ADVANCING PUBLIC HEALTH IN THE CONTEXT OF NATURAL HAZARDS: NORMALISING PREPAREDNESS WITHIN A FRAMEWORK OF ADAPTED PROTECTION MOTIVATION THEORY

© Rachel Westcott BVMS(Hons) BSc DipAppSc

A thesis submitted to fulfil the requirements for the degree of

Doctor of Philosophy

Translational Health Research Institute

School of Medicine

Western Sydney University

28 March 2018

STATEMENT OF AUTHENTICATION

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

Rachel Anne Nosworthy Westcott

28 March, 2018

ACKNOWLEDGEMENTS

There are many people who deserve my unreserved thanks for helping me to negotiate and complete this PhD project.

- Western Sydney University, and the Bushfire & Natural Hazards Cooperative Research Centre for awarding me scholarships to undertake the project.
- My supervisors, Dr Mel Taylor, Prof Kevin Ronan and Prof Hilary Bambrick for their support, guidance and excellent advice. To Prof Janette Perz for stepping in at the 11th hour to be the sole remaining WSU presence on my panel – thankyou.
- The WSU on-line Thesis Writing Group led by Dr Susan Mowbray – our fortnightly meetings were so good!
- The Graduate Research School at WSU for doing their work well to help HDR students.
- The 'OWLs' in the CRC PhD group – the Older & Wiser Learners – infrequent but valuable and enjoyable meetings.
- My marvellous, willing and enthusiastic research participants – what great data you gave me! I'm not able to name you but you were all FABULOUS.
- The Emergency Services on Eyre Peninsula – the Country Fire Service, the Metropolitan Fire Service, South Australia Police, and the State Emergency Service.
- My end-users – SAPOL, the CFS, Primary Industries and Regions South Australia (PIRSA) and South Australian Fire & Emergency Services Commission (SAFECOM).
- Local and community groups and individuals who helped 'spread the word' about my project: the Lower Eyre Agricultural Development Association, AG Excellence Alliance, Agricultural Bureau of South Australia, South Australian No-Till Farmers Association, PIRSA, Primary Producers SA, Department of Environment, Water & Natural Resources Port Lincoln, RSPCA Port Lincoln and local media – Port Lincoln Times, the West Coast Sentinel, the Eyre Peninsula Tribune, the Cummins Linc, the Stock Journal and Southern Cross/GTSBKN Television Port Lincoln.

- Regional Express (REX) airlines, for partial sponsorship of flights between Adelaide and Port Lincoln.
- The friends I made on Eyre Peninsula, including my ‘discovered’ cousin, Bill. Special thanks to my dear friend Jacqui – I was so glad I was on EP when Klim crossed the Rainbow Bridge – and to Annabel for your friendship and generous hospitality.
- My dear friends Masori in Canberra and Jacquie and Carol in Adelaide who rang or messaged me just to touch base when I was ‘chained to my desk’.
- The loyal clients of my Veterinary practice, who accepted my lack of availability when activated to response and recovery duties during two major fires in 2015, and who endured vastly reduced services due to my academic pursuits.
- My SAVEM colleagues who accepted I had to put some quite important EM matters on ‘hold’, and my parish church who understood when I had to go ‘off the roster’
- Lastly, my dear family who supported me unconditionally, who listened and proof-read and discussed and suggested, in addition to all the usual dynamics of family life. To Emilis, my beloved partner, thankyou for building our beautiful home and my loft office, where I can write with a 360 degree view of nature to sustain me. I CAN NEVER THANK YOU ENOUGH!!

DEDICATION

Grateful thanks is extended:

To my parents, Lindsey and the late Peter Westcott, for their selflessness and self-sacrifice, for providing their children with the opportunities of which they were denied; for teaching us self-belief and giving us a social conscience, but most of all for their love.

To my maternal grandfather, John Nosworthy (1885 – 1939) who dearly loved his family, his land and his animals. My love of each of these comes from you.

To my extended family and friends who have all played a part in the completion of this thesis in countless different ways – during my long periods of silence you were never forgotten.

To my animals, several of whom crossed the Rainbow Bridge during this PhD journey, who are oblivious to the nurturing and solace provided by their presence and unconditional love. You are remembered by the pseudonyms given to my study participants.

And lastly, to my cherished partner Emilis Prelgauskas – my dearest friend, for his unwavering and unhesitating support and help in every way possible, but most of all for his love.

****

When I set for the last time…I was carried to this island. I am not so old now as I was then. Every morning a bird brings me a fire-berry from the valleys of the Sun, and each fire-berry takes away a little of my age. And when I have become as young as the child that was born yesterday, then I shall take my rising again and once more tread the great dance.

"In our world", said Eustace, "a star is a huge ball of flaming gas". Ramandu replied, "Even in your world, my son, that is not what a star IS, but only the material of which it is made".

C.S. Lewis, *The Chronicles of Narnia: The Voyage of the Dawn Treader*, (1952).

TABLE OF CONTENTS

AUTHOR'S NOTE TO READERS OF THIS THESIS……x

ANTHOLOGY OF DISSEMINATION……xi

JOURNAL SELECTION and CHRONOLOGY of PUBLICATION.....xvi

LIST OF TABLES and LIST OF FIGURES……xviii

LIST OF ILLUSTRATIONS……xviii

ABBREVIATIONS AND GLOSSARY……xix

TRANSCRIPTION KEY……xx

PHOTOGRAPHIC CREDITS……xx

ABOUT THE RESEARCHER……xxi

THESIS ABSTRACT……xxiii

CHAPTER ONE – Introduction…… 1

RESEARCH RATIONALE, AIMS & OBJECTIVES…….. 2

THESIS OVERVIEW – PUBLISHED PAPERS……... 5

SUMMARY……... 9

THESIS GRAPHIC OVERVIEW……... 11

HIERARCHICAL OVERVIEW OF THESIS STRUCTURE.....12

CHAPTER TWO – Research design and method…….. 13

THE RATIONALE FOR RESEARCH DESIGN……... 13

THE RESEARCH SITE……... 14

RESEARCH PHASES……... 17

CHAPTER THREE – The narrative of Paper 1……... 23

THE RATIONALE FOR PAPER 1…… 23

PAPER 1 AS PUBLISHED…….... 24

CONTEMPORARY RELEVANCE OF THE PAPER……..... 38

POST-PUBLICATION LITERATURE……..... 39

CHAPTER FOUR – The narrative of Paper 2……..... 42

THE RATIONALE FOR PAPER 2……..... 42

PAPER 2 AS PUBLISHED……..... 43

CONTEMPORARY RELEVANCE OF THE PAPER……..... 53

CHAPTER FIVE - The narrative of Paper 3:

Towards public policy and practice. ……..... 56

THE RATIONALE FOR PAPER 3……..... 56

PAPER 3 AS PUBLISHED……..... 57

CONTEMPORARY RELEVANCE OF THE PAPER……..... 62

CHAPTER SIX - The narrative of Paper 4……..... 65

THE RATIONALE FOR PAPER 4……..... 65

PAPER 4 AS PUBLISHED……..... 66

CONTEMPORARY RELEVANCE OF THE PAPER……..... 85

CHAPTER SEVEN - The pilot Survey: Farmers, fire and animals……..... 88

RATIONALE FOR THE PILOT SURVEY……..... 88

Introduction……..... 88

Method……..... 89

Results……..... 89

Discussion……..... 92

Conclusion…….. 97

CHAPTER EIGHT – Future research: identifying the gaps and proposing a way forward - farms, fires and fuels 99

RATIONALE FOR HIGHLIGHTING TOPICS FOR FUTURE RESEARCH...99

Abstract……..... 99

Introduction……..... 100

Method……..... 105

Pilot survey data and interview extracts……..... 106

Expected outcomes…….. 109

Conclusion……..... 110

CHAPTER NINE - THESIS CONCLUSION……..... 111

RESEARCHER FINAL OBSERVATIONS – on reflection…….. 115

APPENDICES - Author's note re Appendices……..... 116

APPENDIX A: Paper SP1, *Australian and New Zealand Journal of Public Health*…….....117

APPENDIX B: Paper SP2, *Climate Risk Management – under review*……..142

APPENDIX C: AFAC paper for peer review, published in AJEM…….....174

APPENDIX D: ANZDMC 2017 Table of Contents – *Peer reviewed papers*……...188

APPENDIX E*:* Recruitment posters and flyers……....192

APPENDIX F: Participant information and consent forms……195

APPENDIX G: Interview guides…….....207

APPENDIX H: Coding examples, interviews and focus groups…….. 214

APPENDIX I: Responders thematic map……..... 215

APPENDIX J: Thematic table.....216

APPENDIX K: Farmer pilot survey……..218

APPENDIX L: Future research.....241

REFERENCES.....242

ENDPIECE.....249

AUTHOR'S NOTE TO READERS OF THIS THESIS

The chapters in this exegesis represent a connecting narrative between the peer-reviewed published papers. The material detailed in the published papers is not repeated. Some frequently used terms which are explained in the papers but not in the narrative are therefore included in the Glossary. Submitted but unpublished papers are included at Appendices A and B.

Likewise, the *Reference* list at the end of the exegesis applies only to the exegesis: published and submitted papers contain their own reference list.

The thesis uses a consistent pattern of boxed text (at the beginning of each chapter) and illustrations (at the end of each chapter). The coloured boxed sections (labelled *Box 1* to *Box 7*) use sequential notations to signpost to the reader what is to follow. These boxed sections are not tables – they are simply text presented differently, and some readers may find this useful. Research questions for each paper are included in boxes 4, 5 and 6.

The illustrations at the end of each chapter are intended to add context and enhance the reader experience. They are therefore labelled *Illustration 1 to 9,* to differentiate them from a *Figure*.

The sections *About the Researcher* and *Researcher final observations* are *italicised* to signify the shift to the researcher's personal voice.

Readers' attention is drawn to the demographic groups participating in this research – emergency responders, and animal owners. Although this research was part of the broader Bushfire and Natural Hazards Cooperative Research Centre's *Managing Animals in Disasters* project, this thesis is *not* about animals in emergencies. It is about the people who own, manage or who are associated with animals, and data was collected with respect to *their* views and experiences. As noted in Figure 1*, the word "human" is used wholistically. Adverse environmental and animal impacts which inevitably affect humans are assumed inclusions.* Therefore, animals were indirectly implicated into data acquisition. Their well-being benefits from the outcomes of this research because of potential behavioural changes occurring among their owners: changes resulting from the strategies mapped out in this thesis, and which aim to improve human preparedness and safety in natural hazards.

ANTHOLOGY OF DISSEMINATION

Peer-reviewed publications

1. WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017b. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology,* 5**,** 13.

2. WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science,* 4, 34.

3. WESTCOTT, R. 2017. Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study. *Australia and New Zealand Disaster and Emergency Management Conference.* Peer reviewed proceedings. Gold Coast, Queensland.

4. WESTCOTT, R. 2017 Narrowing the awareness-action gap: cultivating a culture of routine all-hazards preparedness through public policy initiatives*. Australian Journal of Emergency Management,* 32,4. *(* see image p xv)*

Submitted papers under review

1. WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M.
   Public Health and Natural Hazards: New Policies and Preparedness Initiatives Developed from an Australian Bushfire Case Study.
   Submitted to the Australian and New Zealand Journal of Public Health

2. WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M.
   Natural hazards and adaptive response choices in a changing climate: promoting bushfire preparedness and risk reduction decision-making.
   Submitted to Climate Risk Management, November 2017

Please see pp xiv-xv following for chronology and details of publication.

Peer reviewed blog

What comes first? Building DRR by cultivating a preceding culture of preparedness as a 'social norm'. *PreventionWeb DRR Voices* [Online]. 2017. Available from: http://www.preventionweb.net/experts/oped/view/54363 [Accessed 26 July 2017].
Republished on BNHCRC Views and Visions blog [Online]. Available from: http://www.bnhcrc.com.au/news/blogpost/rachel-westcott/2017/what-comes-first-building-drr-cultivating-preceding-culture [Accessed 6 August 2017].

Conference presentations

1. Australasian Fire and Emergency Service Authorities Council (AFAC) Conference, Darling Harbour, Sydney, September 2017. (Peer reviewed).
   Narrowing the awareness-action gap: cultivating a culture of routine all-hazards preparedness through public policy initiatives

2. Australia and New Zealand Disaster and Emergency Management Conference (ANZDMC) May 2017 (published in peer-reviewed proceedings)
   Mitigating action inertia and the bushfire awareness-action gap: findings from a South Australian case study.

3. Bushfire and Natural Hazards Cooperative Research Centre Research Showcase, Adelaide, July 2017. *How to become bushfire-prepared without really noticing: be fire-fit! Weekly is worth it!* [Online]. Melbourne: Bushfire and Natural Hazards Cooperative Research Centre. Available: http://www.bnhcrc.com.au/resources/presentation-audio-video/3834 [Accessed 6 August 2017].

4. HDR student conference, Western Sydney University, 22 September 2016. *Don't just do something…stand there! Emergency responders' peri-incident perceptions of animal owners in bushfire.*

5. Australian Veterinary Association Annual Conference. Adelaide, SA. May 2016. (Peer reviewed proceedings). *Triage, treat and then what? Bushfire, wildlife and SAVEM.*

6. HDR student conference 16 November 2015. *Investigating the application of Protection Motivation Theory to the behaviour of animal owners and emergency responders in bushfire natural hazards*.

7. Australian Natural Hazard Management Conference, Perth. October 2015. *The Sampson Flat fire January 2015: real world experience meets ground-breaking research.*

8. Australasian Fire and Emergency Service Authorities Council (AFAC) Conference, Adelaide, September 2015. *Veterinary emergency management at the Sampson Flat bushfire in South Australia, January 2015.*

9. Australia and New Zealand Disaster and Emergency Management Conference, Gold Coast, May 2015 *Animal Emergency Management: Response and Recovery Experience and Lessons from the Sampson Flat Fire, South Australia, January 2015*

Posters – See https://www.bnhcrc.com.au/people/rachel-westcott

1. Westcott R. (2018) Fuels ain't fuels! Crops, "conservation farming" and cropland fires. AFAC Conference Perth, Western Australia.

2. Westcott, R., Ronan, K., Bambrick, H. & Taylor, M. (2017). Bushfire preparedness: how to become 'fire-fit' without really noticing. Bushfire & Natural Hazards Cooperative Research Centre Research Showcase, Adelaide; AFAC Conference Sydney, New South Wales.

3. Westcott R. (2016) Narrowing the awareness-preparedness gap: investigating an other-directed application of protection motivation theory (PMT) for animal owners

and emergency responders in bushfire emergencies. BNHCRC Research Advisory Forum, Hobart, Tasmania. May 2016.

4. Westcott R. (2015) The interactions between emergency responders and animal owners in bushfire: Improving community preparedness and response outcomes. Bushfire and Natural Hazards Cooperative Research Centre Forum /AFAC 2015. Adelaide, South Australia. September 2015.

5. Westcott R. (2015) The interactions between emergency responders and animal owners in bushfire: Improving community preparedness and response outcomes. Living with Bushfire: A community conference. Churchill, VIC. October 2015.

Other outputs

1. Tasmanian Fire Service *Bushfire Ready Neighbourhoods Newsletter*, Issue 11, February 2018, page 6. https://www.bushfirereadyneighbourhoods.tas.gov.au/newsletters
2. Westcott, R (2017) *Narrowing the awareness-action gap: Cultivating a culture of routine all-hazards preparedness through public policy initiatives.* Presentation to the South Australian State Recovery Office stakeholder forum 25 October 2017
3. Taylor M and Westcott R. Emergency planning for pets. ABC RN Country Breakfast. 16 September 2017 http://www.abc.net.au/radionational/programs/countrybreakfast/country-breakfast-features-saturday-september-16/8948250
4. PhD student blog from the ANHMC conference http://www.bnhcrc.com.au/news/blogpost/rachel-westcott/2015/getting-front-foot-science-pointy-end
5. Westcott R. (2015) People and their animals in emergencies: snapshots from past emergency events. Australian Journal of Emergency Management, 30:2, 60-65. https://ajem.infoservices.com.au/items/AJEM-30-02
6. Westcott R. Animal emergency management in bushfire. EM Knowledge Blog. February 2015. http://emknowledgeblog.com/2015/02/
7. Project blog page: https://ptlincolnproject.wordpress.com/

Paper 4 – RESEARCH – CULTIVATING FIRE-FITNESS

Featured on the cover of AJEM, October 2017

TABLE 1: JOURNAL SELECTION and CHRONOLOGY OF PUBLICATION

Chronology of paper	Article title	Journal title	Journal description	Rationale for journal selection	Rational for article in relation to overall thesis
1	Expanding protection motivation theory: investigating an effective framework and application to implement with animal owners and emergency responders in bushfire emergencies.	*BMC Psychology*	All aspects of psychology, human behaviour and the mind; developmental, clinical, cognitive, experimental, health and social psychology. Both quantitative and qualitative research methods are welcome.	The paper examined Protection Motivation Theory (PMT), a socio-cognitive theory of interest to the psychology community.	A review of the literature provided scrutiny of PMT and established its suitability as a framework for the research.
2	Don't just do something….. stand there! Emergency responders' peri-incident perceptions of animal owners in bushfire.	*Frontiers in Veterinary Science: Veterinary Humanities and Social Science*	A forum for empirical and theoretical papers at the intersection of animals, veterinary medicine, and society. Embraces a holistic approach to animal and human health within a shared social context. Rigorous quantitative or qualitative methods welcome.	The researcher is a Veterinarian. The journal's focus on the interface of veterinary medicine and social science presented an ideal publication for this paper.	Provides an overview of the qualitative data gathered from focus groups and interviews in phase 1 research, and funnels the research focus.
3	Narrowing the awareness-action gap: cultivating a culture of routine all-hazards preparedness through public policy initiatives.	*Australian Journal of Emergency Management*	Australia's premier journal for emergency management (EM) covering all hazards and all emergencies, EM theory and practice, risk reduction, readiness, response, and recovery. Includes papers by researchers and practitioners.	An ideal Australian journal for this paper. Unabridged version accompanied an oral presentation at the Australasian Fire and Emergency Service Authorities Conference (AFAC) in 2017.	Consistent with the researcher's continuing refinement of the research focus, this paper developed the first of two major outcome themes identified in Paper 2.

4	Mitigating action inertia and the bushfire awareness-action gap: findings from a South Australian case study.	*Australia and New Zealand Disaster and Emergency Management Conference: peer reviewed proceedings*	The ANZDMC is a premium event of its discipline, facilitating professional development and knowledge exchange among emergency and disaster practitioners and researchers from the region.	This conference is a leading forum for emergency management in the region.	This conference offered the opportunity to present aspects of the second major outcome theme identified in Paper 2.
5 (SP1)	Public health and natural hazards: new policies and preparedness initiatives developed from an Australian bushfire case study.	Submitted to *Australian and New Zealand Journal of Public Health*	Publishes peer-reviewed research into public health, relevant to researchers, practitioners and policy makers. The Journal is multidisciplinary and aims to publish methodologically sound research from any of the academic disciplines that constitute public health. Articles on research methods and policy development are welcomed.	A journal of particular relevance to Australia and New Zealand. Natural hazards are a public health issue. The prevention of adverse effects of hazards upon public health and safety is increasingly important.	Consistent with the researcher's continuing refinement of the research focus, this paper discusses public health policy with the potential to be readily implemented to improve public health and safety.
6 (SP2)	Natural hazards and adaptive response choices in a changing climate: promoting bushfire preparedness and risk reduction decision-making.	Submitted to *Climate Risk Management*	Publishes original scientific contributions on the use of knowledge and information regarding the consequences of climate variability and climate change in decision and policy making from the near- to long-term.	Worsening natural hazards are the corollary of ongoing global warming and climate change.	The intent of this paper is to show how the research has come 'full circle' from a robust debate of PMT to demonstrating how PMT can be applied in the context of normalising natural hazard preparedness – "fire-fitness".

LIST OF TABLES

Table 1 Journal selection and chronology of publication xvi

Table 2 Rigour in qualitative research…….. 18

Table 3 Farmer recommendations…… 91

Table 4 Summary of strategies to attain fire-fitness.....113

LIST OF FIGURES

Figure 1 Research rationale – summary of key elements…….2

Figure 2 Overall thesis graphic ……11

Figure 2a Hierarchical overview of thesis structure……12

Figure 3abc The research site ……15

Figure 4ab Geographic distribution of research participants ……...16

Figure 5 Farmer strategies to protect animals from fire ……...90

Figure 6 The Pinery firescar……..101
(overlaid on map of greater Adelaide)

Figure 7 The toll of the Pinery fire…….. 102

Figure 8 Survey responses…….. 107

LIST OF ILLUSTRATIONS

1 Fire approaching Port Lincoln 2009……..... xxv

2 Port Lincoln, gateway to data collection …….....10

3 The horse owners' focus group…….....22

4 In memory of loved ones lost…….....41

5 SAPOL station and the CFS Emergency Centre…….....55

6 Mosaic sofa, Port Lincoln…….....64

7 The '3 Minute Thesis' slide…….....87

8 Beyond the townships…….....98

9 The silos, Port Lincoln…….....110

ABBREVIATIONS AND GLOSSARY

AFAC	Australasian Fire & Emergency Service Authorities Council
ANZDMC	Australia & New Zealand Disaster & Emergency Management Conference
BNHCRC	Bushfire & Natural Hazards Cooperative Research Centre
CAQDAS	Computer Assisted Qualitative Analysis Software
CDL	Catastrophic Day Leave
CFS	(South Australian) Country Fire Service
DRA	Dynamic Risk Assessment – the continuous assessment and control of risk in the rapidly changing circumstances of an incident
DRR	Disaster Risk Reduction
EM	Emergency Management
EP	Eyre Peninsula, or **LEP** – Lower Eyre Peninsula
Fire-fitness	Normalised, every-day, routine preparedness
GDP	Gross Domestic Product
MFS	Metropolitan Fire Service
PIRSA	Primary Industries and Regions South Australia
PMT	Protection Motivation Theory
PPSA	Primary Producers South Australia
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SAPOL	South Australia Police
SAVEM	South Australian Veterinary Emergency Management
SES	State Emergency Service
SFDRR	Sendai Framework for Disaster Risk Reduction
Social microclimate	Immediate social environment , e.g. family or workplace
TA	Thematic Analysis
White noise	Overabundance of distracting or useless electronic information

TRANSCRIPTION KEY

"The researcher" or "this researcher" means the author of this thesis.

Pseudonyms have been used throughout this thesis to protect participants' identity.

Published papers are referred to in the text by the abbreviations P1, P2, P3 and P4. Submitted papers are identified as SP1 and SP2.

In Appendices A and B (submitted papers), formatting differs according to the journal's requirements.

Square brackets [ ] indicate the text contained therein has been added by the researcher to provide clarity without detracting from meaning.

Three dots … indicate omission of word/s in data extracts, again for clarity.

Where the reader is referred to page numbers elsewhere in the thesis, these are the numbers *as per page numbering in the thesis*. PDF reader software will count Roman numerals i to xxv as Arabic numerals 1-25. Therefore, the reader will need to add 25 to the stated page numbers if using the PDF reader software page finding feature.

PHOTOGRAPHIC CREDITS

Unless stated otherwise, all images are by the researcher.

ABOUT THE RESEARCHER

I am a Veterinarian, and since 2009 I have worked in Veterinary Emergency Management (EM) in a volunteer command capacity. In that year I formed and founded South Australian Veterinary Emergency Management Inc. (SAVEM), now an official response agency in the South Australian State Emergency Management Plan (SEMP). SAVEM Inc. was awarded State winner and National highly commended in the 2012 Resilient Australia Awards.

I have had career-long experience and interest in the EM sector as a former serving South Australian police officer and medical imaging technologist in a major trauma centre in Adelaide, the capital city of South Australia. With five years' experience in the Veterinary EM sector, in 2014 I sought opportunities to formalise that knowledge and skill set to put it to best use as a practitioner/researcher. Hence I was drawn to the PhD program offered by Western Sydney University (WSU) and the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC) as part of the Managing Animals in Disasters program. During my professional career I established operational collaborative relationships with Emergency Services agencies and with the media. These pre-existing connections gave me an advantage as a practitioner-researcher in that I had a bank of credibility built by real-world experience and demonstrated effective leadership in bushfire emergencies in South Australia. This enabled me to overcome any scepticism towards 'city' researchers which is sometimes found in pragmatic regional communities, and helped to quickly establish positive relationships with research participants and end-users. A strongly supportive and cooperative research environment ensued.

My pre-PhD publications include:

- *professional dissertation in the third year of Diploma in Applied Science, Medical Imaging (1990), Acute head trauma in motor vehicle accidents*
- *Australian Journal of Emergency Management vol. 28 no. 3, July 2013, Post disaster recovery arrangements for animals in South Australia*
- *Australian Journal of Emergency Management vol. 30 no. 2 April 2015, People and their animals in emergencies: snapshots from past emergency events*

- *Multiple professional articles in the Australian Veterinary Association (AVA) and allied veterinary industry and professional education publications*
- *Conference presentations such as the AVA National Conference in Adelaide, 2011 and 2016, Veterinary Emergency Management*

I was eager to extend my PhD research beyond a veterinary or animal emergency management topic alone, in order to extrapolate its significance to society more broadly in the wider context of public health. To that end, alongside emergency responders, I selected animal owners as a demographic group with a common denominator linking many other demographic boundaries.

The author, with recovering bushfire patient, joey no. 18

(Photo: Matt Turner, The Advertiser/Sunday Mail, 11 June 2015)

THESIS ABSTRACT

This research sought to discover and recommend proactive strategies to strengthen and improve human safety and well-being in a changing climate of natural hazards. This thesis documents the rationale, process and outcomes of that research. People's ability to navigate their daily lives within an environment of worsening natural hazards is an adaptive public health and safety priority - given the predicted global increase in frequency and severity of extreme weather events. There is an urgent need to strengthen and normalise people's preparedness behaviour, and to connect it with an unequivocal understanding of the benefits of such changes. Enhancing people's adaptive responses will help to avoid, or at least minimise, associated human trauma and tragedy. That is the aim of this research.

Achieving positive, adaptive change requires proactive medium to longer term public policy planning and implementation of strategies leading to considered, appropriate response choices and desired protective behaviour as social norms. Demands upon individuals, families, communities and workplaces are high in the complexity of 21st century life: adapting to narrow the bushfire (or other natural hazard) awareness-preparedness gap – *to become fire-fit*[1] – requires a re-ordering of priorities so that fire-fitness becomes a societal-wide, integrated routine – as routine as buying groceries or fuelling a car.

This predominantly pragmatic qualitative research used the socio-cognitive Protection Motivation Theory (described by Rogers[2] in 1975) in the context of bushfire natural hazards with the ultimate aim of reducing human morbidity and mortality, and concurrently promoting positive physical and psychological capacity. The study considered data across and within two demographic groups – emergency responders and the owners of any kind and any number of animals. It sought to

1. determine and discover how casualties to life, property and the environment, including the physical and psychological health of people, their microclimates and livelihoods, can be reduced and minimised while building a culture of preparedness as an integral part of daily life, and

[1] The original term,"fire-fitness" is first outlined on page 3, and is discussed throughout this thesis.
[2] Rogers, R.W. (1975) A protection motivation theory of fear appeals and attitude change. Journal of Psychology, 91, 93-114.

2. help negate wider perceptions of preparedness as a difficult, time-consuming task which although on nearly everyone's 'to do' list is frequently not prioritised.

The major qualitative phase *(phase 1)* was followed by a minor quantitative phase *(phase 2)* in the form of a pilot survey (discussed in Chapter 7) that investigated farmers' bushfire experiences and management strategies. The pilot survey was conducted with a view to determining topics requiring further research, as well as identifying knowledge and learning translatable to novice landowners.

This thesis is presented as a series of six papers – four published (P1-P4), two submitted (SP1, SP2). Each paper addresses particular research questions, noted in the box at the beginning of each chapter, and each published paper is followed by a connecting narrative designed to convey the momentum, flow and logic of the research progression.

The order of the papers presented in the thesis follows the chronology of the research. Paper 1 critically explores the literature and investigates Protection Motivation Theory (PMT) as a framework. Paper 2 provides an overview of the qualitative data and identifies the focus for the next stage of analysis. Paper 3 discusses public policy and leads in to Paper 4 which proposes a number of innovative and practical strategies to help improve fire-fitness for individuals and across communities. The following two papers supplement and complement the four published papers. SP1 contains more detail concerning public policy initiatives. SP2 is essentially P1 in practice and demonstrates how PMT can be usefully applied to achieve the aim of the research - to reduce human morbidity and mortality in natural hazard events. Thus, the reader is encouraged to read SP1 following P3, and SP2 following P4. Readers' attention is drawn particularly to the *Results, Interpretative Analysis and Discussion* sections in SP1 and SP2, where additional information on policy and how PMT was expanded and applied may be found.

Journal selection for the published papers was actively – and flexibly - considered from the beginning of the project with the selection of suitable journals narrowing as the focus of the research itself became more specific. Table 1, *Journal selection and chronology of publication*, details this process.

The research results indicate desired outcomes are indeed achievable by engaging a bold, innovative willingness to move beyond standard conservatism in the sector, and demonstrating a commitment to trial and evaluate recommendations. The well-being and safety of people in natural hazards is increasingly a public health issue. This thesis proposes proactive initiatives that affirmatively and assertively respond to meeting the parallel escalation of the inherent danger of natural hazards in a changing climate without alienating public sentiment. It also identifies the need for further research to fill a gaping omission in the literature regarding cropland fires - with respect to crop types and placement, how different crops 'carry' a fire, and if firebreaks can be better utilised as a fire management tool.

A summary of the strategies developed from the results of this research is presented in Table 4, *Strategies to help achieve fire-fitness*. These are described in more detail in papers P3, P4, SP1 and SP2.

In reconstructing the 'costs' and 'rewards' described in an expanded Protection Motivation Theory to favour an overall net gain, and by providing ways to establish fire-fitness as a desirable and attainable social norm, this research makes a practical and timely contribution to future public policy decision-making in the global 'new reality' of natural hazards.

***Illustration 1**: Fire approaching Port Lincoln township from the north, 23 December 2009. Photo: Michael Reynolds, Port Lincoln (used with permission).*

CHAPTER ONE – INTRODUCTION

THIS CHAPTER CONTAINS:

- **Research rationale, aims & objectives**
- **Thesis overview: the problem of the awareness-preparedness gap, and an exploratory approach to problem-solving**
- **Introducing 'fire-fitness' → normalising preparedness**
- **Thesis structure – published papers and exegesis**
- **Thesis overview graphic & hierarchical structure**

The problem, and rationale for undertaking this research:

Extreme weather events and natural hazards are increasing in frequency and severity due to climate change, and therefore threaten the safety of human populations.
The *awareness-preparedness gap* – i.e. the mismatch between people's *awareness* and *readiness* to manage the hazard threat and treat risk - is persistently too large.
There is an urgent need to reverse this trend and reduce the gap, because human morbidity and mortality in bushfire (and other) natural hazards will not be significantly reduced while the magnitude of the gap remains; people will continue to make poor decisions, perpetuating the cycle of negative outcomes and ramifications emergency responders routinely encounter.
A greater understanding of what *precedes* preparedness is required to diminish the short, medium and long term social, environmental and economic costs and adverse effects of natural hazard emergencies.
New ways to narrow the awareness-preparedness gap need to be developed, implemented and evaluated.
Investigate if this can be achieved with innovative public policy and with understanding learned from applied socio-cognitive theory, to improve dynamic risk assessment and decision-making, and to cultivate a culture of routine preparedness – *'FIRE-FITNESS'*
Develop new strategies contributing to improved human safety, community well-being and ultimately the saving of human life in natural hazards emergencies.

Box 1: *Research rationale. See also Figure 2.*

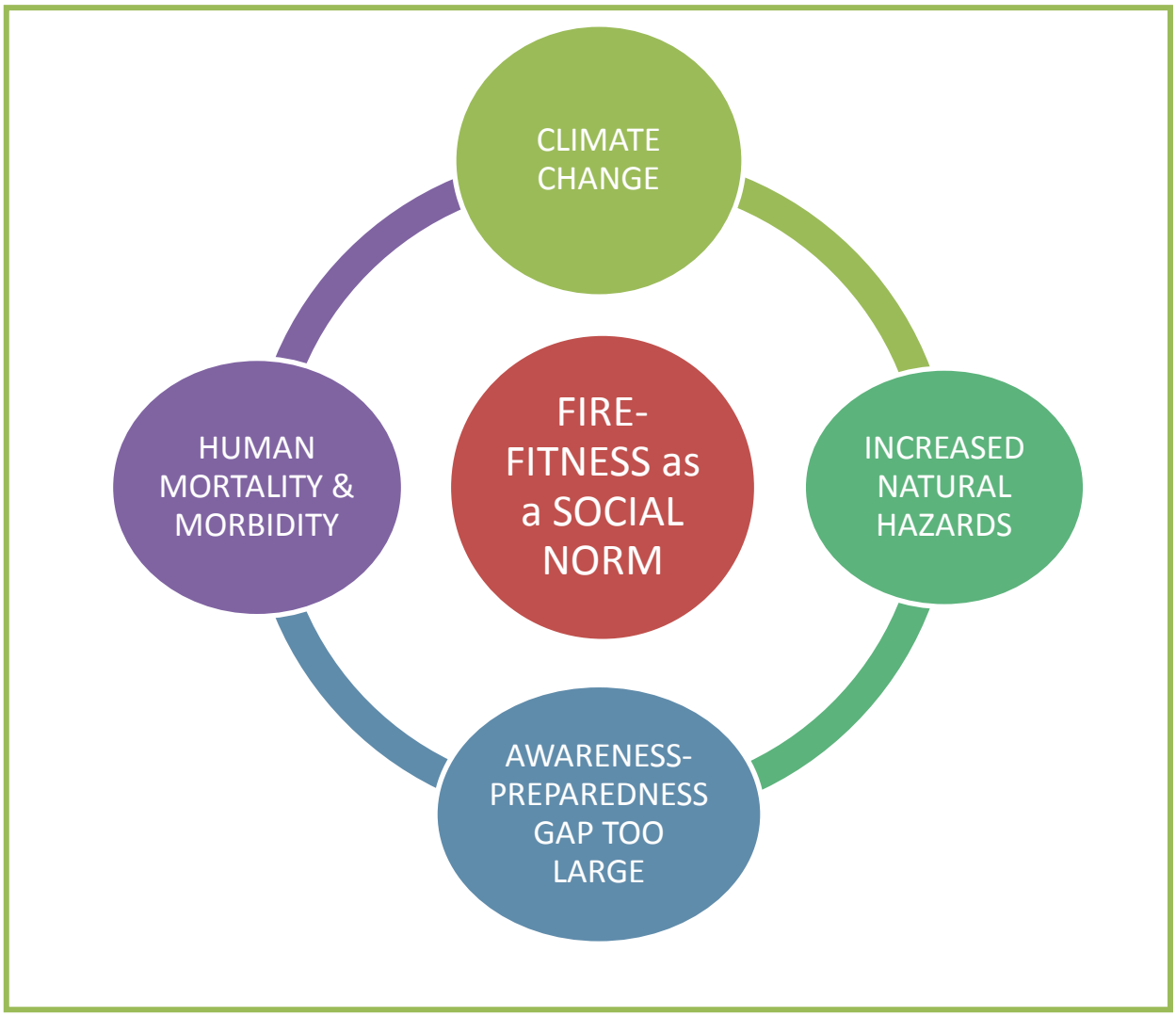


Figure 1: *Research rationale – broad summary of key elements. The word 'human' is used wholistically. Adverse environmental and animal impacts which inevitably affect humans are assumed inclusions.*

RESEARCH RATIONALE, AIMS & OBJECTIVES

This study addresses the need to improve the protection of human life and well-being in a natural hazard emergency by proposing ways to reduce the gap between hazard awareness, and the uptake of protective mitigating action. Despite improved public awareness in recent years, and preparedness campaigns well-delivered by emergency services, the practise of effective prevention and preparedness activity remains inconsistent across all hazards (Ronan and Johnston, 2005, South Australian Country Fire Service, 2015).

Findings recorded in this thesis indicate that part of the solution to this problem could be to take a step back and examine what *precedes* preparedness messaging – and

thereby to initiate a culture of routine preparedness - *"fire-fitness"* - as a social norm. "Fire-fitness" is an original term coined by the researcher during data analysis; it is proposed as an alternative to "preparedness" which historically seems to have had little power to motivate people to prepare. Fire-fitness means to be adapted, suited, fit-for-purpose in the evolutionary sense. It means to be "fit" to face a fire hazard - to be physically, psychologically and emotionally equipped in as many aspects as are possible and applicable to an individual or group. Fire-fitness is a year-round learned and applied pattern of behaviour: it should become established and routine regardless of the season or prevailing climatic conditions, or the perceived likelihood of a hazard event. The hazard itself may be non-routine, but the ability to respond in a protective, timely and safe manner, needs to become instinctual and assertive. Cultural change such as this occurs over the medium to long term, and is necessary because of the predicted ongoing effects of an evolving climate on extreme weather events (Gibbs et al., 2013, Hughes and Steffen, 2013, Steffen et al., 2017).

To explore this problem, a research site significant for several reasons, including its exposure to bushfire hazards, and participant demographic groups covering a broad sector of the community were chosen for data collection (see *research design*, below). The research site was the Lower Eyre Peninsula in South Australia, and participant groups were emergency responders, and the owners of any kind and any number of animals – from one companion or assistance animal, to farmers owning many thousands of livestock. In total 104 individuals took part in the research across two phases: 46 emergency responders and 58 animal owners (including farmers) in phase 1 (focus groups and individual interviews). The pilot survey (phase 2) was completed by 37 primary producers, some of whom may have taken part in phase 1. Many had experienced a fire emergency while some had only theoretical knowledge. The research objective was to draw on the participants' experiences and investigate the interactions between, and challenges facing, these two groups in the context of bushfire, and then to analyse the data in search of ways to develop new or enhanced mitigation measures which could be usefully applied to the wider community.

New strategies should be capable of protecting the public *and* their social, environmental and economic assets, and to be meaningful, need to be relevant and

applicable in the medium to long term. Thus, the proposed strategies[1] developed from this research aim to help cultivate a sustainable culture of fire-fitness to contribute to achieving improved human safety and well-being in the context of climate-change induced, worsening natural hazards in the 21st century and beyond. In parallel with innovative public health and safety policy, other options, as determined by an expanded Protection Motivation Theory, can enhance *Disaster Risk Reduction* (DRR) and contribute to establishing fire-fitness as a social norm. Making preparedness as routine as buying groceries or fuelling a motor vehicle can promote the genesis of a culture of preparedness as people face the *new normal* (or in recent nomenclature, the 'new reality'[2]) of fire, flood and other hazards.

Additionally, in recent decades there has been a tendency for urban migration from city to country, to satisfy a variety of lifestyle choices and preferences. Consequently, there may be an influx of new residents into picturesque regional areas who have neither experience of bushfire, nor knowledge of how to manage the potential threat of fire in their new idyllic surroundings. In the "mosaic of a community"[3], these new residents may be oblivious to their own risk, and similarly, to the escalated risk they may unintentionally bring to their neighbours and community. Helping new community members to understand their risk reduction responsibilities in a non-confrontational way is an important aspect of establishing fire-fitness as a social norm.

This researcher's professional experience as a veterinarian and emergency manager anecdotally indicated and concurred with Gibbs et al's (2013) observation in *BMC Public Health*[4] that: …*a greater knowledge-base is urgently needed to shape policy for disaster preparedness and response* (p8, emphasis added). The overall aim of this research was to use the participant groups' data to identify new ways to increase the uptake of fire-fitness behaviour across a wide demographic spectrum.

---

[1] Refer to Table 4, page 113

[2] http://www.huffingtonpost.com.au/entry/wildfires-are-new-reality-for-california-gov-says_us_5a2d7614e4b073789f6aa6c5

[3] Participant "Shane", emergency responder, 2015

[4] Gibbs et al. *BMC Public Health* (2013), 13:1036 Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness http://www.biomedcentral.com/1471-2458/13/1036

THESIS OVERVIEW – PUBLISHED PAPERS

Research design and theoretical framework

Close examination of the researcher's positionality, and consideration of research design indicated a pragmatic qualitative approach as the most appropriate to achieve practical outcomes (see Chapter 2, *Research design and method* below). Thematic Analysis (TA) was chosen for data analysis because of its flexibility and independence from theory and, given the need to motivate and sustain behaviour change, Protection Motivation Theory (PMT) was used to help investigate and frame potential policy outcomes.

A review of the literature regarding the application of PMT over four decades concluded that it was potentially useful, and could be expanded to address the issue of improving the translation of people's knowledge and awareness of their hazard risk into protective action. This is the ambit of **'Paper 1'** – ***Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies*** - published in BMC Psychology. PMT is a more mature and sophisticated socio-cognitive theory than *fear appeals*[5] - the approach commonly used in natural hazard advertising campaigns. The difficulty with fear appeals is that the initial desired effect is not sustained, but plateaus and fades. New iterations may dilute this effect, but achieving behaviour change *per se* is vastly preferable than scaring the target audience (Tanner et al, 1989).

In parallel, and included in Paper 1, a review of the *animals in emergencies* literature was undertaken. This literature over-represented the post-event recollections of the owners of companion pets and lacked informative data from animal owners in other contexts (see *Chapter 3 - Literature review update*). The two participant groups in this study – emergency responders and animal owners – were chosen to rectify this omission: the latter group (animal owners) so defined because of the intention to collect data from a broad cross-section of people with the commonality of owning animal(s) and representative of many different demographic groups.

[5] The use of fear to 'appeal' to people to motivate behaviour change for the better, but shown to be of limited value.

Early findings

Natural hazards become emergencies when the hazard (e.g. fire) intersects adversely with people and their environments (Neale et al., 2016, Eriksen and Wilkinson, 2017, Westcott et al., 2017b). Primary emergency responders – who may be firefighters, police or other rescue officers, are inevitably present at an emergency incident, usually rapidly, and interface with the public in stressful and possibly life-threatening circumstances. The more cooperative, informed and mutually respectful this interface, the better, safer and more positive the outcomes (Akama, 2012, Akama, 2014). Researching the nature of the emergency responder/animal owner interface sought to usefully inform new approaches to public health and safety policy because of the characteristics of the participant demographics. This is described in the study's second publication, **'Paper 2'**, ***"Don't just do something…stand there!" Emergency Responders' Peri-incident Perceptions of Animal Owners in Bushfire***, published in *Frontiers in Veterinary Science – Veterinary Humanities and Social Science*. The research analysis for this 'overview' publication identified two aspects that further narrowed the study's focus: (i) the need for new public health policy development and (ii) investigation of the underlying causes of decision-making among people involved in a natural hazard emergency.

Refining the focus

The first of these foci is elaborated in **'Paper 3' –** ***Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives*** published in the peer-reviewed proceedings of the Australasian Fire and Emergency Service Authorities Council (AFAC) Conference, 2017 (Appendix C). A peer-reviewed abridged version of this paper was published in the *Australian Journal of Emergency Management* in October 2017. The public health implications are discussed extensively in **'Submitted Paper** 1', submitted to the *Australian and New Zealand Journal of Public Health*: ***Public health and natural hazards: new policies and preparedness initiatives developed from an Australian bushfire case study*** **(Appendix A)***.* This topic was also the subject of a ***3 Minute Thesis*** presentation at the Bushfire and Natural Hazards Research Showcase (2017) (see *Illustration 7*), and precipitated an invitation to write for the United Nations' ***Expert Services: DRR (Disaster Risk Reduction) Voices*** blog. The evolution of inductive data analysis at this point represented a defining moment in the study with a clearly emerging

emphasis on public health and safety. This suggested developing innovative additions to policy as a pertinent avenue to pursue.

Issues around 'preparedness' were identified early in the analysis and informed the theme *Be fire-fit! Weekly is worth it!* with the intention of the phrase being to link *preparedness*, *frequency* and *benefit*. Later, the 'benefit' part of the slogan was further investigated as a key focus of Paper 4 – to achieve a demonstrable *net gain* or benefit (*adaptive rewards*) to people engaging in fire-fitness behaviour.

The second specific focus of the research – the aetiology, or processes, of decision-making in a bushfire or other natural hazard context – supplemented and complemented the public health theme by further investigating the *social microclimate*[1] *(and see below),* identified as an area of interest in Paper 1. It also informed a re-shaping of Rogers' 1983 revision of PMT, specifically, remodeling *maladaptive rewards* and *adaptive costs* so that *adaptive rewards* become the overall net gain. The proposed expansion of PMT was thus refined to shift positive adaptive response choices from the debit side of the PMT equation ("costs") to the much more appealing credit side ("rewards"). This is discussed in **'Paper 4'**, ***Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study,*** published in the peer-reviewed proceedings of the Australian and New Zealand Disaster and Emergency Management Conference (ANZDMC), in Queensland, 2017. This is discussed in more detail in **'Submitted Paper 2',** submitted to *Climate Risk Management* - ***Natural hazards and adaptive response choices in a changing climate: promoting bushfire preparedness and risk reduction decision-making*** **(Appendix B)**.

The expansion of PMT proposed in Paper 1, concluded it was sufficiently flexible to help identify new and more broadly appealing ways to encourage residents in a bushfire at-risk community to engage in proactive preparedness behavior. Based on strategies described in Papers 3 and 4 to cultivate and establish a widespread *culture of preparedness*, the intent of restructuring *adaptive costs* and *maladaptive rewards* was, by design, to promote and achieve an evident overall net gain that favours and actively encourages people to select *adaptive response choices*. The

[1] The social microclimate is discussed in all papers, particularly in P1, P3 and SP2.

key to this is to explore what *precedes* preparedness by implementing public health policies which preference preparedness behaviours as a routine part of daily life.

Strategies that demonstrate the advantages of protective, adaptive behaviours in responding to emergency situations increase the likelihood that people will choose a safer course of action, and are more beneficial to any given social microclimate than (possibly more easily actioned) maladaptive responses (Flynn et al., 1995, Norman et al., 2003, Grothmann and Reusswig, 2006, Lwin and Saw, 2007). These preferred choices are likely to become habituated and routine, especially where the value of such choices is clearly communicated. With a refined focus on disaster risk reduction (DRR) and public health and safety policy, potential applications of this research have been simultaneously funnelled (with respect to DRR) and widened (to encompass broadly applicable public policy). The two data-driven concepts identified in Paper 2, and in the context of PMT, led to a suite of proposals that aim to cultivate, affirm and establish a culture of fire-fitness behaviour and safe decision-making as social norms, thus narrowing the awareness-action gap.

Importance of the social microclimate

The social microclimate was identified during initial data coding as being a versatile and potentially useful contributor to achieving improved preparedness. It is important because it can act as a 'bridge' between the individual and the community in one or more contexts. This means that the social microclimate has the potential to act positively as a unit of synergistic information processing that facilitates the acquisition and subsequent dissemination of knowledge predisposing to action (as described in Papers 1, 3 and 4).

Individuals may belong to one or several social microclimates, with varying degrees of stability and dynamics. The ability to capture and summate knowledge acquired from multiple social microclimates can build a superimposed microclimate of fire-fitness – that is, individuals and communities able to intuitively exercise effective dynamic risk assessment, and choose an adaptive response pathway as the default option.

Information box 1: *more on the social microclimate*

Summary

This thesis contributes to, builds on, and refines existing knowledge and approaches to responding to emergency situations. It proposes achievable and realistic strategies to help individuals and communities effectively and proactively prepare for a fire or other emergency, thereby reducing the awareness-preparedness gap. The new public health and safety initiatives proposed are based on case study research of an at-risk community with a severe and recent fire history. Within that community, rich data from a broad cross-section of participants was achieved by selecting emergency responders and the owners of any kind and any number of animals as the participant groups. The experiences and interactions of these two groups, examined through the lens of PMT, help illuminate how adaptive coping appraisals and adaptive response choices can be made. Thus, better informed, evidence-based problem solving strategies contribute to a more resilient, emboldened individual and community response to an emergency with greater psychological health and a firm, proactive and planned sustainable approach to its emergency management capacity and responsibilities.

A graphic of the overall thesis as a whole is presented below at **Figure 2**, with the hierarchical overview at **Figure 2a**.

Ethical considerations

Ethics approval for research was granted by the Human Research Ethics Committee of Western Sydney University, approval number H11118. All participants gave written, informed consent. The names of all participants are pseudonyms.

Illustration 2: *Port Lincoln, gateway to data collection on Eyre Peninsula – at the airport facing the arrivals lounge*

FIGURE 2:THESIS GRAPHIC OVERVIEW

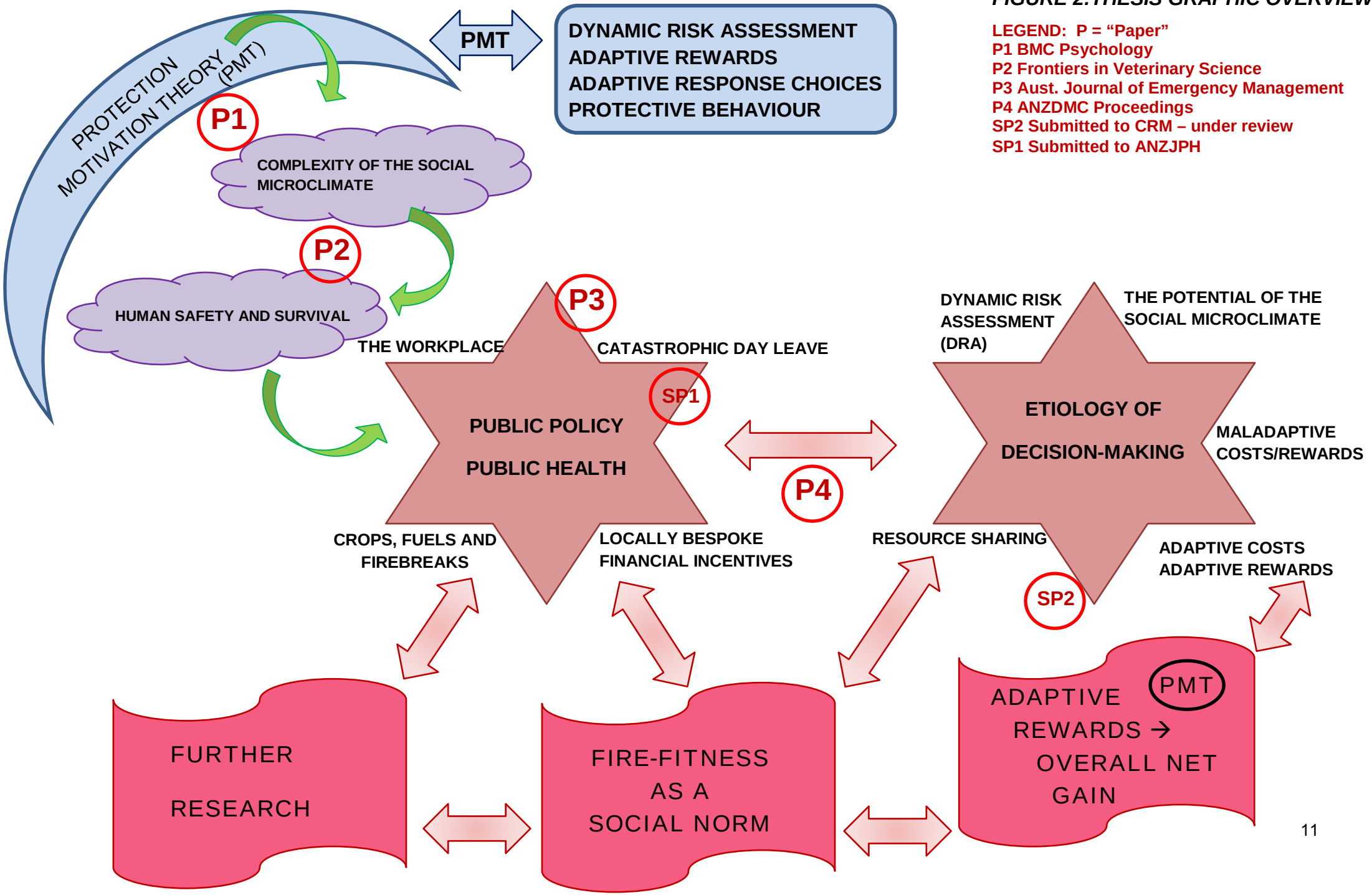
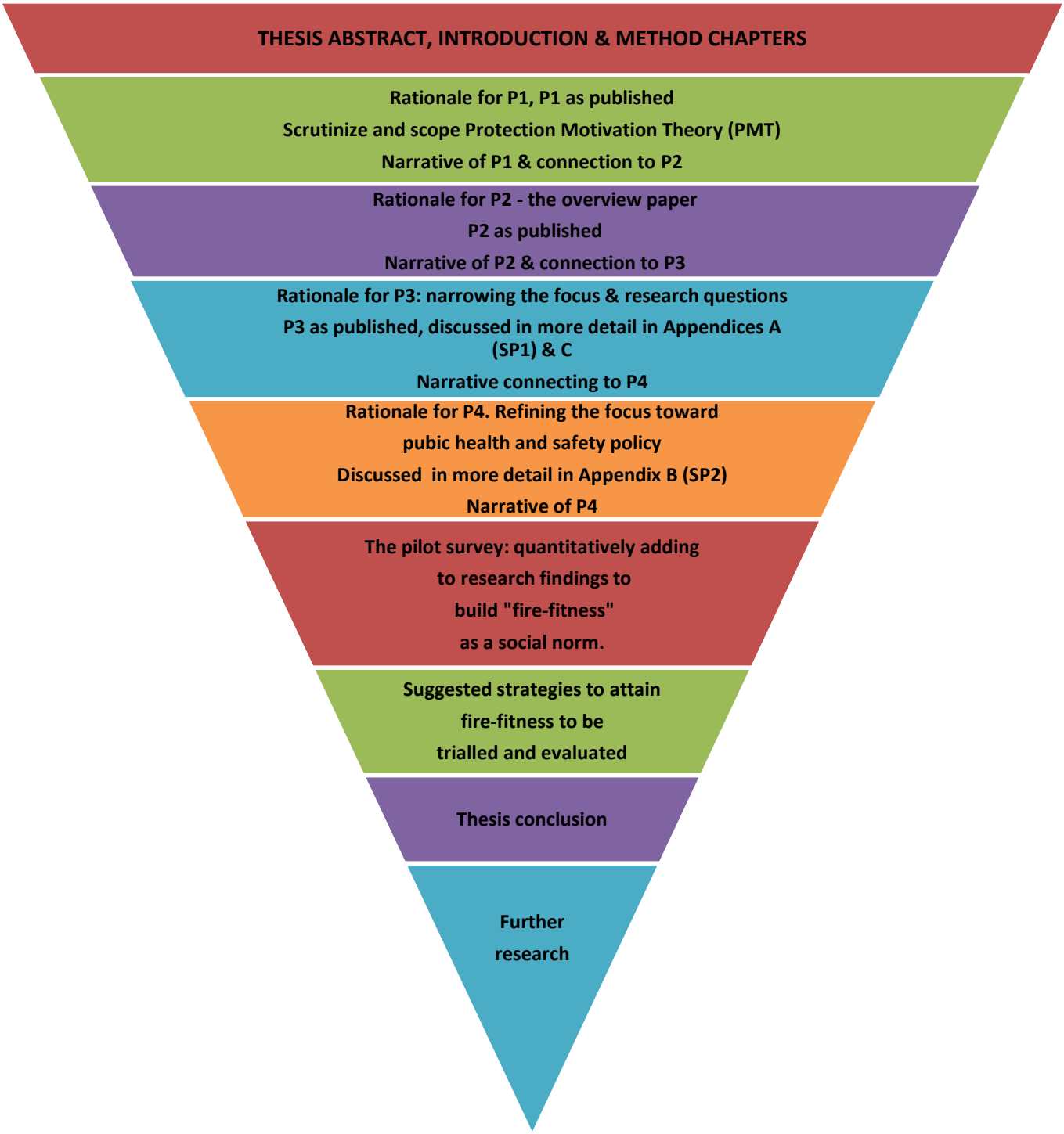


FIGURE 2a: HIERARCHICAL OVERVIEW OF THESIS STRUCTURE



CHAPTER TWO – Research design and method

THIS CHAPTER CONTAINS:

- **The rationale for research design**
- **Research phases**
- **Rigour in qualitative research**
- **The research site**
- **Interviews and focus groups**
- **Treatment of data**

THE RATIONALE FOR RESEARCH DESIGN

Explore people's experiences of living with bushfire risk, and to critically interrogate the meaning of those experiences to reduce that risk: exploration and problem solving
Provide a supportive environment for participants discussing sensitive issues
Consider researcher positionality & situationalist orientation – *the needs of the study* - pragmatic qualitative sequential methods
Data analysis which is independent of theory - Thematic Analysis (TA)
Organically organise accounts of complex phenomena from the participants' perspective: moving from descriptive to interpretative in-depth analysis
Problem-solving with participant's experiential and analyst's critical interpretation
Pilot survey – to identify areas for further investigation impacting the rural primary producer: skills and needs

Box 2: *Research design*

Qualitative research is about meaning. Using language instead of numbers allows the complexity of participants' experiences to be retained and reflected, and subsequently 'made sense of' without losing colour, dynamics or vitality (Sandelowski, 2000, Braun and Clarke, 2013, Savin-Baden and Major, 2013). By applying critical analysis to experiential data, by closely examining descriptions of context and phenomena and actively identifying latent meanings and interpretations, this research identifies practical new ways to decrease people's physical and psychological trauma due to emergency events, and to markedly increase their safety, and ongoing quality of life.

