	X
It is not prompting me to act	3	3.2	
Other	2	2.1	
Unsure	1	1.1	
Total respondents	94		

TABLE 105 PERCEIVED PROMPTED ACTION FOR NORTHERN TERRITORY MAP 2

Map effectiveness

Respondents indicated that the map had a moderate-high perceived effectiveness (M = 4.92, SD = 1.41; scale of 1–7).

Risk perceptions and emotions

The map elicited high perceptions of risk (M = 5.60, SD = 1.51; scale of 1–7), such that respondents perceived the map was representing a situation that would put the respondent at risk and that the risk was serious.

The map also elicited moderate negative emotions (M = 4.42 SD = 2.04; scale of 1–10), such that respondents indicated that they were a combination of anxious, worried, and afraid after viewing the map (and associated warning message), whereas the map elicited low levels of positive emotions of optimism, hope, and enthusiasm (M = 2.45, SD = 1.77; scale of 1–10).

Protective action intentions

When asked to select the top five protective actions they might intend to undertake after receiving that specific map and associated warning message, the sample reported they would undertake actions that were mostly aligned with what the agency had instructed the public to do (Table 106). Again, it is worthwhile noting that the selection of specific actions that precede successful evacuation, such as preparing valuables and listening for information as the situation evolves, are useful protective actions, though not explicitly mentioned in the associated warning message.

Select all that apply	Frequency	Percent
Follow emergency services instructions	37	39.4
Enact my preprepared bushfire plan	35	37.2
Start to evacuate my property and my family if instructed to do so	35	37.2
Prepare valuables, medication, pets, and other significant belongings close by to be ready to leave	25	26.6
Monitor your surroundings	25	26.6
Decide where you and other members of your home (including pets) will go if you need to leave	25	26.6
Keep informed by regularly visiting local fire/emergency agency website to stay informed	24	25.5
Avoid smoke by staying indoors and closing windows and doors	19	20.2
Share this message with other people	19	20.2
Fill containers with water for drinking and firefighting	17	18.1
Listen for more information from emergency services sources	17	18.1
Follow and keep informed via local fire/emergency agency social media accounts	17	18.1
Listen to ABC radio	17	18.1
Share this message with other people/tell friends about this information	16	17
Move flammable items away from your house	15	16
Start preparing to defend my property	15	16
Prepare an emergency kit	12	12.8
Create a household emergency plan/a bushfire plan	9	9.6
Phone local fire/emergency agency to stay informed	9	9.6
Search for local fire/emergency agency mobile application to stay informed	9	9.6
Tell others to follow emergency services' instructions	9	9.6
Wait for police to evacuate you	9	9.6
Source a first aid box/first aid kit	7	7.4
Sign up to receive emergency alerts/warnings	7	7.4
Wait for a text message to tell me what to do	5	5.3
Help others prepare for the fire	3	3.2
Wait for a firefighter to advise me what to do	3	3.2
Other, please specify.	2	2.1
Total respondents	94	

TABLE 106 PROTECTIVE ACTION INTENTIONS FOLLOWING NORTHERN TERRITORY MAP 2

Around 72% of the sample (Map 2 assess: 75%; Map 2 decide: 69%) reported that they would continue to seek further information after receiving this map (and associated warning message) to assess the risk of the situation and to help them decide what action to take. The lower reported levels of seeking further information to assess the situation and decide how to respond than for the previous map signals that there was potentially more certainty in the second map (and associated warning message) on what the threat was and what action needed to be taken than in the first. The sources sought out for both the assess and decide protective action functions are outlined in Figure 28.

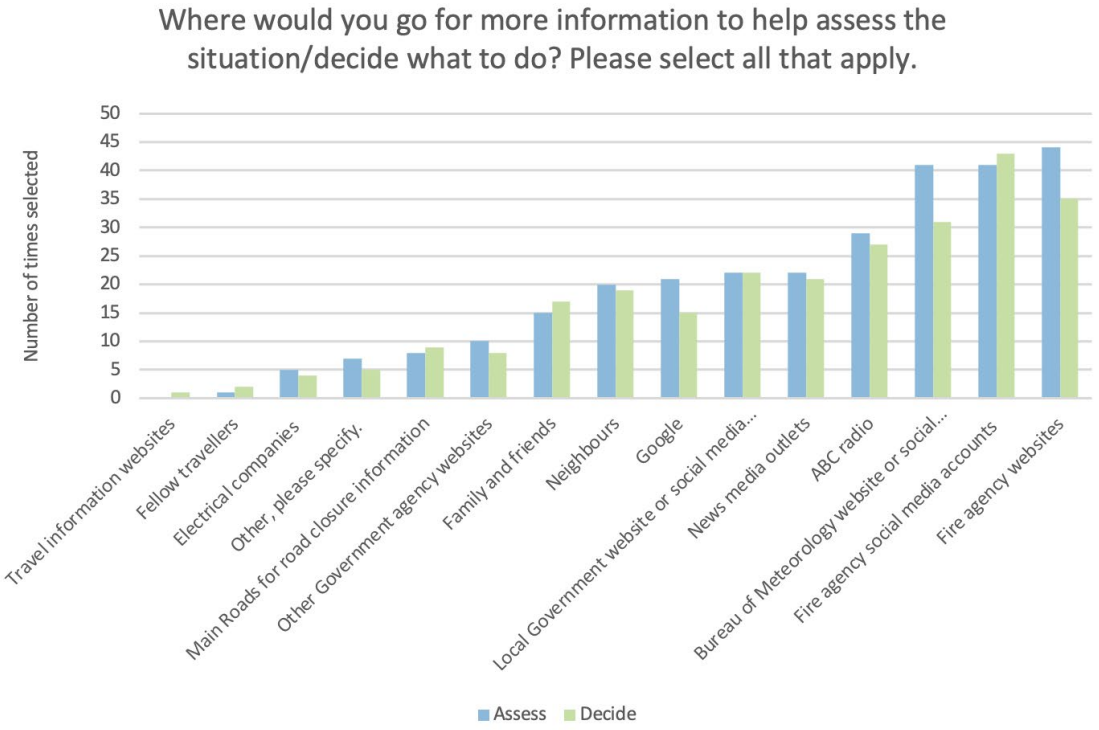


FIGURE 28 INFORMATION-SEEKING FOLLOWING NORTHERN TERRITORY MAP 2

Coping appraisal

The map elicited high perceived self-efficacy (*M* = 5.77, *SD* = 1.12; scale of 1–7), and moderate-high response efficacy (*M* = 5.33, *SD* = 1.31; scale of 1–7), such that respondents perceived they had the capability to perform the protective actions instructed by the emergency services agency and had a belief that those actions would in fact protect their lives and property. However, there was also a moderate perceived response cost (*M* = 4.70, *SD* = 1.72; scale of 1–7), such that respondents perceived that undertaking the actions would be reasonably costly.

Feedback

The feedback provided on Map 2 was a mix of positive and constructive in nature. The positive comments were either general (e.g., 'easy to read and understand, clear information underneath) or specific (e.g., 'the information given with the map was more direct language') and represented 30% of the feedback responses across the sample. The constructive feedback covered areas such as sizing, legibility, and colour choices, requests for more information, and bushfire direction information (Table 107). For example:

> *"I think it's a factual map but visually to comprehend easier I think colour should be used to highlight where it is now, where it's predicted to head and the span of the area and a predicted timeline."*
>
> *"I wish it included information about direction of spread, what the initial source was and if there is any active forces maintaining the situation."*
>
> *"Maybe using something to differentiate between a 'watch map' and an 'act now map' with colour coding. This map, although easy to read, is very similar to the last map/advice that was given and looked very similar."*

Positive responses	Frequency	Percent	Excerpts from participant responses
Positive, general	21	27%	*"I found it really comprehensive."*
Positive, specific	2	3%	*"… the information given with the map was more direct language."*
Constructive responses			
Sizing, legibility, colour choices	17	22%	*"Redesign it for mobile use, provide legible scaling and icon use, provide a incident list as an actual on the webpage together with the map, don't hide information behind tiny icons and inside the little map info-boxes. Make an incident table, and the maps interact with each other. Improve usability and 'scan-ability' of the information. This map is very outdated technology."*
More information needed	13	17%	*"Map needs additional resources information with contact phone numbers.*
Fire direction information	6	8%	*"Only the wind direction, it is extremely important to know which way the wind direction is blowing as it should stay constant most of the daylight hours."*
Ability to interact with map	5	6%	*"As it was only a screen shot of the map I don't know if the actual map would have a key showing the warning levels if you hover over the icons. If the actual map doesn't have these options, I think it should be included to make it super clear."*
Clearer instructions	3	4%	*"In which direction should people evacuate?"*
Information should be clearer/more concise	3	4%	*"More information with less details would be good."*
Connectivity/general use issues	3	4%	*"As I said before, it is too small and wouldn't be readable on a mobile smart phone, especially one with less than a 6" screen that was not FHD (Full High Definition) ."*
Clearer place names/identifiers	2	3%	*"Specific locations to help identify areas affected. Road names, etc."*
Ensure information is updated frequently	1	1%	*"Maps need to be up to date and include all fires in the area. I need to know the locations of fires that might impact me."*
Text more useful than map	0	0%	*"N/A."*
Total measurable responses	59		
Total respondents	94		
No specific feedback provided	35		

TABLE 107 FEEDBACK TO IMPROVE NORTHERN TERRITORY MAP 2

Comparisons between maps

The two maps were compared on key variables including emotions, risk perceptions, coping appraisal, and effectiveness. For emotions, there were no significant differences in positive emotions elicited from viewing the maps. However, there were statistically significant differences in negative emotions, such that Map 2 (M = 4.42, SD = 2.04; scale of 1–10) elicited higher reported negative emotions than Map 1 (M = 3.55, SD = 1.94; scale of 1–10), $t(93) = –6.14$, $p < 0.001$. This significant difference held for risk perceptions, such that Map 2 (M = 5.60, SD = 1.51; scale of 1–7) triggered statistically significant higher risk perceptions than Map 1 (M = 4.67, SD = 1.37; scale of 1–7), $t(93) = –7.57$, $p < 0.001$. There were no statistically significant differences in coping appraisal between the two maps. Finally, there was a statistically significant difference between the maps in their perceived effectiveness, such that Map 2 was perceived to be more effective (M = 4.92, SD = 1.41; scale of 1–7) than Map 1 (M = 4.68, SD = 1.33; scale of 1–7), $t(93) = –2.48$, $p < 0.05$.

Discussion

With the convergence of increasing frequency and severity of bushfires due to our evolving climate crisis and the increased expectations from the community to provide comprehensive and timely information about threats and what protective actions to take, this research seeks to extend the empirical knowledge base for guiding the design and dissemination of bushfire maps, including predictive maps for future bushfire events across Australia. Specifically, the purpose of this study was to assess the extent to which community members use, comprehend, perceive, and act upon maps, including bushfire spread prediction maps, in the context of bushfires.

It is critical to note the limitations of the research. It is possible there is response bias in that people who have experienced bushfire and used bushfire maps in the past were more likely to participate in the research, potentially not representing enough the views of people who have no experience with either. The individualistic approach to map design and associated warning messages across each jurisdiction makes it empirically challenging to make comparisons between jurisdictions. Further, the inclusion of the warning message with the map means that when the sample were asked 'explain what you saw' or 'what is the purpose of the map', they may have been relying more on the warning message than the map itself to relay comments like 'it was a Watch and Act area' or 'it was telling me to evacuate now'. As such, it is unclear whether some respondents understood the meaning of a 'Watch and Act' level warning or were simply outlining what they read with no deeper comprehension. It is anticipated that these nuances around interpretation will receive further inquiry in a qualitative work package (in this research program), where the community are being interviewed using the same stimuli used in this survey for Tasmania and New South Wales/Australian Capital Territory. Some similarities in stimuli were used for the Victorian interviews. Finally, as indicated in the report, when the respondents were asked *'Which of the following platforms would you use to seek information about bushfires? Please select all that apply'*, it is possible that respondents interpreted this in two different ways: (1) platforms they currently use; or (2) platforms they would be willing to use in the future. This ambiguity necessitates further understanding of information-seeking behaviour in respondents who live in a jurisdiction that does not have a formal emergency services app but might have access to a third-party app available in the marketplace. Which app was being referred to was not clear from the style of question in the survey.

Acknowledging these limitations, the research findings offer a practical contribution to the field of emergency management. First, the research offers an empirical foundation to sense-check the proposed principles for map design and dissemination (Work Package 2). Second, the results offer jurisdiction-specific feedback to adjust each jurisdiction's respective communication strategies and map design. Third, the predictive map tested in the New South Wales/Australian Capital Territory survey (Map 2) received positive feedback, which offers community insights to triangulate with agency insights (Work Package 3) on the use of predictive maps in the public domain[8]. Fourth, combining these results with the forthcoming qualitative interviews with communities (Work Package 4) will provide a foundation for the development, design, and further testing of specific map concepts, including predictive maps, for national testing in Phase Two of this research program in 2023.

Cumulatively, the research offers evidence to support the future design of bushfire-related maps, including prediction maps, for jurisdictions across Australia, under the Australian Warning System. The results, to an extent, support the limited guidance in the AIDR Public Information and Warnings Handbook (AIDR 2021) on map use and design and offer additional empirical insights to extend the national doctrine for map design, communication, and dissemination.

This research report should be read in conjunction with outputs from the research program's Work Packages 1–4 to attain a whole-of-phenomenon understanding of the design, communication, dissemination, and use of

[8] See https://www.naturalhazards.com.au/resources/publications/report/role-and-value-predictive-service-products

maps, including prediction maps, for bushfires in Australia. An overview of key findings from these work packages is also available in the Phase One final report[9].