The research site

The research site was selected early in the research design phase **(*Figures 3a,b&c*)**. Lower Eyre Peninsula in South Australia has a recent and severe history of bushfire (Government of South Australia, 2016b, South Australian Country Fire Service, 2016a, Westcott et al., 2017c). It is also an area populated by urban, peri-urban and rural communities – in part, this is influenced by its geography. Likewise, and representative of their geographical location, the residents of Lower Eyre Peninsula own a variety of animals, from people in 'town' owning a single pet or assistance animal, to horses and 'pet' livestock in the peri-urban areas, to large-scale primary producers owning or managing hundreds or thousands of animals **(*Figures 4a & 4b*)**. This diversity among the animal owner group was a key factor in their selection as a demographic, bringing together a heterogeneous population with a single commonality.

Reasons for undertaking research need to be clearly stated and communicated to participants. One officer, after the conclusion of a focus group when the recorder had been switched off asked why this research was being conducted now. Was it a coincidence, he asked, that someone had come to research his region in the context of fire, after there had been large and widely publicised fires only months before, much closer to a major city. He wondered if "someone" had finally realised – perhaps in hindsight – that his region's suffering had gone almost unnoticed. He was reassured to learn that this research had been planned for some months, that the area had been selected as a possible research site well before the incident nearer the city had occurred, and that the 'appeal' of the attributes of the area with respect to its potential contribution was highly valued.

AUSTRALIA

SOUTH AUSTRALIA

LOWER EYRE PENINSULA

Figures 3 a, b & c: *The research site of Lower Eyre Peninsula in South Australia (red circle).*

Figure 4 a: General geographic distribution of the participant demographic, animal owners.

Legend:

Blue *urban (companion animals)*

Green *peri-urban (horses, pet livestock)*

Red *broadacre (primary producers, livestock)*

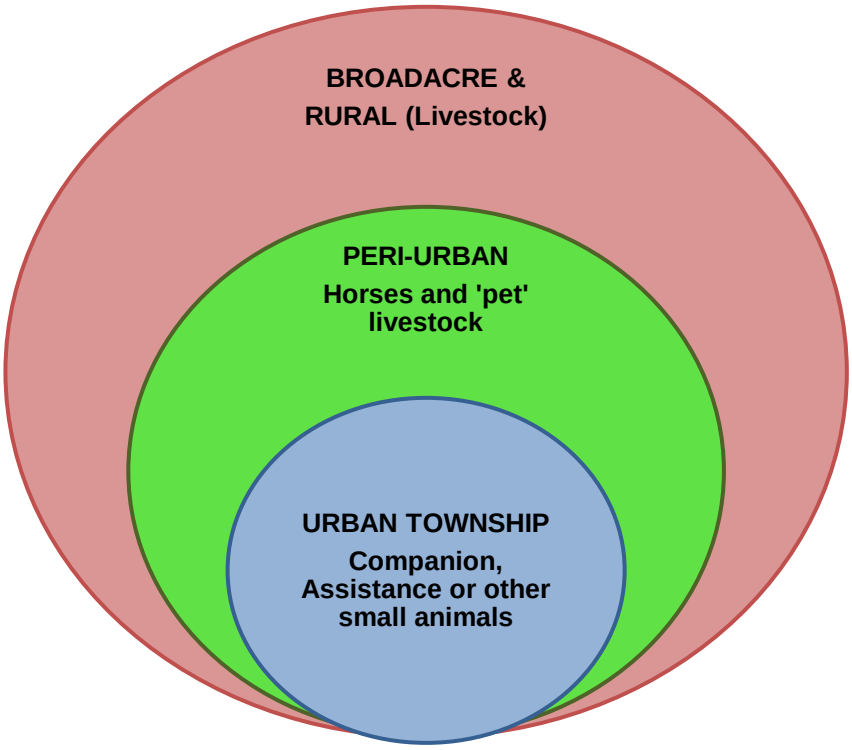


Figure 4 b: *Broadacre properties usually include all animal types. This is more restricted on smaller properties nearer townships, which typically contain small animals as pets or as assistance animals.*

Research phases

From the first stages of design, a sequential mixed methods approach was planned, with one major qualitative phase, and one smaller quantitative phase. The aim of the qualitative phase was to obtain a comprehensive understanding of the expectations, experiences and needs of communities who have "lived through" bushfire emergencies, and expect to face this hazard again. (See *Interview guides,* Appendix E, also included in Paper 2). As the study progressed, the second (quantitative) phase survey was re-designed to a 'pilot' instrument due to the quantity and quality of the qualitative data obtained, and with respect to the constraints of time and funding for the project. Irrespective of this change, the two phases remained complementary, with the qualitative data informing the pilot survey, and survey data cross-checking and validating the phase 1 findings. The sequential design of the qualitative phase meant that earlier data could be used to inform and cross-check discussions and interviews that followed.

This researcher's situationalist orientation (i.e. that the *needs of the study* should govern the choice of philosophical paradigm) indicated a pragmatic approach, with a critical realist ontology (i.e. that a reality exists to produce knowledge that might make a difference and have practical applications) and a contextualist, experiential epistemology (i.e. that knowledge is situational and emerges from contexts) (Braun and Clarke, 2013, Savin-Baden and Major, 2013). Researcher positionality was reflexively scrutinised throughout the project. Sikes describes the need for researchers to be mindful of the continuum between etic and emic perspectives, and of maintaining a balance between the idiographic and the nomothetic (Sikes 2008). Guba and Lincoln (1986) write, "the relationship between researcher and respondent, when properly established, is one of respectful negotiation, joint control and reciprocal learning".

Research design and method, researcher positionality, and application of criteria for academic rigour are described in detail in Paper 2. Minor variations (due to inclusion of different parts of the data set) in later papers are included in each publication.

Phase 1

Rigour in qualitative research

The requirements for academic rigour in the qualitative phase were closely considered throughout the research, beginning with Guba's classic paper published over three decades ago (Guba, 1981), outlining the criteria used to assess the trustworthiness of findings in naturalistic data. These are summarised below in Table 1.

PRAGMATIC QUALITATIVE PARADIGM	RATIONALISTIC QUANTITATIVE PARADIGM	ACHIEVED BY USING
CREDIBILITY **Using TRIANGULATION, CROSS-CHECKING - ("member checks") & PEER DEBRIEFING**	**INTERNAL VALIDITY**	**1. Analysis which is independent of theory** **2. Semi-structured interviews and focus groups sequentially with two different participant groups** **3. A major qualitative & minor quantitative phase overall** **4. Clarification of issues during discussion** **5. Peer-review of publications**
TRANSFERABILITY **With "THICK" DESCRIPTION (of context)**	**EXTERNAL VALIDITY, GENERALISABILITY**	**A narrative of context & "fitness" of findings as context-relevant. This allows comparison with other contexts to which the interpretations may be transferred**
DEPENDIBILITY **Using an AUDIT TRAIL**	**RELIABILITY**	**An account of the *process* of data collection, analysis and interpretation**
CONFIRMABILITY **Using TRIANGULATION & REFLEXIVITY**	**OBJECTIVITY**	**1. A confirmability audit – data exist & are mutually compatible with interpretation.** **2. Discussion which includes evolution & shifts in orientation – i.e. an wholistic focus beyond only research questions & method.** **3. Triangulation, as above.**

Table 1: Rigour in qualitative research *(Guba, 1981, Braun and Clarke, 2013, Savin-Baden and Major, 2013).*

These criteria can be applied during, and after, a study to confirm academic rigour (Guba, 1981, Guba and Lincoln, 1986, Lincoln and Guba, 2013). Guba (1981) goes on to state that the choice of paradigm (such as rationalistic or naturalistic) is like selecting the most appropriate statistical analysis for data; that qualitative and quantitative methods are equally useful in both the above paradigms, and that

naturalistic inquiry in the “real” world (original quotation marks) builds upon and expands tacit knowledge, beyond the confines of propositional knowledge alone. Cronbach (1975) adds that all generalisations (external validity) decay over time like a radioactive half-life, and therefore phenomena are inextricably linked to context.

Data collection methods - Focus groups and interviews

Focus group discussion were chosen for three main reasons: (i) they are an established and well-regarded method of data collection in qualitative research and have been used extensively across different disciplines (Morgan, 1993, Wilkinson, 1999, Bloor, 2001, Silverman, 2005) (ii) the supportive nature of a group environment, where participants were likely to know one another, and may have had shared bushfire experiences with friends or family members, and (iii) convenience - for example, at a regular training event, or at the start of a shift. Focus group discussions enabled detailed examination of complex behaviour and canvassed a range of opinions in a supportive, relatively naturalistic and non-exploitative setting (i.e. the power balance favours the participant). Thus it is ‘participant friendly’, conveying respect and appreciation of group members’ involvement. Answers to open-ended questions about subjective topics provided rich and complex detail, free of the assumptions and priorities contained in a quantitative survey written by a researcher. A focus group is in itself a social context, and the primary data obtained is accessible *because* of the interactions of the group. Facilitated by careful, though minimal, guidance by the researcher to check meanings or tactfully direct the discussion to cover relevant material, the group dynamic can function to “jog the memory” of some group members, encourage those more reticent to actively join the discussion, or raise sensitive topics in a considerate manner. Focus groups are also helpful where a feedback process, e.g. from animal owners to policy makers, needs a stronger or alternative voice (Morgan, 1993, Wilkinson, 1999, Bloor, 2001).

Semi-structured interviews were conducted *in situ* in the workplace or at the participant’s home for participant convenience. Several participants were interviewed by telephone – because they were enthusiastic about joining the study but no mutually convenient time to meet could be found. Senior officers or team leaders, farmers and some animal owners were interviewed individually as this overcame the need to bring individuals with conflicting professional and personal schedules together in one place and time. Ethically, senior emergency responders were also

more amenable to discuss sensitive material regarding their crews in a one-on-one interview.

The potential for raising distressing and emotive issues was a risk in this research, especially in a small regional and rural community, where everyone is aware of someone adversely impacted by fire, and shares the psychological and emotional burden. This was addressed in the Ethics application. *(See also Illustration 4).*

Treatment of data

Thematic Analysis (TA) (Braun and Clarke, 2006, Braun and Clarke, 2013, Savin-Baden and Major, 2013) was used for data analysis because it is a flexible method independent of theory – and hence contributes to *credibility*. Data familiarisation using transcripts of narratives from audio recorded focus groups and interviews preceded data-driven, inductive analysis techniques (i.e. from generalizations to specifics, discovering patterns, themes and categories in data) (Teddlie and Tashakkori, 2009).

In TA, writing is an *active* process and *is* the analysis (Braun and Clarke, 2013). This enables a deep affinity with the data as the researcher becomes immersed in the process, gradually transitioning from the vital, early familiarisation stage, to an appreciation of the data's intricate depths as analysis develops. Themes are *actively* identified by the researcher – they do not 'emerge'.

Initial general coding of data followed the familiarisation process, after which common themes across codes were identified, reviewed and named (Appendix F) (Braun and Clarke, 2006). These steps can overlap or run in parallel – they are not necessarily chronologically linear. Research questions were refined and critically considered throughout this process. Analysis moves dynamically from descriptive to interpretative, from semantic to latent meanings and critical interrogation, shifting the weight, or 'burden of proof', (though not the value) of analysis from the participant to the researcher (Braun and Clarke, 2013, Savin-Baden and Major, 2013).

An unequivocal positionality statement should accompany a well-written qualitative research paper. At the outset of analysis, positionality was explored at length, because the paradigm to which the research is aligned is at the very epicentre of

clarity and credibility. Therefore, some time was taken concerning positionality precision.

Software was useful to manage the data. Coding on a parallel spreadsheet was complementary to the software (see Appendix H), but would have been cumbersome with respect to selecting data extracts – this was more straightforward using the CAQDAS system, NVivo 11. Using the two programs alongside each other was a useful way to cross-check coding, rather like a two-set Venn diagram with a large intersection set, or solving a Sudoku puzzle looking at what numbers are NOT there, rather than the numbers that are.

Phase 2

The decision towards the end of phase 1 to revise the survey's role in the research was taken for several reasons, including:

1. It was part of the original research plan during initial scoping
2. It contributed to rigour (triangulation)
3. It reduced bias by removing the influence of other participants (as in a focus group discussion)
4. There was a preference to engage with the farming sector
5. As an aid to identify primary producers' strengths and needs

Piloting the survey enabled it to be checked for clarity and length, recruitment procedures could be assessed to help determine sample size, and general errors or omissions could be corrected to ensure high quality outcomes of the survey proper (Dillman, 2014).

Treatment of data

There were 53 responses to the pilot survey – 52 online and one in hard copy, with 37 completed. Twenty (20) of these were from farmers who had previous experience of bushfire on their properties. This data set was descriptively analysed to triangulate the farmer interview data from phase 1 of the study (Chapter 7).

The rural primary producer is undoubtedly worthy of further research, to usefully address the skills, needs and culture of the sector – both in terms of their fire-fitness behaviour and activities, and to identify ways to improve process and procedure to positively improve their outcomes. Of particular interest is to determine if rural

primary producers' skill sets include preparedness activity strategies which may be usefully translated to other rural dwellers to improve their safety – this was notionally included in the pilot survey. Additionally, animal owning primary producers are often grain growers - modern techniques of conservation farming, and the impact those systems have on fire behaviour do require further investigation.

Illustration 3: *Port Lincoln Times reporter speaking to two participants in the horse owners' focus group in North Shields, Eyre Peninsula.*

CHAPTER THREE – The narrative of Paper 1

THIS CHAPTER CONTAINS:

- **Rationale for Paper 1**
- **Paper 1 as published**
- **Contemporary relevance of the paper**
- **Literature review update**

THE RATIONALE FOR PAPER 1

Finding a framework to help improve protective behaviour in bushfire
Scope Protection Motivation Theory (PMT) for preliminary assessment
PMT offers coping appraisal rather than only threat appraisal
Positive outcomes demonstrably more attainable
PMT is more humane and arguably more effective than *fear appeals*
PMT has been used in varied contexts over four decades
PMT is a flexible and robust socio-cognitive theory
PMT may achieve healthier psychological outcomes for people post event
Therefore assess PMT in detail with respect to this research

Box 3: *Rationale for P1*

PAPER 1 as published, following on pp 22-35

WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology, 5,13.*

Westcott et al. BMC Psychology (2017) 5:13
DOI 10.1186/s40359-017-0182-3

BMC Psychology

DEBATE Open Access

Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies

Rachel Westcott[1,2*], Kevin Ronan[3], Hilary Bambrick[4] and Melanie Taylor[1,2,5]

Abstract

Background: Protection Motivation Theory (PMT) was developed by Rogers in 1975, to describe how individuals are motivated to react in a self-protective way towards a perceived health threat. Rogers expected the use of PMT to diversify over time, which has proved true over four decades. The purpose of this paper is to explore how PMT can be used and expanded to inform and improve public safety strategies in natural hazards. As global climate change impacts on the Australian environment, natural hazards seem to be increasing in scale and frequency, and Emergency Services' public education campaigns have necessarily escalated to keep pace with perceived public threat. Of concern, is that the awareness-preparedness gap in residents' survival plans is narrowing disproportionately slowly compared to the magnitude of resources applied to rectify this trend. Practical applications of adaptable social theory could be used to help resolve this dilemma.

Discussion: PMT has been used to describe human behaviour in individuals, families, and the parent-child unit. It has been applied to floods in Europe and wildfire and earthquake in the United States. This paper seeks to determine if an application of PMT can be useful for achieving other-directed human protection across a novel demographic spectrum in natural hazards, specifically, animal owners and emergency responders in bushfire emergencies.
These groups could benefit from such an approach: owners to build and fortify their response- and self-efficacy, and to help translate knowledge into safer behaviour, and responders to gain a better understanding of a diverse demographic with animal ownership as its common denominator, and with whom they will be likely to engage in contemporary natural hazard management. Mutual collaboration between these groups could lead to a synergy of reciprocated response efficacy, and safer, less traumatic outcomes.

Summary: Emergency services' community education programs have made significant progress over the last decade, but public safety remains suboptimal while the magnitude of the awareness-preparedness gap persists. This paper examines an expanded, other-directed application of PMT to expand and enhance safer mitigation and response behaviour strategies for communities threatened by bushfire, which may ultimately help save human life.

Keywords: Protection motivation theory, Animals, Animal owners, Emergency responders, Bushfire, Wildfire, Natural hazards, Preparedness

* Correspondence: R.Westcott@westernsydney.edu.au
[1]Centre for Health Research, School of Medicine, Western Sydney University, Campbelltown, Sydney, Australia
[2]Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, Australia
Full list of author information is available at the end of the article

BioMed Central

© The Author(s). 2017 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

If you are an able bodied person on your own with one cat then it's simple – have a backpack ready, put the cat in a carrier and you're away in about 30 seconds. If you're a single mum with an autistic child and an assistance dog, and you have Nanna on Tuesdays and you have six chooks, two ponies, three dogs and goldfish, you're better off starting in about September.
South Australian Country Fire Service Community Engagement Officer Therese Pedler, 2015.

Background

Bushfires are increasing in Australia and worsening globally within temporal and geographic parameters: the corollary of climate change and increasing severe weather events [1, 2]. Fire can become an emergency when people, property, the environment and other assets are affected: the animal-owning public faces this challenge alongside the need to properly and safely manage their animals in addition to themselves. Animal owners are a diverse and widespread group whose needs have not been specifically examined in the context of bushfire, despite the growing understanding of the strong link between effective animal management in an emergency and the saving of human life [3, 4]. In addition, while approximately 63% of Australian households own companion animals [5], the number of animals owned by primary producers, and in animal oriented businesses, is much larger [6].

Prevention and preparedness, the prerequisites for effectively managing a (bushfire) risk, are widely documented as being poorly implemented across all hazards [7–10] whether animals are involved or not. Although community awareness of the danger posed by bushfires seems to be increasing [11], messages of hazard mitigation and preparedness still are inconsistently received, despite the escalation of Emergency Services' public education campaigns throughout the last decade. The *awareness-preparedness gap* in community and individual residents' survival plans is narrowing disproportionately slowly compared to the magnitude of resources utilised to reverse this trend. Thus, new strategies and tactics which resonate broadly with people in at-risk areas and demographics need to be identified and implemented, to accelerate the transition from awareness into action [9, 12]. The impetus is human health and safety, and in simple economic terms, prevention and preparedness are vastly less costly than response and recovery [13, 14].

The presence of animals adds varying degrees of complexity to owners' preparedness and planning when faced with an emergency such as fire or flood. Any subsequent reluctance or delay in adopting safe and timely behaviour can lead to injury or even loss of life, and further, risk the lives of emergency responders. Synergistic collaboration promoting shared responsibility, self-sufficiency and a deeper reciprocal understanding between emergency responders and animal owners can build trust, promote community engagement and strengthen a community's capacity to respond and recover [12, 15].

To date, the majority of the academic literature about animal owners in disasters is skewed towards the retrospective experiences only of pet owners [16]. This omits to document the interaction between animal owners and emergency responders during an incident involving many species of animals owned in a variety of contexts, or present in wildlife habitat. Consequently, there is a need to investigate these different groups to fill current gaps in emergency communication and warnings, either within, or beyond, both groups [17, 18]. This paper contributes to filling this gap. It explores an application of Protection Motivation Theory (PMT) to better theorise and understand the behaviour of animal owners in bushfire to facilitate targeted and meaningful preparedness initiatives and motivate the translation of knowledge into effective, adaptive action.

A case study of a bushfire at-risk regional centre located on the Lower Eyre Peninsula in South Australia – commonly referred to as "the driest state in the driest continent" [19] will be used to investigate the interactions and challenges facing animal owners and emergency responders, and to determine if an application and expansion of PMT can contribute to new or enhanced mitigation and preparedness measures which can be integrated into current arrangements to promote human safety and support community well-being.

Several distinguishing factors determined the research site. These include (i) the area's recent and severe fire history; (ii) regional people tend to appear more resourceful and self-reliant than their urban counterparts [4, 20–23]; (iii) the diversity of animal owners; and (iv) geographical location - it is distant enough from large cities to require some effort and expense to visit, and hence is not "over" researched.

Animal owners overall are a diverse group who could include owners of one or several animals, primary producers, animal Small to Medium Enterprise (SME) operators and guardians or custodians of wildlife. In addition to firefighters, emergency responders can include police, rescue officers of the State Emergency Service (SES), staff of the Royal Society for the Prevention of Cruelty to Animals (RSPCA), Government agriculture officers, Department of Environment rangers, veterinarians and other stakeholders. The 'unpublished observations' noted in this paper are not part of data collection. These are essentially personal communications from some stakeholders during preliminary investigations for research design.

A pragmatic approach within a critical realist ontology and contextualist, experiential epistemology guided this qualitative research design, due to the need to arrive at

practical answers to issues of policy and practice [24–26]. Thematic Analysis (TA) [25, 27] was chosen for data analysis because it is a flexible, versatile method which is independent of theory (7, 20). This allows for extraction of detailed, experiential material from the data to examine in the context of the application and proposed expansion of PMT.

Using PMT, a robust and flexible social theory, animal owners of all categories may be assisted to better understand their own response behavior ahead of seasonal danger, so that it becomes safer, instinctual and routine. The ability to translate awareness into effective planning and preparedness well before the superimposed pressures of an imminent threat arrive, and to collaboratively engage with emergency responders and the community, may help to significantly narrow the gap between hazard awareness and hazard survival.

In his 1983 revision of PMT, Rogers noted that he expected new and different applications for his theory to be developed in the future [28–30]. This has proved to be true over four decades, evolving into disciplines beyond the health sector.

This paper reviews how the use of PMT has evolved beyond self-directed health applications, and explores its potential relevance to animal owners in the context of bushfire. Consequently, it proposes an extension to the theory with respect to other-directed human behavior in natural hazard emergencies. The corollary of this extension aims to be practical, and testable, applications by emergency responders to assist in community engagement, and to improve natural hazard preparedness and planning for animal owners and/or in the presence of animals. A strength, and test, of adaptable, versatile social theory is its ability to successfully "bridge exploration and problem-solving" (Akama, Y. personal communication 2015). Actively applying theory to enquiry, and using the results to form practical strategies beneficial to animal owners *and others*, could help narrow the awareness-preparedness gap overall, and illuminate other research possibilities.

Protection Motivation theory – genesis and early development

Protection Motivation Theory, [28] was originally developed for the health promotion and disease prevention sector, and describes how individuals are motivated to react in a protective way towards a perceived threat. It has four key elements: "threat appraisal", followed by "coping appraisal", which comprises "response efficacy" – the belief that certain processes *will mitigate* the threat - and "self-efficacy", an individual's idea of their *own ability* to implement the required actions to mitigate the threat.

Rogers listed four key elements of PMT thus:

1. the perceived severity of the hazard } — *Threat*
2. the likelihood of the hazard occurring } — *Threat*
3. what mitigation measures are available, and } — *Coping*
4. the individual's ability to successfully enact those measures } — *Coping*

Protection Motivation Theory can be applied to "any threat for which there is an effective recommended response that can be carried out by the individual" [31]. Maddux and Rogers [29] found self-efficacy to be "the most powerful predictor of behavioural intentions" that precede actual behavior [10]. A robust self-efficacy is more likely to (i) lead to the taking of protective action in an appropriate timeframe, (ii) influence the degree of receptivity to information and (iii) promote the likelihood of taking effective remedial action [12, 32].

The objective of PMT is to recognise and assess the danger, and then counter this assessment with effective and efficacious mitigation options. This makes PMT applicable to many social problems; it has been applied to studies of natural hazards - earthquake in the United States, and flood in Germany and France [33–35], as well as adaptations to climate change [36, 37]. This is consistent with Rogers' observation in his 1983 revision that other factors could influence protection motivation and coping behaviors of individuals and groups.

Protection Motivation Theory is recognised as a more mature, sophisticated and humane process than its sometimes controversial [38] predecessor, *Fear Appeals* theory. Tanner [39] explains how frightening the target audience "is not the objective – promoting responsible behaviours is". Using fear as a motivator eventually plateaus and becomes ineffective, and fails to advocate for positive outcome expectancy, or inform how this might be achieved.

Rogers' 1983 revision of PMT [30] produced a more comprehensive model which included adaptive response costs and maladaptive response rewards in the cognitive mediation equation. This resonates significantly among animal owners facing complex decisions in the variably complex environment of their own social microclimate. Precisely because of this relevance to animal owners as a demographic sharing a core commonality which is anecdotally repeatedly reported as being problematic in emergencies, PMT is a logical avenue to explore in developing an enhanced and expanded emergency

response theory. A background review of the animals in emergencies literature follows, preceding a description of PMT, and its advantages in this area.

Literature review

The case for considering animals in emergency management

It is widely agreed that animals add enrichment and complexity to modern life [40–44]. In emergencies, the presence of animals may distract, deter or encourage timely and safe behaviour. Recently there has been a resurgence of academic interest in animal emergency management, following a flurry of publications post Hurricane Katrina, the storm system which struck the Louisiana, USA, coast in 2005. The post-Katrina interest waned, but the grey literature remained engaged, as jurisdictions, particularly in Western society, began to understand more about the importance of including animals in emergency planning. This is evidenced in new and amended legislation, Government documents, official reports, documentary accounts of incidents and the evolution of emergency systems and plans [45–49]. Emergency management has become more sophisticated, and has embraced an increasingly humane and holistic regimen that recognises the importance of psychological health, and that empowered communities may be better able to confront and prevail against adversity [17, 18, 50–54].

Pets are routinely described by their owners as "one of the family" [4, 55–60]. Taylor, Lynch et al [60] found that 86% of Australian pet owners, stated that their pets "made them happy", and 88% said that their pets were "great companions". The Council of Australian Governments' National Strategy for Disaster Resilience [15] has provided overarching guidelines for the direction of Australian emergency management, and has embraced all aspects of this discipline, including provision for animals [61]. Given that 63% of Australian households own a companion animal, and that Australians value their companion and non-companion animals highly, animals need to be included as part of formal emergency management plans. This extends well beyond simplistic "animal welfare" in isolation: while this is important, it is far more significant when the context and extent of human-animal relationships is acknowledged and understood [4, 56, 62–66].

The costs of prevention versus recovery

Devastating large scale events which attract the world's attention, such as Hurricane Katrina, have been well documented with respect to the destruction and chaos they bring to people, communities and ecosystems. Natural hazards of varying degrees of severity frequently appear in news bulletins, usually, and understandably, reporting primarily on the human tragedy. In developed countries, the last decade of emergency management has seen changes which privilege environmental concerns in an increasingly holistic approach, and recognise that *prevention* is vastly less costly than *recovery*–in economic, social and environmental terms [13, 14, 41].

Evacuation and relocation of people and pets

Action inertia has been described as a "barrier to safe behaviour" [67]. Evacuation failure due to animal ownership (i.e. animals, directly or indirectly, being the cause of the "inertia"), has been discussed for some time in the disaster literature [4, 50, 59, 68–71]. Timely and well-prepared evacuation or voluntary relocation is often one of the main desirable protective behaviours, and is the focus in this investigation of applying PMT to animal owners and emergency responders in bushfire emergencies.

The strength of human-animal relationships can influence readiness to evacuate [4]. Heath [69] found that evacuation failure in households with pets was greater than in households with children. However, in households where animals were generally managed more responsibly, such as with regular visits to the veterinarian, animals were less likely to adversely influence timely evacuation. Hunt [50] notes that while post-Hurricane Katrina legislation has improved evacuation compliance in the United States, animal owners still name pet ownership as an obstacle to leaving a residence in accordance with emergency evacuation notices.

Providing evacuation facilities for pets, preferably accompanied by their owners, presents considerable logistical and public safety challenges. However, the provision of such a facility could be advantageous for longer term human psychological health, given that pet loss has been found to predict Post Traumatic Stress Disorder (PTSD), acute stress and peri-traumatic dissociation [72].

The importance of place

Attachment to place is an important consideration to help understand why residents choose to live in areas of higher fire danger, and when managing people displaced from their communities and familiar, secure environments [12, 40, 73, 74]. Eriksen, Gill et al [73] and Paton [12] note the significance of this decision to live in areas of higher fire danger - as people seek refuge from the intensity of urban living, the attraction to a place of peace and beauty is strong. An aesthetically pleasing location, chosen because of its flora *and* fauna, is as much a part of experiencing and achieving good mental health as its destruction by fire is the reverse. New residents may or may not possess sufficient rural living experience or skills to live safely in their new location, may be absentee land owners if they commute to city employment, or

may have purchased a property in the middle of winter when bushfires seem a distant and unlikely event. Similarly, special needs categories, such as elderly or disabled animal owners, or a single parent with a disabled child and an assistance dog, may not be as prepared and/or require additional help. For these, as well as for logistical and social reasons, relief centres are usually not far from the emergency location. Again, shared responsibility and cooperative collaboration among animal owners and responders could help reduce the stress of some inevitable and unavoidable temporary separation, while freeing up limited resources to assist those who need the most help.

Human-animal bond, grief and loss

Attachment theory [75] has expanded over time to include relationships between humans and non-human animals [62]. Animals contribute positively to human life, physically and psychologically. They are noted for the provision of unconditional love and non-judgemental behaviours. Joy, sorrow, love and friendship are all qualities attributed to companion animals. They have a role as diffusers of social awkwardness, or as the means by which new relationships and introductions might form. Some animal owners consider themselves closer to a pet than to family, and rate a pet as being more supportive than humans during times of extreme stress [42, 56, 63]. All groups, including emergency responders, who deal with animals in emergencies or disasters are at risk of psychological trauma, and should have access to mental health services that have an understanding and acknowledgement of the importance and complexities of the human-animal bond [4].

Grief and loss following animal deaths is often not given social legitimacy [42, 58], but should be acknowledged and supported. An absence of the expression of grief can lead to unresolved anger and sadness, and may complicate recovery. Human response to the death of a single animal, possibly the only one an individual has owned, may be very different to the devastation experienced by a farmer facing the loss of an entire herd or flock, but is no less valid [41]. For farmers, the loss is much more complex than only the monetary loss of that year's wool or meat – frequently many generations of a farming family have added to and established valuable animal genetics which are irreplaceable. Even large scale farmers often know the animals in their breeding herds individually by name. Multigenerational family achievement, reputation and therefore legacy to future generations can be destroyed in a bushfire within hours, with sometimes additional tragic consequences.

The Hurricane Katrina response in August 2005 is infamous for the mass human turmoil and displacement which occurred [16, 18, 76]. In many respects, the Hurricane Katrina emergency illuminated the importance of animals in Western society [76] and was a catalyst for passing of the Pets Evacuation and Transportation Standards (PETS) Act [49] in the wake of public outcry over the impact that event had on animals. Leonard and Scammon [63] explain that the rationale behind the PETS Act was to provide increased safety for humans, encouraging animal owners to evacuate in a timely manner, knowing their animals are not forgotten, with animal welfare as a secondary basis for the legislation.

Challenges

There are a number of challenges to address among animal-owning groups. These were identified in the literature and during preliminary investigations and research design, and include:

- Maladaptive behavior such as optimistic bias, or deferring a decision to act or evacuate by preferring to "wait and see". Often this wastes valuable life-saving time [34, 37, 67, 77].
- Belief in myth, folklore or rumour, such as the desirability of releasing animals to "escape", leaving them to wander at large on public roads – risking high impact collision with emergency vehicles, and the associated trauma, injury, and lost time [51, 78, 79].
- Self-responsibility and self-sufficiency – such as planning and finding safe places to relocate animals, which is the owner's responsibility [46, 80, 81].
- Information seeking and meaningful advice from accurate and trustworthy sources rather than relying on exaggerated or incorrect messaging [7, 55, 73, 82, 83].
- Failure to have and implement a year-round prevention and preparedness activities routine [7, 9, 11, 12].
- Adaptive response "costs" such as inconvenience, versus maladaptive "rewards", such as devoting time to a personally preferable activity [10, 30, 84].

These challenges, while not necessarily exclusive to animal owners, may be better discerned, and addressed and/or improved through different mitigation models to meet the needs of this and other groups. Viewing the challenges through the lens of the complex social microclimate, as described below in Fig. 2, affords such a perspective.

It is expected that detailed analysis following data collection will address these and other challenges actively identified in the data. The rationale for selecting PMT, and assessment of its 'fitness' as a framework to help achieve these goals is outlined below with a review of PMT over the last two decades.

People and animal well-being

At one level, animal management in and around emergencies may appear to be an issue of animal welfare alone. But, as highlighted earlier, it is about people - as animals influence people's decision making, and their fate, if adverse, adds to the burden of loss and the trajectories of recovery.

Current animal-owning household preparedness initiatives (by agencies such as the RSPCA) only target animal welfare outcomes, without articulating any possible subsequent benefits associated with human health and safety. Likewise, most of the literature about animal emergency management is about pets, and does not address the spectrum of animal ownership which exists in other sectors, such as farming, agribusiness, boarding and agistment (where animals are kept in the care of someone other than their owner, usually for a fee or reward) and other animal oriented SME's. Discussion of non-companion animal loss is beginning to shift from an exclusive focus on financial or economic implications, with more consideration being given to psychological and emotional trauma. The more open discussion of mental health issues in the public realm generally, and a better understanding of the anguish and stress sustained by bushfire survivors in particular, has prompted greater consideration for farmers who manage and treat their burned or injured animals, or shoot and perhaps massbury their livestock, often after investing decades of skill and experience in genetic selection [18, 41, 85]. The farming community as an animal-owning group, widely recognised as resourceful and self-reliant, and highly experienced in animal husbandry and land management, could contribute significantly to assist other owner groups with less experience, and fewer skills.

Future research – addressing the gap

None of the academic papers discussed above identify or document the animal owner/emergency responder interface as a resource to which PMT could be applied to improve self-efficacy or community efficacy. Nor do any scrutinise the potential to discover an untapped channel to improve hazard preparedness, or link possible broader societal gain with the potential contribution of facilitating animal owners and emergency responders working constructively together. In the context of bushfire, finding timely ways to help navigate a course for people *and* their animals to safety, could contribute to the saving of human life, and help avoid or reduce stress and mental ill-health which often occur following natural hazard emergencies [41, 63, 86]

The translation of knowledge into effective action - thereby lessening the impact of bushfire - is a fundamental necessity to create a culture of positive outcome expectancy and encourage confidence in bespoke bushfire survival plans – whatever their goal. Practical response over many years to awareness campaigns is widely acknowledged to be poor [9, 10, 12, 34, 77, 87, 88]. Figures reported by the South Australian Country Fire Service in their Annual Reports do indicate improvement, but numbers clearly demonstrate the persistently low correlation between awareness and positive behaviour change. In the 2014-15 Annual Report, 97% of the community responded that they understood the need for a plan, but only 41% (up from 25% the previous year) of respondents had actually taken the next step and created a plan suitable for their social microclimate [11]. Despite well-resourced bushfire prevention and survival campaign initiatives, progress in achieving behaviour change remains slow. The vision of this study is to endeavour to create a foundation of a *preceding* culture of preparedness as routine 'business as usual' – as routine as buying groceries or putting fuel in a motor vehicle. Ways to do this are the subject of later data analysis, and broadly involve examination of (i) flexibility of the workplace (ii) municipal fees and charges, and (iii) crop management among farmers.

Future research needs to address gaps in public policy and private practice to help people live and interact more safely in bushfire at-risk areas - often chosen for their natural beauty and nurturing surroundings; this includes routinely establishing emergency plans as relevant to the social microclimate, and, knowing when to leave. Although the best plans can fail – in itself a cause for psychological distress - the consequence of *not* planning could at worst lead to loss of human life, or long or short term morbidity. For people who experience a large scale bushfire, life will never be the same, regardless of personal impact. The social, environmental and economic costs post event can be immense. Animal owners and emergency responders are two groups well placed to contribute to research to help people live and interact more safely in bushfire at-risk areas.

Towards a new expansion: Protection Motivation Theory – the last two decades

Other-directed applications in the health sector

In the last two decades, PMT has expanded beyond the realm of self-protection into vicarious other-directed health sector contexts such as the parent-child unit. In these studies, the use of PMT helped to understand parents' behaviour, and enhanced health communications and messaging [89–91].

Expanding PMT into the environmental domain and natural hazards

PMT has been extended beyond the health sector into the environmental domain of climate change and slow-onset risk such as drought [92, 93]. Significantly, in these studies it was found to be useful in predicting adaptive

behaviours across all aspects of the theory [94]. In a natural hazards context, PMT was used by Mulilis and Lippa [33] in a study of a highly realistic scenario (earthquake); they concluded that further research would help define PMT's application.

Grothmann and Reusswig [34] expanded PMT in a quantitative study to describe the threat and coping appraisals in greater detail than Rogers' original model, specifically pertaining to flood damage prevention. Included in their adaptation of PMT was recognition of *previous experience* (of flood), the reliability of known public protective infrastructure, the costs of private measures and maladaptive responses such as wishful thinking. Their findings concur with Tanner [39] that threat alone is not motivational, and that coping appraisal must be added in order to instill positive outcome expectancy and build response- and self-efficacy. Like Rogers, Grothmann and Reusswig believe PMT to have scope beyond its original application, and observe that a largely untapped advantage of using PMT with respect to natural hazards lies in its ability to better explain and understand human behavior. They note future research should target how to redress the current mismatch between public warnings and communication, and the uptake of appropriate preparedness and response behavior by private citizens.

Expanding other-directed PMT in natural hazards: issues of trust, complexity and response behaviour

Can PMT be applied to communities, groups, families or other collectives specifically including those with animals, exploring its application beyond the parent-child unit to variations of other-directed protective behaviour? As it evolves, dependable, robust, yet malleable social theory should be capable of contributing and responding to societal needs as they are identified. Increased understanding and implementation of more and different ways to narrow the bushfire awareness-preparedness gap will help reduce the human, economic and environmental toll of this natural hazard. Martin et al [95] observe that communities within high fire risk areas should not be viewed as "one homogenous" entity, but as comprising many different groups, each requiring particular information and assistance to successfully negotiate the threat of bushfire. Given this, PMT applied to the specific demographic of animal owners may help emergency responders anticipate how this group could behave within a scenario of threat and danger, and achieve a deeper mutual understanding and synergistic collaboration. Animal owners may learn how their own circumstances and bespoke solutions can help them reposition themselves to achieve a positive response- and self-efficacy.

After the 2009 bushfires in the state of Victoria, Australia, four theories, including PMT, were reviewed by Beatson [10]. The three others were Theory of Planned Behavior (TPB), Extended Parallel Processing Model (EPPM) [38] and Terror Management Health Model (TMHM). Each of these need, and deserve, further evaluation and research with respect to their contribution to public safety in bushfire natural hazards. However, as Beatson notes, both EPPM and TMHM could compromise preparedness actions and favour enhanced psychological resilience. TMHM also has a core focus on the influence of active, but non-conscious, thoughts of death on unsafe behaviours, which complicates further research. A limitation of TPB is that it does not differentiate between issues which may either facilitate or inhibit intention to engage in adaptive behaviour - which PMT does. Lindell and Perry's revised model of Protective Action Decision Model (PADM) [96] appears to be potentially useful in the realm of risk communication. However, as the authors note, this theory needs further evaluation.

The current study utilised PMT because of its well-documented enduring adaptability and reliability. It is also relatively pragmatic and straightforward for lay people to understand and implement. Given the indisputable imperative of improving public preparedness and safety in bushfires, PMT offers the scope for new applications superimposed on an already well-tested and developed base.

Beatson concluded by advocating the need to "stimulate targeted research which will lead to advances in community bushfire safety practice, and to find out which of the many constructs making up the theories are more important as determinants of bushfire-safety-enhancing behaviours". This research responds to this need. It expands on Grothmann and Reusswig's [34] PMT adaptation, adding the concepts of *trust and uncertainty*, *complexity of the social microclimate* and *response choices* (Fig. 1), to investigate its applicability to supporting and empowering animal owners and emergency responders in bushfire emergencies.

Trust and uncertainty

Paton [7, 74] describes *trust* as a critical element contributing to emergency preparedness. Examples include trust in agencies providing hazard information, trust in emergency services defending residents' homes, and trust in oneself – the ability to respond appropriately in the face of danger. Community participation and organizational trust directly link to outcome expectancy, and these interrelate as predictors of preparedness [12]. Trust, alongside accurate and timely information, can overcome uncertainty and avert the danger of maladaptive response [7].

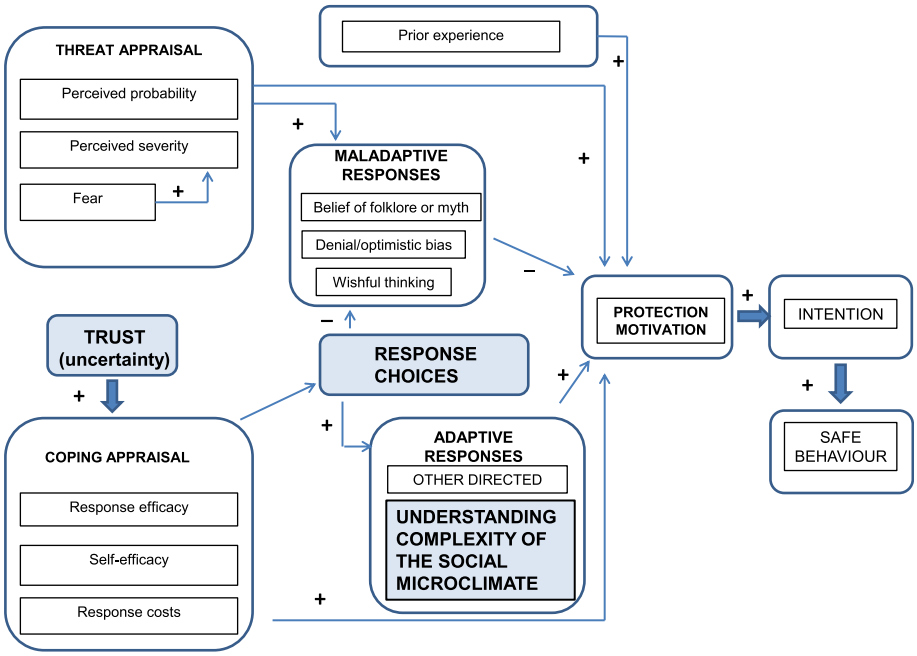


Fig. 1 Expansion of Protection Motivation Theory. After Rogers [30] and adapted from Grothmann and Reusswig [34]. *Blue shading* indicates elements of the proposed PMT expansion. Permission to reproduce in an open access journal has been obtained from the copyright holder by the corresponding author

Trust can, therefore, be assigned a place in the "coping appraisal" half of the PMT equation.

Uncertainty tends to bring community members together to find collective ways to cope, mitigate and survive hazards [12, 55]. Bockarjova and Steg [92] found that PMT contributed to understanding what motivates behavior in the "context of uncertainty". As uncertainty increases, so too does the need to reliably trust sources of information. Community regard for emergency service providers may be defined by the amount of trust they have in that agency [12], and that culture of trust is influenced by past experiences with those agencies [12, 16, 88]. A high degree of organisational trust is more likely to increase self-responsibility for actions taken, and less likely to encourage negative outcome expectancy, preparedness inertia, and fatalistic or other unsafe behavior [12, 39, 51].

Trust pertaining to animal owners

Animal owners as a demographic comprise many subgroups. Owners of livestock, horses, companion pets, wildlife and animal related businesses are major categories. All animal owners need to trust emergency services and information providers that their animals, precious for whatever reasons, will be included and not excluded from emergency discussions – before, during and after the event. Owners also need to trust that responders will understand the importance of animals *to their owners*, regardless of the reason, and that separation, loss or injury of and to them will be traumatic at some level. Trust *can* be misplaced, which is why concurrent accurate information and knowledge sharing are needed. Usually trusted sources, such as a family member or experienced neighbour, may be themselves too traumatised, or be insufficiently knowledgeable about the presenting conditions to offer the guidance needed. Any subsequently compromised animal welfare may compound distress of the owner [47].

Complexity of the social microclimate

The heterogeneity of any given community or demographic as observed by Martin et al [95] and Gordon [51, 55] means that the social microclimate of a population often defines the degree of complexity inherent in any given context or collective, including that of animal owners. Among animal owners, this complexity will be influenced by the number, skill set and roles of individual family or work group members; the numbers and types of animals present, the underlying events of daily routine, and the presence, or otherwise, of a written, practised and understood bushfire survival plan. External influences could be relationships with neighbours, colleagues, and emergency services or other service providers, and all these will cause effective hazard preparedness and mitigation behaviour to vary. Complications can include simple logistics – the numbers of

animals with respect to transport options and the time needed to evacuate or relocate animals to a place which may or may not have been pre-arranged.

When disaster is imminent, the usual differentiation among a community is temporarily lost and "debonding" – the loss of social fabric - is followed by a "fusion" into a homogeneous entity. This state is as much a threat as being de-bonded - and can preference maladaptive response [51]. Hence, concurrent social fusion may be superimposed on the social microclimate, and mask the real need for diverse coping appraisal for groups such as animal owners. Development of warnings, mitigation and response messaging protocols faces the challenge of achieving a balance between broad spectrum, generally applicable information, and providing enough bespoke material to reassure people that their individual circumstances are acknowledged and understood.

Complexity of family and household groups

A family's preparedness and evacuation options are inversely proportional to the degree of complexity of their situation, but proportional to the time required to enact their plan (Pedler, T. & Prelgauskas, E. unpublished observation 2015). Where this includes the presence of animals, and recognising the need for bespoke mitigation options aligned with the social microclimate, broad subgroups pertaining to animal ownership could include:

- the individual
- individual + household members (e.g. family, partner, children, dependent adults, elderly/disabled)
- individual + household members + animals
- individuals or community groups with attachment to non-owned animals at large, such as valued local wildlife
- self-activating or untrained volunteers

The resulting other-directed actions can be included as part of an expanded PMT coping appraisal (Fig. 2).

Individuals – when managing only oneself in an emergency, current warnings, comprising comprehensive information from multiple sources should be sufficient for a physically and psychologically healthy adult to respond safely. While individual reactions will vary, most people support and help each other, and strive to maintain common values [55].

Individuals + household members – year-round outreach by fire services' Community Engagement staff and public campaigns aims to help people understand that time needed for effective preparedness is a function of their personal and logistical resources, encouraging families to be proactive and engage in preparedness activities. This helps them recognise that effective mitigation measures *are* available, *and* can help them assess their own self-efficacy. More and better information leads to improved decision making [97] and helps avoid "highly aroused, emotionally motivated behavior" [55].

Individual + household members + animals – In this category, generalised directives may be insufficiently detailed, and bespoke solutions could be needed. This category is very broad. A family with animals such as a child's pet(s), e.g. rabbits or guinea pigs, is very different from a parent, child and assistance dog, or family with children's ponies or other "pet" livestock, a family business with animals such as boarding kennels, or a family of primary producers.

This category includes consideration of logistical problems such as multiple trips to transport animals, unsafe decisions leaving one person to move or manage stock, with or without adequate means of communication, and leaving too late – waiting "until we smell the smoke". Dangerous consequences could include being caught in a fire front, motor vehicle accidents, injury and death (Prelgauskas, E. unpublished observation 2015).

Individual or community with attachment to non-owned animals, i.e. wildlife or animals wandering at large, which have two main effects. Firstly, populations of local wildlife may be particularly valued, and their survival or otherwise can buoy or depress a community, even in the presence of widespread property damage. Secondly, animals wandering at large could be present, and pose a risk, because they are local wild or feral animals, they have escaped because fencing infrastructure is destroyed, or because they have been intentionally released.

The difficulty of these situations, apart from the danger, lies in the fact that there is often very little that can be done in the short term, and this can be distressing. Wild animals, feral or endemic, require management with particular skills and resources which may necessarily take time to arrive. Loose animals may not be contained for days or weeks, and some may never be found. Injured animals may not receive immediate attention due to higher priorities. Owners may search for animals in vain, may discover them deceased or may be distracted, by their focused concern for animals, from taking the first steps towards their own recovery. The best, or perhaps only, option available may be to record the location of an animal loose or injured as accurately as possible, perhaps with a smartphone GPS or using local nomenclature. The very act of passing that information on to emergency services personnel can bring psychological comfort and peace of mind, and is also very useful for responders.

Responders

While arguably not part of the social microclimate, the presence of responders defines the *milieu interiéur* of a

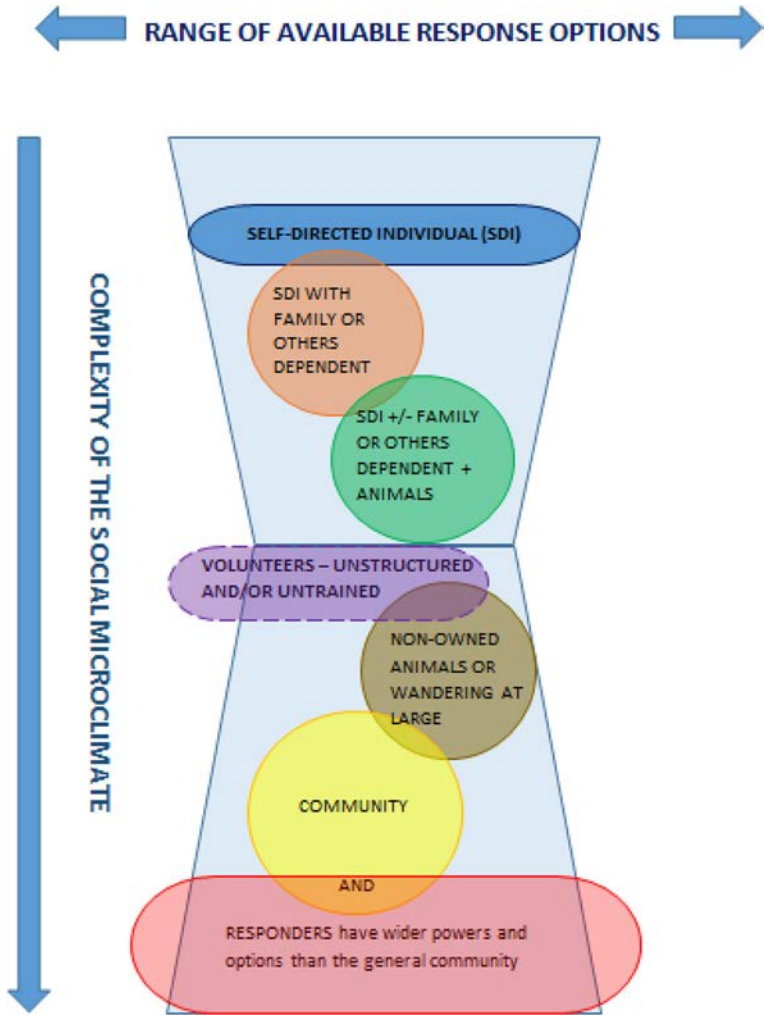


Fig. 2 As conditions become more complex, response behavior options narrow, and are themselves more complex. Legend: Responders (*red*) have the widest range of powers and options available. The "Community" (*yellow*) has fewer but still quite extensive available options, and some of these will overlap with responder services such as Local Government, or Service clubs (e.g. Rotary, Lions). Community overlaps with non-owned animals because of resources potentially deployed in management, or because particular animals are highly valued. Untrained volunteers (*purple*) need management. People with animals (*green*) are a very diverse group with more complex needs than groups without animals (*orange*). An individual (*blue*) with no dependents or special needs should have the least complex microclimate, but does not have the broad legislated capability of emergency responders

natural hazard environment. In their interactions with animals, with or without their owners, responders will need to know how to manage these incidents, and what protocols exist to deal with them. The distraction of dealing with animals as an additional duty for responders should not occur and reduces their attention to core business, i.e. firefighting to protect life, property and the environment. From an operational perspective, an animal management presence on a Staging area, would allow responders to have a direct visual cue to enable rapid and accurate appraisal of the available animal emergency response services. This could assist in building collaborative interactions between responders and animal owners, enhance adaptive response – and boost responder morale [98]. Emergency responders having no choice but to ignore injured animals they may encounter is frequently identified by them as a source of distress, and has been the reason for closed and specific psychological debriefing post event (Klinberg, D. unpublished observation, and Walsh, D. personal communication 2015) [53, 98].