[9] See https://www.naturalhazards.com.au/resources/publications/report/predictions-public-phase-1-report

Next steps

This research provides critical insight into existing map design across all jurisdictions in Australia. The public continues to rely on maps, alongside text-based warnings, to inform their perceptions of risk and support their protective action decision-making. The results from this study combine with the other work packages in the *Predictions in Public* research program to cumulatively underpin the future design of maps for use in the public information and warnings milieu in Australia under the Australian Warning System. This will be executed under Phase Two and Phase Three of the *Predictions in Public* program of research.

Completion June 2023	**Phase 1:** Understanding the status quo. What do agencies aim to achieve by using existing map-based bushfire risk information during an emergency? How do members of the public comprehend and intend to use existing products?
July 2023 – December 2024	**Phase 2:** Developing and testing new national predictive map concepts. How should predictive bushfire spread maps be designed, communicated, and disseminated across Australia?
January 2025 – December 2025	**Phase 3:** Development of fit-for-purpose outputs. How can the results of the project be directly translated into agency policy and practice?

References

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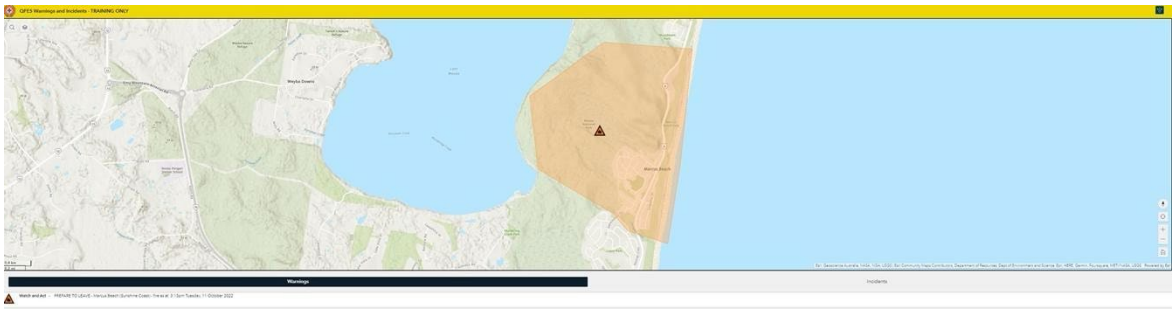
Appendix 1

Stimuli

Queensland map 1

Imagine you see this Current Warnings map indicating a warning has been issued for your location in the suburb of Marcus Beach. Please review the map and then answer the questions below.



PREPARE TO LEAVE - MARCUS BEACH (SUNSHINE COAST

Message

PREPARE TO LEAVE - Marcus Beach (Sunshine Coast)- Multiple Warnings – fire as at 4:18pm Tuesday, 11 November 2022

Warning level: Watch and Act Warning Area: Marcus Beech

"MULTIPLE WARNINGS AREIN PLACE FOR THIS FIRE. To see all current warnings in the area, click on the bushfire warnings map."

A large, slow-moving fire is travelling from Noosa National Park towards Hawthorn Grove, Marcus Beech.

Conditions could get worse quickly.

Firefighters are working to contain the fire, however you should not expect a firefighter at your door.

What you should do:

- If you have a bushfire survival plan, refer to it now.
- Decide where you and other members of your home (including pets) will go if you need to leave. Plan how you will get there and advise family and friends of your plans.
- Pack essential items such as important documents, food and water, medications, and protective clothing.
- Stay hydrated.
- Avoid smoke - stay indoors, dose windows and doors, and avoid driving through smoke where possible.
- Move flammable items away from your house.
- Fill containers with water for drinking and firefighting.
- Help others prepare for the fire.
- Be aware of firefighters working in the area.
- Stay informed by following QFES on Facebook and Twitter, listening to your local radio station, and checking this dashboard regularly.
- If your life or property is threatened, call Triple Zero (000) immediately.

Impacts:

- There is no threat to property at this time, however conditions could get worse quickly.
- The fire is likely to impact the community tomorrow.
- Reduced air quality may cause health impacts for some people.
- Smoke may reduce visibility and affect driving conditions.
- Roads may be closed.

Further Information:

- Next update by 6:18pm or sooner if the situation changes.
- Click here for current QFES incidents and warnings
- Click here for bushfire preparation tips
- Click here for health advice and air quality information
- Follow QFES on Facebook and Twitter
- Click here for road closure information or call 131940

IF39-1489722

Queensland map 2

Imagine you see this Current Warnings map indicating a warning has been issued for your location in the suburb of Marcus Beach. Please review the map and then answer the questions below.

Message

PREPARE TO LEAVE - Marcus Beach (Sunshine Coast)- Multiple Warnings – fire as at 4:18pm Tuesday, 11 November 2022

Warning level: Watch and Act Warning Area: Marcus Beech

MULTIPLE WARNINGS AREIN PLACE FOR THIS FIRE. To see all current warnings in the area, click on the bushfire warnings map.

A large, slow-moving fire is travelling from Noosa National Park towards Hawthorn Grove, Marcus Beech.

Conditions could get worse quickly.

Firefighters are working to contain the fire, however you should not expect a firefighter at your door.

What you should do:

- If you have a bushfire survival plan, refer to it now.
- Decide where you and other members of your home (including pets) will go if you need to leave. Plan how you will get there and advise family and friends of your plans.
- Pack essential items such as important documents, food and water, medications, and protective clothing.
- Stay hydrated.
- Avoid smoke - stay indoors, dose windows and doors, and avoid driving through smoke where possible.
- Move flammable items away from your house.
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- Click here for health advice and air quality information
- Follow QFES on Facebook and Twitter
- Click here for road closure information or call 131940

IF39-1489722

New South Wales/Australian Capital Territory map 1

It is the middle of January in the school holidays. Recent months have been very hot, dry, and windy. You live in a property to the east of Braidwood Road just north of Tarago. Tomorrow will be another dangerous day as hot, dry, and windy conditions have been forecast, with an EXTREME Fire Danger Rating issued. There continues to be significant bushfire activity in the area. Please review the following maps issued by the Rural Fire Service.

Name **Watch and Act - Mcleods Creek Fire (Goulburn Mulwaree LGA)**

Summary Firefighters are working to control a fire burning between the village of Gundaroo and Lake George. The fire is burning in an easterly direction towards Braidwood Road.

The fire is currently 496 hectares and is out of control.

Body

Residents east of the Federal Highway in the villages of Currawang, Tirrannaville, Springfield, Lake Bathurst and Tarago should enact their survival plan. If your plan is to leave, leave now in a southerly direction along Braidwood Road towards Braidwood or Bungendore. Fire activity across the fireground is increasing.