Complexity due to external others

Volunteers who may be untrained or unstructured in the context of social microclimate will also need management, and therefore consume resources [17, 99]. While acknowledged here, this group is outside the scope of the current paper.

Response choices: behaviour and personal safety

Human behaviour with respect to animals is much more complex than simply the welfare of the animal. Attachment to the animal, its place or use within the family, it's value to a primary producer with or without value adding, or its importance as a performance animal are possible influences.

The presence of animals, and human attachment to them whether owned or otherwise, can influence attempts to 'save' animals with disregard for personal safety. Frequently this unsafe behaviour occurs because owners have not realized a threat is imminent, have left activating their plan too late, or possibly have succumbed to optimistic bias and denial. Dangerously, this can lead to a delayed attempt to flee, sometimes with animals in motor vehicles or trailers. Alternatively, owners may be away from home or off-farm at the time, or need more time to move large numbers of animals to safety. Owners might feel guilty if they have not prepared adequately for their animals, and this, superimposed on attachment to them can cause poor decision making such as rash attempts to return to their location. The presence of other sentient beings in an emergency may also cause a change in the behaviour of associated human beings. Generalised options are no longer viable, and the inadequacy of standard protocols could lead to maladaptive responses, including denial, belief of rumours and myth, simplistic judgement and wishful thinking.

Consequences of actions such as these could initiate a cascade of negative or even catastrophic events, leading to an avoidable risk to the lives of emergency responders or others [100]. In Australia, 42% of emergency services personnel, responding to a survey by Taylor et al [101], identified "Occasional or recurring" animal issues and 14% reported "significant or frequent" issues. The most problematic interactions occurred during the initial response, and around the rescue or relocation of animals at this time [101]. For example, overwhelming emotions can cause a limited focus on rescuing family or animals, and subsequent unsafe behavior such as an attempt to drive through a fire front. Response efficacy would be best achieved by advising fire fighters on the ground of the location of concern, enabling deployment of resources (fire crews, water bombers) to protect life and assets.

Strengths, challenges & limitations

PMT appears to have the potential to encourage animal owners to better understand and be rigorous in their bushfire preparedness, and to help emergency responders engage with owners to build a reciprocally beneficial and collaborative relationship. PMT has a very practical and applied history: it has useful depth without being overly complicated. Previous research suggests its relevance and flexibility favours an application where positive on-ground outcomes are sought and required.

PMT has been successfully used in other-directed and natural hazard contexts in the past, and its adaptability has been established over four decades. This positive 'track record' could help convince responders of its merit, however each context for potential application of the theory presents unique challenges. These may include the social microclimate as discussed above, historic and cultural considerations in community interventions, openness to new approaches and the unpredictability of human responses.

Several theories are potentially applicable to the focus of this research [10]. Others are Theory of Planned Behavior (TPB), Extended Parallel Processing Model (EPPM) [38], Terror Management Health Model (TMHM) and Protective Action Decision Model (PADM) [96]. Further research could explore these, and their possible contribution to improve community safety and well-being.

Community intervention has its own inherent challenges. For example, after the Victorian bushfires in southern Australia in February 2009, recovery agencies found problems such as a pre-existing suboptimal relationship between a community and fire authorities, the presence of seasonal temporary residents, variable levels of hazard awareness, and false beliefs about the need for preparedness, all being barriers to effective engagement [88]. Similar issues could be found among hazard preparedness and response processes.

Unfamiliarity with PMT is another limitation. Most front-line, operational responders to bushfires would not be familiar with the theory or its principles. They may even be cautious or sceptical about the use of academic social theory in the practical context of firefighting. Given this, some responder education may be necessary to illustrate the value of PMT. Even so, a willingness to engage with PMT training, as a new and unfamiliar approach, could itself be a challenge.

Attachment to animals is a further potential barrier to the effective application of PMT. Emotive attachment to animals could override adaptive response in some circumstances, and could affect responders as well. Overcoming maladaptive response to ultimately achieve safe behaviour means that adaptive response needs to become instinctual and reflex, and adopting that assertion routine.

Conclusion

The proposed expansion of PMT, as discussed in this paper includes *trust*, *complexity of the social microclimate*, and *response choices* as additive, interactive and testable, elements relevant to the subject groups of animal owners (of all kinds of animals) and emergency responders. This expansion connects an other-directed and natural hazards application, within a demographic and a context not previously researched. Owning animals has been identified as

contributing to complicated, delayed or failed human evacuation, and as a trigger for untimely attempts to return to homes and properties to remove pets and other animals in the face of danger. As a diverse group consisting of nearly two thirds of Australia's population, animal owners may helpfully contribute to contemporary emergency management problem solving. In parallel with emergency responders, new and effective paths to safer communities may be found.

An expansion of PMT, and its implementation as a tool to help emergency responders understand and work positively with animal owners, as detailed above, seems plausible and worthy of further investigation. The theory's depth, in combination with its pragmatism, suggests its potential to be accepted by responders and to effectively improve procedures and outcomes in what can be traumatic and tragic circumstances, often with long term adverse social, environmental and economic consequences.

The literature suggests that PMT is robust, versatile and is still in widespread use after four decades. Its enduring relevance is a key indicator of its usefulness and dynamic applicability, and its evolution since 1975 suggests a baseline theory with considerable scope. PMT has offered solutions in several different realms of enquiry since 1983, as predicted by Rogers. Recently identified as a theory likely to have more to contribute, an expansion into a new application as proposed in this paper may determine solutions which will help achieve safer processes and response behavior, and narrow the bushfire awareness-preparedness gap.

Abbreviations

EPPM: Extended parallel processing model; GPS: Global positioning system; PADM: Protective action decision model; PETS Act: Pets evacuation transportation standards act; PMT: Protection motivation theory; PTSD: Post-traumatic stress disorder; RSPCA: Royal Society for the Prevention of Cruelty to Animals; SES: State emergency service; SME: Small to medium enterprise; TBP: Theory of planned behaviour; TMHM: Terror Management Health Model; USA: United States of America

Acknowledgements

Grateful thanks are extended to Susan Mowbray, Western Sydney University, for her invaluable contribution to earlier drafts of this paper.

Funding

This research is funded by the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC), Australia, and is part of the *Managing Animals in Disasters* (MAiD) project. Other than general approval of the overall structure, and agreement to pre-determined milestones, the funding body has no role in the design of the study and collection, analysis and interpretation of data and in writing the manuscript.

Availability of data and materials

Not applicable.

Authors' contributions

RW and MT contributed to the initial design of the research project on which this manuscript is based, all authors contributed to refinement of the design and research that is currently underway in support of this. RW drafted the manuscript and MT, KR and HB contributed to revisions. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

Not applicable.

Ethics approval and consent to participate

Ethics approval for research that is being undertaken as part of this study has been granted by the Human Research Ethics Committee of Western Sydney University, approval number H11118.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Author details

[1]Centre for Health Research, School of Medicine, Western Sydney University, Campbelltown, Sydney, Australia. [2]Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, Australia. [3]Clinical Psychology, School of Health, Medical and Applied Sciences Central Queensland University, Rockhampton, QLD, Australia. [4]School of Public Health and Social Work, Queensland University of Technology, Victoria Park Road, Kelvin Grove, QLD, Australia. [5]Department of Psychology, Macquarie University, Sydney, Australia.

Received: 15 August 2016 Accepted: 11 April 2017
Published online: 26 April 2017

References

1. Intergovernmental Panel on Climate Change: Fifth Assessment Report. 2016. https://www.ipcc.ch/report/ar5/Accessed 21 Feb 2015.
2. Kitching R. IPCC: Australia and New Zealand face greater fire and flood risk, damage to coral reefs. 2014. http://theconversation.com/ipcc-australia-and-new-zealand-face-greater-fire-and-flood-risk-damage-to-coral-reefs-24642 Accessed 21 Feb 2015.
3. Thompson K. Save me, save my dog: Increasing natural disaster preparedness and survival by addressing human-animal relationships. Aust J Commun. 2013;40(1):123–36.
4. Hall MJ, Ng A, Ursano RJ, Holloway H, Fullerton C, Casper J. Psychological Impact of the Animal-Human Bond in Disaster Preparedness and Response. J Psychiatr Pract. 2004;10(6):368–74.
5. Royal Society for the Prevention of Cruelty to Animals. How many pets are there in Australia? RSPCA Knowledge Base. 2014. http://kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html Accessed 29 Dec 2014.
6. Primary Industries and Regions South Australia. Property Identification Codes and Statistics Report. Adelaide: PIRSA; 2015.
7. Paton D. Risk communication and natural hazard mitigation: how trust influences its effectiveness. Int J Global Environ Issues. 2008;8(1-2):2–16.
8. Paton D. Understanding Preparedness for Natural Hazards: A cross cultural comparison. J Integr Disaster Risk Manage. 2013;3(1):1–18.
9. Ronan KR, Johnston DM. Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families. New York: Springer; 2005.
10. Beatson R, McLennan J. What applied social psychology theories might contribute to community bushfire safety research after Victoria's 'Black Saturday'. Aust Psychol. 2011;46(3):171–82.
11. South Australian Country Fire Service. South Australian Country Fire Service Annual Reports. 2015. http://www.cfs.sa.gov.au/site/about/publications.jsp Government of South Australia. Adelaide. Accessed 15 October 2016.
12. Paton D. Disaster resilient communities: developing and testing an all-hazards theory. J Integr Disaster Risk Manage. 2013;3(1):1–17.
13. Attorney-General's Department: Productivity Commission inquiry into natural disaster funding arrangements. 2014. http://www.pc.gov.au/inquiries/completed/disaster-funding/submissions/submissions-test/submission-counter/sub090-disaster-funding.pdf Attorney General's Department. Canberra: Commonwealth of Australia. Accessed 22 Mar 2016.
14. Chard S. Building Disaster Resilience in Australia and Worldwide. Australia and New Zealand Disaster and Emergency Management Conference Proceedings, Gold Coast: ANZDMC. 2015. http://blog.anzdmc.com.au/. Accessed 1 May 2016.
15. Council of Australian Governments. National Strategy for Disaster Resilience: Building Our Nation's Resilience to Disasters. Department of the Prime Minister and Cabinet. Canberra: Commonwealth of Australia; 2011.

16. Tuason MTG, Güss CD, Carroll L. The disaster continues: A qualitative study on the experiences of displaced Hurricane Katrina survivors. Professional Psychol. 2012;43(4):288–97.
17. Heath SE, Linnabary RD. Challenges of managing animals in disasters in the U.S. Animals. 2015;5(2):173–92 (2076-2615).
18. Rogers C. The critical need for animal disaster response plans. J Bus Contin Emer Plan. 2016;9(3):262–71.
19. Department of Environment, Water and Natural Resources. Managing natural resources. http://www.environment.sa.gov.au/managing-natural-resources/water-resources (2016). Accessed 10 Aug 2016.
20. Gordon R. People and communities: how do they react and recover after fire? Adelaide: Government of South Australia and Australian Red Cross; 2016.
21. Smith B, Taylor MR, Thompson K. Risk perception, preparedness and response of livestock producers to bushfires: a South Australian case study. Aust J Emerg Manage. 2015;30(1):38–42.
22. Eriksen C, Gill N. Bushfire and everyday life: examining the awareness-action gap in changing rural landscapes. Geoforum. 2010;41(5):814–25.
23. Whittaker J, Handmer J, Mercer D. Vulnerability to bushfires in Australia: A case study from East Gippsland, Victoria. J Rural Stud. 2012;28(2):161–73.
24. Savin-Baden M, Major CH. Qualitative Research. Abingdon: Routledge; 2013.
25. Braun V, Clarke V. Successful Qualitative Research. London: Sage; 2013.
26. Cornish F, Gillespie A. A pragmatist approach to the problem of knowledge in health psychology. J Health Psychol. 2009;14(6):800–9.
27. Braun V, Clarke V. Using thematic ananlysis in psychology. Qualitative Res Psychol. 2006;3(2):77–101.
28. Rogers RW. A protection motivation theory of fear appeals and attitude change. J Psychol. 1975;91:93–114.
29. Maddux JE, Rogers RW. Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. J Exp Social Psychol. 1983;19(5):469–79.
30. Rogers R. Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. In: Caccioppo J, Petty R, editors. Social psychophysiology: A sourcebook. New York: Guilford; 1983. p. 153–76.
31. Floyd DL, Prentice-Dunn S, Rogers RW. A meta-analysis of research on protection motivation theory. J Appl Soc Psychol. 2000;30(2):407–29.
32. Paton D, Johnston D. Disasters and communities: Vulnerability, resilience and preparedness. Disaster Prev Manage. 2001;10(4):270–7.
33. Mulilis J, Lippa R. Behavioural change in earthquake preparedness due to negative threat appeals: a test of protection motivation theory. J Appl Soc Psychol. 1990;20(8):619–702.
34. Grothmann T, Reusswig F. People at risk of flooding: why some residents take precautionaryacton while others do not. Nat Hazards. 2006;38:101–20.
35. Poussin JK, Botzen WJW, Aerts JCJH. Factors of influence on flood damage mitigation behaviour by households. Environ Sci Policy. 2014;40:69–77.
36. Koerth J, Vafeidis AT, Hinkel J, Sterr H. What motivates coastal households to adapt pro-actively to sea-level rise and increasing flood risk? Regional Environ Chang. 2013;13(4):897–909.
37. Grothmann T, Patt A. Adaptive capacity and human cognition: The process of individual adaptation to climate change. Glob Environ Chang. 2005;15:199–213.
38. So J. A further extension of the extended parallel process model (e-eppm): implications of cognitive appraisal theory of emotion and dispositional coping style. Health Commun. 2013;28(1):72–83.
39. Tanner JF, Day E, Crask MR. Protection motivation theory: An extension of fear appeals theory in communication. J Bus Res. 1989;19(4):267–76.
40. Chandler CK. Animal assisted therapy in counseling. 2nd ed. New York: Routledge; 2012.
41. Chur-Hansen A. Grief and bereavement issues and the loss of a companion animal: People living with a companion animal, owners of livestock and animal support workers. Clin Psychol. 2010;14(1):14–21.
42. Cordaro M. Pet loss and disenfranchised grief: implications for Mental Health Counseling Practice. J Mental Health Couns. 2012;34(4):283–94.
43. Hesterberg UW, Huertas G, Appleby MC. Perceptions of pet owners in urban Latin America on protection of their animals during disasters. Disaster Prev Manage. 2012;21(1):37–50.
44. Westcott R. People and their animals in emergencies: snapshots from past emergency events. Aust J Emerg Manage. 2015;30(2):62–5.
45. Council of Australian Governments. National Strategy for Disaster Resilience: Building Our Nations's Resilience to Disasters. Canberra: Commonwealth of of Australia; 2011.
46. Westcott R, Prelgauskas E. Post disaster recovery arrangements for animals in South Australia. Aust J Emerg Manag. 2013;28(3):48–52.
47. Rogers J, Scholz T, Gillen A. Dealing with livestock affected by the 2014 bushfires in South Australia: decision-making and recovery. Aust J Emerg Manage. 2015;30(2):13–7.
48. Government of South Australia: Emergency Management Act. Version: 1.7.2016. https://www.legislation.sa.gov.au/LZ/C/A/EMERGENCY%20MANAGEMENT%20ACT%202004.aspx Adelaide: Government of South Australia; 2004. Accessed 1 Aug 2016
49. United States House of Representatives. Pets Evacuation and Transportation Standards Act, vol. H.R. 3858. Washington, D.C: Government of the United States of America; 2006.
50. Hunt MG, Bogue K, Rohrbaugh N. Pet ownership and evacuation prior to hurricane Irene. Animals. 2012;2(4):529–39.
51. Gordon R. Community impact of disaster and community recovery. InPsych - Australian Psychological Society. 2009; (April 2009).
52. Australian Red Cross, Australian Psychological Society. Psychological First Aid: An Australian guide to supporting people affected by disaster. Melbourne: Australian Red Cross and Australian Psychological Society; 2013.
53. Palmer D. Sampson Flat Bushfire: the Paracombe Experience. Adelaide: Daniel Palmer; 2016.
54. One Health Initiative: One health initiative will unite human and veterinary medicine. 2015. http://www.onehealthinitiative.com/index.php Accessed 28 Mar 2016
55. Gordon R. Acute responses to emergencies: findings and observations of 20 years in the field. Aust J Emerg Manage. 2006;21(1):17–23.
56. Barker SB, Wolen AR. The benefits of human-companion animal interaction: a review. J Vet Med Educ. 2008;35(4):487–95.
57. Putney JM. Relational ecology: a theoretical framework for understanding the human-animal bond. J Sociol Social Welfare. 2013;40(4):57–80.
58. Kaufman KR, Kaufman ND. And then the dog died. Death Stud. 2006;30:61–76.
59. Glassey S, Wilson T. Animal welfare impact following the 4 September 2010 canterbury (darfield) earthquake. Australasian J Disaster Trauma Stud. 2011;2011(2):49–59.
60. Taylor MR, Lynch E, Burns P, Eustace G. The preparedness and evacuation behaviour of pet owners in emergencies and natural disasters. Aust J Emerg Manage. 2015;30(2):18–23.
61. Commonwealth of Australia. In: Attorney-General's Department, editor. National Strategy for Disaster Resilience Companion Booklet. Canberra: Commonwealth of Aus'tralia; 2012. p. 20.
62. Beck L, Madresh EA. Romantic partners and four-legged friends: an extension of attachment theory to relationships with pets. Anthrozoos. 2008;21(1):43–56.
63. Leonard HA, Scammon DL. No pet left behind: accommodating pets in emergency planning. J Public Policy Market. 2007;26(1):49–53.
64. Lowe SR, Rhodes JE, Zwiebach L, Chan CS. The impact of pet loss on the perceived social support and psychological distress of hurricane survivors. J Trauma Stress. 2009;22(3):244–7.
65. Wells DL. Associations between pet ownership and self-reported health status in people suffering from chronic fatigue syndrome. J Alternative Complementary Med (New York, NY). 2009;15(4):407–13.
66. Zilcha-Mano S, Mikulincer M, Shaver PR. Pet in the therapy room: An attachment perspective on Animal-Assisted Therapy. Attach Hum Dev. 2011;13(6):541–61.
67. Burns P, Stevens G, Sandy K, Dix A, Raphael B, Allen B. Human behaviour during an evacuation scenario in the Sydney Harbour Tunnel. Australian J Emerg Manage. 2013;28(1).
68. Austin JJ. shelter from the storm: companion animal emergency planning in nine states. J Sociol Social Welfare. 2013;40(4):185–210.
69. Heath SE, Kass PH, Beck AM, Glickman LT. Human and pet-related risk factors for household evacuation failure during a natural disaster. Am J Epidemiol. 2001;153(7):659–65.
70. University of California, Davis. Emergency Preparedness and Response. Caring for animals and humans in disasters and emergencies. 2016. www.vetmed.ucdavis.edu/iawti/emergency_preparedness/index.cfm Accessed 1 Aug 2016
71. Trigg J, Thompson K, Smith B, Bennett P. An animal just like me: the importance of preserving the identities of companion-animal owners in disaster contexts. Social Personality Psychol Compass. 2016;10(1):26–40.
72. Hunt M, Al-Awadi H, Johnson M. Psychological sequelae of pet loss following Hurricane Katrina. (Report). Anthrozoos. 2008;21(2):109.
73. Eriksen C, Gill N, Bradstock R. Trial by Fire: natural hazards, mixed-methods and cultural research. Australian Geographer. 2011;42(1):19–40.

74. Paton D. Preparing for natural hazards: the role of community trust. Disaster Prevention Manage. 2007;16(3):370–9.
75. Bowlby J. Attachment and loss, Vol. I: Attachment. New York: Basic Books; 1969.
76. Rizzuto TE, Maloney LK. Organizing chaos: Crisis management in the wake of Hurricane Katrina. Professional Psychol. 2008;39(1):77–85.
77. McNeill IM, Dunlop PD, Skinner TC, Morrison DL. Predicting delay in residents' decisions on defending v. evacuating through antecedents of decision avoidance. Int J Wildland Fire. 2015;24:153–61.
78. Gordon R. Community process and the recovery environment following emergency. Environ Health. 2004;4(1):19–34.
79. Gordon R. Community and Psychological Responses to Disaster. Melbourne: Australian Psychological Society. 2009b.
80. Royal Society for the Prevention of Cruelty to Animals. Pets in Emergencies. http://www.rspcasa.org.au/the-issues/animals-in-emergencies/(2017). Accessed 1 May 2016.
81. Primary Industries and Regions South Australia. Livestock safety during bushfires. http://www.pir.sa.gov.au/__data/assets/pdf_file/0020/235721/Livestock_safety_during_bushfires.pdf (2017). Accessed 1 Sept 2016.
82. Paton D. Preparing for natural hazards: the role of community trust. Disaster Prev Manage. 2007;16(3):370–9.
83. Wilkinson C, Eriksen C, Penman T. Into the firing line: civilian ingress during the 2013 "Red October" bushfires. Australia: Natural Hazards; 2015.
84. Rippetoe PA, Rogers RW. Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat. J Pers Soc Psychol. 1987;52(3):596–604.
85. ABC Landline: From The Ashes: Pinery Fires 2016. http://www.abc.net.au/landline/content/2016/s4419409.htm Australian Broadcasting Corporation. Accessed 11 Mar 2016.
86. Gibbs L, Waters E, Bryant RA, Pattison P, Lusher D, Harms L, Richardson J, MacDougall C, Block K, Snowdon E, et al. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. BMC Public Health. 2013;13:1036.
87. Akama Y, Light A. A candor in reporting: designing dexterously for fire preparedness. In: CHI '12 Extended Abstracts on Human Factors in Computing Systems. Austin: ACM; 2012. p. 281–90.
88. Akama Y. Passing on, handing over, letting go – the passage of embodied design methods for disaster preparedness. Service Design and Innovation Conference. Melbourne: Lancaster University. Linköping University Electronic Press; 2014: 173-183.
89. Norman P, Searle A, Harrad R, Vedhara K. Predicting adherence to eye patching in children with amblyopia: An application of protection motivation theory. Br J Health Psychol. 2003;8(4):465–74.
90. Flynn MF, Lyman RD, Prentice-Dunn S. Protection Motivation Theory and adherence to medical treatment regimens for muscular dystrophy. J Social Clin Psychol. 1995;14:61–75.
91. Lwin MO, Saw SM. Protecting Children from Myopia: A PMT Perspective for Improving Health Marketing Communications. J Health Commun. 2007;12(3):251–68.
92. Bockarjova M, Steg L. Can Protection Motivation Theory predict pro-environmental behavior? Explaining the adoption of electric vehicles in the Netherlands. Glob Environ Chang. 2014;28:276–88.
93. Keshavarz M, Karami E. Farmers' pro-environmental behaviour under drought: Application of protection motivation theory. J Arid Environ. 2016;127:128–36.
94. Cismaru M, Cismaru R, Ono T, Nelson K. "Act on climate change": An application of protection motivation theory. Social Market Q. 2011;17(3):62–84.
95. Martin IM, Bender H, Raish C. What motivates individuals to protect themselves from risks? The case of wildland fires. Risk Anal. 2007;27(4):887–900.
96. Lindell MK, Perry RW. The protective action decision model: theoretical modifications and additional evidence. Risk Anal. 2012;32(4):616–32.
97. Drabek TE. Disaster warning and evacuation responses by private business employees. Disasters. 2001;25(1):76–94.
98. SAVEM Inc. The Sampson Flat Bushfire Minister's remarks. http://www.savem.org.au/news.htm (2015). Accessed 1 Jun 2016.
99. Irvine L. Ready or not: evacuating an animal shelter during a mock emergency. Anthrozoos. 2007;20(4):355–64.
100. Reason J. Human error: models and management. Br Med J. 2000; 320(Mar 18):768–70.
101. Taylor MR, McCarthy M, Burns P, Thompson K, Smith B, Eustace G. The challenges of managing animals and their owners in disasters: perspectives of Australian response organisations and stakeholders. Aust J Emerg Manage. 2015;30(2):31–7.

Submit your next manuscript to BioMed Central and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in PubMed and all major indexing services
- Maximum visibility for your research

Submit your manuscript at
www.biomedcentral.com/submit

Contemporary relevance of the paper

From the abstract of the paper:

The purpose of this paper is to explore how Protection Motivation Theory (PMT) can be used and expanded to inform and improve public safety strategies in natural hazards.

This paper concluded that PMT is an appropriate model by which to explore preparedness in a natural hazard context. The versatility of PMT is confirmed, being usefully applied to a number of different research settings, from individual health issues to those of slow-onset risk such as drought. It is malleable enough to be broadly applicable, yet sufficiently concise and wholistic to overcome deficiencies present in other theories. PMT is relatively straightforward and should be easily understood by lay people and research end-users. Paper 1 has been well-received, and has been widely accessed around the world since publication. To date (September 2018) the paper has over 5000 accesses and has been cited twice by Wirtz and Rohrbeck (2017) and Thompson et al (2017).

Discovering ways to sustainably motivate behaviour change so that it becomes safer in the context of natural hazards is one of the goals of the research documented in this thesis. PMT *can* contribute to this need. A key point of difference which adds to the appeal of PMT is due to the inclusion of 'coping appraisal' in the matrix: which provides the opportunity for strength-based assessment and *problem solving*. The effect of *prior experience* as noted by Grothman and Reusswig (2006) (who noted PMT was worthy of further research) and the addition in this thesis of the effect of the *social microclimate* and *response choices* is part of the predicted evolution of PMT and its continued future relevance as noted by Rogers (1983). In the context of this thesis, understanding the inherent heterogeneity of the social microclimate and using that synergistically with complementary strategies to choose safe responses can lead to achieving positive outcomes with less cost – i.e. "adaptive rewards".

During data collection for this research, participants frequently raised and discussed the need for strong community preparedness and timely proactive management of

risk. Effectively delivering this requirement is a perennial problem for emergency services, as the regular pre-fire season warnings can sound repetitious and stale: the danger being that people 'switch off' and remain complacent or unmotivated for a variety of reasons. Using PMT, the need for scrutiny of what *precedes* preparedness messaging was identified. Reconstructing and positively utilising the influence of *maladaptive rewards* and *adaptive costs* thereby facilitates achieving an overall net gain. Significantly, factors appealing to the individual, the social microclimate, the community and emergency services negate the predominant influence of maladaptive rewards or adaptive costs, and favour psychological well-being. Ways to overcome *maladaptive rewards* are noted in Paper 1, and are described in more detail in Paper 4 and in SP2 (Appendix B).

Paper 1 affirmed a foundation by which to proceed, and informed the process outlined in Chapter 2: *Research design and method.* Additionally, it demonstrated the importance of continually exploring and problem solving in a global environment of worsening natural hazards and conflicts caused by them – to discover new, innovative ways to lessen their impact upon human beings.

Post-publication literature

The versatility and enduring relevance of PMT was again demonstrated in two research papers published in 2017. Kristoffersen and colleagues (2017) used PMT to study the use of alternative or complementary medicine among people at risk of, or with, coronary heart disease. The authors found that perceived (rather than actual) risk, and response efficacy prompted people to affirm belief in the benefits of healthy living, and adopt behaviours which favour good health. The authors concluded that PMT could be useful in the future to understand behaviours and beliefs concerning the use of alternative medicine among at-risk groups.

In another study, Janmaimool (2017) used PMT to assess participants' likely engagement in sustainable behaviours to reduce waste in Bangkok, Thailand. Janmaimool found that self-efficacy could predict all types of protective behaviours linked to the perceived threat caused by environmental pollutants and contamination – particularly behaviours that required little cost or personal effort to attain. PMT was assessed alongside other theories such as Theory of Planned Behaviour (TPB) and Value Belief Norm (VBN) Theory, which includes the moral aspect of decision-

making. The paper concluded that PMT was better suited to assessing the reasons for motivating behaviour in the context of risk and uncertainty. Interestingly, this Thai study found that the desired behaviour (uptake of waste reducing activities) was more likely to occur where there was either an economic benefit to participants, or where the activity was 'free', such as a small imposition on participants' time. This is an example of *adaptive rewards*, discussed later – principally in Chapter Six.

With respect to the *animals in emergencies* literature, several papers have contributed to the discussion, notably the work of Taylor and colleagues, as part of the Bushfire & Natural Hazards Cooperative Research Centre's *Managing Animals in Disasters* project (Taylor, 2017). Although the research presented here does indeed involve animals, it is primarily about the people attached to those animals: and regard for their safety and well-being before, during and after a bushfire emergency incident, or other natural hazards. This work has overcome some of the omissions in the literature as noted in Paper 1, particularly with respect to the limitations of animal species, location, owner awareness and community interactions.

Recently, Chadwin (2017) and Day (2017) also raised matters of public health associated with companion animal evacuation during an emergency incident, as discussed in P1. Recognised issues include animal owner psychological stress and possible subsequent mental ill health, risk of zoonotic disease and bite injuries and problems of staffing and resources. However, the magnitude of the danger to human health, particularly from bite injures caused by stressed animals (who may be inadequately controlled) and possibly managed by inexperienced handlers (who may lack sufficient training) is overlooked, as are issues of insurance and liability. In the chaotic midst of an emergency, managing animals as suggested by these authors is unlikely to be realistically attainable. The enormity, and associated risks, of sheltering evacuated animals in the response phase of anything other than a small incident precludes this being a safe and achievable option. The need for proactive pre-emergency action by animal owners is noted, but no solutions are offered. Serious omissions from both these papers include the failure to obtain and use data from emergency management practitioners with field experience, to propose practical ways to mitigate risks to human health in animal evacuations and to address the challenges of promoting preparedness through tangible rewards. These

issues, discussed in P1, demonstrate the contemporary relevance of the paper and its contribution to the wider literature.

In this context, it is important to remember the overarching principles of the Sendai Framework for Disaster Risk Reduction (SFDRR) (UNISDR 2015) with its wholistic, integrative health focus. Sendai aims to lessen the impact of disasters on people's health in social, economic and environmental contexts. This includes connecting policy development and implementation with evidence and facilitating the transformation and transfer of research into practice. Beneath the overarching principles of the SFDRR, fire science explores an expanding spectrum of fire-related social, economic, physical and agricultural science topics. This knowledge contributes to the successful and dynamic management of increasingly complex fire problems that affect many aspects of human populations in a changing climate. This study contributes to that knowledge base. It records, documents and analyses some of the experiences, expectations and needs of communities who have 'lived through' bushfire emergencies, and expect to face this hazard again. Collaboration, capacity building and research need to be widespread and diverse to enable bottom-up innovation to meet top-down goals and ideals.

Illustration 4: "In memory of loved ones lost: Black Tuesday, 11 January 2005.

Nine candles in memory of the nine human fatalities in the Black Tuesday "Wangary" fire, 2005 sit atop what was the tree-stump and plough-share letterbox from the farm of a research participant. This memorial is located in the Koppio Museum, Eyre Peninsula.

CHAPTER FOUR – The narrative of Paper 2

THIS CHAPTER CONTAINS:

- **Rationale for Paper 2**
- **Paper 2 as published**
- **Contemporary relevance of the paper**

THE RATIONALE FOR PAPER 2

The purpose of this paper is to provide an wholistic 'overview' Thematic Analysis of the emergency responder interview and focus group data to guide the ongoing analysis and refine the research question(s).
Develop a Thematic map and table
Examine how animal owners' safety can be improved by considering emergency responders observations and identify the benefits of reciprocal collaboration between participant groups
To reflexively examine the method in detail
Channel and refine the next stage of analysis so that findings will be usefully applicable to a wide demographic and to be of greatest societal benefit in the medium to long term
Use data extracts to best illustrate and support analysis
Show that the awareness-preparedness gap *can* be reduced using new knowledge to achieve change
The research question for this paper: *how can bushfire emergency responders' experiences with animal owners help improve owner safety and survival?* Describe the findings from this overview, and the evolution into further research.
Consider 'background' relevance and usefulness of Protection Motivation Theory (PMT)

Box 4: *The rationale for P2*

PAPER 2 as published, following on pp 41-50

WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science, 4, 34.*

frontiers in Veterinary Science

ORIGINAL RESEARCH
published: 16 March 2017
doi: 10.3389/fvets.2017.00034

"Don't Just Do Something … Stand There!" Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire

Rachel Anne Nosworthy Westcott[1,2], Kevin Ronan[3], Hilary Bambrick[4] and Melanie Taylor[1,2,5]*

[1] Centre for Health Research, School of Medicine, Western Sydney University, Sydney, NSW, Australia, [2] Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, VIC, Australia, [3] Professorial Research Fellow, Clinical Psychology, School of Health, Medical and Applied Sciences, Central Queensland University, Rockhampton, QLD, Australia, [4] Head of School, Public Health and Social Work, Faculty of Health, Queensland University of Technology, Brisbane, QLD, Australia, [5] Senior Lecturer Organizational Psychology, Macquarie University, Sydney, NSW, Australia

OPEN ACCESS

Edited by:
Lynette Arnason Hart, University of California Davis, USA

Reviewed by:
Howard H. Erickson, Kansas State University, USA
Janice Lauren Baker, Veterinary Tactical Group, USA

***Correspondence:**
Rachel Anne Nosworthy Westcott
R.Westcott@westernsydney.edu.au

Specialty section:
This article was submitted to Veterinary Humanities and Social Sciences, a section of the journal Frontiers in Veterinary Science

Received: *04 January 2017*
Accepted: *20 February 2017*
Published: *16 March 2017*

Citation:
Westcott RAN, Ronan K, Bambrick H and Taylor M (2017) "Don't Just Do Something … Stand There!" Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. Front. Vet. Sci. 4:34. doi: 10.3389/fvets.2017.00034

Introduction: Narrowing the awareness–preparedness gap in bushfires (wildfires) means that new strategies and tactics will be needed to improve human safety and survival in this increasingly frequent and severe globally significant natural hazard. One way to do this is to explore the peri-event experiences of novel demographic groups living and working in at-risk areas to determine how best to strengthen a collaborative, mutually beneficial interface with emergency responders. Thus, this study included participants from one novel demographic, animal owners, in combination with emergency responders. Animal owners themselves are a large, diverse group whose preparedness and response behavior has not been assessed with respect to their potential contribution to contemporary natural hazard management.

Method: Data were collected using semi-structured interviews and focus group discussions from four emergency responder classifications who were asked about their perceptions of animal owners in bushfire. Thematic analysis was used for data analysis because of its flexibility and suitability to this pragmatic qualitative study. Results from the first of 10 themes, chosen for its "overview" properties, are discussed in this paper, and indicate that exploring the animal owner—emergency responder interface has the potential to generate useful additions to public policy and expansion of social theory.

Conclusion: Analysis of these data in this paper supports the potential for positive outcomes gained by reciprocal collaboration between animal owners and emergency responders. Some simple practical solutions are evident and two major outcome streams are identified. These are (1) policy development and implementation and (2) etiology of decision-making. Considerations and recommendations for research examining the efficacy of these streams and solutions are provided.

Keywords: bushfire, wildfire, animals, disaster, emergency, emergency responder, animal owners

INTRODUCTION

The quotation in the title of this paper means that, to act effectively, it is first necessary to stop and dynamically risk assess a situation, and, even more significantly, to be in a position of confidence with a well-constructed, pre-prepared, and well-practised plan of action. Research shows that such a response can save, not waste, time, and may help reduce the rash, adrenalin-fuelled actions that can end in fatality (1, 2). This concept is counter-intuitively expressed by some responders as *hurry up and wait!* Being ready is the fulcrum about which effective bushfire response choices are made. Considered, timely and safe action—including coping appraisal and adaptive responses—both outside the fire season and within when threat is imminent, will usually promote the least noxious outcome. In this instance, the double negative is chosen deliberately because it is not the same as the "best" outcome.

This study records, documents, and analyses some of the experiences, expectations, and needs of communities who have "lived through" bushfire emergencies, and *expect to face this hazard again*; the ultimate aim of the study is to protect human life by making response behaviors safer and improving fire readiness and response routines. This paper examines the experiences and interactions of firefighters, police, and rescue officers of the State Emergency Service (SES) with animal owners in bushfire hazards, from the emergency responders' perspective. The exploration of this interface aims to inform a collaborative path forward to strengthen shared responsibility, self-sufficiency, and reciprocal understanding to build trust and promote community engagement in future scenarios. A corollary purpose is to evaluate patterns of collaboration that might be generalized across other demographic groups within a community.

A case study of a bushfire at-risk regional center in South Australia—"the driest state in the driest continent" (3) was chosen as the research site because of its recent, and severe, fire history, and its diversity of animal ownership (4, 5). A pragmatic approach within a critical realist ontology and contextualist, experiential epistemology guided the research design due to the need to arrive at practical answers to issues of policy and practice (6–8).

The aim of this study's overall data corpus, of which this data set is a part, is to explore an expansion of Protection Motivation Theory, to better theorize and understand the behavior of animal owners in bushfire situations (9). In part, this study was designed to develop new, meaningful preparedness initiatives to inspire and motivate the translation of knowledge into effective, adaptive action by all residents, and in particular, animal owners, of bushfire at-risk communities.

To date, the majority of academic literature about animal owners in emergencies is skewed toward the retrospective experiences only of pet owners (10). While such a focus may be a useful starting point, it is subject to recall problems and focuses on the views of only one set of animal owners. It also excludes emergency responders' perceptions and in-field observations of animal owners' behavior and reactions during an incident involving many species of animals, owned in a variety of contexts. Consequently, these experiences have not been investigated to identify new information that may be able to fill current gaps in contemporary emergency communication and warnings. This paper's data set, therefore, asks the research question, *how can bushfire emergency responders' experiences with animal owners help improve owner safety and survival?* It explores how emergency responders perceive animal owners (of any species and any number of animals) in the context of bushfire: their assessment of *what* owners do, and *how* they do it, with the goal of discovering *why* owners adopt a certain course of adaptive or maladaptive action. From this, adaptive behaviors can be confirmed and described. Importantly, maladaptive behaviors can be similarly identified, and (i) responses developed to either rectify or neutralize the actions and (ii) favored adaptive behaviors that enhance safety and survival may be usefully translated or applied.

Despite the provision of sophisticated, well publicized and widely accessible public education by fire authorities in Australia, messages of mitigation and readiness remain inconsistently received in the wider community across all hazards. Although *awareness* of the danger posed by bushfires seems to be increasing, the *awareness–preparedness gap* in community and individual residents' survival plans is narrowing disproportionately slowly compared to the magnitude of resources applied to rectify this trend (11, 12). To help address this and to keep ahead of a climate change induced, worsening global fire threat, new strategies, and tactics, which resonate broadly with people—especially those in at-risk areas and demographics—need to be identified and implemented.

Fire can become an emergency when people, property, the environment, and other assets are impacted: the animal-owning public is challenged to properly and safely manage their animals, in addition to themselves, in emergency fire situations. Australia, like many Western countries, is a nation of animal lovers and animal owners. Sixty-three percent of Australian households own a companion animal (13), though the number owned by primary producers in rural and regional areas is much larger (14). Animal welfare is important, but should not be viewed in isolation, because it is frequently inextricably linked to human physical and, arguably more importantly, psychological health. Animals have a role as diffusers of social awkwardness, or as the means by which new relationships and introductions might form. They often change how people behave from day to day in the "routine" world: bringing solace, joy, achievement, profit, and sometimes sadness (15, 16). When faced with an emergency such as fire or flood, the presence of animals adds varying degrees of complexity to owners' preparedness and planning. Yet, the needs of animal owners have not been specifically examined in the context of bushfire, despite the growing understanding of the strong link between effective animal management in an emergency and the saving of human life (17, 18).

As the title of this paper conveys, to act effectively in an emergency it is necessary to be in a position of confidence with a well-constructed, pre-prepared, and well-practiced plan of action. Close to 2,300 years ago, Aristotle wrote: *we are what we repeatedly do. Excellence, then, is not an act, but a habit*. In the context of this study, for "excellence" read, "preparedness," which is a central organizing concept and an *a priori* major theme underpinning analysis of data in the current study. To "do" preparedness effectively requires its promotion from being regarded

as an onerous task to a "business as usual" status—as routine as buying the groceries. Practicing readiness and bushfire preparedness frequently enough may lead, as Aristotle suggested, to safer behavior becoming instinctual. The basic human urge to save a dependent other at the expense of personal safety may never be overcome, but checks and balances, coping appraisal, and adaptive response—to "not just do something"—could mean that more can be achieved with less trauma and anxiety. Equally, the urge to prepare more for others' (particularly dependents) needs compared to one's own benefit is a leveraging point that can be used to motivate preparedness and doing it more effectively (19).

The Thematic Analysis (TA) below (7, 20) combines results and discussion for the first theme within this data set (**Table 1**). This approach is descriptive and interpretative and actively fluctuates between a more essentialist and a more constructionist analysis as the analytic story develops (6, 7).

MATERIALS AND METHODS

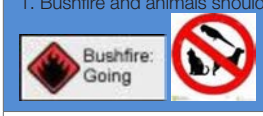
Positionality Statement: Ontology, Epistemology, and Methodological Approach to the Current Study

This paper reports on a data set comprising six interviews and three focus groups ($n = 55$) of emergency responders working in the study research site of the Lower Eyre Peninsula in South Australia. TA was chosen because of its versatility and theoretical independence. The research site was selected by the researcher for different and significant reasons. These include (i) the area's recent and severe fire history; (ii) regional people tend to appear more resourceful and self-reliant than their urban counterparts (2, 18, 21–23); (iii) the diversity of animal owners (the second of two target groups, alongside emergency responders); and (iv) geographical location—it is distant enough from large cities to require some effort and expense to visit, and hence is not "over" researched.

The reasons for engaging in a particular research topic are "never a naïve choice" (24), neither are data coded in an epistemologically free void (20). For this researcher, personal and professional interest, as a veterinarian and emergency manager, were the impetus for the choice of research topic, with the research methodology, and reflexive articulation of an ontological and epistemological position requiring thoughtful consideration to achieve the right "mix" for the project and to inform and define how best to proceed. This researcher's situationalist orientation (i.e., that the *needs of the study* should govern a philosophical paradigm) (6) indicated a pragmatic approach as the most appropriate to enable straightforward answers to practical questions. A critical realist ontology (i.e., that knowledge might make a difference and have practical applications) and a contextualist, experiential epistemology complement this approach as realism imposes a non-pliable version of what constitutes "truth"; at the other end of the ontological continuum, a relativist or idealistic ontological position is too liberal or egalitarian for this study's need for practical outcomes (7).

Sandelowski (25) identifies *qualitative description* as a method that provides straight answers to questions of practice and policy. *Pragmatic qualitative research* is an approach which reaches beyond plain description and ventures toward a more analytic exploration of latent meanings with more detail (6). The position of the pragmatist choosing to engage in pragmatic qualitative research is not to offer a monotone of description devoid of color, but to actively reach within these data to explore the minutiae of *prima facie* experiential detail it promises to reveal—among the "hues, tones, and textures" attributed to qualitative research *in toto* (25). Pragmatism thus "enables critique and action" (8) and was adopted in this qualitative research to achieve practical and effective solutions.

TABLE 1 | Themes of the data corpus.

Bushfire in kingdom animalia *(the taxonomic subject of this research)*		**Paper, scissors, bushfire, action!** *(threat appraisal, coping appraisal)*	
Blue = theme	**Green = subtheme**		**Red = overarching theme**
1. Bushfire and animals shouldn't mix 	1a. (Nearly) every animal has an owner *(people)*	6. The purpose of life is a life of purpose *(responders)*	
	1b. On the sheep's back *(farmers)*	7. A problem understood is a problem half solved *(adaptive response)*	
2. Be fire-fit: weekly is worth it! *(readiness)*		8. Ignorance is not bliss *(maladaptive and unsafe response)*	
3. Complexity of the social microclimate *(the 21st century family and their animals)*		9. Give me a home among the gum trees *(the tree-changers)*	9a. Effortless affordable luxury *(consumerism)*
	4. Trust		
	5. Information gathering		
10. When the dust settles *(recovery)*			

The main themes listed in this table are (1) Bushfire and animals shouldn't mix (2) be fire fit: weekly is worth it! (readiness) (3) complexity of the social microclimate (the 21st century family and their animals) (4) trust (5) information gathering (6) the purpose of life is a life of purpose (responders) (7) a problem understood is a problem half solved (adaptive response) (8) ignorance is not bliss (maladaptive and unsafe response) (9) give me a home among the gum trees (the tree-changers) (10) when the dust settles (recovery).

The researcher's relationship with participants was both as an outsider, i.e., "interested observer," and as an insider, sharing some similar training, qualifications, interests, and professional roles: a matter of which some, but not all, participants were aware (7, 26). Because of a degree of "membership" and understanding of these groups across the data corpus, a certain balance appeared to be achievable, and a conscious effort was made to be impartially, though actively, "journalistic" to strike that balance. Participants discussed emotive anecdotes about traumatic experiences and risk-taking behavior they had witnessed and were sometimes critical of animal-owner groups, thus finding the "equal and opposite" was challenging and important. At the same time, the researcher took care not to skew the interactive data collection process by seeking responses from a non-existent position. Guba and Lincoln (27) describe the researcher–participant relationship as "one of respectful negotiation, joint control, and reciprocal learning." With this in mind, continuous re-appraisal of the research processes and evaluation of the risks of potential pitfalls helped minimize, if not neutralize, the bias of any researcher assumptions.

Procedure—Participants and Recruitment

Some emergency responder contacts were facilitated by organizational project end users in the South Australian State capital of Adelaide. At the research site, local radio, print and television media exposure helped raise awareness of the project, as did a series of three newspaper advertisements. The researcher's blog page contained all recruitment details and project information, including institutional ethics approval, consent forms, and contact details (28).

Two weeks prior to commencement of data collection, a site visit was made to meet with potential participants from the purposively sampled emergency responder group and to distribute information flyers in public places such as the local Council offices, public library, some retail outlets, and businesses. Representatives from all emergency services involved in first response to a bushfire in the area were specifically approached by the researcher and invited to take part: South Australia Police (SAPOL), the Country Fire Service (CFS), the Metropolitan Fire Service (MFS), and the State Emergency Service (SES).

Procedure—Data Collection

Three focus groups and six interviews were conducted at a time and location convenient for the participants, using open-ended, semi-structured questions (Interview Guide—Primary Responders in Appendix). Not all questions were asked of all participants, and a flexible approach to the interview guide was adopted according to the context and roles of each person or group (29). Sometimes, divergent, yet, relevant topics were discussed, which fortified and enriched the data gathered. At other times, the researcher engaged in a dialog with participants, which helped to cross check meanings and draw out topics relevant to the research question.

All participants were given an information sheet and signed a consent form either prior to, or at the time of, meeting the researcher for data collection. Discussions of between 45 and 90 minutes were audio recorded, with a backup copy made by the researcher *in situ*. One copy of each data item was submitted for transcription, keeping the master files and backup copy securely on a password accessed computer and external hard disk drive, respectively.

Procedure—Data Analysis

Thematic Analysis was chosen for analysis, because it is a flexible qualitative method not constrained by theory (7, 20). This plasticity suited the study and the researcher's situationalist, pragmatic approach. The processes to extract detailed experiential material from these data to inform the research were largely, but not entirely inductive, and largely, but not entirely contextualist. The analysis, therefore, moves from descriptive to interpretative when meanings are sought—and needed—to extract answers to the particular question posed of this *data set*.

In data driven, inductive TA, coding is undertaken without the constraints of pre-existing categories. That being said, the overall research question applied to the data corpus contains elements for which the researcher was keenly watching while coding the data set.

Once transcribed, the researcher cross checked the printed transcripts for accuracy by playing back the audio files, and making corrections, both on the hard copy and the electronic version. Before coding began, "data familiarization" took place, by again reading each data item carefully three or four times.

The recursive process of analysis and data driven coding yielded 155 codes. Data were managed using the CAQDAS[1] system, NVivo 11, and on a parallel Excel spreadsheet. The reason for using the supplementary spreadsheet was primarily to enable the researcher to "look" at these data from a different perspective and also provide a form of visual thematic map. The spreadsheet was used up to, and including, the development of themes and subthemes but did not extend into data extraction.

Next, codes on the spreadsheet were grouped into clusters of "like" codes. It was interesting to note that when considering patterns across the data set, these clusters did not translate in their entirety into themes. The final 10 themes actively identified by the researcher comprised codes from different groups as the central organizing concept of each theme was distilled. A thematic map and table (**Table 1**) (other than the tabular form of the spreadsheet) was generated to visualize and enhance the interrelationships and logical structure of the themes and subthemes of data analysis. This paper discusses the first of those themes.

INTERPRETATIVE ANALYSIS AND DISCUSSION: BUSHFIRE IN KINGDOM ANIMALIA

Bushfires can affect all taxonomic Kingdoms. This paper's focus is upon members of *Kingdom Animalia*, specifically, human beings and the non-human animals they own or enjoy. Just as taxonomy is in a permanent state of flux and revision, so too are the rules, recommendations, and management tools associated with bushfire emergencies. A serious fire-affecting people, their livelihoods and microclimates, is a complex *non-routine social problem* (30).

[1] Computer-Assisted Qualitative Data Analysis Software.

The discernment of how people and emergency managers can better equip communities to protect themselves, and the things they hold dear, including their animals, is an indisputable imperative given the evidence-based predicted changes to near-future global weather events.

Theme 1: Bushfire and Animals Shouldn't Mix

Animals on a fireground compound the challenges and complexity this natural hazard presents to their owners, emergency responders, and others in the community. They commonly invoke a variety of human reactions and responses, some of which are very unsafe, and some representing a close encounter with mortality. Many fall into the category of "good luck rather than good management," and others—considerably less than fire prevention authorities would like—represent the outcome of thoughtful and practiced planning. Within this range is found every conceivable permutation of response behavior as unique as the people comprising them. The animal is like the pebble in the pond, and the emanating ripples represent the diverse and potentially far-reaching human consequences of animals being part of the preparedness and response equation.

The ideal situation where animals are absent from a fireground is extremely unlikely. The opposite end of the spectrum, where the presence of animals may contribute to a chain of events which can lead to tragedy and human death, is more probable, with incidents involving animals identified as a reason why people take risks (31, 32). Nobody likes to think of animals being burned to death, and as one interviewee said: *losing horses in a fire …. is one of the worst things in the world to see. It's terrible*. However, animal welfare cannot be viewed in isolation—because it is not a "stand alone" issue in enacting an effective emergency response.

Shane, a senior fire-fighter, detailed how people's emotions can supersede self-preservation.

> We talk about the emotion that's attached to children and families. I think you can almost double it for dogs, cats, and horses. And horses, in particular, seem to attract a hell of a lot more emotion from the people who are attached to them. The amount of grief that a horse owner can cause themselves in their attempts, vain attempts nine times out of 10, to get to their horses is incredible.

Shane went on to describe a situation where some of his crew disregarded orders and went to rescue a horse from a burning stable. If even trained firefighters make emotional decisions because of animals—which they probably did not own—it is not surprising that animal owners also adopt unsafe behavior. Every animal cannot be saved from a fire, but current warnings do not necessarily resonate enough to overrule basic and innate human drivers to attempt the rescue of dependent others (31, 33).

The subsequent psychological trauma and reliving of a distressing fire event may be overcome, or it could linger for a lifetime (34–37). Of the four firefighters in Shane's example above: "*… one rang his wife to say goodbye, literally … Two of them received counselling for three years, severe counselling, like, they needed it*." Similarly, a farmer evacuating horses while a boarding kennel on the adjacent property, full of cats and dogs, describes hearing the animals' cries as the buildings burned and says he will never stop hearing that sound in his head.

People also take risks when they return to a dangerous place prematurely to retrieve or move animals, or when a family's departure is delayed by attempts to catch animals they want to evacuate with them. Just such a scenario was related by Jayne, an experienced fire officer with 10 years experience in a rural, at-risk community, and who works in the area of fire safety and community outreach:

> You must include your animals (in your bushfire plan) because—imagine a family with kids and if mum's only focus is "Let's get the kids in the car. Let's get the kids in the car." But the kids are focused on the cat and the dog … if the cat scarpers and the dog hides under the shearing shed, then you've got kids running off after animals and the mum's trying to run off after the kids and—it just adds all that unnecessary worry and stress and anxiety.

Shane also related some unsafe practices he has seen animal owners adopt.

> We've had instances where people have released horses on the roads and it has been nothing short of a miracle that we haven't worn one in the truck or a member of the public hit them. They should never be put on the road, in my opinion. By all means open every internal gate. It allows them the freedom of movement and again, it's acceptance by the community in the area we live in.

Releasing animals onto public roads results in a different, but equal risk, to their safety, threatens public safety, and can leave people with no escape route. A collision between a motor vehicle and a large animal loose on a road is very likely to injure people in the vehicle, as well as the animal. Ambulances may or may not be able to access the location. Responders are then faced with possible entrapment of people in the vehicle, which could be a fire truck. The diverted or immobilized crew could be placed in life-threatening danger, or, be thwarted in their mission to assist someone else. People are also likely to be distressed by a severely injured animal they are unlikely to have the time, resources or training to be able to help. A catastrophic outcome is preceded by a cascade of component negative events often stemming from one avoidable act, error, or omission. It is the underlying decision-making that needs scrutiny (Westcott 2015, unpublished data).

Focus group member, Kate, offered the counterpoint: "*the theory behind opening up all the gates was that animals will find their own way to a safe spot*." Kate explained this has been a relatively common practice on broadacre farms in the past. But what may be appropriate in a sparsely populated broadacre farming community does not translate into a relatively densely settled peri-urban population and landscape. Potentially adverse consequences are overlooked as the focus is on the animal, and their owners can, quite subconsciously, invert the well-known and

legislated hierarchy of protection, *life*, *property*, *and environment* (38). Development on the urban fringe, often with allotments large enough for small-scale animal keeping, can place residents with the least fire experience in a vulnerable position, risking decision-making based on folklore or myth (39, 40).

The safety of the animal *is* the owner's responsibility, as is the ultimate fate of that animal, although there are occasions where nothing could save a catastrophic situation. The phenomenal speed of a crop fire is an example, but so too is the presence of underlying pathology in an animal, diagnosed or otherwise, which can be fatally exacerbated by the stress of a fire, and peri-fire events.

If animals are lost and people are ill-prepared, they may experience feelings of guilt, or might rationalize the situation to themselves by believing they have done "the best they could." For example, releasing the animal onto a road could be viewed as "giving the animal a chance," and give the owner a feeling of having "done something"—bringing some comfort to the owner, who is then free from having to manage that animal, and can focus on other things. This is not likely to be the motivation for releasing animals, but could creep into a person's consciousness given an immediate or impending threat where preparations, for whatever reason, are less than optimal.

Shane highlighted two extremes:

> If we've got people that are gonna' stay and defend and leave their horses out in the paddock, they're kidding themselves. If they've decided that their action plan on this day with a total fire ban … their horses can come up to the stables. If they're serious about it, they'd put sprinklers in or they do whatever it is to make a fuel reduced zone to try and ensure the survival of those animals. That's a plan. (Horses) sitting in the bottom paddock when the husband's out fighting the fire and the missus can run down on the four-wheeler and get them, that's not a plan. That's the start of a fatality. And I will point that out very bluntly—politely—I ask them to leave their dental records on the table in a fire proof sheet.

Responders certainly notice when animal owners are organized and act safely and with forethought. Amid the inevitable chaos, this glimmer of order stands out like a beacon. It can be a very simple and easily managed response. Zoe in one of the responder focus groups commented: "*people with cats and dogs, they will stick them in cars and they'll just go. They tend to grab their family pets pretty quick*."

Barry, an operational firefighter in another focus group, observed:

> Some people are fairly or ganized—there was a fire at (town name) and I went down the front street and there were people with horse floats[2] (trailers) down there and it was a very visible fire so people were panicking in town, I remember seeing a lot of horse floats down the front street. So some people are organized.

[2]The Australian term, "horse float" is equivalent to the North American "horse trailer."

At another fire, Jack noticed:

> The interesting factor was that a lot of the people who were living around there went to a lot of work to remove the horses to try and get them out. They got a lot out, and they did a very, very good job on a voluntary basis. A lot of people just came and said, "I'm here. Here's my horse float, put it in there, and we'll put it somewhere." I found that really heartening.

To Barry and Jack this seemed "organized," but moving animals when the fire is "very visible" represents considerable risk. Undeniably, the logistics of moving horses multiple times during a summer can be substantial—inconvenient, costly, and time consuming.

Ben, in one of the firefighter focus groups, said:

> If you got an animal and you wanna' look after it, you plan for it, and know how long it's gonna' take to get that horse on the float. And if there's no fire, there's no fire. You don't get a great deal of catastrophic days or extreme fire days through a year, but you might have to move them—animals—10 times, and it might be the tenth time that there's a fire. But we have a lot of days that are really hot and all that, and people get complacent.

Jayne identified reasons why farmers are a group of animal owners who take preparedness seriously, for reasons of economics and animal husbandry: "*Most stock owners … prepare because it's their livelihood, their income, their business continuity. And that might include generations of breeding. Most land owners and stock owners are reasonably well prepared if not very well prepared*."

Other companion animal owners she knows also make good plans:

> I know of one person … on catastrophic days, her workplace is closed, so she's home. But on severe and extreme days, she has a permanent booking at the local boarding kennels, because she doesn't have family in town.
>
> There's someone else with a pet python. So she pops him in two calico bags and takes him very discreetly in a bag and pops him at her feet at work. No one would know what's in the bag … he's restrained and it works. She brings her dogs into town to relatives and doesn't have to worry, or waste time, or try to rush home or anything like that.

Shane positively recalled an example of timely collaboration among one group:

> The local pony club are very, very good. They actually bring their horses into clean areas like fuel reduced zones. There are people there with firefighting gear and that's what they do. They start to talk about it on catastrophic days and they use their social networks to bring the horses in and reduce the amount of movement that's required.

Barry mentioned that relocating and planning for moving animals was not given enough emphasis.

> If it was pushed a lot harder … if there is gonna' be a catastrophic day, you pull your horses out maybe the

> day before. When I moved out of home, my animals used to go with mum and dad in town that day or that morning, if there was gonna' be a catastrophic warning, but I was in that position where I was able to take my animals somewhere. I think if there was more education on getting the animal out a day before, even if there's no fire and it might cost you a few dollars to do that, but you're not gonna' stuff around on that day when there's a fire and get in everyone's way to try and move animals—maybe move them a day before.

Traffic congestion seems to be a frequently overlooked problem that many animal owners fail to consider. Shane commented that:

> There are still others that think, "Oh, look there's a fire. I'll grab the horse float and go rescue my horse." Add to the traffic and add to the congestion. The float's not hooked up, they don't have an escape plan, they don't have a horse that they can get in a horse float without 10 people. All the vagaries of dealing with a big excited animal … rarely get taken into account, neither the reality of the circumstances and the surrounding fuel loads. What are your horses like in smoke and that north wind environment?

These are problems which should be straightforward to solve. The relationship between animal owners and emergency services should be one of partnership and will be enhanced and mutually beneficial if just a little proactive preparedness and reciprocal consideration is exercised. Owners need to recognize that traffic congestion can become a major problem for safe and effective movement of emergency vehicles and for public traffic moving to relief centers or other designated safe areas during an emergency incident. Considerate arrangements to be clear of potential traffic bottlenecks ahead of likely peak use will be greatly appreciated by emergency responders. Animal husbandry and animal behavior may be something which new owners need help to manage and some collaborative mentoring of novice owners could be useful. Stock and horse trailers need regular maintenance and may or may not be in frequent use. No plan is perfect, but better outcomes will be achieved when a plan exists, particularly, if it is enacted early. Jack commented: "*It's always gonna' be crazy. It's always gonna' be chaos. Nothing—any plan that you've got is only gonna' last until it faces reality*."

In Australia, once residents and other non-responders leave a fireground, they are not permitted to return until it is declared safe to do so—which could be days (41). People evacuating multiple animals sometimes arrange a "shuttle" of transport, where animals are unloaded at a roadblock and either reloaded or walked out, so that the person "on the inside" can legally ferry animals up to the road block.

Zoe has often been assigned to road blocks:

> And lots of people have got, like, four horses, but they've only got a two-horse float. If they get that float out for the first two horses, they can't get it back in. What do they do? So they'll walk them out. They'll ask where to go and we'd say, "Look, sorry, we don't know, but you need to clear the road." So we're more concerned with getting them out of the way. They were leading horses out … where the hell do we send them?

Transporting animals before roadblocks are in place can also be problematic. Jayne talked about how moving animals in a more timely fashion is still challenging: *if you've got a single horse float and two horses, that means you've got to make two trips. Have you thought about that?*

Interviewees Jack and Joe, both in the police focus group, suggested another reason:

> People don't like leaving the security of their home—disrupting their home life. Just that people seem to be reluctant, I think, to move the animals even though they know the fire is coming. And they seem to leave it all to the very last minute. And then they're finally rounding up horses and all that sort of thing and you think—I don't know why you didn't do it five hours ago.

The perceptions of the participants who contributed to this data set, all of whom are experienced first responders, tell us about the way animal owners behave. Have they observed a key, common denominator, and/or particular difficulties for animal owners? One of the focus groups talked extensively about two aspects they felt needed attention—allocating safe areas where animals can be taken when people evacuate or relocate on catastrophic days and for owners to be more timely in activating their bushfire survival plan.

The first of these is a perennial topic for discussion because on face value, a solution sounds easy—but in reality is fraught with difficulty. Even in the country, dozens of vehicles all together converging on a central "safe" haven for animals will cause traffic chaos, blocking the paths of emergency vehicles and possibly increasing the incidence of motor vehicle accidents. In the city, with proportionally larger numbers of vehicles approaching a common destination, more problems could be created than solved. Holly, in the group said,

> Somebody needs to bite the bullet and designate one of the ovals (for animals). Horses—if they can get to the racecourse is probably best—you can't have horses running around the oval with kids. And the people running the ovals don't want horses churning up the turf and leaving manure everywhere. So it's feeding, and cleaning, and also who's gonna be responsible if there's any damage, or injury to people? So until we overcome those sorts of problems … it's an insurance nightmare. And at the school, they didn't want to have animals in there again because it made massive marks on the gym floor that had to be repaired, but what's the alternative?
>
> Having dogs and cats, rabbits … in the same evacuation area as people and children, hopefully, they're in pet packs or something like that, but it's still massively distressing for them. It's not fair on the animals. It's not fair on the people.

However, the social responsibility remains, and a solution needs to be found for unacceptable situations such as the older lady who spent most of the (catastrophic) day in her car in the supermarket car park with her cat, dog, and two chooks.

As global temperatures rise, severe bushfires in Australia and elsewhere are the "new normal" (Campbell, D. South Australian CFS, personal communication, 2016), and prevention is vastly less costly than response and recovery (42). Converting an intention (to do something not enjoyable) into a routine action (as non-threatening and essential as buying groceries) could mean a substantial shift in the uptake of readiness behavior.

CONCLUSION

Analysis of these data in this paper supports the premise that reciprocal collaboration between emergency services and animal owners can positively contribute to the efficient progress of a response, with mutual benefit and an enhancement in positive outcome expectancy. This includes more effectively implementing practical solutions to important potential problems such as traffic congestion. Reducing the number of non-essential vehicular movements at the time of an incident significantly improves the ability of emergency services to readily access affected areas. Thus, as these data show, moving animals in anticipation ahead of a day of catastrophic fire danger has the double advantage of reducing traffic at critical times, and removing animals from a high risk area, with the added benefit of allowing their owners to make safe arrangements for themselves.

Designating safe places to take animals remains problematic despite ongoing discussion among response and recovery agencies. Animals are the responsibility of their owners, as is their safety, and/or relocation to a place of refuge. However, special needs groups of people who require help to do this, or who negotiate their social microclimate in the company of an assistance animal, need support and a solution to this potentially distressing and possibly life-threatening problem.

In addition to identifying reciprocal collaboration as mutually beneficial, this analysis identified two key outcomes (i) gaining an understanding of the etiology of behavior and decision-making and (ii) offering practical suggestions to influence policy development and implementation. These are summarized in **Table 2**, and are the subject of later data analysis.

Future research, including analysis of the remaining themes of this data set, will further explore and address these issues from different perspectives, and continue to assess how the interface between animal owners and emergency responders can improve the safety and survival of animal owners, and of other groups. Procedures and processes, strategies, and tactics that are of assistance to animal owners are likely to be translatable and applicable to other areas of need where gaps exist. Additionally, some bespoke solutions may be needed, and could be formulated, trialed, and expanded as required to enhance bushfire survival.

Further research will then be needed to evaluate the efficacy of policy changes suggested by this study overall and to ascertain the role and application of relevant social theory in maintaining and enhancing community well-being, and, ultimately, the saving of human life in a bushfire emergency.

TABLE 2 | Key outcome themes identified in the current study.

Policy development and implementation	Etiology of decision-making
Catastrophic day leave	Effect of the social microclimate
Financial incentives • Insurance policies • Municipal fees and charges • Best practice rewards	Adaptive rewards as opposed to costs—achieving a net gain Maladaptive costs—negate maladaptive rewards
Farming practices, fuels, and firebreaks	Dynamic risk assessment

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the National Statement on Ethical Conduct in Human Research (2007), and the Human Research Ethics Committee of Western Sydney University, approval number H11118, with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by the Human Research Ethics Committee of Western Sydney University.

AUTHOR NOTES

"Don't Just Do Something … Stand There!" is a quotation used in training work-shops by Robert Kearney, Order of Australia Medal, Justice of the Peace, Vietnam veteran, military historian, author and retired trainer to the South Australian Country Fire Service.

AUTHOR CONTRIBUTIONS

RW and MT contributed to the initial design of the research project on which this manuscript is based, and all authors contributed to refinement of the design and research that is currently underway in support of this. RW drafted the manuscript and MT, KR, and HB contributed to revisions. All authors read and approved the final manuscript.

ACKNOWLEDGMENTS

Grateful thanks are extended to the participants in this study and to the South Australian CFS, the MFS, SAPOL, and the South Australian SES. Special thanks to Susan Mowbray, Western Sydney University, for her invaluable contribution to earlier drafts of this paper.

FUNDING

This research is funded by the Bushfire and Natural Hazards Cooperative Research Centre, Australia, and is part of the Managing Animals in Disasters project. Other than general approval of the overall structure, and agreement to pre-determined milestones, the funding body has no role in the study's design, data collection, analysis and interpretation, or in writing the manuscript.

REFERENCES

1. Gordon R. Acute responses to emergencies: findings and observations of 20 years in the field. *Aust J Emerg Manag* (2006) 21(1):17–23.
2. Gordon R. *People and Communities: How Do They React and Recover After Fire?* Adelaide: Government of South Australia and Australian Red Cross (2016).
3. DEWNR. *Managing Natural Resources*. Adelaide: Government of South Australia (2016). Available from: http://www.environment.sa.gov.au/managing-natural-resources/water-resources
4. South Australian Country Fire Service. *Bushfire History*. Adelaide: South Australian Country Fire Service (2016). Available from: http://www.cfs.sa.gov.au/site/about/history/bushfire_history.jsp
5. Government of South Australia. *Wangary Bushfires*. Adelaide: Government of South Australia (2016). Available from: http://www.safecom.sa.gov.au/site/initiatives_reviews/wangary_bushfires.jsp
6. Savin-Baden M, Major CH. *Qualitative Research*. Abingdon: Routledge (2013).
7. Braun V, Clarke V. *Successful Qualitative Research*. London: SAGE (2013).
8. Cornish F, Gillespie A. A pragmatist approach to the problem of knowledge in health psychology. *J Health Psychol* (2009) 14(6):800–9. doi:10.1177/1359105309338974
9. Rogers RW. A protection motivation theory of fear appeals and attitude change. *J Psychol* (1975) 91:93–114. doi:10.1080/00223980.1975.9915803
10. Tuason MTG, Güss CD, Carroll L. The disaster continues: a qualitative study on the experiences of displaced Hurricane Katrina survivors. *Prof Psychol Res Pract* (2012) 43(4):288–97. doi:10.1037/a0028054
11. Paton D. Disaster resilient communities: developing and testing an all-hazards theory. *J Integr Disaster Risk Manag* (2013) 3(1):1–17. doi:10.5595/idrim.2013.0050
12. Ronan KR, Johnston DM. *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families*. USA: Springer (2005).
13. RSPCA. *How Many Pets Are There in Australia?* (2014). Available from: kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html
14. Primary Industries and Regions South Australia. *Property Identification Codes and Statistics Report*. Adelaide: PIRSA (2015).
15. Barker SB, Wolen AR. The benefits of human-companion animal interaction: a review. *J Vet Med Educ* (2008) 35(4):487–95. doi:10.3138/jvme.35.4.487
16. Leonard HA, Scammon DL. No pet left behind: accommodating pets in emergency planning. *J Public Policy Mark* (2007) 26(1):49–53. doi:10.1509/jppm.26.1.49
17. Thompson K. Save me, save my dog: increasing natural disaster preparedness and survival by addressing human-animal relationships. *Aust J Commun* (2013) 40(1):123–36.
18. Hall MJ, Ng A, Ursano RJ, Holloway H, Fullerton C, Casper J. Psychological impact of the animal-human bond in disaster preparedness and response. *J PsychiatrPract*(2004)10(6):368–74.doi:10.1097/00131746-200411000-00005
19. Bird D, Panchuk S, Ronan KR, Anderson-Berry L, Hanley C, Canterford S, et al. *Severe Tropical Cyclone Marcia: An Examination of Information and Warnings Broadcasted to Inform Mitigation and Community Preparedness. Australasian Fire and Emergency Services Authorities Council*. Brisbane: AFAC (2016).
20. Braun V, Clarke V. Using thematic ananlysis in psychology. *Qual Res Psychol* (2006) 3(2):77–101. doi:10.1191/1478088706qp063oa
21. Smith B, Taylor MR, Thompson K. Risk perception, preparedness and response of livestock producers to bushfires: a South Australian case study. *Aust J Emerg Manag* (2015) 30(1):38–42.
22. Eriksen C, Gill N. Bushfire and everyday life: examining the awareness-action gap in changing rural landscapes. *Geoforum* (2010) 41(5):814–25. doi:10.1016/j.geoforum.2010.05.004
23. Whittaker J, Handmer J, Mercer D. Vulnerability to bushfires in Australia: a case study from East Gippsland, Victoria. *J Rural Stud* (2012) 28(2):161–73. doi:10.1016/j.jrurstud.2011.11.002
24. Caelli K, Ray L, Mill J. 'Clear as mud': toward greater clarity in generic qualitative research. *Int J Qual Methods* (2003) 2(2):1–24.
25. Sandelowski M. Whatever happened to qualitative description? *Res Nurs Health* (2000) 23:334–40. doi:10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G
26. Sikes P. Researching research cultures. In: Sikes P, Potts A, editors. *Researching Education from the Inside*. Abingdon: Routledge (2008). p. 143–58.
27. Guba EG, Lincoln YS. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. In: Williams D, editor. *Naturalistic Evaluation New Directions for Evaluation. 30*. San Francisco: Jossey-Bass (1986). p. 15–25.
28. Westcott R. Adelaide: Rachel Westcott (2016). Available from: https://ptlincolnproject.wordpress.com/
29. Taylor GW, Ussher JM. Making sense of S&M: a discourse analytic account. *Sexualities* (2001) 4:293–314. doi:10.1177/136346001004003002
30. Drabek TE. *Social Dimensions of Disaster*. 2nd ed. Emmitsburg: Emergency Management Institute, Federal Emergency Management Agency (2004).
31. Akama Y, Ivanka T. *What Community? Facilitating Awareness of 'Community' through Playful Triggers. Proceedings of the 11th Biennial Participatory Design Conference*. Sydney, Australia: ACM (2010). p. 11–20.
32. Wilkinson C, Eriksen C, Penman T. Into the firing line: civilian ingress during the 2013 "Red October" bushfires, Australia. *Nat Hazards* (2016) 80(1):521–38. doi:10.1007/s11069-015-1982-5
33. Shevellar L, Riggs R. Understanding resistance to emergency and disaster messaging. *Aust J Emerg Manag* (2016) 31(2):31–5.
34. Terpstra T. Emotions, trust, and perceived risk: affective and cognitive routes to flood preparedness behavior. *Risk Anal* (2011) 31(10):1658–75. doi:10.1111/j.1539-6924.2011.01616.x
35. Gordon R. *Community and Psychological Responses to Disaster*. Melbourne: Australian Psychological Society (2009).
36. Gibbs L, Waters E, Bryant RA, Pattison P, Lusher D, Harms L, et al. Beyond bushfires: community, resilience and recovery – a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health* (2013) 13:1036. doi:10.1186/1471-2458-13-1036
37. Gibbs L, Bryant R, Harms L, Forbes D, Block K, Gallagher HC, et al. *Beyond Bushfires: Community Resilience and Recovery Final Report*. Melbourne: University of Melbourne (2016).
38. Government of South Australia. *Emergency Management Act*. Adelaide: Government of South Australia (2004).
39. Prelgauskas E. *Advisory Note to Department of Planning, Transport and Infrastructure, Human Implications from Planning Policy on Expanding Peri-Urban Villages*. Adelaide: Pinery Fire Local Recovery Committee (2016).
40. Prelgauskas E. Helping fire-impacted families in rebuilding: toward enhanced community resilience outcomes. *Aust J Emerg Manag* (2016) 31(4):54–9.
41. South Australia Police. *Guidelines for Managing Road Closures during Bushfires*. Adelaide: Government of South Australia (2016). Available from: https://www.police.sa.gov.au/__data/assets/pdf_file/0006/262176/Road-Closures-Public-Guidelines.pdf
42. Attorney-General's Department. Productivity commission inquiry into natural disaster funding arrangements. Submission 90. *Attorney General's Department*. Canberra: Australian Government (2014). p. 12–22.

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2017 Westcott, Ronan, Bambrick and Taylor. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

APPENDIX

Interview Guide—Primary Responders

1. Background: hazard severity
   - How does "fire season" seem to have changed over the last 10–15 years?
   - How does a response begin?
     - o Resources available and/or deployed
     - o "Situation reports" and communications
     - o Decision-making—local knowledge, prior experience, precautionary actions, intelligence from first-on-site, and influence of ambient conditions
     - o Is it assumed that a fire could reach (the highest) Level 3
   - Likelihood of occurrence—how are prevention and preparedness messages communicated in off-season? Are particular demographics targeted?
   - As a community member, how does being trained as a firefighter/emergency services member change attitudes to a bushfire hazard?
   - Are firefighters/first responders as individuals, each a conduit of information out into the community?
   - How do firefighters/responders deal with being away on a fire truck, when their own homes or properties may be under bushfire threat?
   - Hypothetically, if a fire crew goes to the assistance of a household who have stayed to defend, but for whatever reason that is no longer tenable, and the crew and the residents are in danger as a single group—the fire crew would take control of the situation—how collaborative can such an action be between both parties, or can it?
   - How do the fire crew enforce "life, property, and environment" in circumstances when people may be attempting to gather possessions, or save animals?
2. With respect to animals
   - What kinds of animal issues have arisen during a bushfire response?
     - o Companion animals
     - o Assistance animals
     - o Horses
     - o Livestock
     - o Wildlife
     - o Animals wandering at large
     - o Businesses, e.g., boarding kennels
   - Getting back to *life, property, and environment*: how do you manage the "gray" areas, such as livestock as property
   - Have fire crews picked up animals in field, or are they given animals (especially wildlife) by members of the public?
   - What do they do with them?
   - Does this detract from core business?
   - Fire crews can be distressed by issues of animal welfare during a fire—how do you manage this?
     - o Debrief/after action review
     - o Can it detract/distract from response/team efficacy?
   - What about home owners—wanting to return home to attend to livestock/pets/animals in their care?
   - How do primary responders perceive animal owners, with respect to expectations of behavior in a fire, and their capabilities?
   - Have animal owners caused difficulties for responders in-field? e.g., with well-meaning people (with disregard for their own safety) attempting to rescue animals from a fire? Are these people animal owners? Others unauthorized? Media?
   - What interaction or support has there been locally with existing animal agencies—Primary Industries and Resources SA (PIRSA), Royal Society for the Prevention of Cruelty to Animals (RSPCA), Department of Environment, Water and Natural Resources (DEWNR), Council or Shire Ranger etc?
   - What are your observations of animal owners in the field? e.g., levels of preparation, eagerness to cooperate?
   - Are there challenges for responders with respect to assistance they may be called upon to give, or wish to give, animal owners or to animals directly; or with respect to what they should do, what they can do, and what they actually do? (behavior in the field vs. policy)
3. Information gathering and organizational cohesion/communication
   - How is information sourced in a response, as an input (e.g., field intelligence) and an output (information and advocacy back to community)?
   - Within the organization, how is local knowledge integrated with centralized directives?
   - How is information given to the community assessed for accuracy and timeliness?
   - How is accuracy balanced with giving the community information early in the event timeline?
   - Is organizational credibility (e.g., public perception of the "brand") consciously used to engage community?
   - Have problems with animals and/or their owners presenting in-field adversely affected community relations?
   - Has this been addressed in After Action Reviews?
   - How well does interorganizational cooperation/collaboration work—primary responders with PIRSA, RSPCA, DEWNR, Council Ranger, etc?
   - Individual and community knowledge base—are there particular groups or demographics which are difficult to engage?
   - Are there groups which could benefit from bespoke response options?
   - What training courses or workshops are available for the public, and do these include identified special groups, such as animal owners?

Contemporary relevance of the paper

> ***From the abstract of the paper:***
>
> ***Results from the first theme, chosen for its 'overview' properties, are discussed in this paper, and indicate that exploring the animal owner – emergency responder interface has the potential to generate useful additions to public policy, and expansion of social theory.***
>
> This paper is relevant because:
>
> - the awareness-preparedness gap exists and is persistently too large
> - new and different ways to narrow the gap need to be developed to improve human safety in a changing climate
> - specific participant demographics draw from a wide cross-section of society
> - this research aims to motivate behaviour change without using fear

P2 is about the broad, overarching concepts which define the research. It is the beginning of the Thematic Analysis (TA) of the data. The broadest theme was chosen at this early stage of analysis because of the need to be inclusive of all developing possibilities. With respect to Protection Motivation Theory (PMT), P2 initiates the development of the idea to build a culture which favours selecting safer adaptive behaviours and dynamic risk assessment. A thematic map preceded the thematic table (Appendices I and J), allowing a more analogue visualisation of the themes and subthemes. The table was included in Paper 2 as published.

The title of P2*: Don't just do something, stand there!* and the saying, *Hurry up and wait!,* are two mantras of emergency management response. They mean to resist the temptation to 'rush in', and instead to stop, wait and think – even if briefly – as to the consequences of action. They mean to consider the 'big picture' – (in SP1 submitted to the *Australian and New Zealand Journal of Public Health*, the 'big picture' refers to the Sendai Framework for Disaster Risk Reduction – SFDRR. See p 41 Chapter 3, above).

In a contemporary academic and emergency management setting, the *animals in emergencies* literature is becoming increasingly prominent, as the importance of wholistically managing and understanding people's microclimates is recognised. Additionally, the presence of animals as 'dependent others' seeks to understand how animals are included as part of people's social microclimate, and building on P1, how providing for their well-being is more than an act of animal welfare, in that it is increasingly recognised as significantly influencing the physical and psychological health of owners, and others. This people-centred focus is at the core of the Sendai Framework.

It is as well important to remember the potentially adverse impact an emergency incident has upon responders. Acknowledging the importance of 'caring for carers' is a relatively new sub-discipline of the last decade and one which is increasingly receiving more, and necessary, attention (Benedek et al., 2007, beyondblue, 2016, Gulliver et al., 2016). Community shared responsibility and mutual support (as evidenced in researching the emergency responder-animal owner interface) can lessen the likelihood of detrimental psychological sequelae (Gordon, 2004, Gordon, 2016).

In Australia, and many other Western countries where animal ownership is high, and where bushfires or other natural hazards occur, animals will present as part of the hazard environment. Sometimes the animal is inextricably linked to the human – as in the example given in Paper 2 of an assistance dog with a child. The child may not be able to function in the world without the assistance of the dog, and especially in the high stress environment of evacuating ahead of a fire. Finding ways to manage animals without separating them from their owners is a complex issue of public health and safety, and is yet to be satisfactorily addressed. As one participant noted, animals and people 'all in together' is not fair to either group, and potentially runs a high risk of injury, distress and litigation.

At a practical level, P2 proposes straightforward, easily achievable 'do now' strategies; these directly relate to the participant groups and their mutual, and reciprocal, responsibilities - particularly concerning logistics during a response. These 'little' things are important - easily implemented, and are the beginnings of teaching people to think more broadly and dynamically - to think beyond their own

social microclimate and about dynamic risk assessment. Beyond these simpler things, P2 funnelled the research focus and identified other avenues to pursue to encourage fire-fitness. Thus, refining the focus simultaneously facilitated generation of widely applicable public policy from a point source, to help cultivate and establish a culture of preparedness: to facilitate fire-fitness as a social norm.

Illustration 5: *South Australia Police (SAPOL) station, Liverpool Street, Port Lincoln (top) and the Emergency Services Centre, Matthew Place, Port Lincoln. SAPOL, the Country Fire Service (CFS) and the State Emergency Service (SES) all participated in research interviews or focus groups.*

CHAPTER FIVE

The narrative of Paper 3: Towards public policy and practice.

THIS CHAPTER CONTAINS:

- Rationale for Paper 3
- Paper 3 as published
- Contemporary relevance of the paper

THE RATIONALE FOR PAPER 3

Analysis of the data to develop the first of two key thematic streams identified in Paper 2 – *Policy development and implementation*
Explore data relating to the workplace, financial incentives and farming practices
Critically interrogate the data to search for new preparedness strategies
Use data extracts to best illustrate and support analysis
Propose innovative public health and safety policy to implement and trial with respect to narrowing the awareness-preparedness gap – an approach to attaining fire-fitness
Research question: *what preparedness initiatives can be learnt from the emergency responder-animal owner interface which may be usefully applied to the greater public as a whole, and particularly in a bushfire at-risk community?*
Consider 'background' relevance and usefulness of Protection Motivation Theory (PMT)

Box 5: *Rationale for P3*

PAPER 3 as published, following on pp 55-59

WESTCOTT, R. 2017 **Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives.** ***Australian Journal of Emergency Management,*** **31, 37-41.**

Presented at AFAC17 powered by INTERSCHUTZ – the annual conference of AFAC and the Bushfire and Natural Hazards CRC.

Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives

Dr Rachel Westcott, Western Sydney University and Bushfire and Natural Hazards CRC.

Submitted: 23 July 2017. Accepted: 12 September 2017.

ABSTRACT

This study proposes innovative ways for routine 'fire-fitness' to become a social norm to narrow the bushfire awareness-preparedness gap and thus save human lives. It identifies new, data-driven preparedness policies to help improve human safety in all-hazards emergencies. Public preparedness for natural hazard events requires continual improvement. Addressing this with innovative public health policy and practices aims to more effectively manage the impact of fire and worsening severe weather events on human populations.

The Lower Eyre Peninsula in South Australia was selected as a research site for several reasons including its recent and severe fire history. Data were collected from stakeholders, namely emergency responders and animal owners, to explore, problem-solve and arrive at practical and achievable answers to cultivate a culture of preparedness as a routine activity. Data analysis generated three initiatives with the potential to achieve this, being a new type of workplace leave, financial incentives linked to municipal charges and reviewing management of firebreaks and crop placement in the modern environment of 'conservation farming'. These represent medium to long-term changes to public health and safety policy that can help to make 'fire-fitness' a social norm.

Introduction

A serious fire affecting people, their livelihoods and immediate social environments (the social 'microclimate') is a complex non-routine social problem (Drabek 2004). Discerning how people and emergency managers can better equip communities to protect themselves and the things they hold dear is an imperative given the evidence-based predicted changes to near-future global weather events. Recent severe natural hazards are acknowledged as an indicator of a 'new normal' of extreme weather (New Scientist 2013, Beynon 2016, Lewis 2016) that requires prioritisation of innovative preparedness initiatives.

Fire science explores an expanding spectrum of fire-related social, physical and agricultural science topics and has become a sophisticated research field in many wildfire-prone countries. This knowledge contributes to the successful and dynamic management of increasingly complex fire problems affecting many aspects of human populations. This study contributes to this knowledge base. It records, documents and analyses some of the experiences, expectations and needs of communities that have 'lived through' bushfire emergencies, and expect to face this hazard again. This paper's research question asks: what preparedness initiatives can be learned from the emergency responder/animal-owner interface that may be usefully applied to the public as a whole and particularly in a bushfire at-risk community.

Using a pragmatic qualitative approach, a case study of a bushfire at-risk regional area in South Australia—'the driest state in the driest continent' (Department of Environment Water and Natural Resources 2016)—was chosen as the research site because of its recent and severe fire history and diversity of animal ownership (South Australian Country Fire Service 2016). Fire can become an emergency when it impacts adversely on people, property, the environment and other assets - including commercial viability, business continuity and family legacy to future generations. Experience of such an event, and loss of any kind, can dramatically impact upon human physical and psychological health for variable timeframes, whether in an urban, semi-rural or pastoral environment (Gordon 2009, Chur-Hansen 2010, Gordon 2015).

Fire approaching the township of Port Lincoln in 2009, taken from the north eastern perimeter.

Image: Michael Reynolds

To help people and their social and physical microclimates become 'fire-fit' requires preparedness behaviour to transition from being a desirable, although time-consuming, 'optional extra' to a regular activity which is as routine as buying the groceries or putting fuel in a motor vehicle. In Australia and elsewhere, household levels of fire-fitness are disproportional to the magnitude of public resources assigned to help people achieve bushfire readiness (Ronan & Johnston 2005, Paton 2013, Westcott *et al.* 2017a). Actively cultivating sustainable patterns of behaviour to establish and maintain a culture of preparedness can be achieved through innovative public policies that build capacity and enhance resilience in the medium and long-term. To do so requires careful consideration of what *precedes* preparedness messaging to create an environment conducive to adaptive action outcomes (Westcott 2017). Paradigm change to cultivate a routine culture of preparedness by means of public policy initiatives is achievable, resulting in a safer society with reduced avoidable trauma and anxiety (Westcott *et al.* 2017b).

Method

The need for new, practical strategies to evolve and problem-solve natural hazard public policy and practice (Gibbs *et al.* 2013, Gibbs *et al.* 2016) identified a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology as the most appropriate framing for the study (Cornish & Gillespie 2009, Braun & Clarke 2013, Savin-Baden & Major 2013). For further information, this method is described in detail in Westcott *et al* (2017a). Participant groups were emergency responders (operational members of the South Australian Country Fire Service, State Emergency Service, Metropolitan Fire Service and South Australia Police) and the owners of any kind of animal. This included farmers, small business owners and owners of companion, recreational and assistance animals, or carers of wildlife. This demographic is important for two reasons:

- group commonality (owning an animal) crosses the boundaries of many other groups, with 63 per cent of Australian households owning a companion animal (Royal Society for the Prevention of Cruelty to Animals 2014, Animal Medicines Australia 2016)
- the need to investigate new and different groups to discover key reasons why awareness of bushfire hazards does not necessarily translate into proactive, effective prevention and preparedness behaviours, particularly among bushfire at-risk communities.

Data were collected using semi-structured interviews and six focus group discussions with 69 participants. Thematic Analysis (TA) was used for data analysis because of its flexibility and independence from theory. This interpretative, inductive, data-driven approach enabled straightforward answers to practical questions. The recursive process of analysis was coded and managed with CAQDAS[1] software, NVivo 11. A thematic map and table were generated to visualise actively identified thematic inter-relationships in the data (Westcott *et al.* 2017a). Pseudonyms are used to protect participant identity.

Results, interpretative analysis and discussion

Data analysis of the preparedness theme, 'Be fire-fit: weekly is worth it!' (so-called to connect routine behaviour (fire-fitness) with frequency (weekly) and net benefit (is worth it)) identified three areas of new policy. These areas have the potential to establish prerequisite conditions that favour routine fire-fitness and improve longer-term public health and safety outcomes.

Catastrophic Day Leave: a formal workplace agreement

In Australia, the public are notified of an approaching 'catastrophic' Fire Danger Rating (FDI) at 4.00 pm the previous day by the Bureau of Meteorology (BoM) (Bierman P. personal communication 2016). This information is available via the BoM website. However, people are faced with the dilemma of what to do on a catastrophic day even if they have a well-written and established bushfire survival plan. A myriad of commitments can present as obstacles, including the requirements of the workplace.

Residents need time to enact their plan. This dilemma, and workplace difficulties experienced by employees when requesting leave of absence during the 2013 'Red October' bushfires in New South Wales, is reported by Wilkinson and colleagues (2015). A formal contractual arrangement with employers could overcome this difficulty.

Catastrophic Day Leave (CDL) is proposed as a new workplace agreement that allows employers and employees to negotiate substituting another type of

1 Computer Assisted Qualitative Data Analysis System

leave or entitlement (e.g. recreation leave or overtime) with an agreed number of CDL days. Potentially, such a policy could encourage others to establish plans and arrangements within their networks, promoting a culture of shared responsibility with mutual workplace and community benefits, thus elevating a culture of bushfire preparedness to 'business as usual' status.

Senior firefighter, Shane, described the dilemma of time-poor families trying to juggle preparedness and their daily commitments:

> *Bushfires…to me are the greatest example of time and motion. The fire is in motion and you've never got enough time… there's so much [to do] at an individual level and in the mosaic of a… community.*

CDL is not intended to replace leave already granted to employees who are emergency services volunteers for the purpose of participating in an emergency response. Nor would it be used for out-of-season preparedness work as this should be done in a property owner's own time on non-catastrophic days. While CDL would not be particularly helpful to people who are self-employed, and catastrophic days could outnumber available days of leave, it recognises and proactively addresses the need to implement necessary societal-wide changes that are proportional to preparing for the 'new normal' of changing weather events (Council of Australian Governments 2011, Gibbs *et al.* 2013, Gibbs *et al.* 2016).

Financial incentives

Prevention and preparedness initiatives are vastly less costly than response, relief and recovery operations (Attorney-General's Department 2014, McClean 2017). In combination with CDL, carefully designed, locally targeted financial incentives could encourage the integration of widespread fire-fitness preparedness behaviours into daily routines. In the business focus group, Sandy said, 'people respond very well to financial incentive'.

Community fire water tanks around Lake Eyre Peninsula are a constant reminder to people that the threat of fire is ever present.

Image: Rachel Westcott

Government fees and levies

Currently, emergency services levies are applied in some form to land owners in all Australian states and in the Australian Capital Territory (State Custodians 2017). This is frequently resented in rural areas where land owners may have mainly non-cash assets, usually comprise a large proportion of the available firefighting personnel and resource a response themselves with their own on-farm firefighting vehicles ('farm fire units'). Property owners therefore seem to pay the levy and also fight fires with their own equipment, often leaving their own farms and homes to contribute to community wellbeing. This mismatch could be overcome by separately rewarding best-practice fire preparedness.

Local councils have inspectors with the power to issue fines to land owners on residential or rural living blocks who fail to make their properties fire-ready. A relatively simple extension of this system could see preparedness rebates issued, as well as fines. Arguably, a rewards-based method of acknowledging best-practice preparedness could be more effective than the absence of a fine.

Volunteer rescue officer June spoke with respect to her role as a local government inspector:

> *We have to assess properties annually in October and send notices. I inspect 2,500 properties, rural living and residential properties in my area, and I only send about 120 notices. I hardly ever have to act on any of the notices. But I don't visit farms, you'd just never get around to them all.*

An expansion of the inspectorate would be necessary to include farms. This could be facilitated by the use of 'drone' technology (Unmanned Aerial Vehicles (UAVs)) or by land owners up-loading their own photographic or video evidence for assessment to overcome issues of privacy. Additional costs could be offset by savings because response and recovery are more expensive than preparedness activities (Attorney-General's Department 2014).

New residents and municipal discounts

Participants in both groups were eager to find new ways to help urban migrants learn more about bushfire hazards for their own and the community's safety. New people could readily receive current information and assistance by attending non-compulsory community fire safety information sessions. They could be encouraged to do so via an invitation accompanying their first Council (Shire) rates notice that offers attendees a meaningful discount on the second year's rates. To qualify, participation in a given number of fire information seminars would be required, which could be spread over a 12-month period to give maximum opportunity for people to participate. This kind of education could overcome new residents' misconceptions, as noted by Shane:

> *They [in the subdivision] believe that we will be there to save their house and horses. But we point out there are three fire trucks sitting in that shed and six hundred homes over that hill.*

Fire conservation towers like this one on Winters Hill outside Port Lincoln on the Eyra Peninsular, provide early warning of fire approach for local communities.

Image: Rachel Westcott

Community 'Best Practice' rewards

Extending existing community achievement and award programs could be another way to promote a culture of bushfire safety and help build strong relationships with emergency services organisations. Civic awards similar to the 1970s 'Tidy Towns'[2] program, such as 'Bushfire Best-Prepared Towns', could attract additional funding from government or corporate sources. Such initiatives can enhance community pride and collaboration and boost the local tourism economy.

Property value-adding

Identifying 'bushfire-safer properties' that comply with current Australian Standards (Standards Australia 2009) could help build routine fire-fitness by attracting higher selling prices and encouraging other property owners to similarly value-add. This may be facilitated by linking to a rebate scheme as suggested above, and by applying appropriate annotation. Properties not intended for sale could be promoted as exemplars of fire-fitness by joining existing programs such as the Australia-wide 'Sustainable House Day'[3] or other 'open house' style programs similar to 'open gardens' to showcase and educate others to do likewise. As this concept is already established and understood within communities, extending it to fire-safe properties is an achievable extrapolation.

2 'Tidy Towns' is an initiative of the Keep South Australia Beautiful (KESAB) campaign that began in 1978. It is now known as the Sustainable Communities program. See: www.kesab.asn.au/programs/sustainable-communities/program-information.

3 Sustainable House Day at: https://sustainablehouseday.com/about-shd/.

Farming practices, fuels and firebreaks

The influences of modern 'conservation farming' techniques on fire behaviour were independently discussed by farmer and emergency responder participant groups. No-till cropping, greater productivity, the popularity of oil-seed crops and reduced farm firebreaks all contribute and need further research.

Sheep and wheat farmer Paul noted:

> *I think with our modern farming we're achieving crop yields that are way and above what we've ever been able to do in the past.... there're two contributing factors [to heightened fire risk] - increased area of crop and also a greater crop residue.*

Farmer Trevor added:

> *Pasture or legume crops wouldn't carry a fire as quickly as canola stubble would, so that's an option with stock nearby.*

From a wheat and sheep property further north, Bob observed:

> *There's been a huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that's pretty hard to stop, and there's continuous cropping. Now, every effort is made to retain stubble so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 per cent over the last 20 years at least, so you've doubled the burnable material that's there to go up and so, of course, it goes like nuts.*

Paul added that a review of firebreaks is overdue in the context of modern farming practice:

> *Firebreaks...won't stop the fire but give you something to burn back to. This could be made mandatory with a council by-law so everyone has to do it. A little bit of loss could mean that a lot of people are safer.*

Conclusion

Making fire-fitness a routine social norm requires all stakeholders to proactively reassess what *precedes* preparedness to implement changes with medium to long-term public benefit. Proactive campaigns can resonate with more people by adopting innovative social strategies such as CDL and targeted financial incentives. These methods need trialling and evaluation to determine how best to narrow the awareness-preparedness gap. Additionally, further research is required to accurately determine how modern farming practices and crop types influence fire behaviour to unequivocally manage and balance productivity versus safety. Given the predicted increase in extreme weather and fire severity, the challenge of transitioning fire-fitness to become a social norm—thus fortifying community wellbeing in a bushfire emergency—requires a dynamic, problem-solving paradigm melded from science, government and the at-risk communities themselves.

Acknowledgments

This research is supported by funding from the Bushfire and Natural Hazards CRC. Thanks are extended to Dr Mel Taylor, Professor Kevin Ronan, Professor Hilary Bambrick and Dr Susan Mowbray for their help and support during this project. Grateful thanks also to the communities and Emergency Services of Lower Eyre Peninsula.

References

Animal Medicines Australia 2016, *Pet Ownership in Australia 2016, Animal Medicines Australia, Canberra.*

Attorney-General's Department 2014, *Productivity Commission inquiry into natural disaster funding arrangements. Australian Government, Canberra.*

Braun V & Clarke V 2013, *Successful Qualitative Research, London, Sage.*

Chur-Hansen A 2010, *Grief and bereavement issues and the loss of a companion animal: People living with a companion animal, owners of livestock and animal support workers. Clinical Psychologist, vol. 14, pp. 14-21.*

Cornish F & Gillespie A 2009, *A Pragmatist Approach to the Problem of Knowledge in Health Psychology. Journal of Health Psychology, vol. 14, pp. 800-809.*

Council of Australian Governments 2011, *National Strategy for Disaster Resilience: Building Our Nation's Resilience to Disasters. Department of the Prime Minister and Cabinet. Canberra:*

Department of Environment Water and Natural Resources 2016, *Managing natural resources. Government of South Australia, Adelaide. At: www.environment.sa.gov.au/managing-natural-resources/water-resources [12 September 2017].*

Drabek TE 2004, *Social Dimensions of Disaster, Emmitsburg, Emergency Management Institute, Federal Emergency Management Agency.*

Gibbs L, Bryant R, Harms L, Forbes D, Block K, Gallagher HC, Ireton G, Richardson J, Pattison P, MacDougall C, Lusher D, Baker E, Kellett C, Pirrone A, Molyneaux R, Kosta L, Brady K, Lok M, van Kessell G & Waters E 2016, *Beyond Bushfires: Community Resilience and Recovery Final Report. Melbourne: University of Melbourne.*

Gibbs L, Waters E, Bryant RA, Pattison P, Lusher D, Harms L, Richardson J, MacDougall C, Block K, Snowdon E, Gallagher HC, Sinnott V, Ireton G & Forbes D 2013, *Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. BMC Public Health, vol. 13, p. 1036.*

Gordon R 2009, *Community impact of disaster and community recovery. InPsych - Australian Psychological Society.*

Gordon R 2015, *How do people and communities react and recover after the fires. Community information sessions, Melbourne.*

Lewis S 2016, *Time to adapt: 2015's record-breaking temperatures will be normal by 2030. Sydney: Australian Broadcasting Corporation. At: www.abc.net.au/news/2016-11-07/record-breaking-temperatures-will-be-new-normal-by-2030/8001720 [12 September 2017].*

McClean D 2017, *Australia integrates climate and disaster risk. Geneva: United Nations Office for Disaster Risk Reduction. At: www.unisdr.org/archive/52874 [1 May 2017].*

New Scientist 2013, *Wild weather: extreme is the new normal. At: www.newscientist.com/article/mg21729003-200-wild-weather-extreme-is-the-new-normal/ [12 September 2017].*

Paton D 2013, *Disaster Resilient Communities: Developing and testing an all-hazards theory. Journal of Integrated Disaster Risk Management, vol. 3, pp. 1-17.*

Ronan KR & Johnston DM 2005, *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families, Springer US.*

Royal Society for the Prevention of Cruelty to Animals 2014, *How many pets are there in Australia? At: http://kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html [12 September 2017].*

Savin-Baden M & Major CH 2013, *Qualitative Research, Abingdon, Routledge.*

South Australian Country Fire Service 2016, *Bushfire History. Adelaide: South Australian Country Fire Service. At: www.cfs.sa.gov.au/site/about_cfs/history_of_the_cfs/bushfire_history.jsp [12 September 2017].*

Standards Australia 2009, *Australian Standard® Construction of buildings in bushfire prone areas. Sydney: Council of Standards Australia.*

State Custodians 2017, *Changes to fire services levy to affect home owners. Charlestown: State Custodians. At: www.statecustodians.com.au/changes-to-fire-services-levy-to-affect-home-owners [8 May 2017].*

Westcott R 2017, *What comes first? Building DRR by cultivating a preceding culture of preparedness as a 'social norm'. PreventionWeb DRR Voices. At: www.preventionweb.net/experts/oped/view/54363 [12 September 2017].*

Westcott R, Ronan K, Bambrick H & Taylor M 2017a, *Don't Just Do Something.....Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. Frontiers in Veterinary Science, vol. 4, p. 34.*

Westcott R, Ronan K, Bambrick H & Taylor M 2017b, *Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. BMC Psychology, vol. 5, p. 13.*

About the author

Dr Rachel Westcott is a First Class Honours veterinary graduate of Murdoch University in Perth, Western Australia, and is nearing completion of a PhD with the Bushfire & Natural Hazards CRC and Western Sydney University as part of the Managing Animals in Disasters project. She is a veterinarian in private practice and the coordinator of South Australian Veterinary Emergency Management Inc, an agency of the South Australian State Emergency Management Plan. Her PhD research focuses on public health, by making preparedness for natural hazards a social norm.

Contemporary relevance of the paper

> ***From the abstract of the paper:***
>
> ***This study proposes innovative ways for routine "fire-fitness" to become a social norm to narrow the bushfire awareness-preparedness gap – and thus save human lives. It identifies new, data driven preparedness policies to help improve human safety in all-hazards emergencies.***

Paper 3 is based on an abstract accepted for an oral presentation at the Australasian Fire and Emergency Service Authorities Council (AFAC) conference, 4-7 September 2017, in Sydney, New South Wales. The paper written for the peer reviewed proceedings of the conference was submitted by the conference committee for review and potential publication in the Australian Journal of Emergency Management. It was published in the October 2017 issue.

The paper represents the natural progression of analysis of the data corpus, with an emphasis on reducing the awareness-preparedness gap by using innovative public health and safety strategies across three categories: (i) tailoring workplace leave to help people prepare for bushfire (ii) use of financial incentives, and (iii) reviewing the use of firebreaks, and other farming practices. The first of these involves a potentially significant contributor - the workplace - on which more is written in Paper 4/Chapter Six.

All three recommendations are readily achievable, and need only some visionary advocacy to instigate and trial. None require regulatory or legislative action to implement. It is important to note these strategies are designed to promote and achieve *medium to longer term* changes in the public's level of improved fire-fitness, and in the perception among the wider population of the need to adapt to a worsening natural hazard environment. These two areas are part of a prescient suite of lifestyle changes needed to confront and manage the 'new normal' of extreme weather events (Banwell et al., 2015, Wallace, 2017). These strategies are *not* intended to replace preparedness campaigns. Rather, they are designed to change the preparedness environment by establishing a *preceding* culture of fire-fitness as a routine social norm – as routine as buying groceries or fuelling a car.

Analysis at this point of the research moves dynamically between descriptive, interpretative, constructionist and critically interrogative styles. The latter two apply to the section on *Catastrophic Day Leave* (CDL), where the weighting of the analysis shifts to favour the analyst. Thus, CDL is an analytic construct. *Catastrophic Day Leave* is an original term coined by the researcher during data analysis, and is described and discussed later (pp 74, 126 and 179). As a type of workplace leave, its name may be altered to match local jurisdictional terminology, but the concept remains the same.

Financial incentives were raised on multiple occasions during data collection. What was clear was the need for *locally targeted* bespoke initiatives tailored to suit the heterogeneity and local characteristics of the community, rather than assuming an undifferentiated approach. Some proposals will be more broadly applicable, though in a largely rural area like Lower Eyre Peninsula, it is likely people will respond well to incentives which do not resonate with an urban, or a particularly affluent demographic, and *vice versa*. Local government may be well placed to advise on the most effective local strategy, and initially, proposals from this research could be trialled in two different local government areas – one urban, one rural - to help design and test incentives suitable to a range of residents.

The insurance industry, via the Insurance Council of Australia, is generally represented by a senior officer at most Australian natural hazard emergency locations. Further research should occur regarding the viability of linking best-practice fire-fitness credentials to financial incentives on insurance policies, as well as rebates awarded by local government, as discussed in the paper. Additionally, perceived inconsistencies within the insurance industry should be scrutinised as part of further research, to overcome seemingly quite marked differences between individual assessors from different companies. Assessment needs to be standardised to avoid actual or apparent irregularities. Insurances and subsidies have been explored by Poussin et al (Poussin et al., 2013, 2014) and are discussed in SP1 submitted to the *Australian and New Zealand Journal of Public Health – Public Health and Natural Hazards: New Policies and Preparedness Initiatives Developed from an Australian Case Study* (Appendix A).

A sub-group of any at-risk community is that of new residents. This group may need help to understand their responsibilities, especially if they have no prior experience of natural hazards. Without diminishing the seriousness of the bushfire threat they may face, it is very important they feel welcome and included in the community because they are likely to bring skills, cultural diversity and economic activity.

The strength of civic pride and community cohesion to synergistically engage with and add to existing resources should not be underestimated – particularly where contemporary government and other agency resources are limited. Recognising and utilising the individuals in the social microclimate can work to circumvent these limitations. It may also work to highlight how damping down risk seems to be a weakness in contemporary society which is at best misleading and at worst potentially life threatening (South Australian Country Fire Service, 2017b).

Paper 3 identifies the need for further research on farming practices and a review of the use of firebreaks. Again, locally bespoke, effective options need to be explored, rather than a blanket policy applied. The economics of modern crop science need to be evaluated alongside the influence of a changing climate and severe weather events (Kingwell, 2006, Asseng and Pannell, 2013, Lawrence et al., 2013). Doing so may highlight how some fire-fitness strategies may be implemented with respect to grain growers – whether with firebreaks or crop placement and selection.

In this paper, Protection Motivation Theory (PMT) is relevant as per the expansion proposed in Paper 1. The intention is to motivate behaviour change using strategies to build a culture of preparedness, and with financial incentives, and considering the influences of the social microclimate. Later, in the next chapter, an amendment to PMT is proposed which remodels *adaptive* and *maladaptive* responses to reverse the balance of *costs* and *rewards*, further encouraging fire-fitness as a social norm.

Illustration 6: *Mosaic sofa, Port Lincoln. Built as a symbol of resilience and solidarity by a group of local women, mosaic sofas have become a valued lasting reminder of survival and strength in other fire affected communities. See:*

http://www.abc.net.au/news/2015-11-24/joan-playford-sits-on-kersbrook-couch.jpg/6968432

CHAPTER SIX - The narrative of Paper 4

THIS CHAPTER CONTAINS:

- **Rationale for Paper 4**
- **Paper 4 as published**
- **Contemporary relevance of the paper**

THE RATIONALE FOR PAPER 4

Analysis of the data to develop the second of two key thematic streams identified in Paper 2 – *The aetiology of decision-making*
Explore data relating to the effect of the social microclimate, adaptive and maladaptive costs and rewards, and dynamic risk assessment
Critically interrogate the data to search for new preparedness strategies & tactics
Use data extracts to illustrate and support analysis
Propose innovative public health and safety strategies to implement and trial with respect to narrowing the awareness-preparedness gap
Research question: *How can an enhanced understanding of the aetiology of animal owners' decision-making facilitate the saving of human life in a bushfire emergency? (* Expanded in SP2: ***How can an enhanced understanding of the aetiology of decision-making at the emergency responder – animal owner interface determine ways to promote practising safe, adaptive response choices, and facilitate the saving of human life in a bushfire (or other natural hazard) emergency?)***
Consider a remodelling of Protection Motivation Theory (PMT) to favour and reward adaptive response over maladaptive response – *safer response choices*

Box 6: *Rationale for P4*

Westcott, R. 2017. Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study. Peer-reviewed proceedings of the Australian and New Zealand Disaster and Emergency Management Conference (ANZDMC), Gold Coast, Queensland, May 2017.

Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study.

Rachel Westcott
Centre for Health Research
Western Sydney University and
Bushfire and Natural Hazards Cooperative Research Centre
R.Westcott@westernsydney.edu.au

Paper Presented at the
Australian and New Zealand Disaster and Emergency Management Conference
Broadbeach, Gold Coast (QLD), 22 – 23 May 2017

Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study.

Abstract

This presentation summarises a three year PhD study – part of the BNHCRC project, *Managing Animals in Disasters* - and outlines the proposed translation of research findings into practical applications to benefit individuals and communities in all-hazards emergencies. The purpose of the study was to investigate the interactions and challenges facing animal owners and emergency responders, to expand current social theory, and to explore new or enhanced mitigation and preparedness measures which may be integrated into arrangements to promote human safety, support community well-being and narrow the persistent, and concerning, bushfire awareness-preparedness gap.

The research site for this qualitative study was the Lower Eyre Peninsula in South Australia. This location was determined by several distinguishing factors such as the area's recent and severe fire history and its diversity of animal ownership. In a climate of worsening natural hazards, Emergency Services' public education campaigns have necessarily escalated to keep pace with perceived public threat. The primary factor driving the research design was the need to arrive at practical answers to issues of preparedness, policy and practice. Research questions across the study included:

How can bushfire emergency responders' experiences with animal owners help improve owner safety and survival?

What preparedness initiatives can be learnt from emergency responders' perceptions and observations of animal owners, which may also be usefully applied to other groups in a bushfire at-risk community?

How can an enhanced understanding of the aetiology of animal owners' decision-making facilitate the saving of human life in a bushfire emergency?

A strength of adaptable social theory is its ability to successfully bridge exploration and problem-solving. Actively applying theory to enquiry, and using the results to form practical strategies beneficial to animal owners *and others*, aims to help narrow the awareness-preparedness gap overall, illuminate other research possibilities, and ultimately help save human life.

Keywords: bushfire, preparedness, mitigation, emergency responders, animal owners, animals

Introduction

Bushfires are an ever-present and apparently escalating natural hazard in many parts of the world (Liu et al., 2010, Hughes and Steffen, 2013, Intergovernmental Panel on Climate Change (IPCC), 2014, Kitching, 2014). This worsening threat is further compounded by increases in population density in many high fire danger areas (Prelgauskas, 2016). To keep pace with this increased threat requires discovering, developing and implementing new and additional fire-safe strategies and is a social imperative given the high human, economic and environmental cost of a serious fire.

This paper summarises the findings of a three year research project exploring the animal owner-emergency responder interface in an at-risk bushfire region in South Australia. From the analysis of the stakeholder interviews and focus groups it establishes the research context and proposes new strategies and tactics to improve human safety in natural hazards and to narrow the bushfire awareness-preparedness gap. This paper also demonstrates how social theory - Protection Motivation Theory (PMT) (Rogers, 1975) (Westcott et al, in press) can be advantageously applied to better theorise and understand the behaviours and decision making processes of animal owners in bushfire situations, to construct and achieve safer response choices among animal owners and other demographic groups.

PMT was originally developed for the health promotion and disease prevention sector to describe how individuals are motivated to react in a protective way towards a perceived threat. Rogers' original theory assessed 'threat appraisal' against 'coping appraisal', to which he later added 'adaptive costs' and 'maladaptive rewards' (Rogers, 1983) to better represent the reality of human nature. This study proposes the concepts of 'adaptive costs' and 'maladaptive rewards' be reconstructed and reversed so that *adaptive rewards* become the overall net gain. This approach aims to encourage positive, adaptive actions as default subcomponents of achieving the ultimate aim of saving human life, and conversely, discouraging maladaptive choices due to the deterrent effect of their greater "costs". Integral to this approach is the consideration of applying PMT among differing social microclimates, comprising dependent others, including animals.

A case study of a bushfire at-risk regional area in South Australia – "the driest state in the driest continent" (Department of Environment Water and Natural Resources, 2016) - was distinguished as the research site because of its recent, severe, fire history and its diversity of animal ownership (Government of South Australia, 2016b, South Australian Country Fire Service, 2016a). The case includes responses from livestock farmers and owners of companion and recreational animals, as described by themselves and as perceived by firefighters, police and rescue officers of the State Emergency Service (SES). The perspectives of the animal owner demographic are important because of the urgent need to search among new and different groups to discover key reasons why people make unsafe decisions in bushfire events. Thus informed, potential solutions are proposed to inform, develop and implement strategies to help save human life in bushfire emergencies. More broadly, the proposed new initiatives aim to inspire and motivate the translation of knowledge across different contexts into effective, adaptive actions attainable by residents of bushfire at-risk communities.

Method

The need for this research to arrive at practical answers to issues of policy and practice (Gibbs et al., 2013, Gibbs et al., 2016) identified a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology as the most appropriate framing for the study (Cornish and Gillespie, 2009, Braun and Clarke, 2013, Savin-Baden and Major, 2013). Data was collected using semi-structured interviews and focus group discussions with emergency responders, livestock farmers, owners of companion animals and horses, and several animal-oriented small businesses (n=67). Thematic Analysis (TA) was used for data analysis because of its flexibility and suitability to this pragmatic qualitative study (Westcott et al., 2017). This descriptive and interpretative approach enables straightforward answers to practical questions. The recursive process of analysis was managed with CAQDAS[1] software, NVivo 11, and a thematic map and table (Westcott et al., 2017) was generated to visualise the data's thematic interrelationships (Table 1).

Interpretative analysis and discussion

A serious fire affecting people, their livelihoods and microclimates is a complex *non-routine*

[1] Computer Assisted Qualitative Data Analysis System

social problem (Drabek, 2004). Discerning how people and emergency managers can better equip communities to protect themselves and the things they hold dear is a social imperative given previous research findings and the evidence-based predicted changes to near-future global weather events. Recent severe natural hazards are acknowledged as an indicator of a 'new normal' of extreme weather (New Scientist, 2013, Beynon, 2016, Lewis, 2016) (Campbell, D. South Australian Country Fire Service, personal communication 2016) that requires powerful and innovative preparedness and response initiatives. This involves understanding (i) the context (ii) that people and their social microclimates are complex entities (iii) that preparedness is often suboptimal for varied reasons, and (iv) that preferred response choices require new, readily implementable options to discourage the selection of dangerous, but seemingly desirable, behaviours.

Table 1: Key outcome themes identified in the current study (Westcott et al., 2017)

<table>
<tr><th>CONTEXT AND OVERVIEW</th><th>POLICY DEVELOPMENT & IMPLEMENTATION</th><th>AETIOLOGY OF DECISION-MAKING</th></tr>
<tr><td rowspan="3">Bushfire and animals shouldn't mix
(Theme 1)

• Diversity of animal species and ownership
• Get moving!
• Go….where?
• Special needs groups
• Collaboration
• Future research</td><td>Catastrophic Day Leave (CDL)
(Theme 2 – Be fire-fit! Weekly is worth it!)</td><td>Effect of the social microclimate
(Theme 3 – Complexity of the social microclimate)</td></tr>
<tr><td rowspan="2">Financial incentives
(Theme 2 – Be fire-fit! Weekly is worth it!)
• Insurance policies
• Municipal fees and charges
• Best practice rewards</td><td>Adaptive rewards as opposed to costs - achieving a net gain
(Theme 7 – A problem understood is a problem half solved)</td></tr>
<tr><td>Maladaptive costs - negate maladaptive rewards
(Theme 8 – Ignorance is not bliss)</td></tr>
<tr><td>Farming practices, fuels and firebreaks
(Theme 2 & Theme 1b – On the sheep's back)</td><td>Dynamic risk assessment
(Common to all themes)</td></tr>
</table>

Context and overview: Bushfire and animals shouldn't mix

> *If we've got people that are gonna' stay and defend and leave their horses out in the paddock, they're kidding themselves. If they've decided that their action plan on this day with a total fire ban … their horses can come up to the stables. If they're serious about it, they'd put sprinklers in or they do whatever it is to make a fuel reduced zone to try and ensure the survival of those animals. That's a plan. (Horses) sitting in the bottom paddock when the husband's out fighting the fire and the missus can run down on the four-wheeler and get them, that's not a plan. That's the start of a fatality. And I will point that out very bluntly – politely - I ask them to leave their dental records on the table in a fire proof sheet.*
> Fire officer "Shane" 2015

The presence of animals is one reason people take risks in dangerous situations (Akama and Ivanka, 2010, Wilkinson et al., 2015). Like many Western nations across the world, Australia is a nation of animal lovers and animal owners with 63% of households including a companion animal in their 'family' (Royal Society for the Prevention of Cruelty to Animals, 2014, Taylor et al., 2015). Dangerous response choices reported in the media directed towards the safety of dependent others sometimes involve animals. However, animal welfare, if a motivating factor, should not be considered in isolation because it is intricately linked to human health (Leonard and Scammon, 2007, Barker and Wolen, 2008, Chur-Hansen, 2010, Chur-Hansen et al., 2010).

Senior firefighter Shane has witnessed dangerous human behaviour in attempts to save animals. He explained this is not restricted to an animal's owner – Emergency Services personnel have also risked their lives to save animals from fire. One of Shane's crews, contrary to instructions, went to save a horse from a burning stable: *"…one rang his wife to say goodbye, literally… Two of them received counselling for three years, severe counselling"*. Psychological trauma and the reliving of a distressing fire event may be overcome, or it can linger for a lifetime (Gordon, 2009b, Terpstra, 2011, Gibbs et al., 2013, Gibbs et al., 2016). Similarly, a farmer evacuating horses while a boarding kennel on the adjacent property, full of cats and dogs, describes hearing the animals' cries as the buildings burned, and says he will never stop hearing that sound in his head.

Fire officer Jayne, with 10 years' experience working in fire safety and community outreach, outlined the danger of delay:

> *You must include your animals (in your bushfire plan) because – imagine a family with kids and if mum's only focus is "Let's get the kids in the car" But the kids are focused on the cat and the dog… if the cat scarpers and the dog hides under the shearing shed, then you've got kids running off after animals and the mum's trying to run off after the kids and – it just adds all that unnecessary worry and stress and anxiety.*

Some participants identified the lack of "somewhere to go" as a barrier to timely departure from a high fire danger area on a catastrophic day. Jo in the horse owners group was adamant that knowing where to go well in advance of a fire would positively influence safe decision-making. Dog owner, Maggie, with no connections in the nearest safe town, expressed her frustration:

> *We're told to just pack up and go. Well, I'm sorry, I think that's rubbish. But that's just me. Unless there is a real horror going to happen… I'm not gonna put the dogs in the car and everything else and go somewhere. I mean I know nobody in [town name]. I'm a bit of a separate entity. I'm not being pathetic. I'm just stating a fact. A lot of people are like me. So where am I going to go if I do go away for the day? Stinking hot, you know, with dogs in the car.*

Holly in the SES group articulated several aspects of the problem of safe places for owners with animals:

> *You can't have horses running around with kids. And people running the sports ovals don't want horses churning up the turf and leaving manure everywhere…and who's gonna be responsible if there's any damage, or injury to people? Until we overcome those problems...it's an insurance nightmare.*

Designating safe places to take animals remains problematic despite ongoing discussion amongst response and recovery agencies. Animals *are* the responsibility of their owners, but people with special needs, or who negotiate their social microclimate in the company of an assistance animal, need support and a solution to this possibly life-threatening problem (Westcott et al., 2017). The experience of an older lady who spent most of the (catastrophic) day in her car in the supermarket car park with her cat, dog and two chooks emphasises this dilemma.

These findings support further investigation into (i) identifying how to embed a culture of preparedness in society generally through new public policy, financial incentives and a better understanding of the impact of contemporary farming practices, and (ii) understanding the underlying causes of decision-making as a function of the social microclimate, which can helpfully contribute to achieving safer, adaptive behaviours favouring positive outcomes.

Policy development and implementation

> *I've been to one place in heavy scrub and said look, "We can't come here. This is too dangerous." After the fire, I was the first person there. The house was OK, the fire absolutely incinerated everything around it, but the sprinkler system was running. There the owner was with his young son, walking around putting out hot spots with his sprinkler system just ticking away. It was an awesome, awesome feeling. It's how it was supposed to work. He had a plan. He was prepared psychologically and physically, and he had the gear and it worked brilliantly.*
> Fire officer "Shane", 2015.

Future natural hazards are likely to increase in severity and frequency (Liu et al., 2010, Hughes and Steffen, 2013, Intergovernmental Panel on Climate Change (IPCC), 2014, Kitching, 2014). *For this reason a greater knowledge-base is urgently needed to shape policy for disaster preparedness and response* (Gibbs et al., 2013) (emphasis added). One problematic aspect of preparedness is that messages of mitigation are known to be inconsistently received: the *awareness-action gap* (Ronan and Johnston, 2005, Paton, 2013). Cultivating a societal-wide culture of preparedness could be part of the solution.

The *Be fire-fit: weekly is worth it!* theme (Westcott et al., 2017) is pivotal to understanding and addressing the awareness-preparedness gap. This theme is so named because of the word associations with preparedness and suitability *(fitness)*, frequency *(weekly)* and net benefit *(is worth it).* It is about achieving fluency between knowledge and action and developing policies and practices that help establish preparedness as 'business as usual'. It examines (i) the pre-requisites to preparedness, (ii) responders' perceptions of animal owners' readiness and response behaviour, and (iii) determining how to make effective bushfire preparedness a routine part of daily life – as routine as buying the groceries, or putting fuel in a motor vehicle.

When asked why she thought people don't prepare, Jayne didn't hesitate: *Because it can be very confronting. Why don't people prepare? They might know they're at risk, but why don't they? Because it's actually too confronting.* Participants also identified common barriers to preparedness, including lack of time, resources, knowledge or information. Breaking tasks down into manageable steps by writing a 'bushfire survival plan' to reduce the need for strategic thinking under duress is one way to tackle the confronting nature of dealing with a serious fire, as already actively advocated by fire authorities. But going back one step and scrutinising what *precedes* preparedness messaging may be required to create

and enable a conducive environment receptive to cultivating a societal-wide, cultural shift towards '*business as usual', routine* preparedness. This can be facilitated by strategically implementing new policies and practices to achieve medium- and long-term change across all at-risk groups.

Catastrophic Day Leave

On *catastrophic* days (or the equivalent local jurisdictional nomenclature), people are faced with the dilemma of how to act appropriately even if they have a well written and established bushfire survival plan (South Australian Country Fire Service, 2016b, Department of Fire and Emergency Services, 2017, Natural Resources Canada, 2017, United States Forest Service, 2017). Numerous commitments can present as obstacles. Wilkinson et al (2015) reported varied employee experiences with employers when requesting leave of absence during the 2013 "Red October" bushfires in New South Wales, Australia. Catastrophic Day Leave (CDL) as a contractual arrangement with employers could obviate this difficulty, and promote shared responsibility with mutual workplace benefits. CDL would necessarily involve employer-employee negotiations, such as trading other leave for an agreed number of CDL days a year, or working an extra hour a day for part of each fortnight. Initiating this as a new form of workplace leave would help elevate bushfire preparedness to 'business as usual' status, and raise active awareness of the need to be proactively and effectively prepared in the general community.

Financial incentives

Financial incentives such as discounts on insurance premiums and/or municipal charges (Poussin et al., 2014) are another option to encourage effective fire preparedness and 'fitness' (Westcott, unpublished data 2015). Sandy, in the business focus group unhesitatingly commented: *people respond very well to financial incentive.* In Europe, the French *CatNat* scheme (*Catastrophes Naturelles*) is an example. It is a public/private scheme based on the principle of national solidarity: everyone pays for the benefit of the common good (Poussin et al., 2013, Poussin et al., 2014). In South Australia, the *Emergency Services Levy (ESL),* established in 1999 (Government of South Australia, 2016a), gathers funds to support community emergency responses. However, the 'everyone pays' system has not been uniformly well received in rural areas where landowners (1) have land and infrastructure assets but may be 'cash poor', (2) usually comprise a large proportion of the available fire-

fighting personnel, and (3) supplement the resourcing of a response themselves with their own on-farm fire fighting vehicles (‘farm fire units’). Property owners therefore seem to pay for the privilege of fighting fires with their own equipment - leaving their own farms and homes to contribute to community well-being.

The Government’s response to requests for firefighter discounts on the ESL expresses a dilemma: to exempt one group sets a precedent for others to claim exemption, or could lead to volunteering specifically to claim an exemption (Piccolo 2014, personal communication) (Hyde, 2014). A separate scheme, which rewards preparedness and property management regardless of voluntary service, would overcome the difficulty of rewarding emergency services volunteers *per se*. Such a scheme would impose some additional workload on existing local council inspectors who have the power to issue fines to land owners who fail to make their properties fire ready. These inspectors visit rural living and residential properties – but not farms. Use of modern technology could help overcome the logistical difficulty of assessing large numbers of farming properties, and privacy issues could be managed by asking landowners to send images of their farms themselves.

New residents could be assisted financially by voluntarily attending community fire safety information sessions. An invitation encouraging them to do so could accompany their first Council (Shire) rates notice, offering all attendees a discount on the second year’s rates. To qualify, participation in a given number of fire information seminars would be required, which might be spread over a 12 month period to maximise opportunities for attendance. This scheme could be extended to longer-term ratepayers wishing to update their skills. The possibility of Government subsidy to compensate Local Government for lost revenue should be explored as the cost of achieving net *adaptive reward* is likely to be significantly less than the cost of response and recovery after a severe fire (Attorney-General's Department, 2014).

Farming practices

Most farmer respondents agreed that modern farming techniques could influence fire behaviour. An improved, wider understanding of the fire science of how ‘conservation farming’ (ABC Landline, 2016) techniques affect a serious fire in extreme, or near-extreme, weather conditions is required. The overall aim of this approach is to retain organic matter in the soil for a healthier, more sustainable soil profile, and hence improved plant health and crop yield. How these issues are managed is likely to influence preparedness strategies and tactics.

Retired wheat and sheep farmer Trevor commented:

> *We're so prone to fires down here because everyone's intense cropping so you've got a lot more stubble, and so being able to stop the fire once it starts is very difficult. Pasture or legume crops, don't carry a fire as quickly as canola stubble, so that's an option that the farmer would have, with livestock nearby.*

From a property further north, Bob observed:

> *The biggest change probably has been the huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that's pretty hard to stop. There are now massive amounts of canola, and there's continuous cropping. Now, every effort is made to retain stubble and management practices have completely changed. There's a massive volume of crop material, but there's a huge residual as well, so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 percent over the last 20 years at least, so you've doubled the burnable material that's there to go up and so, of course, it goes like nuts.*

Firebreaks have fallen out of favour in recent years, seemingly because of economic loss due to decreased cropping area. Wheat and sheep farmer Paul noted some compromise may be indicated.

> *The other thing I think that's contributed is that there are fewer firebreaks across the landscape. Firebreaks and spraying fence lines mightn't stop the fire but give you something to burn back to. This could be made mandatory with a council by-law, so everyone has to do it. A little bit of loss could mean that a lot of people are safer. My personal belief is that it would be better to see more firebreaks across the landscape.*

The aetiology of decision-making

> *Dad runs back into burning house to save the cat, doesn't save the photo albums or anything or the wedding dress - saves the cat. Well, the cat's gone out the laundry window. Dad dies. Lose the dad. Lose the house. Cat's fine, but they've lost everything. People will make very emotionally based, not necessarily the safest, decisions based on their animals.*
>
> Fire officer, "Jayne", 2015.

For the purposes of this paper, the *social microclimate* is an individual's immediate social environment, comprising that person and all dependent others. Members of this group may or may not be present in the same physical location at any given time, and consequently, the base microclimate core group can become fragmented, and integrated into another, overlapping microclimate which may function independently until the core group is restored (Westcott et al, in press).

Jayne commented on the effect dependent others, including animals, have on the social microclimate.

> *Animals certainly add another complexity to your bush fire survival plan. If you're a single person and you've only got yourself to worry about, that's one person. If there's a couple of you, you can look after each other. If you're a family and you've got half a dozen kids or less, then there's that complexity as well. If you also care for elderly people that adds another complexity to your plan. If you've got any animal, whether it's as small as a goldfish or as large as 15 race horses, then that adds a huge complexity to your plan.*

Another example of the effect of the social microclimate was recalled by Shane, where a community member challenged him about driving through police road blocks established for public safety.

> *I had a guy at a meeting tell me he didn't care what type of road block we put in place. He would risk jail, go to jail to get to the house where his grandchildren were… he got himself so worked up emotionally about the fact that he needed to go back to his grandchildren and to protect them. I can understand that. But I said to him "Mate, you've got to drive 15 to 20 km to get to the fire. Did it ever occur to you that if you ring triple zero and say that the house at number six Smith Street has got a lady with three children that we might actually have a fire truck there or we can put a fire truck there or we can put aerial support over it?" 'Cause that obviously becomes a priority over an empty hay shed. He looked shocked as it dawned on him. He'd been in this area his entire life, and the emotion driving him was that he had to go to protect his grandkids.*

Ideally, as in Shane's example above, (bushfire) survival plans should allow for the presence and involvement of emergency services who become transient members of the social microclimate *in situ* at the location to which they are deployed. In this example, being deployed to a place of critical need (house with children) is reliant upon correct and timely communication. The grandfather needed to consciously arrest his emotional reflex to rush to the aid of his grandchildren, and consider how to communicate his and their need in a timely, safe and effective way – in this instance, an emergency telephone call. Learning to quickly recognise an understandable, but dangerous, reaction, and redirect it to achieve a safer, effective outcome is part of cultivating a transition to routine preparedness behaviour.

Demonstrating the basic principles of dynamic risk assessment in promotional material is a useful way to avoid emotive reactions in favour of adaptive response. Organisations such as Australian Red Cross, and St. John Ambulance Australia, offer accessible examples in their publicly available website resources, one of which depicts step-by-step life support actions according to the acronym, DRSABCD: *Danger; Response; Send for help; Airway; Breathing; Circulation; Defibrillate* (St John Ambulance Australia, 2016, Australian Red Cross, 2017). Similar 'fire-safe' resources could be adapted and developed by

fire authorities' campaigns to actively promote dynamic risk assessment, either as a single issue or as a hybrid concept with fear appeals (Westcott et al, in press) such as *what would your children do if you died trying to save the cat?* This strategy could resonate with a new or different group of people. It adapts an existing resource and uses a principle which is already widely known in the public realm, particularly among people who are first-aid trained. The opportunity for organisational collaboration also exists, which could be cost-effective, and advantageously help build understanding between *response* and *relief and recovery* agencies and organisations.

The significance of the social microclimate is that it represents a bridge between the 'individual' and the 'community'. It is in a permanent state of flux as members come and go and is important because its members can receive different sources of similar information which can be synergistically summated and processed. Intelligent and strategic use of the social microclimate can contribute to achieving maximal and economic use of resources already to hand (Turem and Born, 1983, Sargent and Hannum, 2009).

The workplace is a social microclimate with potential to become a key link in expanding bushfire awareness and survival – and with minimal imposition on core business. It is an ideal place to help employees learn the portable skill of designing and developing a bushfire survival plan by training employees in good emergency decision-making. These skills will ultimately benefit an employer, be translatable to other social microclimates in the wider community, and simultaneously help to build a culture of preparedness based on sound, safe decision-making (Westcott, unpublished data 2015). Workplace programs could initially be led by the local fire service community engagement officer, and later by an internal appointee with employees involved on a voluntary and/or rotating basis. This approach effectively bridges two related microclimates: the workplace, and the home, effectively reinforces information and creates a synergy of knowledge to inform decisions.

Other worthwhile long-term concepts include scholarships or short courses within agricultural colleges, farming organisations and research groups. Current programs in leadership, mentoring of young farmers and collaborative research between scientists, educators, farmers and industry stakeholders may have the capacity to include topics relevant to positive decision-making more broadly and natural hazards in particular.

Collaboration and communication among social microclimates are keys to promoting safe behaviour, and some simple tasks can be done easily and swiftly with immediate effect. For example, knowing where the neighbours' dogs leads are kept, or which horse needs to be moved first due to its temperament would expedite the response.

Jan, in the dog owners' focus group, has an effective plan. Her 'go kit' is by the front door, and on working days when the fire danger rating is extreme or catastrophic, her dogs have a permanent booking at the local boarding kennels. She said:

> *When you know you live in an extreme fire danger area, you can't think it's not gonna happen. So it's about awareness of what resources are around you. People ask me if I have a sprinkler system at my place. I don't feel I'm capable of running that. You have to know what you're actually capable of. You have to understand your limits, what's within your personal capability. And my limits are – I don't care about the house. It's me and the dogs. And you have to be mentally prepared.*

Jan's simple, practical strategy is in marked contrast to Jayne's example of the father's attempt to rescue the cat. It also emphasises the importance of helping people learn ways to remain safe in an emergency and guide them towards responding propitiously to cues and triggers in a way which overcomes impulsive, dangerous actions. Jayne recounted how another animal owner prepared:

> *There's someone else with a pet python. So she pops him in two calico bags and takes him very discreetly in a bag and pops him at her feet at work. No one would know what's in the bag…he's restrained and it works. She brings her dogs into town to relatives, and doesn't have to worry, or waste time, or try to rush home.*

Jayne's account highlights the central concept of preparedness – safe, adaptive response choices. She pointed out:

> *Protection is about self-help as much as it is about relying on the services that you've got… being bush fire ready isn't easy and simple and quick and cheap. It's not that hard…if you just want to pack and go. But being bush fire ready is no different to any other problem or complexity that people have in their life. So, and I'm really upfront with people, I will say forget it. If you think you're going to do [everything] by tomorrow - no. So get rid of those unrealistic expectations. 'Cause you can't do 20 or 30 or 40 jobs when you can smell the smoke, you can only probably do one or two.*

Rearranging the adaptive-maladaptive response equation to obtain a positive result of *adaptive rewards* could strongly encourage good decision-making. Several strategies could be adopted and trialled to promote awareness and engagement. In the short term, sponsored 'give-aways' of personal protective fire equipment, household 'go kits' and fire safety packs for farm vehicles are a visible and readily implemented means of encouraging thoughtful preparedness (ABC Landline, 2016). In the longer term, public accolades and recognition

similar to the "Tidy Towns"[2] program, such as "Bushfire Best-Prepared Towns", could attract additional funding to a community and boost the local tourism economy if preferentially considered as a visitor destination. It could enhance community pride in parallel with promoting a culture of bushfire safety, and help build strong relationships with emergency services – who will always need the community's collaboration to provide the best possible response.

Specific additions to existing award programs would be relatively simple to implement. A symbol identifying 'bushfire-safer properties', and those compliant with current Australian Standards (Standards Australia, 2009) could be added to listings of properties for sale, helping to 'value-add' (Westcott, unpublished data 2015). Qualifying properties might display a gateway notice, or join a community 'open house' style program, similar to 'open gardens', to showcase and educate others to do likewise. As this concept is well established in the community, extending it to fire safe properties (including discussion and demonstration as to how animals are managed) is an achievable extrapolation.

Conclusion

Not long ago, conservation farming was a concept which received a mixed reception among primary producers, but is now widely practiced. This change took time. Similarly, the process to redefine, demonstrate and establish the adaptive rewards of good decision making and safe bushfire behaviour requires the investment of longer-term strategic planning, assessment and re-assessment of initiatives to cultivate and maintain behaviour change into the future.

Narrowing the bushfire awareness-preparedness gap can be achieved by seeking new information from different demographics groups and other social microclimates, and using this information to design and test public policy and strategies, with the objective of cultivating a widespread culture of preparedness.

Identifying, developing and implementing new strategies and tactics to make people safer in all-hazard emergencies is undeniably and increasingly critical, and contemporary emergency services' public outreach endeavours continually strive to succeed in this goal.

[2] "Tidy Towns" is an initiative of the Keep South Australia Beautiful (KESAB) campaign which began in 1978. It is now known as the Sustainable Communities program. See: http://www.kesab.asn.au/programs/sustainable-communities/program-information/

Collaborative integration with social microclimates such as the workplace could facilitate establishment of natural hazard knowledge and preparedness activity as routine 'business as usual'. Catastrophic Day Leave, financial incentives, innovative agricultural research and simple additions or adaptations to existing resources could all contribute to achieving adaptive response choices as the most desirable option available to people confronted with a natural hazard emergency.

References

ABC LANDLINE. 2016. *Rising Up* [Online]. Australian Broadcasting Corporation. Available: http://www.abc.net.au/landline/content/2016/s4582374.htm [Accessed 30 November 2016].

AKAMA, Y. & IVANKA, T. 2010. What community?: facilitating awareness of 'community' through playful triggers. *Proceedings of the 11th Biennial Participatory Design Conference.* Sydney, Australia: ACM.

ATTORNEY-GENERAL'S DEPARTMENT 2014. Productivity Commission inquiry into natural disaster funding arrangements. *In:* ATTORNEY GENERAL'S DEPARTMENT (ed.). Canberra: Australian Government.

AUSTRALIAN RED CROSS. 2017. *Useful Resources* [Online]. Carlton: Australian Red Cross. Available: http://www.redcross.org.au/files/Basic_Life_Support.pdf [Accessed 28 February 2017].

BARKER, S. B. & WOLEN, A. R. 2008. The benefits of human-companion animal interaction: a review. *J Vet Med Educ,* 35**,** 487-95.

BEYNON, H. 2016. *Extreme weather the "new normal"* [Online]. New York: United Nations Office for Disaster Risk Reduction. Available: https://www.unisdr.org/archive/49634 [Accessed 1 November 2016].

BRAUN, V. & CLARKE, V. 2013. *Successful Qualitative Research,* London, Sage.

CHUR-HANSEN, A. 2010. Grief and bereavement issues and the loss of a companion animal: People living with a companion animal, owners of livestock and animal support workers. *Clinical Psychologist,* 14**,** 14-21.

CHUR-HANSEN, A., STERN, C. & WINEFIELD, H. 2010. Gaps in the evidence about companion animals and human health: some suggestions for progress. *Int J Evid Based Healthc,* 8**,** 140-6.

CORNISH, F. & GILLESPIE, A. 2009. A Pragmatist Approach to the Problem of Knowledge in Health Psychology. *Journal of Health Psychology,* 14**,** 800-809.

DEPARTMENT OF ENVIRONMENT WATER AND NATURAL RESOURCES. 2016. *Managing natural resources* [Online]. Adelaide: Government of South Australia,. Available: http://www.environment.sa.gov.au/managing-natural-resources/water-resources [Accessed 10 August 2016].

DEPARTMENT OF FIRE AND EMERGENCY SERVICES. 2017. Perth: Government of Western Australia. Available: https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireChecklists/DFES_Bushfire-Fire_danger_ratings.pdf [Accessed 10 January 2017].

DRABEK, T. E. 2004. *Social Dimensions of Disaster,* Emmitsburg, Emergency Management Institute, Federal Emergency Management Agency.

GIBBS, L., BRYANT, R., HARMS, L., FORBES, D., BLOCK, K., GALLAGHER, H. C., IRETON, G., RICHARDSON, J., PATTISON, P., MACDOUGALL, C., LUSHER, D., BAKER, E., KELLETT, C., PIRRONE, A., MOLYNEAUX, R., KOSTA, L., BRADY, K., LOK, M., VAN KESSELL, G. & WATERS, E. 2016. Beyond Bushfires: Community Resilience and Recovery Final Report. Melbourne: University of Melbourne.

GIBBS, L., WATERS, E., BRYANT, R. A., PATTISON, P., LUSHER, D., HARMS, L., RICHARDSON, J., MACDOUGALL, C., BLOCK, K., SNOWDON, E., GALLAGHER, H. C., SINNOTT, V., IRETON, G. & FORBES, D. 2013. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health,* 13**,** 1036.

GORDON, R. 2009b. Community and Psychological Responses to Disaster. Melbourne: Australian Psychological Society.

GOVERNMENT OF SOUTH AUSTRALIA. 2016a. *About the Emergency Services Levy* [Online]. Adelaide: Government of South Australia,. Available: https://www.revenuesa.sa.gov.au/taxes-and-duties/emergency-services-levy/frequently-asked-questions2#ABOUT [Accessed 24 October 2016].

GOVERNMENT OF SOUTH AUSTRALIA. 2016b. *Wangary Bushfires* [Online]. Adelaide: Government of South Australia. Available: http://www.safecom.sa.gov.au/site/initiatives_reviews/wangary_bushfires.jsp [Accessed 1 December 2016].

HUGHES, L. & STEFFEN, W. 2013. *Be prepared: climate change and the Australian bushfire threat.* [Online]. Climate Council. Available: http://www.climatecouncil.org.au/uploads/c597d19c0ab18366cfbf7b9f6235ef7c.pdf [Accessed].

HYDE, B. 2014. *Merger talks for South Australia's emergency services* [Online]. Adelaide: *The Advertiser*: News Corp. Available: http://www.adelaidenow.com.au/news/south-australia/merger-talks-for-south-australias-emergency-services/news-story/5e64d80751e0381eccf27a8c0ea3b472 [Accessed 6 October 2016].

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC). 2014. *Fifth Assessment Report* [Online]. IPCC. Available: https://www.ipcc.ch/report/ar5/ [Accessed 29 December 2014].

KITCHING, R. 2014. *IPCC: Australia and New Zealand face greater fire and flood risk, damage to coral reefs* [Online]. Available: theconversation.com/ipcc-australia-and-new-zealand-face-greater-fire-and-flood-risk-damage-to-coral-reefs-24642 [Accessed 29 December 2014].

LEONARD, H. A. & SCAMMON, D. L. 2007. No Pet Left Behind: Accommodating Pets in Emergency Planning. *Journal of Public Policy & Marketing,* 26**,** 49-53.

LEWIS, S. 2016. *Time to adapt: 2015's record-breaking temperatures will be normal by 2030* [Online]. Sydney: Australian Broadcasting Corporation. Available: http://www.abc.net.au/news/2016-11-07/record-breaking-temperatures-will-be-new-normal-by-2030/8001720 [Accessed 8 November 2016].

LIU, Y., STANTURF, J. & GOODRICK, S. 2010. Trends in global wildfire potential in a changing climate. *Forest Ecology and Management,* 259**,** 685-697.

NATURAL RESOURCES CANADA. 2017. *Canadian Wildland Fire Information System* [Online]. Montreal: Government of Canada. Available: http://cwfis.cfs.nrcan.gc.ca/maps/fw [Accessed 24 January 2017].

NEW SCIENTIST. 2013. *Wild weather: extreme is the new normal* [Online]. Available: https://www.newscientist.com/article/mg21729003-200-wild-weather-extreme-is-the-new-normal/ [Accessed 1 November 2016].
PATON, D. 2013. Disaster Resilient Communities: Developing and testing an all-hazards theory. *IDRiM Journal,* 3**,** 1-17.
POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2013. Stimulating flood mitigation through insurance: an assessment of the French CatNat system. *Environmental Hazards,* 12**,** 258-277.
POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2014. Factors of influence on flood damage mitigation behaviour by households. *Environmental Science & Policy,* 40**,** 69-77.
PRELGAUSKAS, E. 2016. Helping fire-impacted families in rebuilding: toward enhanced community resilience outcomes. *Australian Journal of Emergency Management,* 31**,** 54-59.
ROGERS, R. 1983. Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. . *In:* J. CACCIOPPO & R. PETTY (EDS.) (ed.) *Social psychophysiology: A sourcebook.* New York: Guilford.
ROGERS, R. W. 1975. A protection motivation theory of fear appeals and attitude change. *Journal of Psychology,* 91**,** 93-114.
RONAN, K. R. & JOHNSTON, D. M. 2005. *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families*, Springer US.
ROYAL SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS. 2014. *How many pets are there in Australia?* [Online]. Available: kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html [Accessed 29 December 2014].
SARGENT, T. C. & HANNUM, E. 2009. Doing More With Less. *Journal of Teacher Education,* 60**,** 258-276.
SAVIN-BADEN, M. & MAJOR, C. H. 2013. *Qualitative Research,* Abingdon, Routledge.
SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016a. *Bushfire History* [Online]. Adelaide: South Australian Country Fire Service. Available: http://www.cfs.sa.gov.au/site/about/history/bushfire_history.jsp [Accessed 1 December 2016].
SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016b. *More about Fire Danger Ratings* [Online]. Adelaide: Government of South Australia. Available: http://www.cfs.sa.gov.au/site/fire_bans_and_ratings/more_about_fire_danger_rating.jsp [Accessed 10 January 2017].
ST JOHN AMBULANCE AUSTRALIA. 2016. *DRSABCD Action Plan* [Online]. Deakin Australian Capital Territory: St John Ambulance Australia. Available: http://stjohn.org.au/assets/uploads/fact%20sheets/english/DRSABCD%20A4%20poster.pdf [Accessed 1 February 2017].
STANDARDS AUSTRALIA 2009. Australian Standard® Construction of buildings in bushfire prone areas. Sydney: Council of Standards Australia.
TAYLOR, M. R., LYNCH, E., BURNS, P. & EUSTACE, G. 2015. The preparedness and evacuation behaviour of pet owners in emergencies and natural disasters. *Australian Journal of Emergency Management,* 30**,** 18-23.
TERPSTRA, T. 2011. Emotions, Trust, and Perceived Risk: Affective and Cognitive Routes to Flood Preparedness Behavior. *Risk Analysis: An International Journal,* 31**,** 1658-1675.

TUREM, J. S. & BORN, C. E. 1983. Doing More with Less. *Social Work,* 28**,** 206-210.
UNITED STATES FOREST SERVICE. 2017. *Wildland Fire Assessment System* [Online]. Washington D.C.: United States Department of Agriculture. Available: http://www.wfas.net/index.php/fire-danger-rating-fire-potential--danger-32/class-rating-fire-potential-danger-51 [Accessed 24 January 2017].
WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science,* 4.
WILKINSON, C., ERIKSEN, C. & PENMAN, T. 2015. Into the firing line: civilian ingress during the 2013 "Red October" bushfires, Australia. *Natural Hazards*.

Contemporary relevance of the paper

> ***From the abstract of the paper:***
>
> ***The purpose of the study was to investigate the interactions and challenges facing animal owners and emergency responders, to expand current social theory, and to explore new or enhanced mitigation and preparedness measures able to be integrated into future arrangements to promote human safety, support community well-being and narrow the persistent, and concerning, bushfire awareness-preparedness gap.***
>
> ***A strength of adaptable social theory (such as Protection Motivation Theory) is its ability to successfully bridge exploration and problem-solving. Actively applying theory to enquiry, and using the results to form practical strategies beneficial to animal owners and others, aims to help narrow the awareness-preparedness gap overall, illuminate other research possibilities, and ultimately help save human life.***

Paper 4 is effectively Paper 1 in practice; in developing the analysis of the second thematic stream identified in Paper 2: *Aetiology of decision-making* by revising PMT and via (i) the effect of the social microclimate (ii) adaptive rewards as opposed to costs, and (iii) maladaptive costs (negating maladaptive rewards). P4 identifies the reasons for and causes of particular behaviours in the experiential context of bushfire natural hazards. This can facilitate first, a better practical understanding of the cognitive processes that predispose to such behaviours and second, enables an examination of how they may be changed to favour more considered outcomes with less risk. A thread common to all three is dynamic risk assessment (Australasian Fire and Emergency Service Authorities Council, 2013). This part of the data analysis considers the heterogeneity of an(y) individual's social microclimate, the influence of different variables or subsets on that entity, the need for *flexibility* in a (bushfire) survival plan and how PMT can be adapted to encourage safe response behaviour.

Very early in data analysis, it became evident the *complexity of the social microclimate* was a significant factor influencing decision-making. The social microclimate is essentially a dynamic common denominator which exists pre-, post- and during an emergency as well as in 'peacetime'. It links different settings with

different needs, and is also a vehicle by which information can be transferred, received and processed. The social microclimate of the workplace was identified as having potential to become a 'knowledge hub' to contribute to increased uptake of fire-fitness practices more broadly, and which offers advantages to employers, businesses, employees and their respective families or other social groups, as detailed in the paper. This workplace ethos can be fortified by employers offering their staff Catastrophic Day Leave, building a strong workplace culture of fire-fitness, which may permeate into other social microclimates and the wider community. Synchronous dissemination of fire-fitness information to other groups can be equally beneficial – the key is to provide information to *more than one* social microclimate at any given time, with at least one member of the core unit having membership of each group.

There is a need to discover, develop and implement strategies which help preference safe response choices. Shifting the construct of maladaptive/adaptive rewards to add strong appeal to safe response choices can encourage better decision-making. The malleability of PMT can be used to achieve this, rearranging the *rewards* and *costs* part of the equation by integrating processes and options with clear benefit to people and their social microclimates. This is in contrast to *fear appeals*, which, although frequently employed in public safety campaigns, arguably does not provide a sustained desirable effect on the target audience. Using adaptive rewards is one of a suite of strategies to trial and evaluate and potentially add to the armoury of tools to proactively promote and enhance effective public health in natural hazards messaging. Used in conjunction with the recommendations in Paper 3, *adaptive rewards* can become a strategy with significant longevity and capacity.

Confronted with a dangerous or complex situation, the cognitive processes of dynamic risk assessment are part of a valuable and often life-saving skill set. Infusing that skill among the public, and accompanying it with an understanding of the process can contribute to enhancing safety for all involved. Resource adaptation and sharing can be a cost-effective way to do this. In parallel with proactive individuals in an engaged social microclimate these strategies may facilitate organisational collaboration and communication. Both these factors are essential to improve performance in the anticipated future context of economic constraints,

especially the relationship between *response* and *relief and recovery* agencies, and as elaborated in P4.

A potential obstacle to the smooth implementation of all or some of these strategies includes inherent conservatism as evident in the environment of natural hazard bureaucracy (Neale et al., 2016). A gradualist approach to climate change is no longer an option – the global population is faced with a narrowing window of opportunity even for effective adaptation. Every avenue needs to be explored with rigour and tenacity to make people and the environments they hold dear, and in which they *live, move and have their being*, nurturing places of solace, challenge and achievement, and above all, places that are safe. The range of strategies and policies proposed by this research offer a wide choice of options to trial and evaluate to facilitate this desirable outcome into the future.

Illustration 7: *This researcher's '3 Minute Thesis' slide, presented at the Bushfire and Natural Hazards Research Showcase in Adelaide, 4 July 2017. This presentation combined key elements of Papers 3 and 4 regarding routine preparedness, the social microclimate and financial incentives.*

CHAPTER SEVEN

The pilot Survey: Farmers, fire and animals

THIS CHAPTER CONTAINS:

- **Rationale for the pilot survey**
- **Survey's contribution to the project**
- **Farmers' experience with fire**
- **Where to from here?**
  - **future research**

RATIONALE FOR THE PILOT SURVEY

Represents the quantitative component of the sequential mixed methods design and contributes to academic rigour – triangulation
Piloting the survey permits checking for length, clarity , content, errors and omissions
Completion of the survey by an individual removes the influence of other participants, which may occur in a focus group
Allows related topics to be introduced – e.g. crops and conservation farming
A means to further investigate the rural primary producer: skills, needs and knowledge, and knowledge transfer to other groups
Addresses researcher's intention to engage with the farming sector
Facilitates identification of gaps requiring further research

Box 7: *Rationale for the pilot survey*

Introduction

This chapter reports on the pilot survey (phase 2) undertaken with farmers as part of this study's sequential mixed methods design. It describes considerations surrounding the survey design and launch, data collection, findings, survey modification and recommendations for further research. Including a pilot survey in the research design works to further explore the data (Teddlie and Tashakkori, 2009), contributes to triangulation (Onwuegbuzie, 2005) and confirms the need for further research in the areas of concern. Farmers who have experienced a bush fire were recognised as key informants to define the research purpose. The survey thus focused on farmers' bushfire experience, knowledge and management of fires to

identify management strategies which may be translated to other less well-informed groups such as new or novice land owners to help build their skills and knowledge. This consilience adds another facet to the overall aim of the research described in this thesis, that is, to narrow the awareness-preparedness gap – *to become 'fire-fit' – by encouraging fire preparedness as a social norm,* and thus help make people and their assets safer in a bushfire event.

Method

A survey with 54 questions was written using SurveyMonkey, an open-access online tool widely used to develop and distribute surveys. The survey included background information for participants, instructions for completing the survey and a consent page (Appendices E and I). Respondents were asked to answer questions across nine sections as dictated by their experience, omitting sections not applicable. Particular attention was paid to the agricultural calendar when launching the survey in March 2016 – this period was post-harvest but prior to seeding. Local media assisted in promoting awareness of the survey by reporting the survey launch and giving a brief summary of its purpose. The survey link was distributed on-line via agricultural groups (e.g. Primary Industries and Regions South Australia, Primary Producers South Australia), with the option for providing a hard copy. The selection criteria was that participants work in primary production, as a farm owner, worker or manager. Participants were not required to have actual experience of fire on their farms.

Results

In total 53 responses were received, including one in hard copy, with 37 'complete' surveys. Forty per cent (40%) of respondents (n=14) had been farming for 30 years or more; the respondents were located in all agricultural regions of South Australia except the North West Pastoral and Kangaroo Island, and in one region of northern New South Wales. Farms ranged in size from four to 135,000 hectares: 56% (n=21) of farms were greater than 1000 hectares. Livestock and cropping were the most common farming systems utilised, with just over 40% (n=15) having either heritage or non-listed areas on-farm set aside and managed as significant native habitat and conservation areas.

Farmers and their animals

Of the 30 respondents (81%) who answered *YES* to having a bushfire survival plan, 28 indicated their bushfire plans included arrangements for all, most or some of their animals, though nearly half (n=13) stated their plan needed updating. Twenty-two (73%) of the group of 30 farmers *had* experienced a fire on their farms, and listed general strategies to protect animals – all of these respondents listed *move to a low-fuel paddock or paddock with dam, irrigation or firebreaks* as their strategy of choice (Figure 5). One quarter (n=7) stated they would also use yards with sprinklers to protect stock, while the majority (57%, n=16) preferred pets to leave the property with people.

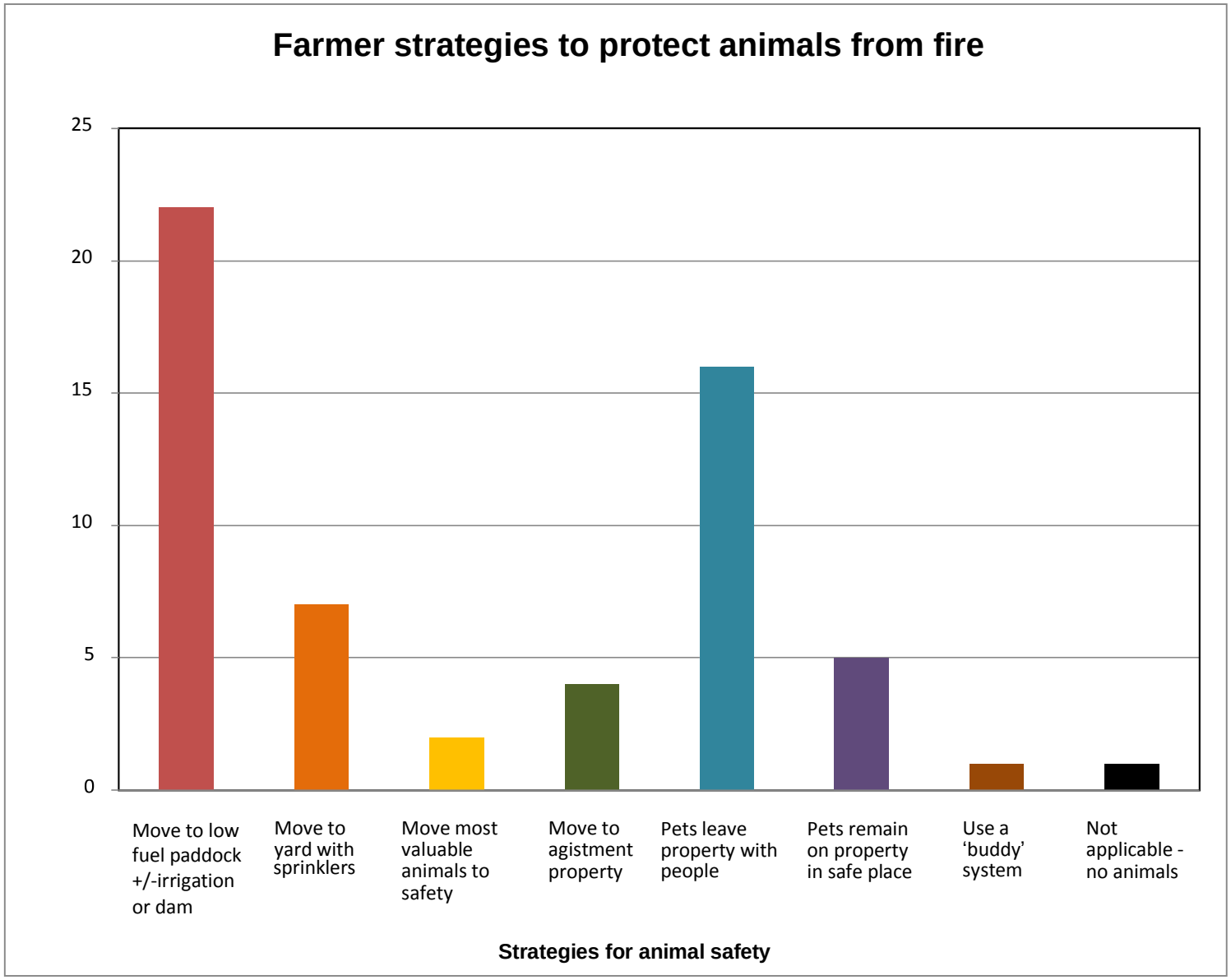


Figure 5: *Farmer strategies to protect animals from fire*

Learning from experience and local knowledge

There were 29 comments from individual responses to question 52 - W*hat would be your best advice to people new to farming…to help them prepare and respond appropriately to living with the threat of bushfire?* This data is presented in Table 2 and descriptively analysed in the following discussion.

FARMER RECOMMENDATIONS TO NEW OR NOVICE LAND OWNERS
Be responsible and proactive – choosing to live in a fire risk area means accepting the consequences & acting accordingly
Learn about how fires behave – be educated
Communication, communication, communication! Know your neighbours. Know how to contact them – print phone numbers and have a "fire phone tree". Join or form a neighbour's group. Tell neighbours when you might be away. Have a UHF radio. Have a farm fire unit. Have the CFS app.
Source good information from reliable sources like the CFS and the CFS website. Don't accept all local information without question as some may be outdated
The firies can't be everywhere – be prepared to be on your own
Write and practice an action plan. Know your safe places.
Know the local codes of practice for harvesting, slashing and other activities such as snail cabling
If you aren't prepared or are ill equipped for whatever reason, best to leave early. You can always rebuild. Be vigilant about your decision-making - whether you plan to stay or leave.
Have an independent water supply dedicated for fire use only. Match fittings to allow for CFS use.
Install a sprinkler system
Install non-mains powered pump(s), preferably diesel powered
Maintain equipment
Ensure good access to buildings & sheds
Use wide gates & possibly install gates between neighbouring properties
Ensure you have appropriate clothing
Keep access to drinking water
Have fire breaks around crops
Keep a low grazed or mown area for livestock – these paddocks become part of the crop rotation system for the next season.
Don't expect someone else to rescue you if you haven't done the right thing
Keep the team together and work out who is the leader. Stay calm.
Understand that in a fire incident you may panic, so talk it through with people who have "been there and done that".

***Table 2**: Farmer recommendations to new or novice land owners*

Discussion

As identified in earlier interview data (see Appendix B) and discussed in SP2 strategies to address issues raised during this research may be best managed on a local, bespoke basis: *district to district (respondent #1)*. Proactive, locally appropriate applications could be successful, and need to be trialled and evaluated (Van den Bergh and Faure, 2006, Poussin et al., 2013, Poussin et al., 2014, Penman et al., 2016). Whole-of-jurisdiction plans are likely to be less efficacious or functional if applied state-wide beyond the parameters of local conditions. This has been a failing in previous attempts to successfully apply discounts on insurance schemes, for example, and has been asserted as a reason not to pursue financial incentives (El-Masri and Tipple, 2002, Spence, 2004).

Maladaptive responses (e.g. commonly held errors or misconceptions, complacency, denial, wishful thinking) as discussed in P1, P2 and P4, can, and do, risk lives. Many farmers commented on the need to take the threat of fire seriously, and discussed several important considerations to promote safety and self-efficacy. Future research including measures to address these concerns may be found in Chapter Eight, and listed in Appendix L.

Elapsed time makes people complacent (Respondent #18) was a frequent comment (Westcott, 2017b, Westcott et al., 2017b). Respondent #3 observed*: the CFS will never be able to save everything or stop every fire,* which correlates with interview data reported in Westcott (2017c) and the need to proactively promote strategies to build self-efficacy, self-responsibility and an understanding of adaptive response and 'fire-fitness' (Westcott, 2017b, Westcott, 2017c) (See also Appendix B).

Respondent #4 wrote that the family property was equipped with a *fire safety bunker, CSIRO accredited.* In reality, conditions and criteria for accreditation are not readily available on product websites and vary greatly, and while such a structure may be one of the many 'tools in the toolbox' of fire safety, they can create risk by encouraging a false sense of security and complacency. It also fails to recognise these structures are not a 'one size fits all' or 'silver bullet' perfect solution (Australian Building Codes Board, 2014).

A 2017 South Australian Country Fire Service campaign uses the slogan: *complacency kills* (NATION Creative, 2017, South Australian Country Fire Service,

2017a). Respondent #7 wrote: *The CFS advertisements are now more sensible. Previous ads just scared people and scared people panic!* As noted by the respondent, in past years, the advertising emphasis has been on fear and loss. Using 'fear appeals' is a dubious strategy because of the documented effects of rapidly developing immunity and lack of longevity (Tanner et al., 1989, So, 2013, Westcott et al., 2017b).

As Tanner et al (1989) stated: *frightening the audience is not the objective: motivating safe behaviour is.*

Psychological health

The issue of unresolved psychological trauma was evident among some respondents who experienced fire, especially the events surrounding 'Black Tuesday'[1] in 2005. This was expressed in different ways.