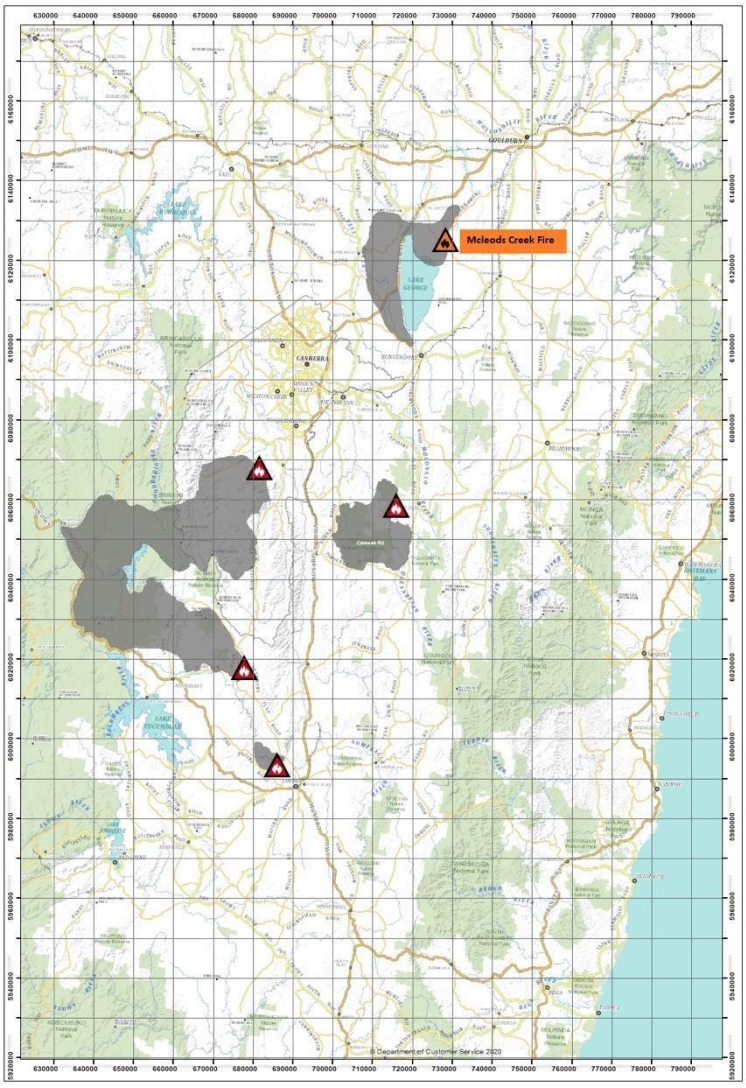
Make sure you take important items with you such as:

• Important documents and identification • Medications and prescriptions • Food and water for your family and pets • Chargers for electronic devices

There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.

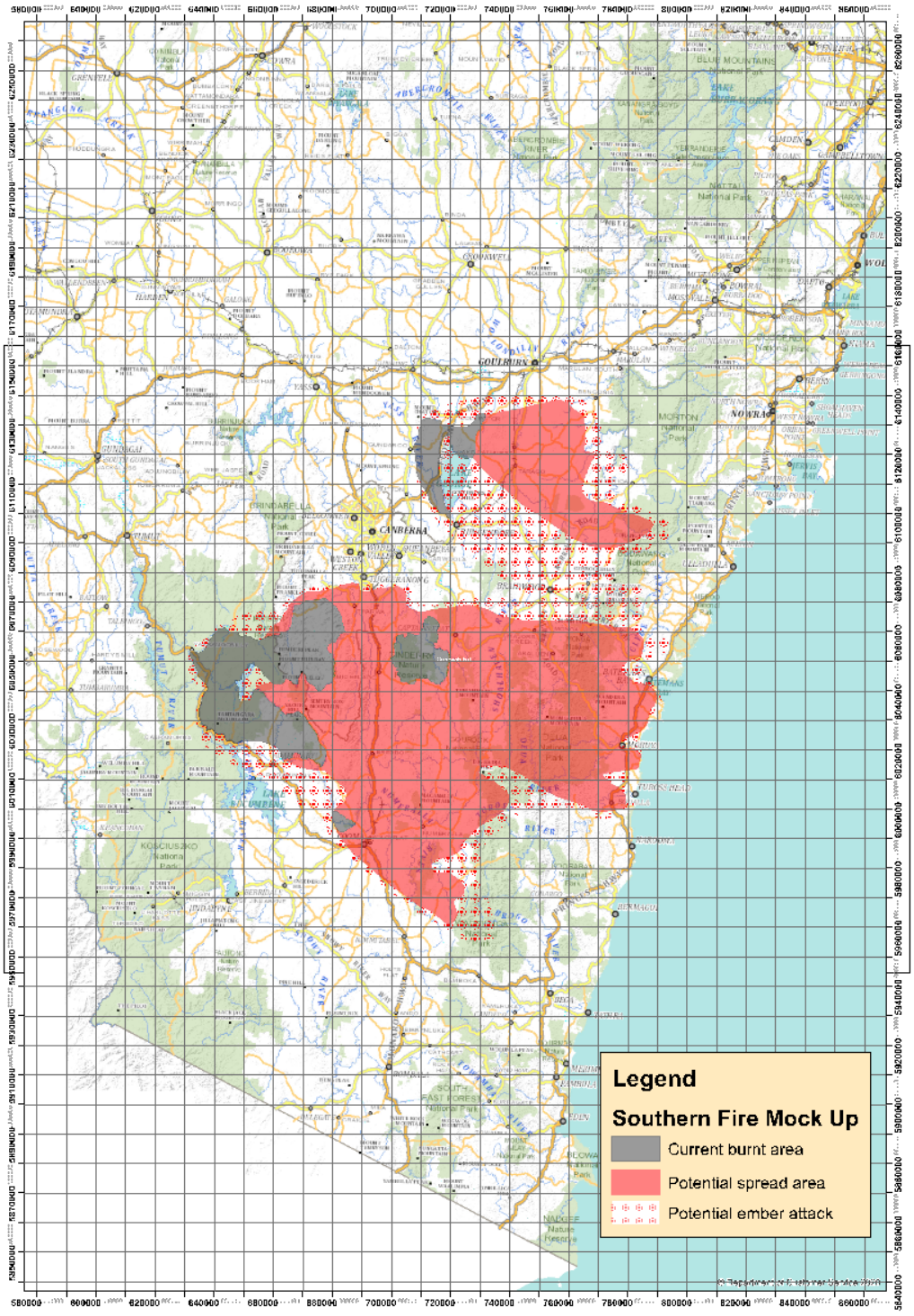
*Actions

-If your life is at risk, call Triple Zero (000).-If the fire impacts on your location, seek shelter and protect yourself from the heat of the fire.-If your plan is to leave or you are not prepared, consider leaving if it is safe to do so. Go to a safer location away from the fire.-Roads may be dangerous, and could be cut by fire without warning. Only travel if you know it is safe.-Stay up to date on the situation by monitoring local radio, the RFS website, Fires Near Me NSW smartphone app or social media.



New South Wales/Australian Capital Territory map 2

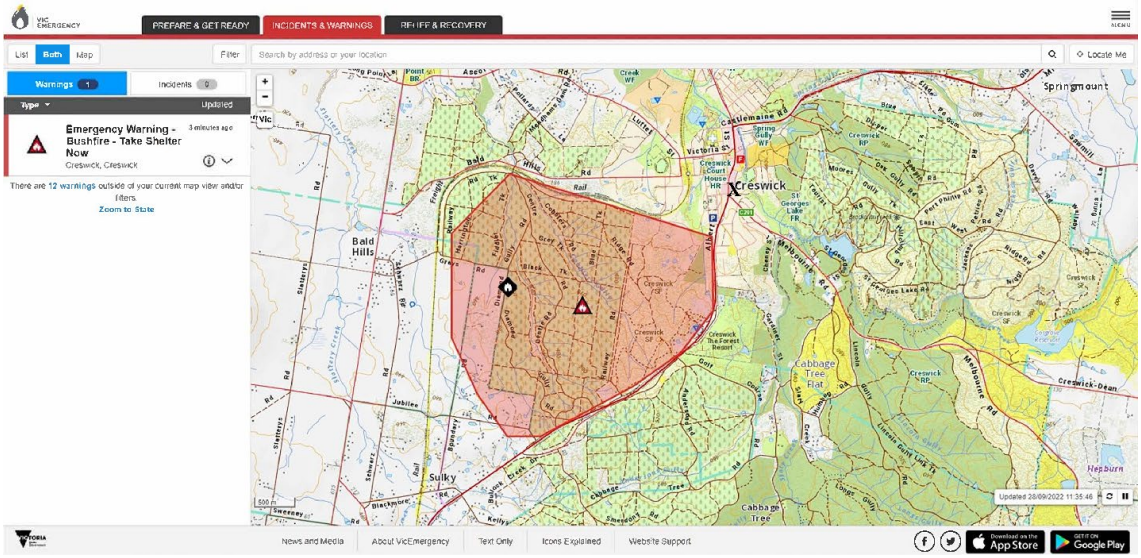
It is the middle of January in the school holidays. Recent months have been very hot, dry, and windy. You live in a property to the east of Braidwood Road just north of Tarago. Tomorrow will be another dangerous day as hot, dry, and windy conditions have been forecast, with an EXTREME Fire Danger Rating issued. There continues to be significant fire activity in the area. The following map provides a prediction of potential fire spread for tomorrow. Please review the map issued by the Rural Fire Service.



NOTE: no accompanying text to this map

Victoria map 1

It's a typical summer's day in February. It is very hot and dry. You and your family live in the township of Creswick (marked as X on the map). You see smoke in the air. You pull up Victoria's official emergency information app, VicEmergency, and see the following map and warning.



EMERGENCY WARNING - BUSHFIRE - Take Shelter Now
Incident Location: Creswick
Issue Date:
Next Update:

More details at http://emergency.vic.gov.au/respond/#!/warning/12395/moreinfo

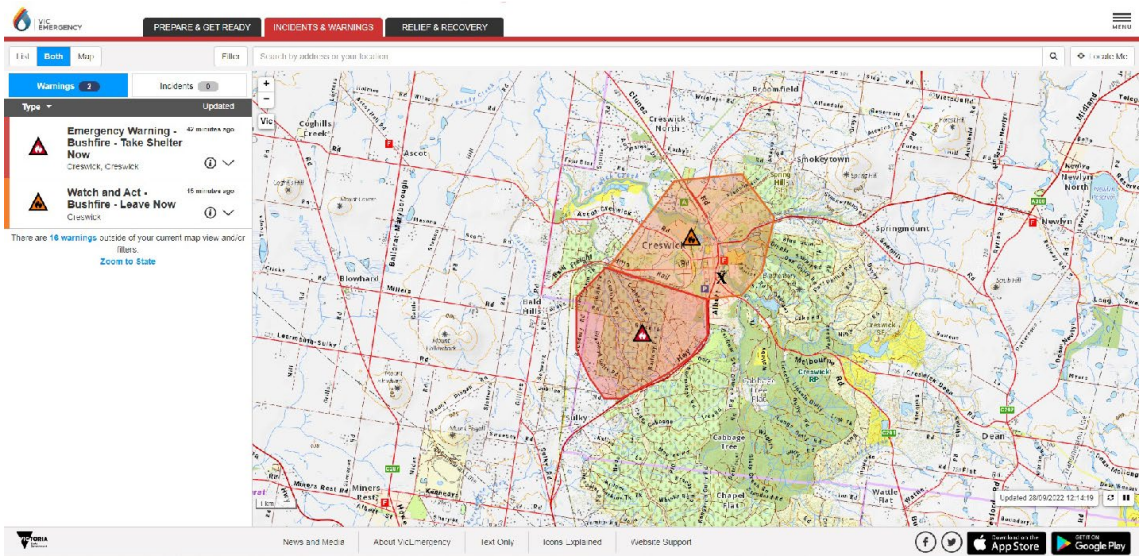
This Emergency Warning is being issued for Creswick.
- There is a bushfire at Creswick that is out of control.
- The bushfire is travelling from Diamond Gully Road in a north-easterly direction towards the Creswick township. The fire started near Diamond Gully road and Greys Road road.
- This message is for people along Hyde park Street and Bald Hill Road, Creswick and the bushfire could impact anytime within the next 30 minutes.

You are in danger and need to act immediately to survive.

The safest option is to take shelter indoors immediately. It is too late to leave.

Victoria map 2

It's a typical summer's day in February. It is very hot and dry. You and your family live in the township of Creswick (marked as X on the map). You see smoke in the air. You pull up Victoria's official emergency information app, VicEmergency, and see the following map and warning.



WATCH & ACT - BUSHFIRE - Leave Now
Incident Location: Creswick
Issue Date:
Next Update:

More details at http://emergency.vic.gov.au/respond/#!/warning/12394/moreinfo

This Watch & Act message is being issued for Creswick.

- There is a bushfire at Creswick that is out of control.
- The bushfire is travelling from Diamond Gully Road in a north-easterly direction towards the Creswick township. The fire started near Diamond Gully road and Greys Road road.
- Hyde Park Street and Bald Hill Road, Creswick could be impacted by the bushfire anytime within the next 30 minutes.

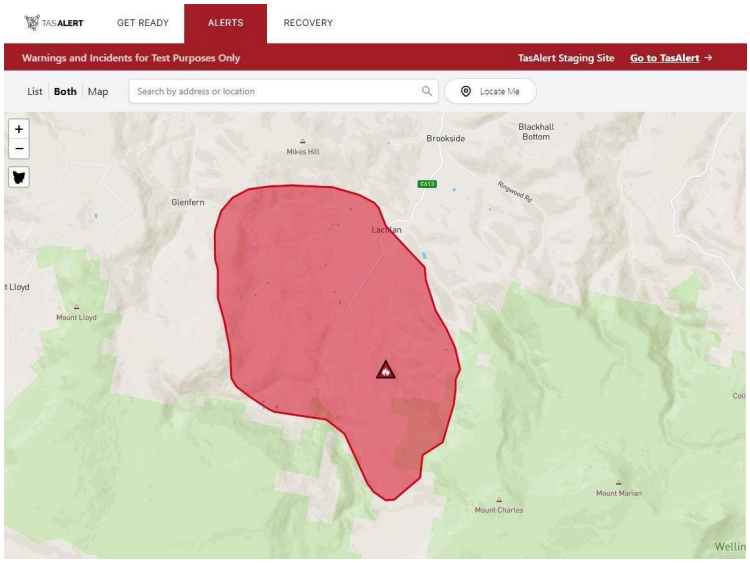
Don't wait, leaving now is the safest option - conditions may change and get worse very quickly. Emergency Services may not be able to help you if you decide to stay.