Respondent #19 commented: *don't ever under estimate a bush fire, after being 3 kilometres from the Wangary fire, the fear of that day still resonates through me, when I hear that there is "a fire".* Exactly this sentiment was expressed by Gordon in a personal communication after the 2015 Sampson Flat fire, and 'Shane' in the phase 1 interviews (Gordon, 2016, Westcott, 2017c).

Respondent #9 wrote:

> *The general public needs to push governments to provide more resources for CFS, big planes lots of them and more diversity in on-ground units that are safer in big fires. We are talking about our FOOD production that needs defending not just a few farmers. The fire on Eyre Peninsula in 2005 smashed a lot of farmers and impacted everyone in the country.*

Respondent #18 observed: *The terror of a fire event can make even experienced fire fighters make wrong decisions.*

These responses convey the long-lasting impact and trauma of surviving a bushfire. They reiterate earlier findings from farmer and firefighter interviews, and confirm and

[1] Also known as the 'Wangary' fire, 10-11 January, 2005.

highlight the need for training in dynamic risk assessment and teamwork (Westcott, 2017b, Westcott et al., 2017a) (see also Appendix B).

Protecting the family home and buildings

Reducing the fuel load is a continual and continuous process during Spring, noted respondent #23, and this needs to be understood by new residents. Keeping a well-maintained cleared space around buildings with low vegetation and/or plants of low flammability is an imperative, and if possible, keeping a watered, green garden surrounding the home. This can help keep buildings safe.

Respondent #30, for example, was adamant his home and buildings were saved from a devastating fire by the surrounding deciduous English trees which effectively damped down the approaching fire front. Respondent #24 similarly wrote about plants reducing the hazard of fire to buildings: *If possible grow lucerne[2] around house / sheds it shuts fire down. The two best defences I saw post 2005 fire were high tin fences and patches of lucerne.*

Such selective planting around homes and buildings has been documented as a fire retardant strategy and is a readily achievable, short and long term strategy to enhancing fire preparedness (Ramsay and Rudolph, 2003, Delaine and Rural Solutions SA, 2012).

Another proactive approach to protecting house and farm buildings is to have a maintenance and management plan for any dangerous goods on site. An example of exactly this type of proactive practice was described by respondent #6:

> *Dangerous goods held on farm need to have a plan to deal with. There are often large quantities of dangerous chemicals, fuels, gas cylinders and highly flammable goods such as hay stored. [The fire service] needs to know what may be / is there before they put fire fighters on your property for safety and threat planning reasons.* ***Part of our plan includes an "in event of emergency" cylinder at entry to our farm*** *which includes a map outlining the layout and type of such goods.*

Actions such as this can be easily demonstrated and implemented by other property owners, and would be welcomed by responding emergency services. Farm and

[2] Lucerne is the Australian name for alfalfa.

firefighter safety can be linked to property value-adding and holding community open days as previously reported (Westcott, 2017c, Westcott, 2017a).

Palmer (2016) vividly described just such a danger encountered at the Sampson Flat fire in 2015 in South Australia:

> *As the fire crews tried to get to the sheds, I could hear Daryl telling them by radio to stay away as the bangs being heard were from exploding ammunition. The crews that were trying to save the sheds earlier said that they could hear rounds zipping through the air over their heads. (p.39)*

Ensuring there is ready access to a clear property lay out that explicitly signposts dangerous goods can be easily demonstrated and implemented by property owners, even being part of the program in community open days, as previously reported (Westcott, 2017c, Westcott, 2017a). Such an initiative would also be welcomed and valued by responding emergency services as it would work to promote farm and firefighter safety, inform proactive fire-fitness practices and help value-add to a property (Westcott, 2017b).

Negative responses

Several respondents were scathing of the official response to a particular fire incident, while others were less critical, even with respect to the same fire. Tardiness was, and is, is perceived with disdain. This reiterated a comment from the farmer interviews, where sheep farmer, Mike, who had been severely affected by fire in the past said:

> *Government agencies need to get in sooner. The lag-time before you even hear from them is bad, and wastes time to get relief happening. We know they can't get out on a fireground until the firies [firefighters] give them the OK, but we need to know they are ready to be straight out of the blocks as soon as possible, not back in [the city] thinking about it. And another thing – we used to have extension offices for PIRSA[3], and now they're mostly shut down. It's the centralisation-decentralisation roundabout, and we're at the height of centralisation, and it doesn't necessarily help. It's really important that [government departments]…have the ability to act quickly because it's really*

[3] PIRSA – Primary Industries and Regions South Australia. The Government department responsible for agriculture and primary industries.

the first 24, 36 hours that's critical. After that, things start to sort themselves out. Government agencies need to be able to act in a timely fashion. Even a 36-hour delay means that you've missed it, really.

Other respondents expressed frustration and dissatisfaction with the official response at various incidents. They expressed resentment at the apparent lack of integration of local knowledge, and a 'too little too late' response, which *leads to a complete waste of taxpayer dollars* (Respondent #1*)*. Acting in a timely manner reduces the cost of a response as well as social, economic and environmental trauma, and frees up funding for essential formal *Recovery*[4] processes (Westcott, 2017b, Westcott, 2017c). For local people, as the survey responses indicate, bad experiences are not forgotten, however there is some recognition that the Emergency Services mindset has progressed and changed for the better since 2005.

Alterations to survey

Of the 54 questions, only three were identified by respondents as requiring rewording or restructuring. These were questions

23 (on rating assistance received post-fire),

35 (regarding stock yards with sprinklers) and

51 (regarding different social microclimates at the time of a fire).

Question 23 – *How would you rate the assistance you received from all sources?* Two respondents commented that this question needed an option such as 'always', 'definitely' or 'yes', commenting that 'mostly' was not accurate as the highest option.
Question 35 – *What strategies would you use to protect your animals?* One respondent indicated that yards may or may not be equipped with sprinklers, and this should be differentiated in the question.
Question 51 – *Would the presence of any of the following (at the time of a fire) change what you would do when responding to a fire threat?* The question listed various possible iterations of the immediate social microclimate. One respondent

[4] An upper case 'R' is used intentionally. A *PPRR* model of Emergency Management (EM) includes Prevention, Preparedness, Response, Recovery – phases are neither discrete nor chronologically linear.

commented they did not understand the question and advised it be reviewed for clarity.

Although not mentioned in respondents' comments, anecdotal feedback indicated the survey was too long. In hindsight, it was recognised too many topics were included in the one instrument and three separate survey instruments could have been designed, for example:

1. The insurance questions could be designed as a separate survey and could collect additional information about using locally suitable financial incentives as a means to promote fire preparedness (fire-fitness as a social norm).
2. Cropping and conservation farming could be designed as a stand-alone survey, as proposed in the next chapter, and possibly linked to gathering information about on-farm conservation, restoration and management practices regarding native habitat, cropping and vegetation.
3. A survey on the availability and efficacy of assistance before, during and after an incident could be particularly helpful to better inform the measures and support provided by Response, Relief and Recovery agencies.

Further research is required, as outlined in the following chapter.

Conclusion

As a pilot instrument, the survey was comprehensive and successfully achieved its aim to gain insights based on farmers' experiences with fire to inform future response. It also illuminated practical and useful strategies to help improve safety and the physical and psychological well-being among communities living with the threat of fire.

The pilot survey contributed to triangulating the study as a whole. Open-ended questions allowed participants to respond in detail and independently of the researcher's own perceptions. Significantly, the data received from the different survey participant population reiterated and reinforced findings from phase 1 and identified related and additional topics to pursue in future work.

Illustration 8: *Beyond the townships, much of Eyre Peninsula is a broadacre cropping region. Sheep are more commonly farmed than cattle on mixed farming enterprises.*

CHAPTER EIGHT

Future research: identifying the gaps and proposing a way forward- Farms, fires and fuels.

THIS CHAPTER CONTAINS:

- **Rationale for outlining future research**
- **Identified gaps & expected outcomes**

RATIONALE FOR HIGHLIGHTING TOPICS FOR FUTURE RESEARCH

Utilisation is everything **–the end-user's mantra - exploration (research) must also problem-solve**
There is a massive gap in the literature regarding the problems of crop fires
Broadacre farms are at high risk due to climate change
Grain producers contribute significantly to the nation's *gross domestic product*
Data collected during the above project (chapters 1-7) strongly support the need for further research into managing the risk of fire in cropping land
Conservation farming, use of firebreaks and crop placement are key factors to consider
Data to be collected from grain producers, other key stakeholders and industry leaders. Findings to be trialled and evaluated, leading to further research

Box 8: *Rationale for future research*

No project should end without a vision for answering any questions raised and filling any identified gaps. This process, as part of the infinite human quest for knowledge, is of course without end. This chapter, written in the form of a research proposal, identifies how future research could help to answer the questions and fill the gaps identified in this research.

Abstract

Two of the most destructive fires in South Australia this century have been the 2005 Wangary fire on Eyre Peninsula and the 2015 Pinery fire in the lower north of the state. Both fires occurred in standing mature crop or stubble - the speed and ferocity of the fires still astounds those who experienced them. The social, economic and environmental losses because of the fires were enormous yet there is very little

information in either the academic or 'grey' literature regarding the specific problems associated with crop fires. Findings from this researcher's project on Lower Eyre Peninsula in 2015 further indicated an urgent need for further research on crop fires and how to manage the inherent risk presented by thousands of hectares of dry matter fuel on broadacre farms. Future research outlined here aims to help build a body of work to better understand the threat and management of crop fires and reduce the existing knowledge gap. The research findings will also help to proactively reduce risk and safeguard life, livelihoods, property, agricultural productivity and economics, food security, and the environment – with the ultimate aim being to protect people and their livelihoods in a climate likely to become hotter, drier and with an increased risk of fire.

Introduction

Crop fires are hot, fast moving fires which behave differently from 'bushfires'. Two devastating crop fires have occurred in South Australia since 2000 – the 2005 'Wangary' fire on Eyre Peninsula, and the 2015 'Pinery' fire in the Lower North of the state. Both fires created a very large firescar in a very short time (Figure 6). In Australia, harvesting of grain crops usually occurs at the height of the fire season: these crops grow up to two metres high and cover thousands of hectares with densely planted dry matter, of varying flammability[1]. Modern plant breeding and conservation farming techniques maximise yield and help optimise the economics of farming; they also lead to very high fuel loads before, during and after harvest. Despite these inherent risks, there is very limited research targeting the aetiology, management and development of risk reduction strategies to address the threat of crop fires. A proactive approach to better understanding how crop types and farming techniques affect crop fire behaviour would contribute to managing, treating and reducing fire risk to farming communities, farm infrastructure and food production. Data from key stakeholder and industry groups are needed to define the relationship between conservation farming and fire, and identify strategies to reduce risk.

[1] Different crop types (e.g. oilseed, cereal, legume, pasture) vary in flammability.

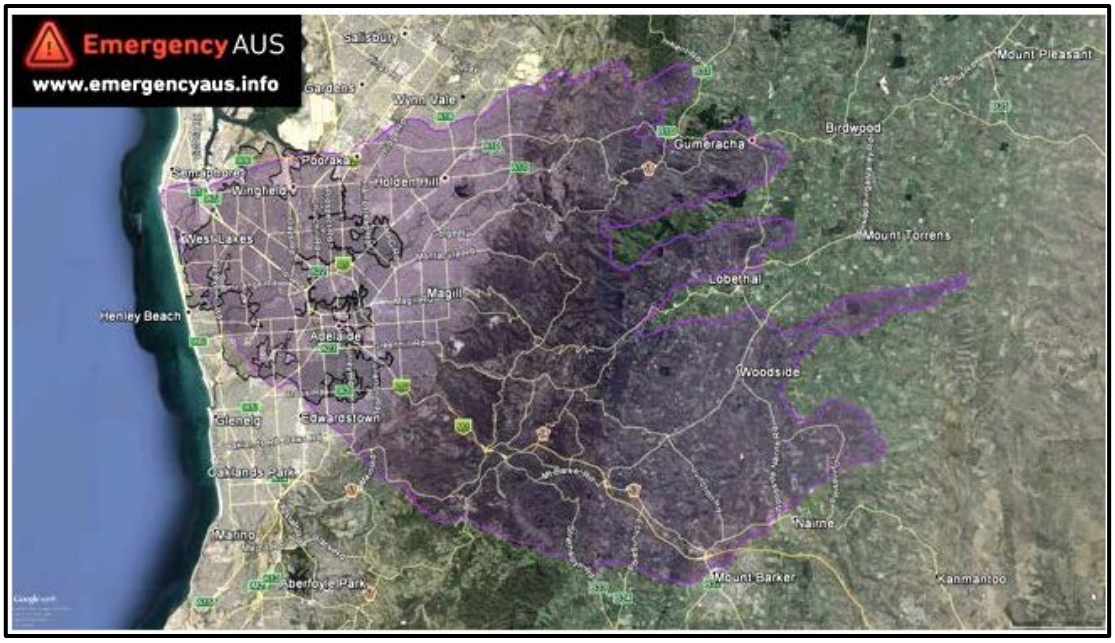


Figure 6: *the Pinery firescar overlaid on a map of greater Adelaide to demonstrate the extent of the fire. Approximately 86,000 hectares burned in about eight hours (Baum, 2016). Used with permission. Similarly, the Wangary fire burned about 79,000 hectares in about six hours.*

Climate change, severe weather and natural hazards

Bushfires are increasing in Australia and worsening globally within temporal and geographic parameters: the corollary of climate change and increasing severe weather events (Intergovernmental Panel on Climate Change (IPCC), 2014, Kitching, 2014). Fire can become an emergency when people, property, the environment and other assets are affected: risk reduction strategies are essential to manage this increasing global threat and to protect industries potentially vulnerable to extreme weather conditions (Westcott et al., 2017b).

In the pilot survey described in Chapter 7, respondent #45 commented: *The main human activity that is currently contributing to increased fire risk is our insistence on ignoring the effects of climate change.*

Economic contribution and value of grain production

Grain production is a highly productive industry in South Australia with over 4,000 grain producing farms employing about 12,000 people over a cropped area of 3.55 million hectares. South Australia's grain harvest for the 2017-18 season is expected to be 6.7 million tonnes, with an estimated farm gate[2] value of value of AU$1.7

[2] The value of the product to the primary producer as it leaves the farm, without any value-adding.

billion. Close to ideal conditions in the 2016-17 season produced 11.1 million tonnes, representing AU$2.2 billion at the farm gate. South Australia's grain exports earned AU$4.6 billion in 2015-16 (Primary Industries and Regions South Australia, 2017a). The 10 year average harvest is expected to be 7.7 million tonnes. This increased grain yield is due to advances in farming methods over the last 20 years - as well as hard work (Primary Industries and Regions South Australia, 2017b).

Economic losses – Pinery 2015 and Wangary 2005

The Pinery fire burnt approximately 86,000 hectares. There were two human fatalities and losses in grain and hay alone totalled AU$24m, with AU$75m in insurance claims during the first week after the fire (Australian Broadcasting Corporation, 2015, Primary Industries and Regions South Australia, 2015a). The toll of the Pinery fire is depicted below (Figure 7) (Baum, 2016). The high number of destroyed vehicles and machinery is in part due to this fire occurring at harvest-time.

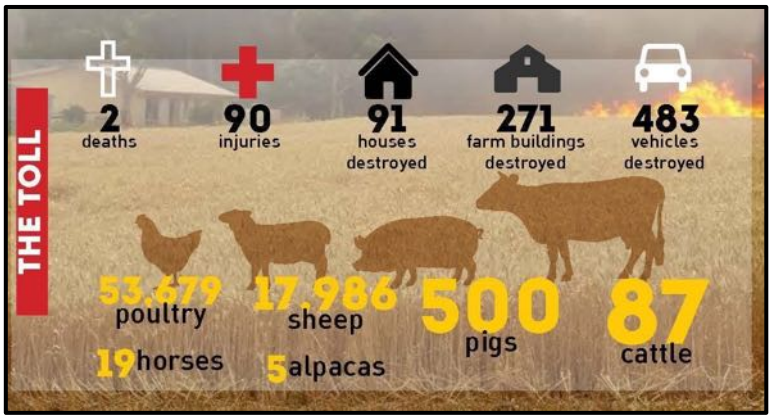


Figure 7: *The toll of the Pinery fire (Baum, 2016) (used with permission). The vehicle toll includes at least 93 pieces of farm machinery.*

The 2005 Wangary fire burnt approximately 79,000 hectares, 80% of which was highly productive agricultural land used for cereal, oilseed and pulse grain production, and extensive livestock grazing on improved pastures. Significant losses included 9 human fatalities, 93 houses, 237 sheds, approximately 47,000 livestock, and 6,300 kilometres of fencing, with property losses totalling around AU$100m (Egan, 2006, Schapel, 2007, South Australian Country Fire Service, 2016c).

In the South Australian Parliament, Hansard recorded the Premier acknowledging: *The economic impact of the [Pinery] fire and the flow-on effects to these local communities are of great concern* (The Premier of South Australia the Hon. Jay

Weatherill, 2015). More recently, the United Nations Office for Disaster Risk Reduction noted that *Australia estimates that its annual economic losses from disasters will triple to US$17.7 billion by 2050* (McClean, 2017a). Domestic and international food security is as much at risk as the welfare of farming communities.

Research findings supporting the need for further research

Findings from research detailed in this thesis indicate not all crop types grow, behave and burn similarly. Cereal crops, legumes and pasture all ignite and carry a fire differently, and oilseed crops such as canola are taller and burn faster (Westcott, 2017c).

After the Pinery fire, a farmer who lost his breeding ewes observed:

> *While many people think canola stubble would be less of a fire risk than a thicker wheat stubble, this fire [Pinery] disproved that myth. The fire was ferocious, particularly through the canola stubble where the ewes were. (Reflections on the Pinery fire, p27). (Pinery Fire Community Action Group, 2016).*

Modern agricultural science – plant breeding and soil science – and no-till conservation farming techniques have resulted in highly productive farms with healthier soils containing more organic matter that are able to support strong plants with higher grain yields. Consequently, economic benefits to farming families, communities and to the nations' gross domestic product (GDP) are increased. However, different crop properties combined with increased plant density per hectare mean more organic matter on the ground, and hence more fuel in the event of a fire.

Findings from research detailed in this thesis, specifically data from 14 farmer interviews (in 2015) and 37 on-line pilot survey responses (in 2015/16) strongly suggest modern, productive conservation farming techniques contribute to dangerous fire conditions (Westcott, 2017c, Westcott, 2017b, Westcott, 2017a, Westcott et al., 2017a). Understanding how this might occur, and studying crop type, density and placement, can help shape strategies to treat and manage that risk, and allow efficient, modern farming methods to continue to evolve to economically and profitably manage a farm and its produce as safely as possible. Establishing updated and informed best practice management plans, protocols and/or codes of practice

with respect to reducing the risk posed by crop fires to people, property, the economy and the environment is another important mitigation strategy within and beyond the agricultural sector.

Firebreaks

Survey and interview data supported a review of the use of firebreaks as a possible contributor to managing risk on broadacre farms. Anecdotally, firebreaks have fallen out of favour in recent years, possibly due to the perception of economic losses they cause due to reduced area of crop. Firebreaks may not stop a fire, but they can help in strategically managing fire-containing activities (Westcott, 2017c).

Planting around assets

Modern broadacre grain producing farms are enterprises with valuable infrastructure, machinery and multiple buildings. They may include livestock, and sometimes are involved with conserving or re-establishing native vegetation. Protection of these assets can be enhanced by achieving a better understanding of the influence of adjacent planting - ranging from surrounding crops to a watered garden containing lawns or irrigated grasses or leguminous plants, and stands of deciduous European trees such as oaks, elms, non-suckering ash and liquidambars. Less flammable trees such as these may help damp down a fire approaching a dwelling or other infrastructure.

Literature review

Academic literature regarding crop fires is sparse. The grey literature includes a report by Primary Industries and Regions South Australia (PIRSA) (Government of South Australia, 2011) written in response to the Coroner's findings from the inquest into deaths during the Wangary fires of 2005 in South Australia (Government of South Australia, 2005). This PIRSA document is the only one identified to specifically link crop management with fire. However, this is as a general *code of practice* rather than an assessment of the relationship between crop type, crop density, conservation farming and fire (Government of South Australia, 2011).

There is a moderate body of work regarding fire in temperate eucalypt forest (Bradstock, 2010, Bradstock et al., 2010, Collins et al., 2014) and others regarding modelling of fire spread due to physical parameters such as wind and fuel moisture (Krusel et al., 1992, Cochrane et al., 2012, Halliday et al., 2012, Cruz et al., 2016),

mathematical modelling (Richards, 2000) and fuel break management (Varela et al., 2014). No research was found concerning the relationship between crop fires and conservation farming. A search on the word “crop” yielded only one relevant ‘find’ in Bradstock (2010), where cleared land is referred to as *seasonally fuel free due to cropping or grazing*. This statement is misleading because (i) in conservation farming land is never truly fuel free, and (ii) the seasonal window where fire is unlikely is very narrow – a matter of a few months from germination post break-of-season (which may be well into winter) through the cooler months until early to mid-spring.

The lack of literature regarding crop fires represents a serious and concerning knowledge gap. This, in combination with the research findings presented in this research, strongly indicate the need to address this gap. Doing so will enable risk reduction strategies to be trialled and implemented to safeguard an economically valuable industry with highly significant investments in social and environmental capital.

Research questions

Three research questions arose from considering the wider literature and earlier findings (Westcott, 2017c, Westcott, 2017a, Westcott et al., 2017a):

- Do conservation farming methods and techniques influence the severity of a crop fire, and if so, how does this occur?
- Can crop type and crop placement (such as proximity to dwellings or other infrastructure) be managed to treat risk and increase safety?
- Can the use of routine strategic firebreaks pre fire season help reduce risk, and manage crop fires?

Method

This future research develops and extends earlier findings to specifically assess and treat risk for crop farming. Gathering data via semi-structured interviews and a brief on-line or email survey from grain producers, key stakeholders and industry leaders will help inform the answers to these questions.

Assistance with recruitment may be obtained from groups supportive of the original 2015 research project: Lower Eyre Agricultural Development Association, AG Excellence Alliance, Agricultural Bureau of South Australia, South Australian No-Till

Farmers Association, Bushfire & Natural Hazards Cooperative Research Centre, and local media – Port Lincoln Times, the West Coast Sentinel, the Eyre Peninsula Tribune, the Stock Journal and Southern Cross/GTSBKN Television Port Lincoln.

Support for the research implementation would be best sought from the South Australian Government's department of Primary Industries and Regions SA (PIRSA), Primary Producers SA, SA Grain Growers and the South Australian Country Fire Service.

Pilot survey data and interview extracts

The 2015 pilot study collected data from farmers located in South Australia and New South Wales (n=37): 81% of respondents had experienced fire on their farms. Seventy-five (75) per cent of respondents had been farming for more than 20 years, and 81% for three or more generations of their family. Two or more generations of the family are currently employed on 54% of farms.

Re modern farming practices

When asked *do you think changes to farming practices (e.g. no-till cropping and increased crop density) could contribute to altered fire behaviour,* 55% of pilot survey responders answered "yes definitely", and 33% answered "yes possibly" (Figure 8, below).

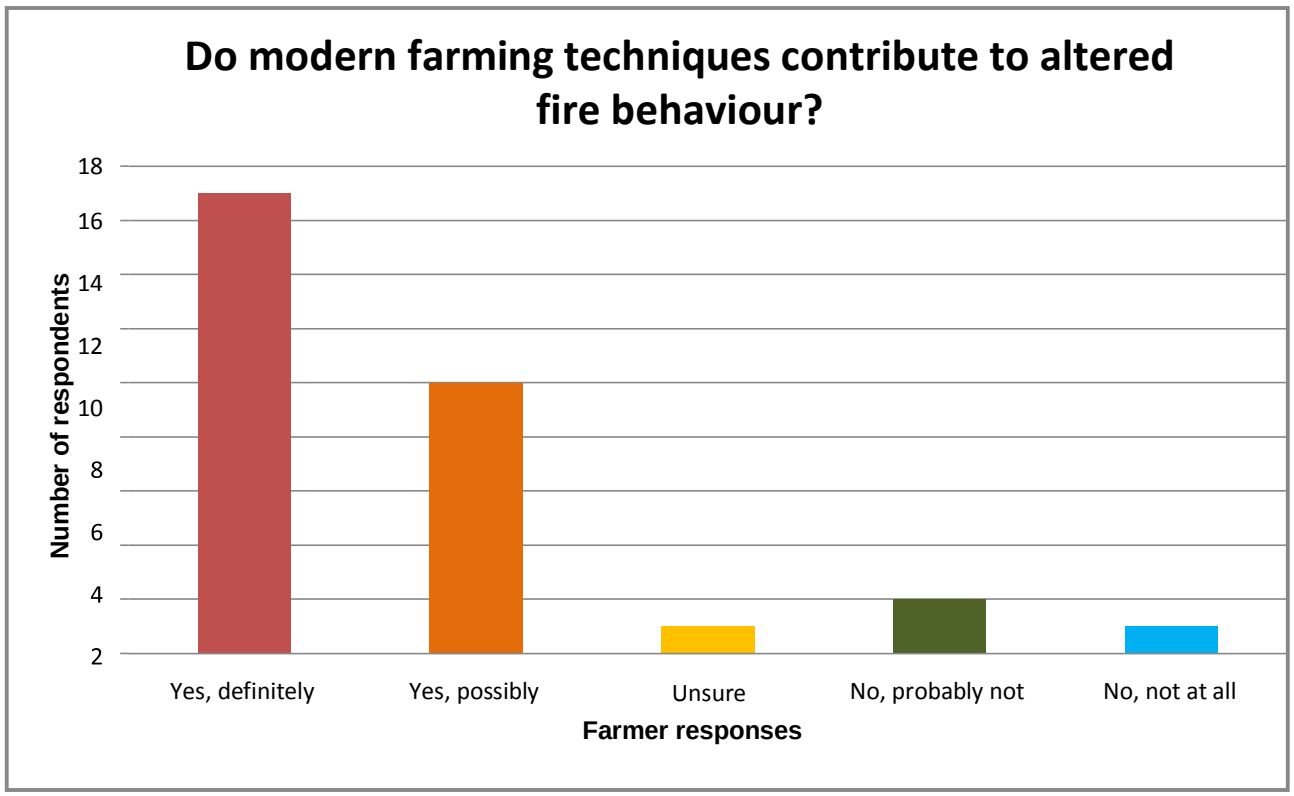


Figure 8: *Responses to question: do you think changes to farming practices could contribute to altered fire behaviour, e.g. no-till cropping and increased crop density?*

Comments accompanying this question included the observations:

> *Many years of 'fire stick farming' has led to a dominance of fire adapted species [of vegetation]… a move away from burning of grazing country would lead to less fire [adapted] species and thus reduce the impact of fire.(Respondent # 1).*
>
> *The move towards cropping and away from livestock means there is a higher fuel load during the fire season and less grazed-out paddocks exist to slow a fire down. (Respondent # 3).*

Use of firebreaks

In response to the question *do you cut firebreaks in your paddocks,* 43% answered "yes" and 43% "no", with 14% answering "sometimes".

Additional comments with this question included:

1. *Always when the seasons dictate(good winter rainfall) with disc plough 4.5m sometimes twice to create a bare fire break* ***I believe that not enough is done to create fire breaks anywhere in the state of South Australia***
2. *We do weed spray along all fencelines*
3. *Ploughing or spraying a 6 metre break*
4. *Better to have bare laneways.*
5. *High load or high risk paddocks. Always cut breaks on paddocks surrounding the house. Slashed, cultivated or mowed. Chemicals on fencelines at times. At least 4m in width around house and sheds. 2.8m around paddocks.*
6. *Fencelines sprayed and often cultivated*
7. *Some land is not suited to firebreaks. elsewhere, graded and sprayed breaks up to 10 M wide*
8. *We use rubble roadways and slashed laneways*

Crop type and crop placement

Crop placement and types of crops was raised by several farmers in earlier interviews. “Bob”, “Paul” and “Trevor” (pseudonyms) each independently discussed how different types of crops “carry” a fire, and how growing more flammable crops further away from livestock and other assets could be a helpful consideration (Westcott, 2017c, Westcott, 2017a). In Paper 3, data extracts from all three farmers were included:

Bob:

> *The biggest change probably has been the huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that’s pretty hard to stop… There’s a massive volume of crop material, but there’s a huge residual as well, so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 percent over the last 20 years at least, so you’ve doubled the burnable material that’s there to go up and so, of course, it goes like nuts.*

Trevor:

> *We're so prone to fires down here because everyone's intense cropping so you've got a lot more stubble, and so being able to stop a fire once it starts is very difficult.*

Trevor went on to discuss the differences between types of crops, including options which might be more suitable adjacent to livestock or other assets - pointing out that as well as more fuel, some crops burn much faster.

> *Pasture or legume crops, they wouldn't carry a fire as quickly as certainly your canola stubble would, so that's an option that the farmer would have, if there's stock or buildings nearby.*

Paul:

> *I think with our modern farming and agricultural techniques we're achieving crop yields that are way and above what we've ever been able to do in the past….in 30 years, I've seen cereal yields double, and what that means, of course, is that there's double the amount of crop residue over the summer period after the crops have been taken off, and the proportion of arable land going into crops has increased also. So we've got two contributing factors there - increased area of crop and also a greater crop residue, which adds to the fuel load.*

This was reiterated in the survey data, where Respondent #3 noted how in recent years cropping seems to be increasingly preferred to livestock farming.

Expected outcomes

It is anticipated this proposed project will help inform, define and determine:

- The relationship between modern broadacre crop farming practice, no-till farming and fire behaviour.
- If crops can be strategically placed to reduce risk.
- If firebreaks are a useful risk reduction tool in the context of crop fires; how and where they are most beneficial, e.g. along adjacent properties' boundary fences.
- Potential economic losses due to firebreak use.

- The need for further research into crop fire risk reduction, prevention and management, trials and evaluation.

and to

- Update the farmers' harvesting and fire code of practice from the document written a decade ago (Government of South Australia, 2008).

Conclusion

Understanding the influence of modern farming techniques upon crop fire behaviour and identifying and developing strategies to treat and manage that risk aims to help reduce risk to people, their environments and livelihoods, the state and national economy and to global food production. Consequently, this will allow efficient, modern farming methods to continue to evolve economically and profitably while simultaneously proactively managing and safeguarding a farm and its produce as effectively as possible by reducing the potential risk of a crop fire. Social, environmental and economic benefits can be expected.

Illustration 9: *the silos, Port Lincoln. A natural deep water harbour, grain arrives at the silos from the broadacre farms of Eyre Peninsula and the west coast of South Australia.*

CHAPTER NINE - THESIS CONCLUSION

As discussed in this thesis, bushfire and other natural hazards continue to occur more severely and more frequently within and beyond Western countries as global climate change advances. As identified in this thesis, various strategies, some locally bespoke, will need to be continuously developed, applied or adapted as appropriate to proactively promote higher levels of fire preparedness *and* to achieve the goal of fire-fitness as a social norm in Australia and elsewhere. As advocated in this thesis, increasing awareness - building 'fire-fitness' as a social norm - is increasingly important as part of the effort to reduce traumatic human and environmental catastrophes. This thesis has proposed strategies to enhance and build fire-fitness. The suite of practical strategies, developed from empirical data from interviews, focus groups and a pilot survey with fire responders and fire survivors encourage safer response choices and advocate adaptive rewards to help reduce the gap in awareness-preparedness behaviours in emergency fire situations.

The initial focus of this research on utilising Protection Motivation Theory (PMT) as applied to the study's selected demographic groups – emergency responders and animal owners was maintained throughout. The wider ambit of the research was refined during the course of the project and by the time analysis reached the fifth paper, SP1 (Appendix B), the potential to adjust Rogers' 1983 modifications to PMT as a strategy to bolster societal-wide disaster risk reduction (DRR) was established.

Paper 1's debate concerning PMT identified the *social microclimate* as a significant unit in the overall equation of cultivating and establishing a culture of natural hazard preparedness as a social norm. Adding *response choices* to Rogers' (1983) revised PMT flowchart aligned with his premonition of iterative versions of PMT and was predictive of how *adaptive rewards* would appear later. Progressively, strategies and tactics were identified to promote positive outcome preparedness and by the end of Paper 2, two major areas were confirmed as the subjects of the next stage of analysis: public policy and the aetiology of decision-making. Both these areas reflect iterations of the social microclimate – the family, the workplace, in schools and in peer or industry groups.

Paper 3 began with a marked problem-solving intention, shifting between a mainly inductive and occasional constructionist approach it aimed to deflect some of the conservatism inherent in the sector as described by Neale and colleagues (2016). At this point of the analysis, several strategies and policies had suggested themselves as having potential to trial and evaluate, and to reposition preparedness, newly renamed in the analysis as "fire-fitness", as a routine social norm in daily life.

Papers 4 and SP2 elaborated on specific aspects of public policy and the aetiology of decision-making. Paper 4 proposed adopting adaptive response choices as a desirable and attainable strategy to build safety and fire-fitness in the medium to long terms. Simple adaptations or extensions of existing resources can be readily implemented, trialled and evaluated. In parallel, the expected outcomes of further research suggested for the agricultural sector would be broadly protective socially, economically and environmentally.

Towards the end of the thesis, Chapter Six (and the submission at Appendix B) completes a full circle back to PMT and the significance and complexity of the social microclimate, as a refined version of the original proposition – refined due to a deeper researcher understanding post data collection and analysis. This section shows how reconstructing 'adaptive costs' and 'maladaptive rewards' to achieve 'adaptive rewards' as an overall net gain can motivate desired protective behaviour. It draws as well on the principles of dynamic risk assessment as a tool to help refine people's response choices, and as a counterbalance against traditional attempts to change behaviour by using fear as a motivator.

In a time-poor 'first world' of white noise[1] and social pressure, behaviour can be successfully changed by making the required effort *appeal* to people by being quick, simple, worthwhile and rewarding for the individual or their microclimate. In addition to recommendations in this thesis summarised below in Table 4, an example is the 2017/2018 campaign by the South Australian Country Fire Service: The 5 Minute Bushfire Plan[2]. Sub-headed *It's simple to create*, this campaign is one of the first to emphasise safe, positive outcomes rather than frightening the target audience.

[1] In this context, the overabundance of distracting or useless electronic information
[2] https://www.cfs.sa.gov.au/site/prepare_for_a_fire/5_minute_bushfire_plan.jsp

SUMMARY OF RESEARCH FINDINGS - STRATEGIES TO ATTAIN FIRE-FITNESS

Strategy	Refer to pages	Notes
Catastrophic Day Leave (CDL)	58,63,74,86,126, 179	Negotiate with employer and include in employment contracts.
Financial incentives	59,63,74,127,180	Bespoke & locally relevant, may be offered by government or insurance companies.
Reward best practice		
• Identify excellence in property preparedness	50,60,94,131,180, 182	Local Government inspectors, agricultural groups, service clubs, community groups, media.
• Rebates independent of Emergency Services levies	59,63,74,127,180	Separate scheme to specifically reward fire-fitness, rather than offset against an existing levy.
• Use bushfire compliance to value-add to properties at point of sale	60,80,129,157 164,178,183	Identify well-prepared properties for sale on listings and signage.
• Hold fire-ready open days, like open garden schemes	60,80,129,183	Use community networks to demonstrate, encourage and inspire others to implement fire fitness strategies and simple ideas.
• Give public awards such as *Bushfire Best Prepared* towns	60, 80, 129, 183	Local Government promotion e.g. signage on approach to town.
Review the use of firebreaks on farms and rural living blocks.	60,104,107,129, 183	Include financial incentives and rewards. Show how safety doesn't mean a cost.
Think about crop locations	xxv,60,76,100, 103,108,131	Grow more flammable crops further away from assets.
Strategic planting around assets	94,104	Watered gardens, legumes, European trees.
Synchronise the social microclimate	86,150,165	Deliver chronologically synchronised, similar information to different members of the same social microclimate in different locations, e.g. workplace and in school.
Resource sharing between other agencies and Emergency Services	77,155,165, 166	To help teach Dynamic Risk Assessment in communities. Link to agencies using DRSABCD.
Adaptive rewards	7,38,50,68,70,79, 85,86,147,150, 153,157,164	To show how rewards of adaptive behaviour can outweigh costs of maladaptive response choices.
Farmer recommendations to new or novice land owners	89,91	Share local knowledge and experience and build community
Trial and evaluate the above	xxv,12,50,60,79, 86,112	Evidence-based reporting

Table 4: data driven strategies to build and cultivate fire-fitness as a social norm.
Reminder to readers: page numbers listed are according to the thesis Table of Contents. Add 25 if using PDF reader software page finding feature.

Finally, the need for further research into the poorly understood – and sometimes 'wicked' - problem of cropland fires is outlined in Chapter 8 and in Appendix L as the logical 'next step'- an imperative research requirement in order to avoid a deficit in awareness of unpredictable unknowns (Taleb, 2010, Steffens, 2016).

In essence, this thesis has proposed practical strategies to change human behaviour in the medium to long terms, in order to make people safer in the context of complex and worsening natural hazards. Some of its findings and recommendations challenge conventional approaches – but a willingness to adopt evidence-based innovation unshackled by conservatism is the hallmark of human endeavour - striving to preserve and perpetuate humanity.

RESEARCHER FINAL OBSERVATIONS – on reflection

Overall, the project was satisfying and rewarding, particularly in the data collection phase interacting with research participants, and in analysis. One of the most difficult and at times frustrating aspects of the project concerned the length of turn-around time for review and publication of papers, which seems to detract from timely and effective dissemination of research to end-users, for testing and/or application. By comparison in an EM environment, there is a structure of an event, an activation, a response, and a review. Recommendations follow, and changes implemented for continuous improvement and best practice. This process uses naturalistic data as an essential tool from which to learn.

In my 30 year career to date, trained in a paramilitary context and working in a high-achieving and often intensely pressured environment of veterinary science, results frequently need to be fast, accurate and able to be implemented rapidly. The ethos and purpose of academic research is to enable a continuum of growth in learning and knowledge to benefit humanity as a whole. End-users, key stakeholders and beneficiaries of research would be better served by a system where review times leading to publication are more temporally aligned with research processes. The need for peer review and high standards of academic rigour are important and must not diminish, but to be effective into the future, review times need to be as short as possible.

The research in this thesis has successfully identified public health strategies expected to be useful in the medium to long terms, as well as identifying topics requiring further research. It has met its aims and objectives, and contributed research findings valuable to academic knowledge, and to public policy and public safety.

APPENDICES

Author's note re Appendices

Appendices A and B are listed first as they are the unpublished papers, SP1 and SP2. Thereafter, Appendices C to H are listed chronologically to assist the reader with an understanding of the project timeline.

Appendix A SP1 - Paper submitted to Australian and New Zealand Journal of Public Health. Title: *Public Health and Natural Hazards: New Policies and Preparedness Initiatives Developed from an Australian Bushfire Case Study.*

Appendix B SP2 - Paper submitted to *Climate Risk Management*, submitted November 2017, revision submitted 12 February 2018. Title: *Natural hazards and adaptive response choices in a changing climate: promoting bushfire preparedness and risk reduction decision-making.*

Appendix C	AFAC Paper for peer review, published in AJEM
Appendix D	ANZDMC 2017 Table of Contents – Peer reviewed papers
Appendix E	Recruitment posters and flyers
Appendix F	Participant information and consent forms
Appendix G	Interview guides, phase 1
Appendix H	Coding examples, interviews and focus groups
Appendix I	Responders Thematic map
Appendix J	Thematic table and notes
Appendix K	Farmer pilot survey
Appendix L	Future research

Appendix A: Paper SP1
Submitted to *Australian and New Zealand Journal of Public Health*

Public Health and Natural Hazards: New Policies and Preparedness Initiatives Developed from an Australian Bushfire Case Study.

(Word count excluding Abstract and References: 8670; one table, two Appendices).

Authors: 1. Rachel Westcott[a,b] – Corresponding author

Veterinarian and researcher
[a] Translational Health Research Institute, School of Medicine, Western Sydney University, Sydney, NSW, Australia

[b]Bushfire and Natural Hazards Cooperative Research Centre Melbourne, VIC, Australia

R.Westcott@westernsydney.edu.au

Postal address: Translational Health Research Institute,
School of Medicine
Western Sydney University
Locked Bag 1797, Penrith,
New South Wales 2751 Australia

2. Kevin Ronan[b,c]

[c] School of Health, Medical and Applied Sciences, Central Queensland University, Rockhampton, QLD, Australia
[b]Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, VIC, Australia

K.Ronan@cqu.edu.au

3. Hilary Bambrick[d]

[d]School of Public Health and Social Work, Queensland University of Technology, Brisbane, QLD, Australia

h.bambrick@qut.edu.au

4. Melanie Taylor[b,e]

[e]Department of Psychology, Macquarie University, Sydney, NSW, Australia
[b]Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, VIC, Australia
[a]Translational Health Research Institute, School of Medicine, Western Sydney University, Sydney, NSW, Australia
mel.taylor@mq.edu.au

Abstract

Introduction
Public preparedness for natural hazard events is low. With worsening severe weather events due to climate change, public health policy and practices must evolve to more effectively engage communities and manage the increasing global threat. This study, with its innovative focus on the emergency responder-animal owner interface in bushfire emergencies, aims to identify and inform new preparedness policies and build adaptive capacity in order to minimise risk to human health and promote well-being and safety in an all-hazards context. These new policies seek to (i) contribute to establishing and maintaining a culture of preparedness as a routine aspect of everyday life, and thus (ii) promote and protect public health in the short, medium and long terms.

Method
Semi-structured interviews and focus groups were used to investigate the interactions between emergency responders and animal owners in a bushfire (wildfire) context. Participants were (i) emergency responders from four different organisations, and (ii) the owners of any kind of animal. The latter was selected because the group commonality (owning an animal) traverses other demographic boundaries. It included livestock and grain producers with their own 'farm fire units' as well as owners of companion and recreational animals. Data were analysed using Thematic Analysis (TA).

Results/Discussion

This paper discusses results from one of the seminal themes actively identified from the data. Three policies designed to improve human safety and well-being and to enhance preparedness practices in bushfire and other hazards are proposed and discussed. These three proposed initiatives are (i) a new system of workplace leave (ii) an innovative regime of financial incentives for fire-ready properties, and (iii) review of the use of firebreaks on farms and rural blocks.

Conclusion
Policies proposed in this research aim to proactively narrow the awareness-preparedness gap and build adaptive capacity to minimise risk to human health and promote well-being and safety in all-hazards contexts. Further research regarding how farming practices, fuel loads and crop productivity influence fire behaviour would beneficially inform fire science, and help to evaluate the efficacy of any newly implemented public policy which aims to promote public health and safety in a natural hazard emergency.

Keywords
Bushfire; Disaster; Public Health; Preparedness; Policy; Emergency responders; Farmers; Animal owners

1.1 Introduction

The ultimate aim of this study is to better protect human life and well-being in bushfire[1] and other emergencies by establishing preparedness behaviour as routine - thereby reducing the *awareness-preparedness gap* (i.e. the mismatch between awareness and preventative action). This gap is narrowing disproportionately slowly compared with the magnitude of public resources currently assigned to help people attain readiness (1-3). Making safe, potentially lifesaving fire preparedness behaviours a routine element of daily life is one of a suite of 'lifestyle' changes people increasingly need to adopt due to the escalating influence of climate change on natural hazards (4). At present, household levels of fire-fitness in Australia and elsewhere are low, with fire-safe routines often assigned a lower priority than other competing complexities of everyday life (1, 2, 5). The practise of considered, timely and safe action – to be *fire-fit* – both outside the fire season and within it when threat is imminent, is a present-day imperative. This denotes the need for adaptive capacity building in communities around the globe. This paper proposes three policies that aim to actively cultivate sustainable patterns of routine behaviours to better enable protection of lives and property, fortify psychological and physical preparedness and facilitate resilient and effective responses.

The Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) (6) has a more holistic, integrative focus on health than its 2005-2015 Hyogo Framework for Action (HFA) predecessor and aims to lessen the impact of disasters on people's health in social, economic and environmental contexts (7). From an economic perspective alone, the public cost of natural hazards in Australia is expected to "triple to US$17.7 billion by 2050" (8). Implementing the SFDRR has clear benefits including improved preparedness, and discerning ways to translate risk mitigation and reduction strategies into standard, practical applications to curb human suffering (9-11).

Following the HFA decade, and acknowledging the importance of psychological health and the factors that affect it, the people-centred Sendai Framework has evolved to embrace health *and* well-being. It extends beyond the HFA in encompassing science and technology[2] (12). This includes connecting policy development and implementation with evidence and facilitating the transformation and transfer of research into practice. Three components of the SFDRR – health, economic development and climate change - demonstrate how the boundaries between public health and environmental health are increasingly less distinct (13). Public health as a discipline has accordingly expanded beyond responding to specific events or disease outbreaks: it is now recognised that collaboration, capacity building and research need to be widespread and diverse to enable bottom-up innovation to meet top-down goals and ideals (14-17).

Beneath the overarching principles of the SFDRR, fire science explores an expanding spectrum of fire-related social, economic, physical and agricultural science topics. This knowledge contributes to the successful and dynamic management of increasingly complex fire problems that affect many aspects of human populations in a changing climate. This study contributes to that knowledge base. It records, documents and analyses some of the experiences, expectations and needs of communities who have 'lived through' bushfire emergencies, and expect to face this hazard again.

[1] The Australian term, "bushfire" is synonymous with "wildfire".

[2] For example, there were three references to "technology" in the HFA, with 19 in the SFDRR (Trogrlik et al., 2017).

A case study of a bushfire at-risk regional area in South Australia – 'the driest state in the driest continent' (18) was chosen as the research site because of its recent, and severe, fire history and the diversity of animal ownership (19). The research site is not named because this would compromise participant privacy, but it is an area comprising an urban hub with a surrounding periurban arc, and a hinterland of broadacre mixed farming (livestock and crops) with some coastal oceanic aquaculture.

To date, the academic literature about emergencies and animal owners is skewed towards the retrospective experiences of pet owners (20). This omits to document the experiences of animal owners as a whole – people who own various animals in a variety of contexts – alongside the in-field responders whose task it is to help secure public safety. This paper therefore asks the research question, *what preparedness initiatives can be learnt from the emergency responder-animal owner interface in a bushfire at-risk community that can be usefully applied to generate new public health policy?*

Emergencies can occur when people, property, the environment and other assets (including livestock and other animals) intersect adversely with hazards (14). Australia, like many Western countries, is a nation of animal owners: 63 percent of households own one or more companion animals with a much larger number of animals owned by primary producers (21-23). Animals may be considered 'dependent others' by virtue of the emotional relationship that exists between animal and owner: their welfare is frequently inextricably linked to human physical and, arguably more importantly, psychological health regardless of the category of ownership (24-26). Additionally, for livestock farmers, animals often represent a major component of their livelihood, and good animal husbandry is an important part of a farm's commercial viability and business continuity (27). However, an economic relationship does not exclude emotional attachment and both are considerations at the responder-owner interface (3, 28).

When faced with an emergency such as fire, the animal-owning public is challenged to effectively and safely manage their animals in addition to themselves; this adds varying degrees of complexity to owners' preparedness and planning (3, 28). Incidents involving animals have been identified as a reason why people place their own welfare and safety at risk (29-32). There is, in parallel, an increasing understanding of the strong link between effective animal management in an emergency and the saving of human life, as well as a growing awareness of the longer term, adverse human health implications of losing animals in an emergency incident, whether they be pets, recreational or sport animals, livestock or wildlife (24). Despite these factors, animal owners as a demographic group have not been considered with respect to their likely contribution to effectively and authentically inform modern emergency management and disaster risk reduction.

Having confidence in being bushfire ready, and in being able to safely and appropriately respond to a fire emergency is a realistically attainable goal – but one that is too frequently overshadowed by the magnitude of the awareness-preparedness gap (3, 28). To overcome this requires a shift in thinking that elevates preparedness from being regarded as an inconvenient and often postponed task to 'business as usual' status – as routine as buying the groceries, or putting fuel in a motor vehicle. While the basic human urge to save a dependent other at the risk of personal safety may never be overcome, learned coping appraisals and adaptive responses, in combination with proactive preparedness routines as part of everyday living, could facilitate pre-hazard behaviours that overall reduce risk-taking while achieving a more effective response with less trauma and anxiety.

2.1 Method[3]

As practical answers to issues of policy and practice are essential in this field (33, 34), a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology guided the research design (28, 35-37). Data were collected from 67 participants via semi-structured interviews and focus group discussions with emergency responders, livestock farmers, and animal owners (Appendices A and B, Interview guides). The sequential nature of data collection allowed the interview guides to be informed by earlier material, and modified accordingly. This allowed the researcher to cross-check meanings and conduct *in situ* member checking and data verification. The interview guide allowed flexibility – some questions were context dependent, and therefore not all questions were asked of all participants (38). Audio recordings were transcribed verbatim and coded. Thematic Analysis (TA) was applied because of its flexibility and independence from theory (36, 39). This analytic, interpretative approach explored latent meanings in the data, and enabled straightforward answers to practical questions. The recursive process of analysis was managed with CAQDAS[4] software, NVivo 11, and a thematic map and table were generated to visualise thematic interrelationships in the data (28).

Research participants were firefighters, police officers, rescue officers of the State Emergency Service (SES), farmers with their own farm fire units and animal owners. The animal owner demographic is important because of the urgent need to search among new and different groups to discover key reasons why awareness of bushfire hazards does not necessarily translate into proactive, effective prevention and preparedness behaviours, particularly among fire at-risk communities. Additionally, the demographic selection criterion of owning animals (from a single pet to many thousands of livestock) crosses many other demographic boundaries, and hence reduced the possibility of avoidable omissions in the data.

Ethics approval for this research has been granted by the Human Research Ethics Committee of Western Sydney University, approval number H11118. The names of participants used in this paper are pseudonyms.

3.1 Results, interpretative analysis and discussion

A serious fire affecting people, their livelihoods and microclimates falls well within the remit of the SFDRR and is a complex *non-routine social problem* (40). Discerning how people and emergency managers and responders can better equip communities to protect themselves, and the things they hold dear, including their animals, is an urgent requirement given the increasingly severe weather conditions that indicate a 'new normal' of extreme weather. Effectively addressing this therefore requires prioritising innovative preparedness initiatives (34, 41-45).

This paper proposes three holistic, evidence-based public health policy initiatives and practices to improve bushfire preparedness (bushfire being emblematic of all natural hazards). These policies aim to first, raise the profile of emergency preparedness in the public domain and second, proactively promote and facilitate more extensive levels of engagement with preparedness activities at the individual and community levels. To achieve and maintain an embedded culture of preparedness, it is first necessary to understand and establish

[3] A detailed Positionality statement can be found at reference #28.
[4] Computer Assisted Qualitative Data Analysis System

prerequisite conditions which *precede* and favourably predispose towards successful preparedness messaging and action outcomes. This foundation, built on medium to long term strategies, will help develop policies based on the best interest of future public health, and is required *before* a substantial shift in the implementation of preparedness practice and routines will be generally evident as normative behaviour.

3.1.1 Preparedness – Be fire-fit: weekly is worth it!

The preparedness theme *Be fire-fit: weekly is worth it!* is prominent in this study because the implied corollary of being prepared *(fire-fit)*, and of frequency *(weekly)* is a net benefit *(is worth it)*. This theme is pivotal to addressing the awareness-preparedness gap and achieving fluency between knowledge and action among people at all levels - by linking science with policy and evidence with implementation (6, 14, 28).

Arguably, a fundamental problem with the term *preparedness* is the need for a more specific, contextual and informative definition. To address this, it is useful to identify key components of preparedness and precisely articulate its meaning (46-49). Austin (2012) identifies seven "clusters" of preparedness pertinent to community based organisations in the United States. These are (i) internal protocol training, (ii) external response agreements, (iii) disaster response capabilities, (iv) information collection and distribution to staff, (v) client preparation, (vi) building protection, and (vii) emergency supplies. In an Australian context, Penman et al (2013) distil preparedness into three categories, (i) personal capacity of the resident(s), (ii) available equipment, and (iii) condition of the property's grounds.

Aligning with Penman and colleagues' notion of personal capacity, the academic literature on residents' preparedness considers the importance of psychological and physical capability and suggests reasons why people do, or do not, prepare (33, 47-51). One contributing factor to preparedness inertia is the dilemma people face when confronted with multiple, often superimposed, important preparedness tasks (52). For example, where two highly desirable outcomes present, such as the safety of a family *and* the desire to save home and property, including livestock, the resultant indecision means that the next step – engaging in proactive preparedness activities – can stall and nothing is done. The present study argues that by promoting preparedness routines as 'business as usual' and as an everyday priority both outcomes are achievable, are unequivocally worth striving to attain, and could result in a healthier outcome experience with less physical and/or psychological trauma. In turn, safely protecting property, including livestock and other animals, contributes to building a sense of confidence which can inspire and create its own momentum, and substantially increase resilience and awareness of well-being, as espoused in the Sendai Framework (16, 53, 54). However, achieving better short-term outcomes and affecting long-term change requires a critical examination and evaluation of what *precedes* preparedness; this includes considering how public policies can promote adaptive capacity and facilitate a culture of preparedness to become a routine response in society generally.

Realistically, there are some limitations to achieving this: affording equipment, for example, is a potentially limiting factor in being 'fire-fit' as not everyone will have the disposable income or the resources to reach their ideal level of preparedness in one six-month fire season. This is particularly the case in rural areas where income is often infrequent and sporadic, occurring after harvest or shearing when produce is sold. Jayne, an experienced fire officer in a rural, at-risk community, works in the area of fire safety and community outreach. She spoke about people she had met who would eventually like to remain *in situ* and 'stay

and defend' their homes and properties. She describes their bushfire survival plan as a dynamic document that includes a strategy to attain the desired level of preparedness over a specified time frame. The plan flexibly accommodates achieving a cumulative level of readiness each year so that over time, and with planning, their goal to safely stay and defend is achieved. Jayne explains such a plan combats the danger of being daunted by the magnitude and financial burden of the preparedness task.

> *So, set yourself a three year limit, in the first three years, you're going to pack and go and leave early but over winter you might do your research and find out what sprinkler system you like and how much it's going to cost…and you may have a specific savings plan over the next three years to be able to get all the stuff you need, to be able to stay and defend.*

The data suggest the resultant peace of mind, adaptive capability and confidence – self-efficacy and response-efficacy - is self-generating. The challenge remains how to engage with, or understand, those who elect, for whatever reason, not to prepare their homes, their properties and their predominant social microclimate (such as family, business or workplace group). Pragmatically, complete consensus is very unlikely and some people will be unreachable, or remain unconvinced of the need for action (47). Then, the presenting problem is how to help people adjacent to an absent or disengaged neighbour or property-owner. Additionally, there will be people who live on the outer peri-urban fringe or in a rural community because they prefer to live with less social interaction. Someone does need to know they are there, which is where communal local knowledge can literally mean the difference between life and death (55, 56).

Jayne commented,

> *The people who attend the meetings or the workshops…they're almost already half converted. They're seeking information to do something about reducing their risk. It's the people that don't come, either because they don't think they need to or they don't have time that are the people that are more of a concern.*

In the aftermath of an event, intra-community compassion can contribute significantly to reducing potentially devastating psychological trauma; it can also inspire those previously less engaged to become involved in community activities in general, and in fire-fitness activities in particular (57-59).

Bushfire prevention and preparedness is promoted in Australia and internationally as *everyone's responsibility* (60-64). It is important however not to misread *every-one* as preferencing the actions of an individual over the involvement of community and collaboration between people, however small the subgroup. Both are important and mutually inclusive and encouraged. Both benefit from shared communication and from the synergy achieved by collaboration among a group of people with a common goal.

Social connectedness and community engagement can reduce the negative outcomes of natural hazard emergencies (1, 50, 58, 65). Akama and Ivanka (2010) discuss the need to understand and promote the real meaning of "community"; the creation of sub-groups bonded by a common goal, and how self-empowerment can catalyse behaviour change (1, 53, 59, 66). Individuals, community groups, local, state and federal governments, workplaces and policy development can all contribute to and promote this change, and in doing so, increase

the status of a culture of preparedness and being 'fire-fit' – to make investment in resilience "gainful" (67).

Shane, an experienced, senior firefighter, was candid about how difficult preparedness can be. However, he also indicated that a collaborative whole-of-community approach strengthens the likelihood of effective and proactive initiatives, and can circumvent the effect of a cascade of undesirable events combining to create a catastrophe.

> *Bush fires…to me are the greatest example of time and motion. The fire is in motion and you've never got enough time, ever, no matter what you do. There's so much planning at an individual level in the mosaic of a neighbourhood or a rural community to get every square ticked, the whole thing can fail with one person in the middle being blasé and naive. So one individual really can, yeah, be the weakest link and let the whole chain down.*

The pressing issue is to neutralise the "weak link" effect - for good outcomes to be less reliant on *everyone* being engaged, and to build in some redundancy as 'insurance'. The answer to this is in the preparedness planning stage (in peacetime – i.e. out of fire season), with less margin for error in the activation phase. Community sub-groups (close neighbours, residents of a street or other local geographic nucleus) can plan to, and do, overcome absences of group members. One of the objectives of such planning is to accommodate the fact that in Australia people frequently take holidays in bushfire season (which includes summer school holidays and the Christmas – New Year period). Neighbours in close-knit communities, towns or farming regions often know, within reason, who is where and when, and plan actions like activating a neighbouring farm's sprinkler system, or bringing the working dogs or pet horse to a safe location (Westcott, unpublished data 2015). This can be as simple as pre-fire season conversations about where the dogs' leads are kept, or which horse needs to be moved first due to its temperament. The importance and value of this collaborative action cannot be underestimated (3).

However, self-responsibility is the pre-requisite building block for a strong community effort. Jayne explained,

> *Protection is about self-help as much as it is about relying on the services that you've got… being bush fire ready isn't easy and simple and quick and cheap. It's not that hard…if you just want to pack and go. But being bush fire ready is no different to any other problem or complexity that people have in their life. So, and I'm really upfront with people, I will say forget it. If you think you're going to do [everything] by tomorrow - no. So get rid of those unrealistic expectations… you can't do 20 or 30 or 40 jobs when you can smell the smoke, you can only probably do one or two.*

Paul, a sheep farmer of several decades, agreed:

> *So, really, look, in the end, it comes down to people taking responsibility for themselves and their own property, doesn't it? And having a whole-of-farm plan, which is important for farmers for all sorts of reasons, including fire management.*

Such self-responsibility links back to the issue of lack of preparedness with many people waiting *until they smell the smoke* to take safe pre-emptive action. The difficulty and inherent danger of this is described by Penman et al (2013) - a delay in decision-making until a threat

is imminent results in insufficient time to carry out required tasks and means that decisions are made under duress, with potentially fatal consequences.

When asked why she thought people don't prepare, Jayne didn't hesitate: *Because it can be very confronting. Why don't people prepare? They might know they're at risk, but why don't they? Because it's actually too confronting.* The critical challenge here is to first defuse the confronting, sometimes overwhelming nature of the preparedness task, and then to facilitate the transition from knowledge and understanding to intention and action. Breaking tasks down into manageable steps and writing a 'bushfire action plan' to reduce the need for strategic thinking when an emergency situation arises is one way to achieve the former, and is already actively encouraged by fire authorities as part of an established and ongoing multi-media public outreach. However, an environment conducive to achieving effective action must necessarily occur *before* preparedness can be substantially realised – before advertising and use of messages intended to motivate the target audience with fear or 'shock tactics', the effect of which can be short-lived (68, 69). This requires a cultural, paradigm shift which itself can be created incrementally (13) via a foundation which preferences and facilitates routine, effective preparedness activities. Thus, hurdles such as lack of time, or the dangerous maladaptive responses of 'action inertia' (52) or acting impulsively without even a brief dynamic risk assessment can be overcome.

3.2 Shaping policy – cultivating a culture of preparedness

Future natural hazards are likely to increase in severity and frequency due to climate change (44, 70-72). *For this reason, a greater knowledge-base is urgently needed to shape policy for disaster preparedness and response* (33) (emphasis added).

To proactively promote preparedness and the capability to effectively manage risk, a strategic awareness and concurrent problem-solving approach is needed from "bottom up" and "top down" (1, 31, 59, 73). At the local level, participants identified several common barriers to preparedness – including lack of time, resources, knowledge or information – as well as the problem of how to act appropriately on days which are declared *catastrophic* (or the equivalent nomenclature, depending on the jurisdiction of origin) (74-77). Although this terminology can be shocking for people unfamiliar with Australian bushfire weather conditions, it realistically represents weather conditions that favour the ignition of potentially uncontrollable fires, and threaten public health and safety. At the government level, further commitment is necessary to actively demonstrate a proactive approach to well-structured preparation. An effective and achievable start would be to bring discussion on routine hazard preparedness into mainstream forums by trialling the implementation of policies and schemes, as discussed below, designed to proactively build a culture of preparedness from new, evidence-based initiatives (Table 1).

Governments should also critically scrutinise policies which unintentionally position people at risk. The increasing development of land on the peri-urban fringe often attracts new residents from urban areas seeking a 'tree change' lifestyle. Commonly, these newcomers have little or no knowledge of the dangers of bushfires, and limited comprehension of the threat they pose. It is irresponsible of developers, and of approving agencies, to place the most vulnerable demographic (with respect to their fire education and experience) in the position of greatest risk on the outer peri-urban fringe, adjacent to crops or dense vegetation, and where public services are sometimes limited (78).

Table 1: New policy areas to build a culture of preparedness.

3.2.1 New policy - Catastrophic Day Leave (CDL)

This research proposes instigating new workplace agreements to help narrow the awareness-preparedness gap. In Australia, 'catastrophic' fire danger days are declared at 4.00 pm the previous day by the Bureau of Meteorology (BOM) (Bierman, P. personal communication 2016). This information is freely and readily available to the public via the BOM website. At present however, people are faced with the dilemma of how to manage required tasks on a day rated as *catastrophic* even if they have a well written and established bushfire survival plan. A myriad of commitments can present as obstacles. Catastrophic Day Leave (CDL) could effectively assist to alleviate the dilemma. The concept of CDL is an analytic construct – where the analysis shifts to a more constructionist and critically interrogative style (35, 36).

CDL would necessarily involve employer-employee negotiations, and a 'trade-off' of some kind. An example could be trading some sick or recreation leave for CDL days or working an extra hour a day for eight or nine days a fortnight to accrue CDL. Wilkinson et al (2015) report varied, at times problematic employee experiences with employers when requesting leave of absence during the 2013 'Red October' bushfires in New South Wales, Australia. A formal contractual arrangement for CDL with employers could obviate this difficulty, and promote shared responsibility with mutual workplace benefits. Initiating CDL as a new form of workplace leave would have the dual effect of elevating a culture of bushfire preparedness to 'business as usual' status - thus raising active awareness of the need to prepare well in the wider community, and enabling employees so act safely in a timely manner. For these reasons it is important to *name* this proposed leave according to the purpose for which it is intended: generic 'personal leave', which may be made available to employees for many different reasons, does not contribute specifically to encouraging a societal-wide culture of bushfire preparedness among different social microclimates, including the workplace. Proactively initiating and establishing such a policy in businesses helps to widely promote preparedness as routine. This type of initiative is representative of new policy which will be necessary to manage the impact of climate-change induced, worsening natural hazards (33, 34, 79).

Importantly, CDL is not intended to replace leave already granted to employees who are emergency services volunteers for the purpose of participating in an emergency response. Nor would it be used for out-of-season preparedness work as this is not the purpose of the leave. It would be difficult to abuse because catastrophic days are declared publicly the previous day. While CDL would not be particularly helpful to people who are self-employed, and catastrophic days could outnumber available days of leave, this new policy highlights the need to make essential societal-wide changes to proactively prepare for the 'new reality' of changing weather events (45).

Potentially, colleagues, workmates and neighbours, encouraged by a CDL policy, would be prompted to actively instigate shared plans and arrangements within their community networks, including the important ability for community leaders to report back to service providers and emergency services at any time to contribute to the common goal of continuous improvement. This would help build stronger productive relationships between communities and responders, with the resultant symbiosis likely to encourage and promote an informed community voice. For example, when the contributions of individuals and families are heard and valued, the empowerment created helps communities better equip themselves to confront barriers to preparedness, and dismantle them step by step (31, 80, 81). Subsequently, improved communication and safer decision-making between all parties supplements knowledge bases formulated cooperatively and collaboratively across government agencies,

fire authorities, research findings, and community members with prior fire experience and local knowledge; this depicts the synergistic interface of science and policy in the SFDRR. Further, respectful integration of each group's expertise maximises positive outcomes, and can recognise and circumvent less helpful suggestions with a decreased risk of causing offence to well-meaning but less knowledgeable individuals.

3.2.2 Financial incentives and rewarding best practice

Financial inducement or reward can help achieve a societal shift towards establishing a routine culture of preparedness by implementing a system of rebates or discounts on insurance premiums, local government charges or other taxes (82), and by actively rewarding 'best practice'. Sandy, in the business focus group unhesitatingly commented: *people respond very well to financial incentive. There needs to be an incentive for groups to actually come together and discuss things.*

An example is the French *CatNat* scheme (*Catastrophes Naturelles*), a public/private scheme based on the principle of national solidarity: everyone pays for the benefit of the common good (82, 83). In France, household policies cover 'insurable' risk, and the *CatNat* scheme, created by law in 1982, is designed for events considered uninsurable, such as natural disasters. *It is based on paragraph 12 of the preamble of the Constitution of 27 October 1946, which states: "The Nation declares all French citizens to be equal and united in solidarity when faced with loss resulting from natural disasters"* (84).

In Australia, raising public monies to contribute to funding emergency services is controversial, although a levy introduced for this purpose applies across almost the entire country, either as a stand-alone charge or linked to insurance premiums (85, 86). The 'everyone pays' system is frequently resented in rural areas where landowners (i) may have land and infrastructure assets but are 'cash poor', (ii) usually comprise a large proportion of the available (and in Australia, predominantly volunteer) fire-fighting personnel, and (iii) resource a response themselves with their own on-farm firefighting vehicles ('farm fire units'). Property owners therefore seem to pay for the privilege of fighting fires with their own equipment – often leaving their own farms and homes less well defended to contribute to community well-being. Additionally, in the past, uninsured landowners have been perceived as receiving Government relief benefits ahead of others who were well prepared and fully insured (South Australian Pinery Bushfire Local Recovery Committee 2017, personal communication). Those who *are* well prepared and fully insured *need* to be recognised and arguably rewarded for their compliance, responsibility and understanding of the impact good management and husbandry has in a broader societal context.

Requests for fire-fighter discounts on such levies identify a dilemma: to exempt one group will set a precedent for others to claim exemption, or could lead to volunteering for the purpose of qualifying for an exemption (Piccolo 2014, personal communication) (87). This suggests that any discount or rebate scheme, if viable, will need to be clearly differentiated from Government charges. A separate scheme, which rewards preparedness and property management, regardless of voluntary service, would overcome the difficulty of rewarding emergency services volunteers *per se*. Local councils in the research site, for example, already have inspectors who visit rural living and residential properties – but not farms - within their district, issuing compliance notices and warnings to land owners who fail to make their properties fire ready. Volunteer rescue officer June spoke with respect to her role as a local government inspector:

> *We have to assess properties annually in October and send notices. I inspect 2,500 properties, rural living and residential properties in my area, and I only send about 120 notices. I hardly ever have to act on any of the notices. But I don't visit farms, only residential. No-one visits farms, you'd just never get around to them all.*

Although extending the scheme would impose some additional workload and costs on local government these would foreseeably be offset by savings to the community given the high cost of recovery after an emergency event (8, 88). A relatively simple extension of this existing system could see preparedness rebates issued as well as fines, although an expansion, in some form, of the inspectorate would be necessary to include farms. Concerns regarding inspectors' increased workload or privacy issues could be managed using technology such as Unmanned Aerial Vehicles (UAV's – 'drones'), or by inviting landowners to upload documentation themselves in order to qualify for a rebate. The amount should be at least the equivalent of the property's levy, but preferably a greater amount, as a cost-neutral exercise offers little incentive.

Sheep and wheat farmer Paul said:

> *It's in their [Local Government's] power to enforce people to clean up their blocks and they'll get a couple of notices if they haven't cleared the grass and eventually the council could do it and send them the bill. So, I guess there's a financial business incentive*.

Paul's view is that as good property preparedness does not attract a fine, it is, in itself, a financial incentive. However, a more clearly defined method of acknowledging best-practice preparedness may be more effective in overtly achieving the desired result. This proposed scheme of rebates or discounts recognises both individuals' contribution to the community, and to the common good of society. Encouraging and fostering this paradigm is an essential part of a continuum of community synergy achieved by processes such as the French *CatNat* system at one end of the spectrum, and neighbour-helping-neighbour at the other.

A financial incentive for residents new to an area and needing to increase their bushfire knowledge for their own, and their community's safety, could be achieved by offering discounts linked to their attendance at non-compulsory community fire-safety information sessions. They could be encouraged to do so via an invitation accompanying their first Council (Shire) rates notice, offering all attendees a meaningful discount to be applied to the second year's rates. To qualify, participation in a given number of fire information seminars would be required, which could be spread over a 12 month period to give maximum opportunity for people to attend. Senior firefighter Shane recalled an observation he often makes to newcomers to the community regarding shared responsibility: *I point out there are three fire trucks sitting in that shed and six hundred homes over that hill.*

This scheme could be expanded and made available to other longer-term ratepayers as well, who may wish to update their skills. The possibility of State or Federal Government subsidy to compensate local government for lost revenue should be explored as the cost of awarding financial incentives is likely to be significantly less than the cost of response and recovery after a severe fire (8, 88).

In the longer term, public awards and recognition similar to the late twentieth-century "Tidy Towns"[5] program, such as "Bushfire Best-Prepared Towns", could attract additional funding from government or corporate sources and boost the local tourist economy due to increased publicity, or if preferentially considered as a holiday destination. Proactively promoting a culture of bushfire safety in this way builds community pride as well as strong relationships with emergency services – who will always need the help of community collaboration to provide the best possible response. Additions to existing community achievement and civic award programs, specifically intended to publicly reward bushfire readiness, would be relatively simple to implement as an extension of current programs.

Value-adding to properties at point-of-sale by making bushfire compliance a desirable, marketable commodity is another financial incentive. This could be achieved by adding a notation on advertising material identifying 'bushfire-safer properties' compliant with current Australian (or other relevant) Standards (89), and encourage others to similarly 'value-add'. This strategy would need to be aligned with a formal system of acknowledging eligible properties as described above. Qualifying properties could be given the option of displaying a gateway notice, or participate in community 'fire-ready' open days, similar to 'open gardens', to showcase and educate others to do likewise. As this concept is already established and understood by the community, extending it to 'fire-fit' properties (including discussion and demonstration as to how animals are managed) is an achievable extrapolation.

Financial incentives and other strategies to build 'fire-fitness' may be best managed on a locally bespoke basis (3). Whole-of-jurisdiction plans may not be efficacious or functional if applied state-wide beyond the parameters of local conditions. This has been a failing in previous attempts to successfully apply discounts on insurance schemes, for example, and has been asserted as a reason not to pursue financial incentives. Proactive, locally appropriate applications could be successful, and need to be trialled and evaluated (82, 83, 90, 91).

3.2.3 Farming practices, fuel loads and firebreaks

Most farmer respondents agreed that modern farming techniques could influence fire behaviour. 'Conservation farming' practices such as no-till cropping, greater crop productivity, density of crop per hectare, improved plant structure and reduced farm firebreaks have the potential to significantly compound the complexities of a fire. How these issues are managed is likely to influence preparedness strategies and tactics. Evidence-based research findings could help overcome the difficulties encountered in a "wicked" fire problem (92, 93), which crop fires tend to become. In the context of modern fire science, a "wicked" fire problem is one where every problem is novel and fraught with uncertainty. It is difficult to define until a solution is actioned, but from that action there is no retreat, and no alternative. Solutions are neither right nor wrong, they are not replicable, nor formulaic, and the plan for problem solving is necessarily flexible. The responses to wicked problems contribute to a portfolio of learned precepts, and provide strategies which may be adapted, but not reproduced, in future events. In short, wicked fire problems can inform and teach dynamic problem-solving skills in the most critical of circumstances.

Sheep and wheat farmer Paul noted:

[5] "Tidy Towns" is an initiative of the Keep South Australia Beautiful (KESAB) campaign which began in 1978. It is now known as the Sustainable Communities program. See: http://www.kesab.asn.au/programs/sustainable-communities/program-information/

I think with our modern farming and agricultural techniques we're achieving crop yields that are way and above what we've ever been able to do in the past….in 30 years, I've seen cereal yields double, and what that means, of course, is that there's double the amount of crop residue over the summer period after the crops have been taken off, and the proportion of arable land going into crops has increased also. So we've got two contributing factors there - increased area of crop and also a greater crop residue, which adds to the fuel load.

Retired wheat and sheep farmer Trevor added: *We're so prone to fires down here because everyone's intense cropping so you've got a lot more stubble, and so being able to stop a fire once it starts is very difficult.* Trevor went on to discuss the differences between types of crops, including options which might be more suitable adjacent to livestock or other assets - pointing out that as well as more fuel, some crops burn much faster. *Pasture or legume crops, they wouldn't carry a fire as quickly as certainly your canola stubble would, so that's an option that the farmer would have, if there's stock or buildings nearby.*

From a wheat and sheep property further north, Bob agreed with Paul, particularly with respect to the increase in crop yields. He stated:

The biggest change probably has been the huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that's pretty hard to stop… There's a massive volume of crop material, but there's a huge residual as well, so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 percent over the last 20 years at least, so you've doubled the burnable material that's there to go up and so, of course, it goes like nuts.

Firebreaks have fallen out of favour, seemingly because of potential economic losses associated with decreased crop areas. However, as wheat and sheep farmer Paul noted, some compromise may be indicated.

The other thing I think that's contributed is that there are fewer fire breaks across the landscape. Once upon a time, farmers were quite diligent about preparing fire breaks right across their properties and with the greater amount of area cropped, that becomes problematic and farmers are less likely or less willing to do it, I think. So, all those things add up…

Firebreaks and spraying fence lines mightn't stop the fire but give you something to burn back to. This could be made mandatory with a council by-law, so everyone has to do it. A little bit of loss could mean that a lot of people are safer. My personal belief is that it would be better to see more fire breaks across the landscape. Currently there's no obligation on the farmer, or on a rural living block, to put a fire break in anywhere. So, I think that's something that we could consider going forward – a by-law type of arrangement for strategic fire breaks.

Firefighter Garry was adamant about the benefits of firebreaks to stock, and therefore also to farmers, their families and businesses:

If a farmer would put a criss-cross through a paddock with his wide line and create a fuel reduced zone through the middle like a giant cross, the sheep will go to that clear area. They will do it. I've seen it done sometimes by accident. Guys out testing farm

machinery have gone through with a disk plough or whatever, then they've had a fire in the paddock and the livestock have all moved into the fuel reduced zone. They're just trying to stay alive. It's in their instincts and animals will do it.

These observations highlight the need to seek a better understanding of how relatively new variables in farming techniques affect a serious fire particularly in catastrophic, extreme or severe fire weather conditions.

4.1 Conclusion

The outcomes of this study are intended to be *transformative* in that the new, public health preparedness initiatives proposed here aim to be practical and realistic. They also seek to motivate the translation of knowledge into effective, adaptive actions attainable by all residents of bushfire at-risk communities. Making good preparedness behaviour and practises routine - and thereby narrowing the awareness-preparedness gap - requires all stakeholders to undertake a proactive reassessment of how to 'do' preparedness and become fire-fit. As evidenced by participants in this study, such a reassessment would help reduce hazard-related human mortality and morbidity and the associated negative social, economic and environmental impacts of natural hazard emergencies. Multi-media advertising campaigns, public information and freely accessible resources already exist – but the premise on which they are founded needs a proactive re-evaluation to help establish a culture of preparedness as 'business as usual' in society generally. Until that culture becomes established, this research suggests that more and more of the same messaging, however professional and sophisticated, will not significantly, nor sufficiently, narrow the awareness-preparedness gap without the help of additional, supplementary strategies. New social and workplace policies that are practical and achievable such as Catastrophic Day Leave, financial incentives such as rewards for 'best practice' and reductions in municipal fees, and mandatory fire breaks on farms have the potential to cultivate a more desirable culture of routine preparedness.

The implementation, evolution and efficacy of such applied preparedness initiatives and policy, broadly translatable across many societal groups, will need to be evaluated by future research. Additionally, as suggested by findings here, further research to determine how changes in farming practices and crop types and density influence fire behaviour is needed to manage and balance productivity versus safety, and add to fire science. Given the probability of increased fire weather and fire severity, and as documented in the SFDRR, the challenge of fortifying community wellbeing in a bushfire emergency requires a dynamic, problem-solving paradigm melded from science, government and the at-risk communities themselves. Based on current findings, this paper concludes that implementing new practical and achievable policies that work across social and workplace contexts are steps toward achieving this goal.

Table 1: New policy areas to build a culture of preparedness.

PROMOTING PREPAREDNESS through NEW POLICY
1. Catastrophic Day Leave (CDL)
2. Financial incentives • *Insurance policies and taxes* • *Municipal fees and charges* • *Best practice rewards*
3. Farming practices, fuels and firebreaks

APPENDIX A: INTERVIEW GUIDE - Primary responders

1. Background: Hazard severity

- How does "fire season" seem to have changed over the last 10 -15 years?
- How does a response begin?
    - Resources available and/or deployed
    - 'Situation reports' and communications
    - Decision making – local knowledge, prior experience, precautionary actions, intelligence from first-on-site, influence of ambient conditions
    - Is it assumed that a fire *could* reach (the highest) Level 3
- Likelihood of occurrence –how are prevention and preparedness messages communicated in off-season? Are particular demographics targeted?
- As a community member, how does being trained as a firefighter/Emergency services member change attitudes to a bushfire hazard?
- Are firefighters/first responders as individuals, each a conduit of information out into the community?
- How do firefighters/responders deal with being away on a fire truck, when their own homes or properties may be under bushfire threat?
- Hypothetically, if a fire crew goes to the assistance of a household who have stayed to defend, but for whatever reason that is no longer tenable, and the crew and the residents are in danger as a single group - the fire crew would take control of the situation - how collaborative can such an action be between both parties, or can it?
- How do the fire crew enforce "life, property, environment" in circumstances when people may be attempting to gather possessions, or save animals?

2. With respect to animals

- What kinds of animal issues have arisen during a bushfire response?
    - companion animals
    - assistance animals
    - horses
    - livestock
    - wildlife
    - animals wandering at large
    - businesses e.g. boarding kennels
- Getting back to *Life, Property, Environment*: How do you manage the 'grey' areas, such as livestock as property
- Have fire crews picked up animals in field, or are they given animals (especially wildlife) by members of the public?
- What do they do with them?
- Does this detract from core business?
- Fire crews can be distressed by issues of animal welfare during a fire – how do you manage this?
    - Debrief/After Action Review
    - Can it detract/distract from response/team efficacy?
- What about home owners – wanting to return home to attend to livestock/pets/animals in their care?
- How do primary responders perceive animal owners, with respect to expectations of behaviour in a fire, and their capabilities?
- Have animal owners caused difficulties for responders in-field? e.g. with well- meaning people (with disregard for their own safety) attempting to rescue animals from a fire? Are these people animal owners? Others unauthorised? Media?
- What interaction or support has there been locally with existing animal agencies – Primary Industries and Resources SA (PIRSA), Royal Society for the Prevention of Cruelty to Animals (RSPCA), Department of Environment, Water and Natural Resources (DEWNR), Council or Shire Ranger etc?
- What are your observations of animal owners in the field? e.g. Levels of preparation, eagerness to cooperate?
- Are there challenges for responders with respect to assistance they may be called upon to give, or wish to give, animal owners or to animals directly; or with respect to what they should do, what they can do, and what they actually do? (behaviour in the field vs policy)

3. Information gathering and organisational cohesion/communication

- How is information sourced in a response, as an input (e.g. field intelligence) and an output (information and advocacy back to community)?
- Within the organisation, how is local knowledge integrated with centralised directives?
- How is information given to the community assessed for accuracy and timeliness?
- How is accuracy balanced with giving the community information early in the event timeline?
- Is organisational credibility (e.g. public perception of the "brand") consciously used to engage community?
- Have problems with animals and/or their owners presenting in-field adversely affected community relations?
- Has this been addressed in After Action Reviews?
- How well does inter-organisational cooperation/collaboration work – primary responders with PIRSA, RSPCA, DEWNR, Council Ranger etc?
- Individual and community knowledge base – are there particular groups or demographics which are difficult to engage?
- Are there groups which could benefit from bespoke response options?
- What training courses or workshops are available for the public, and do these include identified special groups, such as animal owners?

OPPORTUNITY FOR OPEN DISCUSSION, CLOSING COMMENTS AND THANKS

APPENDIX B: INTERVIEW GUIDE - Animal owners (companion, assistance, recreational, wildlife, business oriented or large-scale primary production animals)

1. Background and introduction

- How long have you lived in the area?
- Where do you live:
    - Town
    - on farm
    - moved from farm to town
    - other
- Do you have a bushfire survival plan for your family and animals?
- For the property?
- Are you a member of community groups/clubs/service clubs?
- Other volunteer Emergency groups such as CFS?
- What have been your experiences with bushfires over the last 10 years?
- Just as an overview:
- Have you have been directly affected (e.g. evacuated, fought the fire), or indirectly affected (prepared to evacuate, family/friends directly affected)

2. Sources of information before a fire

- How confident do you feel about your own knowledge about bushfire preparedness?
- Where would you go for more or for current information?
- Which sources of information do you see as providing accurate and reliable information? Why?
- Are there sources of information you would not go to? Why?
- Previous experience with relevant agencies – does past experience affect who you go to for accurate information?
- What information have you sought in the past?
- Are there gaps or queries still to fill or answer?
- What information do you think you may need in the future? Do you think that will be readily available?
- Have gaps been identified that need filling?
- Is there usually enough up to date information available early in the timeline of a fire event?
- Where does that usually come from?
- Of these, what are the most significant issues relevant to you as an animal owner?

3. Organisational trust

- How helpful have various agencies been when you have approached them for information generally, i.e. not necessarily with animals?

- You may have multiple experiences with multiple agencies - have they been consistent within the same agency?
- How do previous responses from those agencies affect your readiness to approach them again?
- If your animals have been involved, did that affect how agencies were able to assist you, and how?

4. Turning information into action, and uncertainty into confidence

- Perhaps you feel completely confident you could effectively cope with a future bushfire event. But if not, what do you think needs to happen so you can reach that point, or make progress towards reaching that point?
- How confident are you that you have sufficient resources, and the practical ability to carry out your plan, given your own personal or domestic circumstances?
- How different would this be if you were home alone, or if you had your usual family members present? What different resources would you need?
- Bushfire preparation is an annual necessity. Do you collaborate with neighbours, other social groups, or with groups of like-minded people, such as you might meet at a training course like the CFS Fiery Women program?
- Do you make arrangements with remote safe locations in a "buddy" system?
- *Outcome expectancy – positive or negative*
- How do you think you'd go with a bad fire nearby next fire season?
- How ready are you? Confident?
- From the perspective of owning animal(s) what specific resources or information would make you feel more able to prepare for bushfire?

5. Hazard severity and likelihood, mitigation measures and self-efficacy

- With respect to severity, that is, how severe you perceive the threat of a fire to be – do you think you would stay and defend, or leave early? What criteria would you apply to make that decision?
- How likely do you think a serious fire is to occur near Pt Lincoln again?
- Does thinking that change what you, as an individual, would do?
- With respect to the likelihood that a bushfire will occur – do you think bushfires might be more or less dangerous in the future? More or less frequent?
- Mitigation available – do you believe there are appropriate responses to a bushfire that are realistically available and attainable by you, that will promote your safety, and effectively reduce the harmful, or undesirable consequences of a fire?
- Do you think you could carry out these responses?
- From the perspective of an animal owner?

6. Special circumstances and the need for bespoke adaptive solutions

- Do you think you need any additional mitigation/response options or measures with respect to your animals?
- Remembering the different animals that could be owned by, or cared for, by you.
- How does your behaviour differ when you are looking after others, rather than just yourself?
- This can include human family, with or without animals
- e.g. do you need more time to get organised, or does having other people around speed things up?

OPPORTUNITY FOR OPEN DISCUSSION, CLOSING COMMENTS AND THANKS

ABBREVIATIONS

BOM	Bureau of Meteorology
CAQDAS	Computer Assisted Qualitative Data Analysis System
CDL	Catastrophic Day Leave
HFA	Hyogo Framework for Action
SES	State Emergency Service
SFDRR	Sendai Framework for Disaster Risk Reduction
TA	Thematic Analysis
UAV	Unmanned Aerial Vehicle

5.1 Ethics statement
Ethics approval for this research has been granted by the Human Research Ethics Committee of Western Sydney University, approval number H11118.

6.1 Author contributions
RW, KR and MT contributed to the initial design of the research project on which this manuscript is based, all authors contributed to refinement of the design. RW drafted the manuscript and KR, HB and MT contributed to revisions. All authors read and approved the final manuscript.

7.1 Conflict of interest statement
The authors declare that they have no competing interests.

8.1 Funding statement
This research is funded by the Bushfire and Natural Hazards Cooperative Research Centre (BNHCRC), Australia, and is part of the *Managing Animals in Disasters* (MAiD) project. Other than general approval of the overall structure, and agreement to pre-determined milestones, the funding body has no role in the design of the study and collection, analysis and interpretation of data and in writing the manuscript.

9.1 Acknowledgements
Grateful thanks are extended to the participants in this study, and to the South Australian Country Fire Service, the Metropolitan Fire Service, South Australia Police, and the South Australian State Emergency Service.
Special thanks to Susan Mowbray, Western Sydney University, for her invaluable contribution to earlier drafts of this paper.

10.1 References
1. Paton D. Disaster Resilient Communities: Developing and testing an all-hazards theory. *Journal of Integrated Disaster Risk Management.* 2013;3(1):1-17. doi: 10.5595/idrim.2013.0050
2. Ronan KR, Johnston DM. Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families: Springer US; 2005.
3. Westcott R, Ronan K, Bambrick H, Taylor M. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology.* 2017;5(1):13. doi: 10.1186/s40359-017-0182-3
4. Banwell C, Dixon J, Bambrick H, Edwards F, Kjellstrom T. The sociocultural context of climate change adaptation in Australia, with a focus on hot weather. In: Butler CD, Dixon J, Capon AG, editors. *Health of People, Places and Planet: Reflections Based on Tony McMichael's Four Decades of Contribution to Epidemiological Understanding.* Canberra: Australian National University; 2015. p. 379.
Available from: http://press-files.anu.edu.au/downloads/press/p320071/pdf/ch201.pdf

5. Paton D, Johnston D. Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management.* 2001;10(4):270-7. doi: 10.1108/EUM0000000005930
6. United Nations Office for Disaster Risk Reduction. Sendai Framework for Disaster Risk Reduction Geneva: United Nations Office for Disaster Risk Reduction; 2015 [Available from: http://www.unisdr.org/we/coordinate/sendai-framework.
7. Murray V. Public Health Matters [Internet]: Public Health England. 2015. [cited 2017]. Available from: https://publichealthmatters.blog.gov.uk/2015/07/30/the-sendai-framework-reducing-the-impact-of-disasters-across-the-globe/.
8. McClean D. Australia integrates climate and disaster risk Geneva: United Nations Office for Disaster Risk Reduction; 2017 [Available from: https://www.unisdr.org/archive/52874.
9. McClean D. Global Platform stresses action on Sendai Cancun: United Nations Office for Disaster Risk Reduction; 2017 [Available from: http://www.unisdr.org/archive/53459.
10. Raine J. Sendai Framework for Disaster Risk Reduction 2015-2030 - Australia's approach. Canberra: Commonwealth of Australia, Attorney-General's Department,; 2017.
11. Attorney General's Department. Emergency Management Australia Canberra: Commonwealth of Australia; 2017
[Available from: https://www.ag.gov.au/EmergencyManagement/Emergency-Management-Australia/Pages/default.aspx.
12. Trogrlić RŠ, Cumiskey L, Triyanti A, Duncan MJ, Eltinay N, Hogeboom RJ, et al. Science and Technology Networks: A Helping Hand to Boost Implementation of the Sendai Framework for Disaster Risk Reduction 2015–2030? *International Journal of Disaster Risk Science.* 2017;8(1):100-5. doi: 10.1007/s13753-017-0117-x
13. Bambrick H, Moncada S. From social reform to social transformation: human ecological systems and adaptation to a more hostile climate. In: Butler C, Dixon J, & Capon AG editors. *Health of People, Places and Planet: Reflections based on Tony McMichael's four decades of contribution to epidemiological understanding.* Canberra: ANU Press (2015) p. 353-364.
[Available: http://press-files.anu.edu.au/downloads/press/p320071/pdf/ch181.pdf

14. Aitsi-Selmi A, Egawa S, Sasaki H, Wannous C, Murray V. The Sendai Framework for Disaster Risk Reduction: Renewing the Global Commitment to People's Resilience, Health, and Well-being. *International Journal of Disaster Risk Science* (2015) 6(2):164-76.doi: 10.1007/s13753-015-0050-9
15. Aitsi-Selmi A, Murray V. The Sendai framework: disaster risk reduction through a health lens. *Bulletin of the World Health Organization* (2015) 93(6):362.doi: 10.2471/BLT.15.157362.
16. Aitsi-Selmi A, Murray V. Protecting the Health and Well-being of Populations from Disasters: Health and Health Care in The Sendai Framework for Disaster Risk Reduction 2015-2030. *Prehospital and Disaster Medicine* (2016) 31(1):74-78.doi: 10.1017/S1049023X15005531
17. Blanchard K, Aitsi-Selmi A, Murray V. The Sendai Framework on Disaster Risk Reduction: from science and technology to societal resilience. *International Journal of Disaster Resilience in the Built Environment* (2015) doi: 10.1108/IJDRBE-04-2015-0019
18. Department of Environment Water and Natural Resources. Managing natural resources Adelaide: Government of South Australia,; 2016 [updated 31 May 2016. Available from:
http://www.environment.sa.gov.au/managing-natural-resources/water-resources.

19. South Australian Country Fire Service. Bushfire History Adelaide: South Australian Country Fire Service; 2016 [Available from: https://www.cfs.sa.gov.au/site/about_cfs/history_of_the_cfs/bushfire_history.jsp.
20. Tuason MTG, Güss CD, Carroll L. The disaster continues: A qualitative study on the experiences of displaced Hurricane Katrina survivors. *Professional Psychology: Research and Practice* (2012) 43(4):288-97. doi: 10.1037/a0028054
21. Royal Society for the Prevention of Cruelty to Animals. How many pets are there in Australia? 2014 [updated 12 November 2014. Available from: kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html
22. Primary Industries and Regions South Australia. Property Identification Codes and Statistics Report. Adelaide: PIRSA, 2015.
23. Animal Medicines Australia. Pet Ownership in Australia 2016. Canberra: Animal Medicines Australia, 2016. [Available from: http://animalmedicinesaustralia.org.au/wp-content/uploads/2016/11/AMA_Pet-Ownership-in-Australia-2016-Report_sml.pdf
24. Chur-Hansen A. Grief and bereavement issues and the loss of a companion animal: People living with a companion animal, owners of livestock and animal support workers. *Clinical Psychologist* (2010)14(1):14-21.
doi: 10.1080/13284201003662800
25. Cordaro M. Pet Loss and Disenfranchised Grief: Implications for Mental Health Counseling Practice. *Journal of Mental Health Counseling* (2012) 34(4):283-94.doi: 10.17744/mehc.34.4.41q0248450t98072
26. Heath SE, Linnabary RD. Challenges of Managing Animals in Disasters in the U.S. *Animals* (2015) 5(2):173-92. doi: 10.3390/ani5020173
27. Rogers C. The critical need for animal disaster response plans. *Journal of Business Continuity & Emergency Planning*. 2016;9(3):262-71.
28. Westcott R, Ronan K, Bambrick H, Taylor M. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science* (2017) 4(34). doi: 10.3389/fvets.2017.00034
29. Thompson K. Save me, save my dog: Increasing natural disaster preparedness and survival by addressing human-animal relationships. *Australian Journal of Communication.* 2013;40(1):123-36.
30. Hall MJ, Ng A, Ursano RJ, Holloway H, Fullerton C, Casper J. Psychological Impact of the Animal-Human Bond in Disaster Preparedness and Response. *Journal of Psychiatric Practice*® (2004) 10(6):368-74.doi: 10.1097/00131746-200411000-00005
31. Akama Y, Ivanka T. What community?: facilitating awareness of 'community' through playful triggers. Proceedings of the 11th Biennial Participatory Design Conference; Sydney, Australia. 1900444: ACM; 2010. p. 11-20.
doi: 10.1145/1900441.1900444
32. Wilkinson C, Eriksen C, Penman T. Into the firing line: civilian ingress during the 2013 "Red October" bushfires, Australia. *Natural Hazards* (2016) 80(1):521-38. doi: 10.1007/s1 1069-015-1982-5
33. Gibbs L, Waters E, Bryant RA, Pattison P, Lusher D, Harms L, et al. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health* (2013) 13:1036.
[Available from: http://www.biomedcentral.com/1471-2458/13/1036
34. Gibbs L, Bryant R, Harms L, Forbes D, Block K, Gallagher HC, et al. Beyond Bushfires: Community Resilience and Recovery Final Report. Melbourne: University of Melbourne, 2016 November 2016. [Available from:

http://beyondbushfires.org.au/__data/assets/pdf_file/0003/2183511/Web_Beyond-Bushfires-Final-Report-2016-copy.pdf
35. Savin-Baden M, Major CH. Qualitative Research. Abingdon: Routledge; 2013.
36. Braun V, Clarke V. Successful Qualitative Research. London: Sage; 2013.
37. Cornish F, Gillespie A. A Pragmatist Approach to the Problem of Knowledge in Health Psychology. *Journal of Health Psychology* (2009) 14(6):800-9.doi: 10.1177/1359105309338974
38. Taylor GW, Ussher JM. Making Sense of S&M: A Discourse Analytic Account. *Sexualities*. 2001(4):293-314.
39. Braun V, Clarke V. Using thematic ananlysis in psychology. Qualitative Research in Psychology. 2006;3(2):77-101. doi: 10.1191/1478088706qp063oa
40. Drabek TE. Social Dimensions of Disaster. 2nd ed. Emmitsburg: Emergency Management Institute, Federal Emergency Management Agency; 2004.
41. New Scientist. Wild weather: extreme is the new normal 2013 [Available from: https://www.newscientist.com/article/mg21729003-200-wild-weather-extreme-is-the-new-normal/.
42. Beynon H. Extreme weather the "new normal" New York: United Nations Office for Disaster Risk Reduction; 2016 [Available from: https://www.unisdr.org/archive/49634.
43. Lewis S. Time to adapt: 2015's record-breaking temperatures will be normal by 2030 Sydney: Australian Broadcasting Corporation; 2016 [Available from: http://www.abc.net.au/news/2016-11-07/record-breaking-temperatures-will-be-new-normal-by-2030/8001720.
44. Steffen W, Hughes L, Alexander D, Rice M. Cranking up the Intensity: Climate Change and Extreme Weather Events. Potts Point: Climate Council of Australia, 2017 8 February 2017.
[Available from: https://www.climatecouncil.org.au/cranking-intensity-report

45. Wildfires are the 'new reality' for California, Gov. Brown warns: The Huffington Post Australia; 2017
[Available from: http://www.huffingtonpost.com.au/entry/wildfires-are-new-reality-for-california-gov-says_us_5a2d7614e4b073789f6aa6c5.
46. Austin DW. Preparedness clusters: A research note on the disaster readiness of community-based organizations. *Sociological Perspectives* (2012) 55(2):383-93.doi: 10.1525/sop.2012.55.2.383
47. Penman TD, Eriksen C, Blanchi R, Chladil M, Gill AM, Haynes K, et al. Defining adequate means of residents to prepare property for protection from wildfire. *International Journal of Disaster Risk Reduction* (2013) 6:67-77. doi: 10.1016/j.ijdrr.2013.09.001
48. Eriksen C, Prior T. Defining the importance of mental preparedness for risk communication and residents well-prepared for wildfire. *International Journal of Disaster Risk Reduction* (2013) 6:87-97. doi: 10.1016/j.ijdrr.2013.09.006
49. Prior T, Eriksen C. Wildfire preparedness, community cohesion and social–ecological systems. *Global Environmental Change* (2013) 23(6):1575-86. doi: 10.1016/j.gloenvcha.2013.09.016
50. Kanakis K, McShane CJ. Preparing for disaster: preparedness in a flood cand cyclone prone community. *Australian Journal of Emergency Management*. 2016;31(2):18-24.
51. Grothmann T, Reusswig F. People at Risk of Flooding: Why Some Residents Take PrecautionaryActon While Others do not. *Natural Hazards* (2006) 38:101-20. doi: 10.1007/s11069-005-8604-6

52. McNeill IM, Dunlop PD, Skinner TC, Morrison DL. Predicting delay in residents' decisions on defending v. evacuating through antecedents of decision avoidance. *International Journal of Wildland Fire* (2015) 24:153-61.doi: 10.1071/WF12213
53. Warrandyte Community Association. Be Ready Warrandyte Melbourne: Government of Victoria; 2013
[Available from: https://www.youtube.com/watch?v=jty_99L5eJA.
54. Australian Academy of Science. Theo Murphy High Flyers Think Tanks Canberra: Australian Academy of Science; 2014 [Available from: https://www.science.org.au/news-and-events/events/climate-change-challenges-health.
55. Blaikie P, Cannon T, Davis I, Wisner B. At Risk: Natural Hazards, People's Vulnerability and Disasters. London: Routledge; 2014.
56. Elsworth G, Gilbert J, Rhodes A, Goodman H. Community Safety Programs for Bushfire: What Do They Achieve, and How? Australian Journal of Emergency Management. 2009;24(2):17-25.
57. Maywald K. Sampson Flat Bushfire Recovery Final Report. Adelaide: Department of Communities and Social Inclusion, 2016. [Available from:
http://www.dcsi.sa.gov.au/__data/assets/pdf_file/0005/53285/2015-Sampson-Flat-Bushfire-Recovery-Report.pdf
58. Gordon R. Community impact of disaster and community recovery. InPsych - Australian Psychological Society. 2009(April 2009). [Available from:
https://www.psychology.org.au/inpsych/community_impact/
59. Akama Y. Passing on, handing over, letting go – the passage of embodied design methods for disaster preparedness. Service Design and Innovation Conference; 25 June; Lancaster University: Linköping University Electronic Press; 2014. p. 173-83.
60. South Australian Country Fire Service. Preparing yourself for a bushfire. Adelaide: Government of South Australia; 2017 [Available from: https://www.cfs.sa.gov.au/site/prepare_for_a_fire/preparing_yourself_for_a_bushfire.jsp.
61. Smalley JCE. Protecting Life and Property from Wildfire. Quincy, MA: National Fire Protection Association Inc.; 2005.
62. Ministry of Forests Lands and Natural Resource Operations. FACTSHEET: Wildfire prevention is everyone's responsibility Vancouver: Government of British Columbia; 2016 [Available from: https://news.gov.bc.ca/factsheets/factsheet-forest-fire-prevention-is-everyones-responsibility.
63. Government of Victoria. Plan and Prepare. Melbourne: Government of Victoria; 2016 [Available from: http://www.cfa.vic.gov.au/plan-prepare/.
64. Adelaide Hills Council. Fire prevention in the Adelaide Hills: it's everyone's responsibility. Adelaide: Government of South Australia; 2016 [Available from: http://www.ahc.sa.gov.au/ahc-community/documents/preparation_checklist___house_plan.pdf.
65. Paton D, McClure J. Preparing for Disaster: Building household and community capacity. Springfield, Ill.: Charles C. Thomas; 2013.
66. Akama Y. Birds of a Feather Melbourne: RMIT University; 2012 [Available from: https://vimeo.com/49646137.
67. United Nations Office for Disaster Risk Reduction. Leaders' Forum for Disaster Risk Reduction. The Cancun High-Level Communiqué - Ensuring the resilience of infrastructure and housing. Cancun: United Nations International Strategy for Disaster Reduction, 2017 26 May 2017. [Available from: https://www.unisdr.org/archive/53426
68. Tanner JF, Day E, Crask MR. Protection motivation theory: An extension of fear appeals theory in communication. *Journal of Business Research* (1989) 19(4):267-76. doi: 10.1016/0148-2963(89)90008-8

69. So J. A Further Extension of the Extended Parallel Process Model (E-EPPM): Implications of Cognitive Appraisal Theory of Emotion and Dispositional Coping Style. *Health Communication* (2013) 28(1):72-83.
doi: 10.1080/10410236.2012.708633
70. Liu Y, Stanturf J, Goodrick S. Trends in global wildfire potential in a changing climate. *Forest Ecology and Management* (2010) 259(4):685-97. doi: 10.1016/j.foreco.2009.09.002
71. Intergovernmental Panel on Climate Change (IPCC). Fifth Assessment Report: IPCC; 2014 [Available from: https://www.ipcc.ch/report/ar5/.
72. Kitching R. IPCC: Australia and New Zealand face greater fire and flood risk, damage to coral reefs 2014 [Available from: https://theconversation.com/ipcc-australia-and-new-zealand-face-greater-fire-and-flood-risk-damage-to-coral-reefs-24642
73. Eriksen C, Gill N, Bradstock R. Trial by Fire: natural hazards, mixed-methods and cultural research. *Australian Geographer* (2011) 42(1):19-40.
doi: 10.1080/00049182.2011.546317
74. South Australian Country Fire Service. More about fire danger ratings Adelaide: Government of South Australia; 2017 [Available from: https://www.cfs.sa.gov.au/site/bans_and_ratings/more_about_fire_danger_ratings.jsp.
75. Department of Fire and Emergency Services. Fire Danger Ratings Perth: Government of Western Australia; 2018 [Available from: https://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/Pages/firedangerratings.aspx.
76. Natural Resources Canada. Canadian Wildland Fire Information System Montreal: Government of Canada; 2017 [Available from: http://cwfis.cfs.nrcan.gc.ca/maps/fw.
77. United States Forest Service. Wildland Fire Assessment System Washington D.C.: United States Department of Agriculture; 2017 [updated 28 December 2016. Available from: http://www.wfas.net/index.php/fire-danger-rating-fire-potential--danger-32/class-rating-fire-potential-danger-51.
78. Prelgauskas E. Helping fire-impacted families in rebuilding: toward enhanced community resilience outcomes. *Australian Journal of Emergency Management*. 2016;31(4):54-9.
79. Council of Australian Governments. National Strategy for Disaster Resilience: Building Our Nation's Resilience to Disasters. Department of the Prime Minister and Cabinet. Canberra: Commonwealth of Australia; 2011. [Available from: https://www.ag.gov.au/EmergencyManagement/Documents/NationalStrategyforDisasterResilience.PDF
80. Paton D. Preparing for natural hazards: the role of community trust. *Disaster prevention and Management: An International Journal* (2007) 16(3):370-9. doi: 10.1108/09653560710758323
81. Boura J. Community Fireguard: Creating Partnerships with the Community to Minimise the Impact of Bushfire. *Australian Journal of Emergency Management*. 1998;13(3):59-64.
82. Poussin JK, Botzen WJW, Aerts JCJH. Factors of influence on flood damage mitigation behaviour by households. *Environmental Science & Policy* (2014) 40:69-77. doi: 10.1016/j.envsci.2014.01.013
83. Poussin JK, Botzen WJW, Aerts JCJH. Stimulating flood mitigation through insurance: an assessment of the French CatNat system. *Environmental Hazards* (2013) 12(3-4):258-77. doi: 10.1080/17477891.2013.832650
84. Caisse Centrale de Réassurance (CCR). Natural Disasters Compensation Scheme Paris: CCR; 2016 [Available from: https://www.ccr.fr/en_US/-/indemnisation-des-catastrophes-naturelles-en-

france?redirect=httpAFFrecette.ccr.frFrechercheFp_p_idD36p_p_lifecycleD06p_p_stateDnormal6p_p_modeDview6p_p_col_idDcolumn-16p_p_col_posD26p_p_col_countD36_3_keywordsDindemnisation6_3_struts_actionD52Fsearch52Fsearch&inheritRedirect=true%3f.
85. Government of South Australia. About the Emergency Services Levy Adelaide: Government of South Australia,; 2016 [Available from: https://www.revenuesa.sa.gov.au/taxes-and-duties/emergency-services-levy/frequently-asked-questions2#ABOUT.
86. State Custodians. Changes to fire services levy to affect home owners Charlestown: State Custodians; 2017 [Available from: https://www.statecustodians.com.au/changes-to-fire-services-levy-to-affect-home-owners.
87. Hyde B. Merger talks for South Australia's emergency services Adelaide: *The Advertiser*: News Corp; 2014
[Available from: http://www.adelaidenow.com.au/news/south-australia/merger-talks-for-south-australias-emergency-services/news-story/5e64d80751e0381eccf27a8c0ea3b472.
88. Attorney-General's Department. Productivity Commission inquiry into natural disaster funding arrangements. Attorney General's Department, Canberra: Australian Government; 2014. p. 12-22. [Available from:
http://www.pc.gov.au/inquiries/completed/disaster-funding/submissions/submissions-test/submission-counter/sub090-disaster-funding.pdf
89. Standards Australia. Australian Standard® Construction of buildings in bushfire prone areas. Sydney: Council of Standards Australia; 2009. [Available from: https://www.saiglobal.com/PDFTemp/Previews/OSH/as/as3000/3900/3959-2009.pdf
90. Van den Bergh R, Faure M. Compulsory Insurance of Loss to Property caused by Natural Disasters: Competition or Solidarity? *World Competition.* 2006;29(1):25-54.
91. Penman TD, Eriksen CE, Horsey B, Bradstock RA. How much does it cost residents to prepare their property for wildfire? *International Journal of Disaster Risk Reduction*. 2016;16(Supplement C):88-98. doi: 10.1016/j.ijdrr.2016.01.012
92. Tatham P, Houghton L. The wicked problem of humanitarian logistics and disaster relief aid. *Journal of Humanitarian Logistics and Supply Chain Management* (2011) 1(1):15-31. doi: 10.1108/20426741111122394
93. Steffens R. Wicked (fire) problems, sweet (and messy) solutions Portland: International Association of Wildland Fire; 2016 [Available from: https://vimeo.com/167323188.

********** END APPENDIX A **********

Appendix B: Paper SP2, submitted to *Climate Risk Management*

Natural hazards and adaptive response choices in a changing climate: promoting bushfire preparedness and risk reduction decision-making.

(Word count excluding Abstract and References: 8204; one table).

Authors: 1. Rachel Westcott[a,b] – Corresponding author

[a]Translational Health Research Institute, School of Medicine, Western Sydney University

[b]Bushfire and Natural Hazards Cooperative Research Centre
Level 1, 340 Albert St, East Melbourne, Victoria, 3002 Australia

R.Westcott@westernsydney.edu.au

Postal address: Translational Health Research Institute
School of Medicine
Western Sydney University
Locked Bag 1797, Penrith,
New South Wales 2751 Australia

2. Kevin Ronan[c]

[c]School of Health, Medical and Applied Sciences, Central Queensland University, Rockhampton, QLD, Australia

[b]Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, VIC, Australia

K.Ronan@cqu.edu.au

3. Hilary Bambrick[d]

[d]School of Public Health and Social Work, Queensland University of Technology, Brisbane, QLD, Australia

h.bambrick@qut.edu.au

4. Melanie Taylor[b,e]

[e]Department of Psychology, Macquarie University
Sydney, New South Wales 2109 Australia

[b]Bushfire and Natural Hazards Cooperative Research Centre

mel.taylor@mq.edu.au

Abstract

Introduction

Bushfires[1] are an escalating natural hazard worldwide. This requires developing and implementing new strategies to narrow the bushfire awareness-preparedness gap and improve human safety in the medium to long terms. Redirecting adverse decision-making to achieve positive outcomes in a fire situation is a social imperative given the high human, economic and environmental cost of a serious fire. This paper explores underlying aetiologies that influence decision-making processes in natural hazard emergencies through the lenses of the emergency responder - animal owner interface and Protection Motivation Theory.