By choosing to stay, you and your family may be at risk of serious injury or death.

Tasmania map 1

Imagine you see this map about a bushfire threatening and impacting your immediate location of Lachlan and surrounding roads.

Please review the map and then answer the questions below.



OFFICIAL

Emergency Warning

BUSHFIRE EMERGENCY WARNING – MT CHARLES ROAD, JEFFERYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS – EVACUATE NOW

This is a bushfire emergency warning message for MT CHARLES ROAD, JEFFERYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS.

There is a bushfire near MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS that is out of control.

MT CHARLES ROAD, JEFFEREYS TRACK, WHITE TIMBER ROAD, UPPER SWAMP ROAD, LOWER SWAMP ROAD, AND SURROUNDS is expected to be at extreme risk as early as 2.00pm.

The fire is travelling towards Lachlan.

Burning embers may threaten your home before the main fire arrives.

Smoke and ash may make it difficult to see and breathe.

Tasmania Fire Service and Tasmania Parks and Wildlife Service is attending. Conditions are expected to worsen.

What to do:

If your home is built using contemporary bushfire design standards, is well prepared and you can actively defend it, it may provide shelter.

If your home is unprepared, go to a safer location now only if the path is clear.

There is a nearby safer place at Gleeson Park, Lachlan.

If you have made a bushfire plan, use it now.

If you don't live near Lachlan, stay away.

For fire updates, listen to ABC Local Radio or visit TasALERT.com

Community Information:

For information on current road closures, visit the Tasmania Police website: police.tas.gov.au/community alerts/

People at higher risk from the effects of smoke, including those with medical conditions, are advised to have a personal plan for avoiding smoke and managing their health. Advice is available from the Department of Health health.tas.gov.au/health-topics/environmental-health/air quality or Asthma Australia asthma.org.au/about asthma/triggers/bushfires and smoke/

If there is a fire and your plan is to evacuate or leave, the best option is to stay with family or friends.

Alert Level:	EMERGENCY WARNING
Type:	Bushfire
First Reported:	
Location:	Cyclone Ridge, Buckland
Status:	Going
Size:	Not reported
Last Updated:	21/11/2022 11:48am
Agency:	Tasmania Fire Service

Issued At: 21/11/2022 11:48am

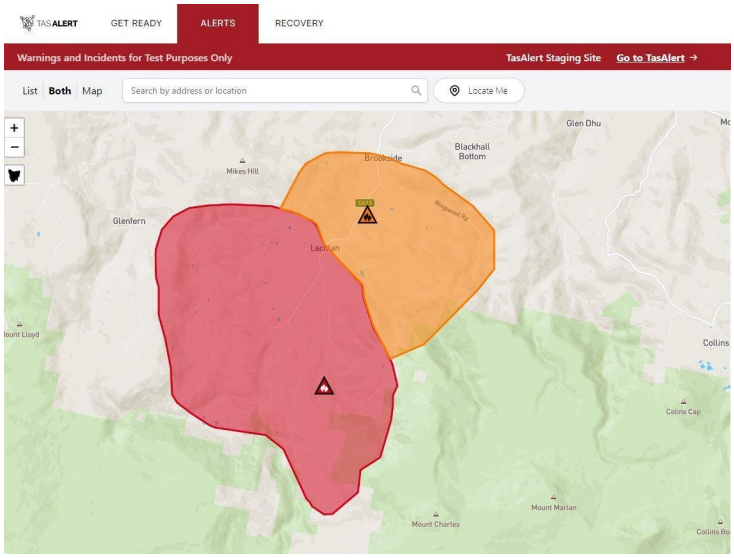
Incident number: 20022246

OFFICIAL

Tasmania map 2

Imagine you see this map about a bushfire threatening and impacting your immediate location of Lachlan and surrounding roads.

Please review the map and then answer the questions below.



OFFICIAL

Watch and Act

BUSHFIRE WATCH AND ACT – LACHLAN AND SURROUNDS – MONITOR CONDITIONS AS TYARE CHANGING

This is a bushfire watch and act message for Lachlan.

There is an uncontrolled bushfire in the Wellington Range near Lachlan.

This fire is expected to put Lachlan at high risk by 4.00pm.

The fire is travelling towards Lachlan.

Embers, smoke, and ash may fall on Lachlan and threaten you and your home before the main fire arrives.

Tasmania Fire Service and the Tasmania Parks and Wildlife Service are attending. Conditions are expected to worsen.

What to do:

If you have prepared your home and can actively defend it, it should provide shelter.

If you are going to leave, make sure you have a clear path to a safer place.

There is a nearby safer place at the Gleeson Park, Lachlan.

If your family has made a bushfire plan, use it now.

If you do not live near Lachlan, stay away. The roads could be very dangerous.

For fire updates, listen to ABC Local Radio or visit TasALERT.com

Community information:

For information on current road closures, visit the Tasmania Police website: police.tas.gov.au/community alerts/

People at higher risk from the effects of smoke, including those with medical conditions, are advised to have a personal plan for avoiding smoke and managing their health. Advice is available from the Department of Health health.tas.gov.au/health-topics/environmental-health/air-quality or Asthma Australia asthma.org.au/about-asthma/triggers/bushfires-and-smoke/

If there is a fire and your plan is to evacuate or leave, the best option is to stay with family or friends.

Alert Level:	WATCH AND ACT
Type:	Bushfire
First Reported:	
Location:	Wellington Range, Lachlan
Status:	Going
Size:	Not reported
Last Updated:	21/11/2022 11:48
Agency:	Tasmania Fire Service

Issued At: 21/11/2022 11:48am

Incident number: 20022246

OFFICIAL

South Australia map 1

You live in the town centre of Melrose in the Flinders Ranges and see a map and warning message that shows there is a bushfire burning in Mt Remarkable National Park. Please review the map and answer the questions below.

Government of South Australia

CFS SA Country Fire Service

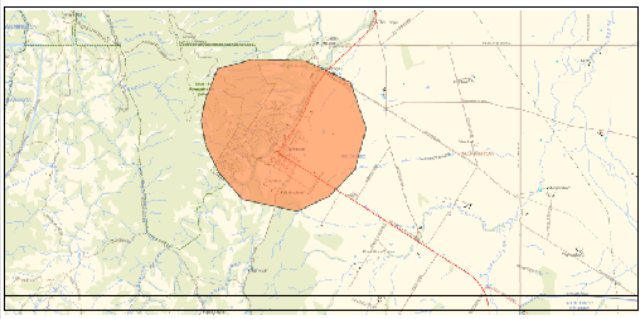
Message ID: 0007061
Time Message Issued: 08:02
Date Message Issued: 14/10/2022

Watch and Act Message - MELROSE, MT REMARKABLE RANGE TRACK Bushfire - Prepare to Leave Issued 14 Oct 2022 08:02

Issued for Mt Remarkable and Melrose near the Mt Remarkable National Park and Melrose Township in the Flinders Ranges.

Take action now as this bushfire may threaten your safety. If you are not prepared, leave now and if the path is clear, go to a safer place. Do not enter this area as conditions are dangerous.

The MELROSE, MT REMARKABLE RANGE TRACK fire is uncontrolled. This stubble fire is burning in a south easterly direction towards Dorrington Road, Stuart Street, Lambert Street, Brewery Street, Joes Road, Nott Street, Horrocks Highway and the Melrose Township including the Melrose Caravan and Tourist Park. Conditions are continually changing.



Shapes on this map image indicate the Warning Area to which this message applies.
YELLOW: Advice Message; ORANGE: Watch and Act Message; RED: Emergency Warning

For updates listen to your local ABC radio station on a battery powered radio, visit the CFS website www.cfs.sa.gov.au or phone the Information Hotline on 1800 362 361.

This message will be updated as the situation changes or before: 14/10/2022 15:59

Homes that have been built to withstand a bushfire, and are prepared to the highest level, may provide safety.

You may lose power, water, phone and data connections.

Fire crews are responding but you should not expect a firefighter at your door.

WHAT TO DO:

- Check and follow your Bushfire Survival Plan.
- Protect yourself from the fire's heat – put on protective clothing.
- Tell family and friends of your plans.

IF YOU ARE LEAVING:

- Leave now, don't delay.
- Roads may become blocked or access may change. Smoke will reduce visibility.
- Secure your pets for travel.
- If you become stuck in your car, park away from bushes, cover yourself, get onto the floor as the windows may break from the intense heat.

1 of 2 14/10/2022, 8:05 am

South Australia map 2

You live in the town centre of Melrose in the Flinders Ranges and see a map and warning message that shows there is a bushfire burning in Mt Remarkable National Park. Please review the map and answer the questions below.

Government of South Australia

CFS SA Country Fire Service

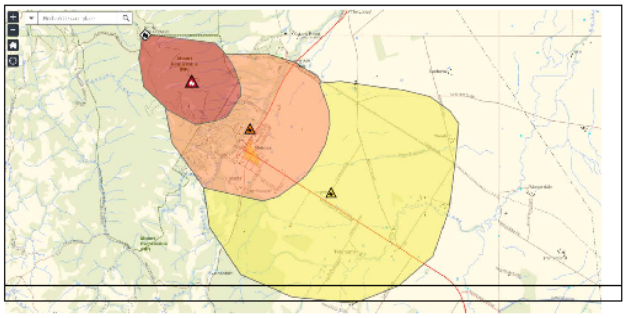
Message ID: 0007061
Time Message Issued: 08:02
Date Message Issued: 14/10/2022

Watch and Act Message - MELROSE, MT REMARKABLE RANGE TRACK Bushfire - Prepare to Leave Issued 14 Oct 2022 08:02

Issued for Mt Remarkable and Melrose near the Mt Remarkable National Park and Melrose Township in the Flinders Ranges.

Take action now as this bushfire may threaten your safety. If you are not prepared, leave now and if the path is clear, go to a safer place. Do not enter this area as conditions are dangerous.

The MELROSE, MT REMARKABLE RANGE TRACK fire is uncontrolled. This stubble fire is burning in a south easterly direction towards Dorrington Road, Stuart Street, Lambert Street, Brewery Street, Joes Road, Nott Street, Horrocks Highway and the Melrose Township including the Melrose Caravan and Tourist Park. Conditions are continually changing.



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- Roads may become blocked or access may change. Smoke will reduce visibility.
- Secure your pets for travel.
- If you become stuck in your car, park away from bushes, cover yourself, get onto the floor as the windows may break from the intense heat.

1 of 2 14/10/2022. 8:05 am

Western Australia map 1

It's January school holidays and you and your family are spending the week at your holiday home in the picturesque town of Eagle Bay in Western Australia's south-west region. It's a typical WA summer, with daily temperatures in the high 30s with hot, gusty afternoon winds. It's late at night when you start to see the distinct glow of a bushfire in the near distance. You look up the state's official emergency information website – Emergency WA – and see the following warnings and maps.

The following alert has been issued by the Department of Fire and Emergency Services (DFES)

This is a new alert.

Time of issue: 2:45 PM
Date of issue: 15 January 2022

Bushfire WATCH AND ACT for parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON

ALERT LEVEL:

A bushfire WATCH AND ACT is in place for people in the Eagle Bay townsite, Meelup Regional Park and in an area bounded by Cape Naturaliste Road to the north and west, Okapa Rise to the south and Wardandi Drive and Willanup Rise in parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON.

- There is a possible threat to lives and homes as a fire is approaching in the area and conditions are changing.
- The fire started near the intersection of Cape Naturaliste Road and Endicott Loop in DUNSBOROUGH.

WHAT TO DO:

- If you are not prepared or you plan to leave, leave now if the way is clear.
- If you are well prepared and plan to actively defend your home, make final preparations now.
- If you plan to stay and actively defend, do not rely on mains water pressure as it may be affected. You need to have access to an independent water supply, and start patrolling your property to put out spot fires.
- Keep doors and windows closed and turn off evaporative air conditioners, but keep water running through the system if possible.
- If you are not at home, do not try to return as conditions in the area could be very dangerous.

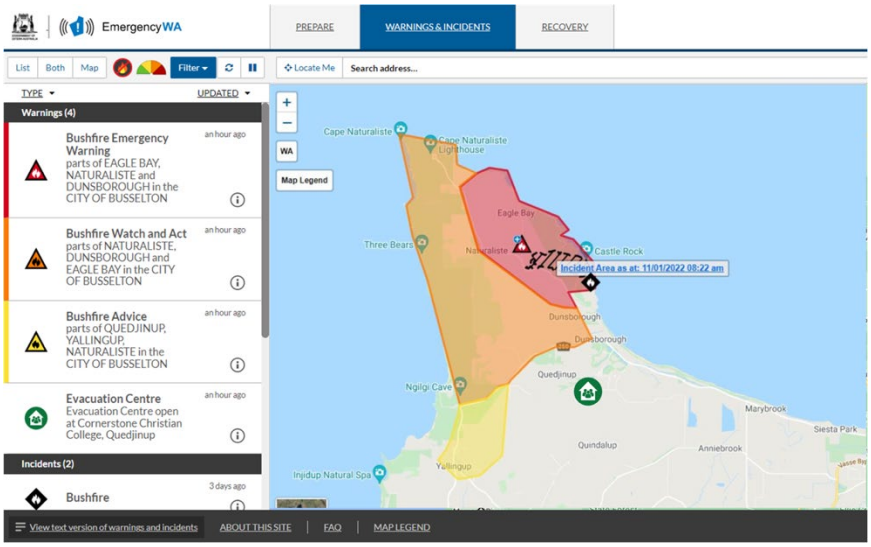
BUSHFIRE BEHAVIOUR:

- The bushfire is moving fast in a north westerly direction.
- It is out of control and unpredictable.
- Burning embers are likely to be blown around your home.

ROAD CLOSURES AND CONDITIONS:

Western Australia map 2

It's January school holidays and you and your family are spending the week at your holiday home in the picturesque town of Eagle Bay in Western Australia's south-west region. It's a typical WA summer, with daily temperatures in the high 30s with hot, gusty afternoon winds. It's late at night when you start to see the distinct glow of a bushfire in the near distance. You look up the state's official emergency information website – Emergency WA – and see the following warnings and maps.



The following alert has been issued by the Department of Fire and Emergency Services (DFES)

This is an emergency broadcast. It is essential that the words are not changed.

This alert has been upgraded to Emergency Warning

Time of issue: 3:30 PM
Date of issue: 15 January 2022

Bushfire EMERGENCY WARNING for parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON

ALERT LEVEL:

A bushfire EMERGENCY WARNING is in place for people in the Eagle Bay townsite, Meelup Regional Park and in an area bounded by Cape Naturaliste Road to the north and west, Okapa Rise to the south and Wardandi Drive and Willanup Rise in parts of EAGLE BAY, NATURALISTE and DUNSBOROUGH in the CITY OF BUSSELTON.

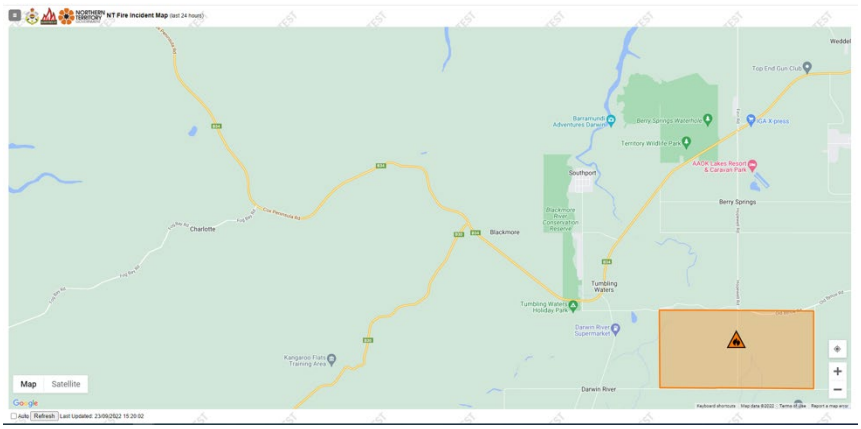
- You are in danger and need to act immediately to survive. There is a threat to lives and homes.
- The fire started near the intersection of Cape Naturaliste Road and Endicott Loop in DUNSBOROUGH.

- **WHAT TO DO:**

- It is too late to leave, leaving now would be deadly.
- You need to shelter in your home in a room away from the fire front and make sure you can easily escape.
- You must shelter before the fire arrives, as the extreme heat will kill you well before the flames reach you.
- Close all doors and windows and turn off evaporative air conditioners, but keep water running through the system if possible.
- Choose a room with two exits and water such as a kitchen or laundry.
- If your home catches on fire and the conditions inside become unbearable, you need to get out and go to an area that has already been burnt.
- Protect yourself by wearing long sleeves and trousers, made from cotton or wool, and strong leather boots.

Northern Territory map 1

You are living in North Leonino Road in Darwin River (inside the polygon). A fire is heading from North West Darwin River area towards your neighbourhood. Please review the map and then answer the questions below.



BUSHFIRES NT MESSAGE: EMERGENCY WARNING

LOCATION: Leonino Road, Darwin River (inside the polygon)

ALERT LEVEL: Emergency Warning - An Emergency Warning is the highest level of Bushfires Alert. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

FIRE TYPE: Bushfire. **INFORMATION CURRENT AS AT:** 23/11/2022 14:30:00

STATUS: GOING - A fire which is spreading on one or more fronts. Effective containment strategies are not in place for the entire perimeter.

RISKS FACED BY PEOPLE IN THE AREA: Smoke from this fire may affect visibility, Active fire may occur close to the roadside , Firefighting crews may be working close to the roadside , A bushfire is running or contained under very high to extreme weather conditions , The risk of loss of life or threat to properties is almost certain or has occurred , Bushfires NT is primarily undertaking defensive strategies to protect lives and property.

WHAT TO DO: If unsafe to stay, leave immediately. If unsafe to leave, shelter indoors immediately. Protect yourself against the impacts of extreme heat - wear protective clothing, stay indoors. Conditions will change, continue to monitor conditions.

ADVICE TO THE PUBLIC: For the safety of firefighting crews and other vehicles, drivers in the area are urged to slow down, turn on headlights and drive safely for the conditions. For further information regarding bushfires, visit Fire Incident Map.

IT IS EXPECTED THIS SITUATION MAY CONTINUE UNTIL: 23/11/2022 20:30:00

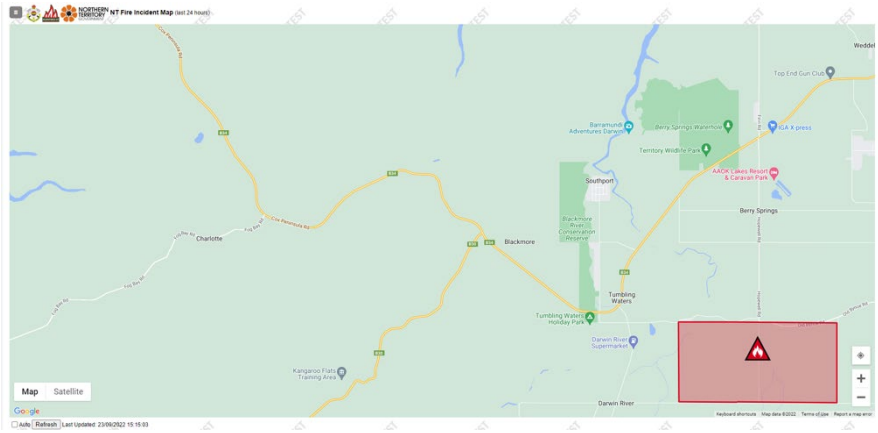
INFORMATION AUTHORISED BY: Duty Officer

RESPONSIBLE AGENCY: Bushfires NT, Northern Territory Department of Environment, Parks and Water Security

*** PLEASE DO NOT REPLY TO THIS E-MAIL ***

Northern Territory map 2

You are living in North Leonino Road in Darwin River (inside the polygon). A fire is heading from North West Darwin River area towards your neighbourhood. Please review the map and then answer the questions below.



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