Method

Data were collected using semi-structured interviews and focus group discussions, and analysed using theoretically-independent Thematic Analysis (TA). Three themes with direct relevance to decision-making were actively identified: (i) observing the influence of social microclimate; (ii) maladaptive response choices (iii) adaptive response choices. A fourth, dynamic risk assessment, is common to each. These themes generated three main organisational- and socially-mediated pathways for improving bushfire preparedness and human safety.

Conclusion

By exploring how decision-making is influenced at the emergency responder-animal owner interface, this study proposes potentially useful strategic concepts for medium- to long-term improvement in public bushfire preparedness and disaster risk reduction. These include (i) understanding the complexities and synergism of various social microclimates, (ii) organisational collaboration and resource sharing, and (iii) creating a rewarding environment favouring safe response choices. The findings suggested in this paper aim to develop a safer environment for all inhabitants in areas at risk of bushfire, and other natural hazards.

[1] The Australian term “bushfire” is synonymous with “wildfire”.

Keywords

Fire; decision-making; disaster risk reduction; climate change; emergency responders; animal owners.

> *Dad runs back into burning house to save the cat, doesn't save the photo albums or anything or the wedding dress - saves the cat. Well, the cat's gone out the laundry window. Dad dies. Lose the dad. Lose the house. Cat's fine, but they've lost everything. People will make very emotionally-based, not necessarily the safest, decisions based on their animals.*
>
> Fire officer, "Jayne", 2015.

Introduction

Bushfires are increasing in frequency and severity in many parts of the world due to higher temperatures and altered rainfall patterns, often meaning longer growing seasons and hotter, drier fire seasons (Liu et al., 2010, Hughes and Steffen, 2013, Intergovernmental Panel on Climate Change (IPCC), 2014, Kitching, 2014, Steffen et al., 2017). This is especially the case in southern Australia, where this study took place. This worsening fire threat due to climate change is further compounded by increases in population density in many high fire danger areas, particularly where new developments are located adjacent to crops or bushland (Prelgauskas, 2016). Increasing residents' knowledge and keeping people fire aware, prepared and safe is a perennial challenge for fire authorities and emergency services.

People under duress in a bushfire emergency can make dangerous, unsafe choices which may have tragic, fatal consequences (Haynes et al., 2010). This study interviewed emergency responders and civilians who have experienced a fire emergency, to help establish a better understanding of the underlying aetiology of decision-making. Identifying the reasons for and causes of particular behaviours in the experiential context of bushfire natural hazards leads to first, a better practical understanding of the cognitive processes that predispose people to such behaviours and second, examines how they may be changed to favour more considered outcomes with less risk.

The rules, recommendations and management tools associated with bushfire emergencies are in a permanent state of flux and revision because a serious fire that affects people, their livelihoods and social and environmental microclimates is a complex *non-routine social problem* (Drabek, 2004). Discerning how people and emergency managers can better equip communities to protect themselves, and the things they hold dear, is a social imperative given previous research findings and the evidence-based predicted changes to near-future global weather events. Recent severe natural hazards are acknowledged as an indicator of a 'new normal' of extreme weather (New Scientist, 2013, Beynon, 2016, Lewis, 2016) which requires prioritisation of innovative preparedness and public health policy initiatives. This, in part, involves understanding the *complex social microclimates* among individuals, families, workgroups and communities that may require different, accessible, locally bespoke response options that may be correspondingly more complex, but not necessarily more difficult to establish and implement (Westcott 2017, in press, ANZDMC proceedings). However, adopting new policy requires multi-agency concurrence and support – and may be complicated by pre-existing conservatism among practitioners and policy-makers (Neale et al 2016).

Being *motivated* to embark on a certain course of action (such as planned early evacuation) does not necessarily equate with achieving positive or desirable outcomes. For example, when faced with an imminent bushfire threat, the desire to save dependent others, including animals or precious belongings in the immediate social microclimate - family, business or workplace group - may be a motivating factor to enter, or remain in, a potentially dangerous location (Westcott et al., 2017b). Should the resident be unprepared, physically or psychologically, acting upon such motivation could be life-threatening. Planning and decision-making therefore needs to preference desirable, safe behaviour versus in-situ decision-making and maladaptive responses which could, and often do, lead to injury or even death (Haynes et al., 2010).

Research shows the presence of animals can precipitate dangerous behaviour in humans, which can predispose towards adverse outcomes (Heath et al., 2001, Akama and Ivanka, 2010, Haynes et al., 2010, Hunt et al., 2012, Austin, 2013). In parallel, there is a growing awareness of the longer-term adverse human health implications of losing animals in an emergency incident (Chur-Hansen 2010) whether

pets, recreational or sport animals, livestock or wildlife. Given the observation that animals have been identified as a reason why people place their own welfare and safety at risk (Akama and Ivanka, 2010, Wilkinson et al., 2015), studying the underlying causes of decision-making among animal owners as a specific demographic could contribute significantly to improving human safety overall in fire and other natural hazard events.

Australia, like many Western countries, is a nation of animal owners with 63 percent of Australian households owning a companion animal (Royal Society for the Prevention of Cruelty to Animals, 2014, Animal Medicines Australia, 2016). The number of animals owned by primary producers in rural and regional areas is much larger (Primary Industries and Regions South Australia, 2015). Thus, the animal-owner demographic represents a diverse societal group which traverses many other demographic boundaries. To date, the research concerning animal owners in emergencies is skewed towards the retrospective experiences of pet owners (Tuason et al., 2012). This omits to document the actual experiences and potential contributions of animal owners as an undifferentiated whole – involving many different species of animals in a range of contexts – as well as the perspectives of in-field responders whose task it is to help secure public safety. Likewise, the natural hazard literature lacks rigorous investigation into new sources of information which lead to safer decision-making and the reformulation of response choices to favour safer, positive outcomes – 'adaptive rewards'.

There is an urgent need to problem-solve the persistent magnitude of the *awareness-preparedness gap* (i.e. the mismatch between awareness and preventative action) (Westcott, 2017c) by exploring the opinions and experiences of new and different groups of people, including among households with dependent others, to ascertain how and why preparedness and response behaviours vary (Norris et al., 2002, Eriksen and Gill, 2010, Haynes et al., 2010, Eriksen and Wilkinson, 2017). Uncovering key reasons which contribute to people making unsafe decisions in bushfire events has the potential to be translated across policy and different household contexts in bushfire at-risk communities, and across society more generally as the population health effects of climate change become more dominant. This study addresses that need, and asks the research question, *how can an enhanced understanding of the aetiology of decision-making at the emergency*

responder – animal owner interface determine ways to increase the practise of safe, adaptive response choices, and facilitate the saving of human life in a bushfire (or other natural hazard) emergency?

This study used an expanded application of Protection Motivation Theory (PMT) to promote, teach and learn safer response choices in the context of natural hazards. It sought to discover ways to sustainably motivate behaviour change by establishing a preceding environment which encourages safer choices, thereby protecting life and property (Rogers, 1975, Westcott et al., 2017b).

PMT was originally developed for the health promotion and disease prevention sector, and describes how individuals are motivated to react in a protective way towards a perceived threat. PMT has proven versatility over four decades, being usefully applied to a number of different research settings, from individual health issues as documented by Norman and colleagues (2003), as a predictor of pro-environmental behaviour (Bockarjova and Steg, 2014), to those of slow-onset risk such as drought (Keshavarz and Karami, 2016).

Rogers' initial theory in 1975 assessed 'threat appraisal' and 'coping appraisal', to which he later added 'adaptive costs' and 'maladaptive rewards' (Rogers, 1975, Rogers, 1983) to better represent the reality of human nature (Westcott et al., 2017b). In PMT, 'threat appraisal' defines an individual's perception of the likelihood and severity of a threat, while 'coping appraisal' expresses awareness of available mitigation options, and the individual's belief in their own ability to implement those options – self-efficacy and self-trust (Eriksen and Wilkinson, 2017). This provides the opportunity for strength-based assessment and *problem solving*.

Grothman and Reusswig (2006) included the effect of *prior experience* when using PMT to assess preparedness in floods, and noted PMT was worthy of further research. Westcott et al (2017b) added the influence of the *social microclimate* and *response choices* - again consistent with Rogers' expected evolution of PMT and its continued future relevance (Rogers, 1983). In this context, understanding the inherent heterogeneity of the social microclimate and using that synergistically with complementary strategies to choose safe responses can lead to achieving positive outcomes with less cost – i.e. "adaptive rewards".

This paper proposes an expansion of these concepts through a 2 x 2 typology, understanding adaptive/maladaptive response and costs/rewards through a more encompassing matrix (Rogers, 1983, Westcott et al., 2017b). This is an abductive, iterative process informed by the experience, knowledge and beliefs of participants and by data analysis, and includes an expanded focus on the concept of *adaptive rewards* arising from a reconstruction of 'adaptive costs' versus 'maladaptive rewards'. Thus, an unequivocal appreciation of the *benefits* of positive, adaptive actions through sound planning and decision-making that considers possible choices and actions more systemically is encouraged and favoured over avoidable choices with greater maladaptive *costs.* Just as a major catastrophic event is often the result of a cascade of smaller, singular negative actions, errors or omissions (Reason, 2000), so too a major positive outcome, such as saving human life, can arise from a more structured and learned decision-making process, including not just avoiding threat but arising from a summation of multiple smaller positive steps (Westcott et al., 2017a). Integral to this approach is the consideration of applying PMT in differing social microclimates, including those with dependent others and animals. Such an application can be beneficial across multiple groups – including emergency responders - and help to narrow the bushfire awareness-preparedness gap, with the ultimate aim of saving human life (Westcott et al., 2017b).

METHOD

A case study of a bushfire at-risk regional area in South Australia – "the driest state in the driest continent" (Department of Environment Water and Natural Resources, 2016) – was chosen as the research site because of its recent, and severe, fire history and the diversity of animal ownership among a resourceful regional community (South Australian Country Fire Service, 2016a). The case includes responses from livestock farmers (predominantly sheep, with some cattle) and owners of companion and recreational animals, as described by themselves, and as perceived by firefighters, police and rescue officers of the State Emergency Service (SES).

The need for this research to arrive at practical answers to issues of (public health) policy and practice (Gibbs et al., 2013, Gibbs et al., 2016, Neale et al., 2016)

identified a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology as the most appropriate framing for the study (Cornish and Gillespie, 2009, Braun and Clarke, 2013, Savin-Baden and Major, 2013). Data were collected using 21 semi-structured interviews and nine focus group discussions (Westcott et al., 2017a) with natural hazard management professionals and volunteers and community members from several groups: emergency responders (police, firefighters and rescue officers - five focus groups, five interviews), livestock farmers (10 interviews), owners of companion animals and horses (two focus groups, five interviews), and several animal-oriented small businesses (five businesses, two focus groups, one interview) with 96 participants in total. Focus group and interview participants were exclusive.

The sequential nature of data collection allowed the interview guides to be informed by earlier material, and modified accordingly. This allowed the researcher to cross-check meanings and conduct *in situ* member checking and data verification. The interview guide allowed flexibility – some questions were context dependent, and therefore not all questions were asked of all participants (Taylor and Ussher, 2001). Audio recordings were transcribed verbatim and coded.

Thematic Analysis (TA) was used for data analysis in this qualitative study because of its flexibility and independence from theory. This descriptive and interpretative approach enables straightforward answers to practical questions (Sandelowski, 2000, Braun and Clarke, 2013, Savin-Baden and Major, 2013). The recursive process of analysis was managed with CAQDAS[2] software, NVivo 11, a thematic map and table was generated to visualise the data's thematic interrelationships, and researcher positionality was carefully evaluated (Westcott et al., 2017a). Pseudonyms were used to protect the identity of all participants. Ethics approval was given by the Human Research Ethics Committee of Western Sydney University, approval number H11118.

RESULTS, INTERPRETATIVE ANALYSIS and DISCUSSION:

This paper identified four areas relevant to enhancing practical knowledge about the aetiology of human decision-making in the context of natural hazards in general and bushfire in particular (Westcott et al., 2017a). These are:

[2] Computer Assisted Qualitative Data Analysis System

1. The complexity, importance and influence of the social microclimate
2. Adaptive response – where rewards exceed costs
3. Maladaptive response – where costs exceed rewards
4. Dynamic risk assessment

The complexity, importance and influence of the social microclimate

For the purposes of this paper, the *social microclimate* is an individual's immediate social environment, comprising that person and all dependent others *as determined by that individual* (Westcott et al., 2017b, Westcott et al., 2017a). Members of this group may or may not be present in the same physical location at any given time - for example, some may be at locations remote to an incident: at school, in the workplace, or living in an aged-care facility. Consequently, the base social microclimate core group can become fragmented, and integrated into another, overlapping social microclimate which may function independently until the core group is restored. Individuals within the core group may differ in their perceptions of group structure, and the dynamic of dependency will influence decision-making as part of dynamic risk assessment – this is a critical component because it facilitates and integrates *flexibility* in planning and practice. Similarly, modern emergency management practices are *flexible* systems which recognise the need for wholistic, inclusive engagement with people, their social microclimates and communities, but without compromising awareness of emergency services' expertise (Westcott et al., 2017b).

The social microclimate was identified during initial data coding as being a versatile and potentially useful contributor to achieving improved preparedness. It is important because it can act as a 'bridge' between the individual and the community in one or more contexts. This means that the social microclimate has the potential to act positively as a unit of synergistic information processing that facilitates the acquisition and subsequent dissemination of knowledge predisposing to action. Individuals may belong to one or several social microclimates, with varying degrees of stability and dynamics. The ability to capture and summate knowledge acquired from multiple social microclimates can build a superimposed social microclimate of fire-fitness – that is individuals and communities able to intuitively exercise effective dynamic risk assessment, and choose an adaptive response pathway as the default

option.

The social microclimate frequently may include animals kept for a variety of purposes - such as companionship, recreation, therapy, assistance or as part of a business enterprise. Others may be valued local wildlife. Jayne, an experienced fire officer with 10 years' experience in a rural, at-risk community, commented on the effect animals have on the social microclimate with respect to emergency preparedness.

> *Animals certainly add another complexity to your bushfire survival plan. If you're a single person and you've only got yourself to worry about, that's one person. If there's a couple of you, you can look after each other. If you're a family and you've got half a dozen kids or less, then there's that complexity as well. If you also care for elderly people, whether it's parents or in-laws, or special needs children, that adds another complexity to your plan. If you've got any animal, whether it's as small as a goldfish or as large as 15 race horses, then that adds a huge complexity to your plan. And then you might have visitors or be having a birthday party or holiday makers or you might have WWOOFers[3] or something, so there's another complexity to your plan.*

The opening excerpt from Jayne at the beginning of this paper is an example of a potentially multi-layered aetiology behind an action with tragic consequences. It is not possible to fully understand the impact or influence any given individual's environmental or social microclimate has upon decision-making, but numerous extraneous circumstances could prompt dangerous choices, such as the grief of a family bereavement, children facing difficulties at school, or even the cat surviving recent expensive surgery. The observation of poor decision-making *per se* is an over-simplification, and arguably less helpful than elucidating the aetiology of that decision (Shevellar and Riggs, 2016). Understanding this will assist to identify and inform realistic and safer alternatives, and offer alternate choices to help redirect dangerous, often spontaneous decision-making.

Barry, a participant in one of the firefighter focus groups, noted how people sometimes take action in the interest of their animals' safety at the expense of their

[3] Willing Workers On Organic Farms

own. He linked this to the human tendency to favour 'optimistic bias', as detailed later.

> *Owners seem to lose all sense of their (own) safety once their animal is in danger. A lot of people - they just take their time before they physically do anything, they think it's never going to happen to them, until it gets close enough, then they turn around and say wow, too late, horses in paddock, dog not ready, car not packed. And then a lot of people worry about their animals first.*

Shane, an experienced, senior firefighter involved in community outreach and education programs in his region, recalled a public meeting where a senior member of the community challenged him about driving through road blocks which had been established by the police for public safety.

> *I had a guy at a meeting tell me he didn't care what type of road block we put in place. He would risk going to jail…to get to the house where his grandchildren were… he got himself so worked up emotionally about the fact that he needed to go back to [protect] his grandchildren. I can understand that. But I said to him "Mate, you've got to drive 15 to 20 km to get to the fire. Did it ever occur to you that if you ring triple zero[4] and say that the house at number six Smith Street has got a lady with three children that we might actually have a fire truck there or we can put a fire truck there or we can put aircraft, aerial support over it?" 'Cause that obviously becomes a priority over an empty hay shed. He looked shocked as it dawned on him. He'd been in this area his entire life, and the emotion driving him was that he had to go to protect his grand kids.*

This example highlights the danger, and difficulty, of complex emotional responses. It is completely understandable that the children's grandfather would want to assist them immediately regardless of his own safety. It is equally clear that to do so by rushing to their aid by himself could initiate a cascade of negative events which may end in tragedy: risking his own life; failing to notify authorities of an urgent need of which he was aware – thereby not helping the children; putting the lives of

[4] Triple zero (000) is the phone number to call for help in a life-threatening emergency in Australia, and is equivalent to '911' in the United States, or '999' in the United Kingdom.

responders at additional risk if an emergency rescue was required. If people can learn to quickly recognise this normal, but dangerous, emotion-driven reaction, and consciously 'take one step back' – i.e. dynamically risk assess - and appraise the situation in a rational manner to redirect and communicate information to the appropriate agency, risk is reduced and an appropriate response can be actioned rapidly. This is an example of *coping appraisal* within PMT, and an illustration of how *adaptive rewards* outweigh *maladaptive rewards* or *costs*.

The complexity of the social microclimate requires that an effective 'bushfire survival plan' should be flexible enough to accommodate *more than one scenario.* The plan can, however, evolve over time, as the key to writing a comprehensive plan is writing a basic plan as the foundation document. It also means that careful consideration needs to be devoted to degrees of perceived dependency given the chain of responsibility linking a hierarchy of social microclimate connections that often influence or determine actions that may or may not be taken. For example, an elderly family member in residential care may assume assistance will be provided as on previous occasions by a close relative, instead of by staff of the institution. Part of the 'dynamic' in dynamic risk assessment involves factoring in these variables and clearly communicating the involvement of *everyone* named in the plan, irrespective of their location, or whether or not they take an active role.

The complexity of these interactions may be further compounded by the nature of intergenerational linkages, particularly if a plan is not routinely well communicated and understood by core group members. Parents are probably more likely to attempt removal of children from school (rather than leave them in the care of the educational institution) in the event of a fire emergency, than they are to remove elderly family members from residential aged care facilities – despite the fact that both institutions should maintain effective survival plans, and that fire authorities argue that it is preferable to defend a school containing 100 children than have 100 children in 50 different farmhouses throughout the district (Port Lincoln Country Fire Service, personal communication, 2015). The strength of linkages between generations, the degree of organisational trust and the deeply held, innate urge to protect dependent others can be conflicting and confounding. The subsequent trauma and anxiety can be reduced by understanding how the process of choosing *adaptive rewards* is an active behavioural choice favouring positive outcomes.

In ‘peacetime’, out of fire season, the ‘survival’ plan can be adapted to become a ‘management’ plan, which could also include logistical details such as checking the width of access gates, maintenance of driveways and clearly identified water sources and fittings. It could involve proactively engaging with existing and concurrent community outreach programs in several different contexts: home, work or other social groups. It may also include using the local fire service’s Community Engagement Officer in the workplace, paralleling the officer’s participation in primary and secondary schools to potentiate the effect of information brought home to the family, and prompting parents to be more amenable and receptive to the messages brought home by their children (Westcott, 2016, Westcott, 2017a, Westcott, 2017b).

The social microclimate in emergency planning

The social microclimate is a significant unit in emergency planning because it is a bridge between the ‘individual’ and the ‘community’. It is a dynamic social unit as people belonging to the core group come and go, and is important because its members can receive different sources of similar, simultaneous information which can be synergistically summated and processed. As well as enhancing acquisition of knowledge, this has other advantages – life’s economic challenges frequently mean more has to be done within existing resources, optimising what is already to hand (Turem and Born, 1983, Sargent and Hannum, 2009). Innovative and strategic use of the social microclimate can contribute to achieving this requirement, just as breaking down preparedness into manageable, smaller pieces is an encouraging tactic to counter what could seem like an overwhelming task (Westcott 2015, unpublished data).

The workplace - a social microclimate with potential

For many people, the most familiar, and logical extension of their social microclimate outside the home or family environment is the workplace. Arguably, it has a more consistent structure and fewer variables than the domestic social microclimate. Part of an employers’ social responsibility as a corporate citizen could be to train employees in good emergency decision-making – skills which will ultimately benefit an employer, be translatable to other social microclimates in the wider community, and simultaneously help to build a culture of preparedness based on informed,

considered decision-making (Westcott, 2017b, Westcott, 2017d). Such training could serve as a useful place to help employees learn to design, develop or improve a corporate bushfire survival plan, a skill transferable to their home and family. This could be particularly applicable in small towns or non-metropolitan locations in areas of higher bushfire risk where organisations should already have bushfire plans included in workplace safety arrangements. Implementing this could resource-share and 'borrow' from high-risk industries such as aviation, with structured training based on manuals (including check lists), procedure tailored to work practices and competency-based training to ensure familiarisation and rapid initiation of protocols.

Workplace programs could initially be led by the local fire service community engagement officer, and later by an internal appointee with employees involved on a voluntary and/or rotating basis. This approach effectively bridges two related social microclimates: the workplace, and the home: reinforcing information and creating a synergy of knowledge to inform decisions. This could be especially useful for people new to an area, or those who have moved from an urban environment. Further, engaging employees by listening to and including their ideas could help build a positive team culture with management, and benefit the overall business through proactively planning the safety *and* the viability of the organisation (Paton, 2013, Akama, 2014, Rogers, 2016). Organisational awareness in turn may assist employers to support employees who need to prepare their properties on days of extreme fire weather, or who find their homes threatened unexpectedly whilst they are at work (Wilkinson et al., 2015, Eriksen and Wilkinson, 2017, Westcott, 2017b).

A manager at one rural business, Sandy, explained how her organisation regularly updates and checks their bushfire survival plan:

> *We sit down quite regularly and check through our plan here. We also rotate our staff around so we're pretty multi-skilled, and can adapt when something happens, and we have to shift people around. We put information out in our newsletter in the spring. A reminder to prepare for summer, you know, "are you up to speed, have you got your bases covered, is your [farm fire] unit working?" It's a social as well as a moral responsibility.*

The workplace has potential to become a key link in expanding bushfire awareness and survival – by training employees in positive adaptive decision-making and in

dynamic risk assessment as an active process preferencing protective behaviour in an emergency event.

Adaptive response: where rewards exceed costs – achieving a 'net gain'

To solve an already well-articulated problem involves an assessment of coping appraisal and the provision of realistic and achievable alternative behaviour options. Socio-cognitive theories such as PMT could contribute to identifying, understanding and implementing protective cognitive processes to help change adverse decision making behaviours (Westcott et al., 2017b).

As detailed earlier, Rogers' original PMT assessed 'threat appraisal' and 'coping appraisal', to which he later added 'adaptive costs' and 'maladaptive rewards' (Rogers, 1983) to better represent the reality of human nature. This paper reconstructs and reverses the concepts of 'adaptive costs' and 'maladaptive rewards' so that *adaptive rewards* outcompetes *adaptive costs*, *maladaptive rewards* and *maladaptive costs* to become the overall net gain. This requires decision makers to adopt conscious, *informed response choices* in any given social microclimate with respect to their needs. Examples of each category are given below in Table 1.

The actively identified themes pertaining to *adaptive rewards* and *maladaptive costs* represent two juxtaposed concepts corresponding to *adaptive response and coping appraisal,* and *threat appraisal and maladaptive response* respectively, as described in PMT. These themes enable further exploration of the aetiology of decision-making with the intention of problem-solving difficulties and gaps identified by the data (Westcott et al., 2017b). Unforeseen obstacles such as illness, unemployment or unexpected financial hardship are a subset of *response choices*. They should be identified, acknowledged and articulated because they could lead to (a) inability to prepare despite awareness and a desire to do so, which in itself could cause distress, and (b) suboptimal decision-making due to superimposed psychological stress, and possibly impetuous actions 'on the spur of the moment'.

COSTS		REWARDS	
MALADAPTIVE	**ADAPTIVE**	**MALADAPTIVE**	**ADAPTIVE**
Fines for failing to clean up a property Criticism from friends, family and colleagues for failing to clean up Poor relationships with emergency services Physical injury or losses directly due to fire which could affect all or some of *life, property, environment* Psychological ill-health of varying severity and duration	Taking fewer extra work shifts to work on fire preparedness Criticism from peer group for removing native vegetation Giving up free time to attend local 'fire safe' courses and to write a Survival Plan Forfeiting a holiday and buying and installing a sprinkler system Selling up and leaving the area due to negative emotions or experiences	Taking extra shifts at the workplace to earn extra income instead of cleaning up a property Spending free time with family Buying a holiday rather than a sprinkler system	Increased property value and appeal Confidence to *stay and defend* safely (Fire Danger Rating [FDR] dependent) Ability to offer a safer place for family & others +/- animals Having knowledge and peace of mind – psychological wellness Acquiring new and versatile skills Having the ability to inspire others; knowledge sharing and growth Earned appreciation of fire authorities Building organisational trust and mutual respect Value-adding & making a profit on the sale of a property Having a better holiday next year

Table 1: Examples of how 'adaptive rewards' can become the predominant outcome. While maladaptive and adaptive choices both carry 'costs', *adaptive rewards* lead to a positive overall gain. This is part of 'coping appraisal' in PMT. Positive motivation, intention and action follow.

Shane highlighted two extremes of response choices as an example:

> *If we've got people that are gonna stay and defend, but they leave their horses out in the paddock, they're kidding themselves. If they've decided that their action plan on a day with a total fire ban is to stay, their horses should*

come up to the stables. If they're serious about it, they'd put sprinklers in or they do whatever it is to make a fuel reduced zone to try and ensure the survival of those animals. That's a plan. [Horses] sitting in the bottom paddock when the husband's out fighting the fire and the missus can run down on the four-wheeler and get them, that's not a plan. That's the start of a fatality. And [Black Tuesday] is proof of that, [Black Saturday] is proof of that and then I will point that out very bluntly – politely - I ask them to leave their dental records on the table in a fire proof sheet.

Shane refers to two fatal Australian fires – the 2009 Victorian "Black Saturday" fires, and the "Black Tuesday" fire in 2005 on Eyre Peninsula, South Australia. There were 173 deaths in the Black Saturday fires which devastated over 20 communities with a firescar in excess of 450,000 hectares. Over 2,000 houses were destroyed in semi- and peri-urban areas, farmland and forest, with many factors contributing to the loss of human life (Teague et al., 2010). Nine people died in the 2005 'Wangary' fire on Eyre Peninsula, five were children, and all but one died on the road in motor vehicles, as a result of either high impact collision due to thick smoke and poor visibility, or by entrapment by fire as they fled (Government of South Australia, 2005, Schapel, 2007).

In the excerpt above, Shane, has used *fear appeals* to urge people to make effective survival plans. The request to leave dental records on the table is a jolting statement – essentially, telling people there is a high chance they could die if they are ill-prepared and make poor decisions. For some people, this will be a 'wakeup' call and could inspire them to act, while others will not hear the message, partly because using fear as a motivator is controversial due to a failure to sustain the desired outcome. Tanner (1989) explains how frightening the audience is much less valuable than encouraging the adoption of sound decision-making and responsible protective behaviour (Tanner et al., 1989, Witte, 1992, So, 2013, Westcott et al., 2017b). A major disadvantage of 'fear tactics' is that the beneficial effects eventually plateau and no longer inspire safe behaviour. Conversely, PMT provides a more intricate, holistic, and humane process with a focus on *positive outcome expectancy* (Beatson and McLennan, 2011, Paton, 2013). Fear appeals are probably here to stay, because multiple methods are required to reach as many people as possible. New iterations may negate the 'plateau' effect. Different, innovative methods to encourage

sustainable, safe behaviour would necessarily be in addition to, not instead of, current communications and warnings, as it is very important not to diminish or dilute communicating the severity of a threat.

Adaptive response: 'a problem understood is a problem half solved'

A respectful balance needs to be achieved between experienced local knowledge and fire authorities' expertise. Shane described a visit he made to two adjacent, similar properties, only one of which had decided to act upon the motivation to promote safety and survival with a positive strategy for bushfire survival.

> *I've been to one place in heavy scrub and said look, "We can't come here. This is too dangerous." After the fire, I was the first person there. The house was OK, the fire absolutely incinerated everything around it, but the sprinkler system was running. There the owner was with his young son, walking around putting out hot spots with his sprinkler system just ticking away. It was an awesome, awesome feeling. It's how it was supposed to work. He had a plan. He was prepared psychologically and physically, and he had the gear and it worked brilliantly.*
>
> *Go round to the next house that we lost. It was another place that I said we can't come here. Bad access and massive fuel load. The owner said, "Oh, I wanna put a sprinkler system in." Well, don't want to, do it! His house burned down and the sprinkler system that he'd bought [but not installed] was in a pile in the corner and that was really difficult – poor man. I felt terrible for him.*

There are other problems which are well understood, but more difficult to solve. Special needs groups – such as the elderly, homeless or disabled – and their advocates frequently raise the perennial problem of having "nowhere to go" on a catastrophic[5] day. With no family or connections in the nearest safe town, one dog owner, Maggie, was at a loss to know what she would do with her animals.

> *We're told to just pack up and go. Well, I'm sorry, I think that's rubbish. But that's just me. Unless there is a real horror going to happen – because of high fire danger, I'm not gonna put the dogs in the car and everything else and*

[5] In Australia, a 'catastrophic' day denotes the highest level of Fire Danger Rating. See https://www.cfs.sa.gov.au/site/bans_and_ratings/more_about_fire_danger_ratings.jsp

go somewhere. I mean I know nobody in [town name]. I'm a bit of a separate entity. I'm not being pathetic. I'm just stating a fact. A lot of people are like me. So where am I going to go if I do go away for the day? Stinking hot, you know, with dogs in the car.

The horse owners' focus group similarly raised the perplexing problem of "nowhere to go"; resolving this was a priority in their discussion as it would change their decision-making and their behaviour for the better in a fire. Jo, in the group said:

We want up-to-date information about the fire - which way it's travelling, and which towns might be affected, and about where you could go, so all we have to do is pack up and go there. And the biggest key is the up-to-date information.

This group agreed that maladaptive actions such as the locally long-held practice of opening gates to external roads to release animals are dangerous. Group member Cindy said, *because the first thing that's gonna happen is you're going to have a horse hit by a vehicle that can't see the horse.* However, giving horses freedom to move within a property is helpful - if the property is large enough. Cindy said she regularly moved all her horses from paddock to paddock so they are all familiar with the whole property. *They know all the paddocks now because they've spent time in each one of them. They know where all the gates are.*

The availability of adaptive responses predispose towards safe decision-making by the animal owner. Clearly, these adaptive behaviours are aligned and share commonality with good preparedness, creating a favourable environment for positive outcome decision-making. Jan, in the dog owners' focus group similarly gave a considered response. Her plan is simple and effective. Her 'go kit' is by the front door, and on working days when the fire danger rating is extreme or catastrophic, her dogs, like a number of others, have a permanent booking at the local boarding kennels in town. She said:

But when you know that you live in an extreme fire danger area, you can't think it's not gonna happen. So it's about awareness of what resources are around you. People ask me if I have a sprinkler system at my place. I don't feel I'm capable of running that. You have to know what you're actually

capable of. You have to understand your limits, what's within your personal capability. And my limits are – I don't care about the house. It's me and the dogs. And you have to be mentally prepared.

Jan's simple, practical strategy is in marked contrast to Jayne's example of the father's attempt to rescue the cat. It also emphasises the importance of helping people identify their own strengths and priorities, learn ways to remain safe in an emergency and guide them towards responding propitiously to cues and triggers in a way which overcomes impulsive, dangerous actions.

Maladaptive response – where costs exceed rewards

Shevellar and Riggs (2016) note that humans preferentially favour enjoyable activities over those less appealing. Jayne talked about how people can tend to delay dealing with issues they find unpleasant, such as going to the dentist or updating a will with the lawyer. She prefaced her remarks by relating the language people use: *"I should get around to", or, "I've been meaning to…."*. But people don't say, "I must get around to buying the groceries", or "I must get around to fuelling up the car". Failing to acquire food and fuel has potentially dire consequences in everyday life, but these activities are not generally distressing, assuming the availability of appropriate financial resources. But going to the dentist or the lawyer might be perceived as something adverse and preferably avoided for a range of reasons. Seemingly, bushfire preparedness fits into this category also. However, given that proactive decision-making with respect to bushfires could save homes, families, animals and livelihoods, it is surprising that people are persistently reluctant to access and act upon the abundance of resources freely available to help them (Paton and Johnston, 2001, Ronan and Johnston, 2005, South Australian Country Fire Service, 2016b).

Natalie, from one of the firefighters groups, with other experienced first responders, was adamant as to why uptake of these resources is suboptimal: *because it is too confronting.* This indicates a fundamental obstacle to good decision-making which must be overcome, or risk further emasculating preparedness messaging regardless of the efficacy of the campaign. More variations of fear appeals may yield no net gain if thwarted by failure to address and create a *preceding*, prerequisite environment

conducive to positive *response choices.* One way to do this is to reduce the enormity of a task by breaking it down into 'manageable chunks'. Natalie explained:

> *We're trying to make it easy to target those people that go, "This is too overwhelming. It's too big. It's too hard. It's too costly. I don't know where to start". That can be particularly relevant if you want to prepare your home and defend it against the bushfire. But if you don't want to be there, the easiest thing is to have a phone or listen to the weather, have a backpack and get out of there. That's not difficult. That's it. It's achievable for everybody.*

There are several elements of threat appraisal (as described in PMT) which favour maladaptive response, including complacency, denial, optimistic bias, fatalism, folkloric beliefs and 'wishful thinking' (Grothmann and Reusswig, 2006, Neale et al., 2016, Eriksen and Wilkinson, 2017, Westcott et al., 2017b).

Natalie went on to outline another maladaptive human tendency:

> *There's another thing called optimistic bias - we know bad things happen. We know car accidents happen. We know bushfires happen, we know people drop dead of a heart attack… But optimistic bias deep in our brains says that happens to other people, and we overestimate that good things happen to us.*

Members of all emergency responder groups agreed that *complacency is the major problem*. Firefighter Mal said:

> *People just go, "It's not gonna happen to me. This is semi-urban, you know. We're not gonna get any fires in here." I think if the [town name] fire went through now, there'd be a lot of people there that would go, "But we're in a town." And all of a sudden, "Bang!" Sheds on fire, stables on fire, horses die.*
>
> *The people that experienced Black Tuesday in 2005 became hypersensitive, and hypersensitivity, while in some individuals will last the rest of their life, with a lot of the people it's got probably a four to five year cycle. You get your peak and then it drops off to, "Oh, it won't happen again." That's normal human behaviour.*

City and country cousins

‘Suburban-like’ subdivisions on the edges of small towns can create a number of difficulties as well, not only because of the controversial actions of planning authorities who approved their location (Prelgauskas, 2016). Maxine, in the horse owners group, commented:

> *Before the ’05 fire there were maybe 10, 12 families there. Since then there’s been a sub-development and it’s grown. Back then, it was a lot more community-based and for up until probably the past two years we had an annual get-together…but since the sub-development it’s become a lot less community…and… more town-like.*

Maxine continued:

> *We have lots of people that come from cities because they want to live in the country, but they don’t know the rules of the country. Like a guy from the city who lives next to us, and goes out on a hot day and starts mowing. It's limestone - you don't do that. There'll be sparks. You're gonna set fire to the place. And he's, "Oh, no, no, it's fine. It's just all powdery. You hit it and it just...".Yeah, all right. ‘Cause they just don't have enough knowledge. Well, to me, if they’re moving into the place, there should be a booklet of all the dangers and differences: "this is what you got to do to maintain your yard."*

Sandy, in the small-business focus group, agreed:

> *There needs to be a pack of information for new people, but updated for everyone, and delivered to everyone.*

New people could readily receive current information by attending non-compulsory community fire safety information sessions. They could be encouraged to do so via an invitation accompanying their first Council (Shire) rates[6] notice, offering all attendees a meaningful discount to be applied to the second year’s rates. To qualify, participation in a given number of fire information seminars would be required, which could be spread over a 12 month period to give maximum opportunity for people to

[6] Council rates are a local, municipal tax charged to each property annually for the purpose of funding services to ratepayers.

attend (Westcott, 2017d). New residents, especially people with little bushfire experience, need information to help them understand their responsibilities, and the limitations of the fire service (Eriksen and Wilkinson, 2017).

Shane noted 'wishful thinking' as a function of newcomers' assumptions:

And then they [in the subdivision] remind me that [the fire service] will go in there and save their house and horses. And, again, we don't leave them with the misconception that we will be there, because we might be. But we point out there are three fire trucks sitting in that shed and six hundred homes over that hill.

However, Zoe, in the SES group also observed:

> *I can't say that it's only city people. There was a lady the day of the [town name] fire. She drove from [town name] to [town name] and if you couldn't see the smoke from the road, there's something wrong. She walked inside. She turned on the air conditioner. She put the [dial-up] Internet on. So therefore no home phone. And there's a black spot for mobiles out there and she grew up in the country. And it was only that her internet happened to drop out and somebody happened to ring her. And she went, "Oh, is there?" And that fire had been going for 24 hours by then. She was probably in denial.*

Adaptive versus maladaptive: better choices and longer term gain

Achieving *adaptive rewards* as the outcome of re-considering and re-expressing the adaptive-maladaptive equation is a goal which could significantly and positively affect good decision-making. Several strategies could be adopted and trialled to promote awareness and engagement, including developing a culture of preparedness by implementing medium to long term changes to public health and safety policy (Westcott, 2016, Westcott, 2017d, Westcott, 2017b, Westcott, 2017c). This may be encouraged by including:

- Negotiating leave of absence with employers on high fire danger days
- Easily accessible locally applicable, bespoke financial incentives linked to Government charges or insurances
- Value-adding to properties demonstrating "best practice"

- Holding fire-ready open days
- Civic awards to publicly acknowledge best practice
- Review the use of firebreaks and crop types
- Synchronous awareness programs in schools and the workplace
- Resource sharing with other agencies

In the short term, sponsored ‘give-aways’ of personal protective fire equipment, household ‘go kits’ and fire safety packs for farm vehicles are visible and readily implemented means of encouraging thoughtful action, training and preparedness (ABC Landline, 2016).

Not long ago, what is now termed “conservation farming” (Johansen et al., 2012, Llewellyn et al., 2012, ABC Landline, 2016) was a new concept with a mixed reception among primary producers. This approach included ‘no-till’ farming and reduced or minimal burning-off of stubble, with the overall aim of retaining organic matter in the soil for a healthier, more sustainable soil profile, and hence improved plant health and crop yield. These methods are now widely practiced, but the change took time. Similarly, the process to redefine, demonstrate and establish the adaptive rewards of good decision making and safe bushfire behaviour, as discussed earlier, requires the investment of longer-term strategic planning, assessment and re-assessment of initiatives to cultivate and maintain behaviour change into the future. This requires active assessment of what precedes planning and preparedness, and could arguably lead to more enduring changes to levels of preparedness than the real but possibly shorter-lived “windows of opportunity” in the immediate post-event aftermath (Neale et al., 2016, Eriksen and Wilkinson, 2017).

Dynamic risk assessment – a life-saving skill linked to ‘coping appraisal’

Teaching the basic principles of dynamic risk assessment (DRA) in promotional material is an additional and important way to help avoid spontaneous and emotive reactions in favour of adaptive response. It is valuable in the pre-preparedness, preparedness and response phases of an emergency event. Once people reach the ‘coping appraisal’ half of PMT, knowing how to intuitively engage in DRA can significantly facilitate accurate assessment of the ability to successfully implement

mitigation activities. In the pre-preparedness phase, DRA can assist people to realistically appraise their strengths and abilities; this is reviewed closer to times of perceived threat, and actively engaged as a process when threat is imminent. Proactively using DRA is demonstrated by organisations such as Australian Red Cross, and St. John Ambulance Australia, in their publicly available website resources and posters, one of which depicts step-by-step life support actions according to the acronym, DRSABCD: *Danger; Response; Send for help; Airway; Breathing; Circulation; Defibrillate* (St John Ambulance Australia, 2016, Royal Life Saving Society WA Inc., 2018). Similar 'fire-safe' resources, displayed in parallel, could be adapted and developed by fire authorities' campaigns to actively promote DRA, either as a single issue or as a hybrid concept with fear appeals, such as *Assess the danger; Be smart, be safe; Consider the consequences; Decide and act,* alongside*, What would your children do if you died trying to save the cat?*

This strategy sends a message of dynamic risk assessment which could resonate with a new or different group of people. It adapts an existing resource – thus doing more with the resources already to hand – and uses a principle which is already widely known in the public realm, particularly among people who are first-aid and workplace-safety trained. The opportunity for organisational collaboration also exists, which could be cost-effective, and advantageously help build understanding between *response* and *relief and recovery* agencies and organisations.

An example of a suitable slogan to build preparedness and encourage DRA includes *Be fire-fit! Weekly is worth it!* (Westcott et al., 2017a) which promotes uptake of preparedness behaviours by showing that preparedness (fire-fitness) regularly (weekly) is beneficial (is worth it) (Westcott, 2017a, Westcott, 2017c).

LIMITATIONS

There are four major limitations to this study. The first is that the majority of participants represent people already 'bushfire thoughtful'. They are aware of the potential risk, and usually looking for opportunities to strengthen their level of preparedness and safety. Reaching residents who are, for whatever reason, less engaged, remains the challenge. Seeking to cultivate and establish a societal-wide

culture of preparedness is one way to potentially treat this risk. Secondly, strategies proposed in this paper would be of limited benefit to disadvantaged groups such as the homeless, the unemployed, those with English as a second language, and others. Many of these bring their own particular needs and challenges. Then, consultation with stakeholders, industry and public bureaucracy would be needed to demonstrate the value of establishing an environment of adaptive rewards, and to explain the potential positive contribution such an outcome could make (Neale et al., 2016). Lastly, care should be taken with terminology, which can be off-putting if perceived as jargonistic or exclusivist.

CONCLUSION

Understanding the aetiology of decision-making by exploring the complexities of the social microclimate and maladaptive and adaptive response choices can encourage and preference safe decision-making practices. Demonstrating *adaptive rewards with an evident net gain* as the corollary of adaptive response choices is one way to promote and establish safer decision-making behaviours in natural hazards such as bushfire, even if gradually. Targeted initiatives could be instigated and tested to preference and embed a proactive culture of preparedness and safety, and effective dynamic risk assessment could be incorporated into education, training and advertising, and be used as a tool in the community to enhance bushfire survival plans. This necessarily includes ongoing identification of particular gaps and needs which may prevent people responding safely.

In daily life people decide on a course of action for a reason – which is often one of perceived net gain for themselves or for others in their social microclimate. Desirable behaviour and the rewards of adaptive response should therefore clearly represent an appealing net gain - in addition to the ultimate aim of saving human life - and surpass any perceived benefit from impetuous or dangerous maladaptive choices.

People need to be encouraged to freely decide for themselves, and be convinced of the benefits *to themselves and their immediate dependent others* when embarking on a certain course of action. Financial inducement, whether as a sum of money discounted from municipal fees or insurance policies, or as an addition to property valuation, may help achieve this. In the short and long term, strategies to encourage voluntary participation in a growing culture of preparedness is likely to symbiotically

intersect with the adoption of positive, adaptive response choices, which in turn promote and motivate protective behaviour.

The pre-existing social microclimate (the domestic or workplace environment which exists preceding an emergency) often significantly influences motivational choices which lead to positive or negative outcomes. The social microclimate in the workplace and in educational facilities also affords an opportunity for simultaneous education and training of groups of people, who upon dispersal take knowledge with them as they return to their core domestic unit. This synergism can achieve more of the desired effect without additional inputs, and encourages shared responsibility and innovative use of existing resources.

As with bushfire preparedness, an understanding of what precedes decision-making will usefully translate to encourage behaviours that fire authorities have been promoting for decades. Emergency services and communities have a mutual responsibility for reciprocal and respectful appreciation of the influence an individual or group social microclimate has upon decision-making. Additionally, recognition of the limitations of response capacity, the need for shared responsibility, and an understanding that positive, adaptive response can optimise and share available resources and contribute to the common good will help fortify a strong collaborative community approach to face the “new normal” of extreme weather events.

REFERENCES

ABC LANDLINE. 2016. *Rising Up* [Online]. Australian Broadcasting Corporation. Available: http://www.abc.net.au/news/2016-11-26/rising-up/8063470 [Accessed 12 September 2017].

AKAMA, Y. 2014. Passing on, handing over, letting go – the passage of embodied design methods for disaster preparedness. *Service Design and Innovation Conference.* Lancaster University: Linköping University Electronic Press.

AKAMA, Y. & IVANKA, T. 2010. What community?: facilitating awareness of 'community' through playful triggers. *Proceedings of the 11th Biennial Participatory Design Conference.* Sydney, Australia: ACM.

ANIMAL MEDICINES AUSTRALIA 2016. Pet Ownership in Australia 2016. Canberra: Animal Medicines Australia.

AUSTIN, J. J. 2013. Shelter from the Storm: Companion Animal Emergency Planning in Nine States. *Journal of Sociology & Social Welfare,* 40**,** 185-210.

BEATSON, R. & MCLENNAN, J. 2011. What Applied Social Psychology Theories Might Contribute to Community Bushfire Safety Research After Victoria's 'Black Saturday'. *Australian Psychologist,* 46**,** 171-182.

BEYNON, H. 2016. *Extreme weather the "new normal"* [Online]. New York: United Nations Office for Disaster Risk Reduction. Available: https://www.unisdr.org/archive/49634 [Accessed 12 September 2017].

BOCKARJOVA, M. & STEG, L. 2014. Can Protection Motivation Theory predict pro-environmental behaviour? Explaining the adoption of electric vehicles in the Netherlands. *Global Environmental Change,* 28**,** 276-288.

BRAUN, V. & CLARKE, V. 2013. *Successful Qualitative Research,* London, Sage.

CORNISH, F. & GILLESPIE, A. 2009. A Pragmatist Approach to the Problem of Knowledge in Health Psychology. *Journal of Health Psychology,* 14**,** 800-809.

DEPARTMENT OF ENVIRONMENT WATER AND NATURAL RESOURCES. 2016. *Managing natural resources* [Online]. Adelaide: Government of South Australia,. Available: http://www.environment.sa.gov.au/managing-natural-resources/water-resources [Accessed 12 September 2017].

DRABEK, T. E. 2004. *Social Dimensions of Disaster,* Emmitsburg, Emergency Management Institute, Federal Emergency Management Agency.

ERIKSEN, C. & GILL, N. 2010. Bushfire and everyday life: examining the awareness-action gap in changing rural landscapes. *Geoforum,* 41**,** 814-825.

ERIKSEN, C. & WILKINSON, C. 2017. Examining perceptions of luck in post-bushfire sense-making in Australia. *International Journal of Disaster Risk Reduction,* 24**,** 242-250.

GIBBS, L., BRYANT, R., HARMS, L., FORBES, D., BLOCK, K., GALLAGHER, H. C., IRETON, G., RICHARDSON, J., PATTISON, P., MACDOUGALL, C., LUSHER, D., BAKER, E., KELLETT, C., PIRRONE, A., MOLYNEAUX, R., KOSTA, L., BRADY, K., LOK, M., VAN KESSELL, G. & WATERS, E. 2016. Beyond Bushfires: Community Resilience and Recovery Final Report. Melbourne: University of Melbourne.

GIBBS, L., WATERS, E., BRYANT, R. A., PATTISON, P., LUSHER, D., HARMS, L., RICHARDSON, J., MACDOUGALL, C., BLOCK, K., SNOWDON, E., GALLAGHER, H. C., SINNOTT, V., IRETON, G. & FORBES, D. 2013. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health,* 13**,** 1036.

GOVERNMENT OF SOUTH AUSTRALIA 2005. Wangary Coronial Investigation Findings Summary. Adelaide: Government of South Australia.
GROTHMANN, T. & REUSSWIG, F. 2006. People at Risk of Flooding: Why Some Residents Take PrecautionaryActon While Others do not. *Natural Hazards,* 38**,** 101-120.
HAYNES, K., HANDMER, J., MCANENEY, J., TIBBITS, A. & COATES, L. 2010. Australian bushfire fatalities 1900–2008: exploring trends in relation to the 'Prepare, stay and defend or leave early' policy. *Environmental Science & Policy,* 13**,** 185-194.
HEATH, S. E., KASS, P. H., BECK, A. M. & GLICKMAN, L. T. 2001. Human and pet-related risk factors for household evacuation failure during a natural disaster. *American Journal of Epidemiology,* 153**,** 659-665.
HUGHES, L. & STEFFEN, W. 2013. *Be prepared: climate change and the Australian bushfire threat.* [Online]. Climate Council. Available: http://www.climatecouncil.org.au/uploads/c597d19c0ab18366cfbf7b9f6235ef7c.pdf [Accessed 12 September 2017].
HUNT, M. G., BOGUE, K. & ROHRBAUGH, N. 2012. Pet ownership and evacuation prior to hurricane Irene. *Animals,* 2**,** 529-539.
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC). 2014. *Fifth Assessment Report* [Online]. IPCC. Available: https://www.ipcc.ch/report/ar5/ [Accessed 12 September 2017].
JOHANSEN, C., HAQUE, M. E., BELL, R. W., THIERFELDER, C. & ESDAILE, R. J. 2012. Conservation agriculture for small holder rainfed farming: Opportunities and constraints of new mechanized seeding systems. *Field Crops Research,* 132**,** 18-32.
KESHAVARZ, M. & KARAMI, E. 2016. Farmers' pro-environmental behaviour under drought: Application of protection motivation theory. *Journal of Arid Environments,* 127**,** 128-136.
KITCHING, R. 2014. *IPCC: Australia and New Zealand face greater fire and flood risk, damage to coral reefs* [Online]. Available: https://theconversation.com/ipcc-australia-and-new-zealand-face-greater-fire-and-flood-risk-damage-to-coral-reefs-24642 [Accessed 27 January 2018].
LEWIS, S. 2016. *Time to adapt: 2015's record-breaking temperatures will be normal by 2030* [Online]. Sydney: Australian Broadcasting Corporation. Available: http://www.abc.net.au/news/2016-11-07/record-breaking-temperatures-will-be-new-normal-by-2030/8001720 [Accessed 12 September 2017].
LIU, Y., STANTURF, J. & GOODRICK, S. 2010. Trends in global wildfire potential in a changing climate. *Forest Ecology and Management,* 259**,** 685-697.
LLEWELLYN, R. S., D'EMDEN, F. H. & KUEHNE, G. 2012. Extensive use of no-tillage in grain growing regions of Australia. *Field Crops Research,* 132**,** 204-212.
NEALE, T., WEIR, J. K. & MCGEE, T. K. 2016. Knowing wildfire risk: Scientific interactions with risk mitigation policy and practice in Victoria, Australia. *Geoforum,* 72**,** 16-25.
NEW SCIENTIST. 2013. *Wild weather: extreme is the new normal* [Online]. Available: https://www.newscientist.com/article/mg21729003-200-wild-weather-extreme-is-the-new-normal/ [Accessed 12 September 2017].
NORMAN, P., SEARLE, A., HARRAD, R. & VEDHARA, K. 2003. Predicting adherence to eye patching in children with amblyopia: An application of protection motivation theory. *British Journal of Health Psychology,* 8**,** 465-474.

NORRIS, F. H., FRIEDMAN, M. J., WATSON, P. J., BYRNE, C. M., DIAZ, E. & KANIASTY, K. 2002. 60,000 Disaster Victims Speak: Part I. An Empirical Review of the Empirical Literature, 1981–2001. . *Psychiatry: Interpersonal and Biological Processes,* 65**,** 207-239.

PATON, D. 2013. Disaster Resilient Communities: Developing and testing an all-hazards theory. *Journal of Integrated Disaster Risk Management,* 3**,** 1-17.

PATON, D. & JOHNSTON, D. 2001. Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management,* 10**,** 270-277.

PRELGAUSKAS, E. 2016. Helping fire-impacted families in rebuilding: toward enhanced community resilience outcomes. *Australian Journal of Emergency Management,* 31**,** 54-59.

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA 2015. Property Identification Codes and Statistics Report. Adelaide: PIRSA.

REASON, J. 2000. Human error: models and management. *British Medical Journal,* 320**,** 768-770.

ROGERS, C. 2016. The critical need for animal disaster response plans. *Journal of Business Continuity & Emergency Planning,* 9**,** 262-271.

ROGERS, R. 1983. Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. . *In:* J. CACCIOPPO & R. PETTY (EDS.) *Social psychophysiology: A sourcebook.* New York: Guilford.

ROGERS, R. W. 1975. A protection motivation theory of fear appeals and attitude change. *Journal of Psychology,* 91**,** 93-114.

RONAN, K. R. & JOHNSTON, D. M. 2005. *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families*, Springer US.

ROYAL LIFE SAVING SOCIETY WA INC. 2018. *DRSABCD Action Plan* [Online]. Mount Claremont: Royal Life Saving Society WA Inc. Available: https://royallifesavingwa.com.au/your-safety/first-aid-and-emergency-care/drsabcd-action-plan [Accessed 12 February 2018].

ROYAL SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS. 2014. *How many pets are there in Australia?* [Online]. Available: kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html [Accessed 29 December 2014].

SANDELOWSKI, M. 2000. Whatever Happened to Qualitative Description? *Research in Nursing & Health,* 23**,** 334-340.

SARGENT, T. C. & HANNUM, E. 2009. Doing More With Less. *Journal of Teacher Education,* 60**,** 258-276.

SAVIN-BADEN, M. & MAJOR, C. H. 2013. *Qualitative Research,* Abingdon, Routledge.

SCHAPEL, A. E. 2007. Inquest conducted by Mr Anthony E Schapel, Deputy State Coroner, South Australia. Adelaide: Government of South Australia,.

SHEVELLAR, L. & RIGGS, R. 2016. Understanding resistance to emergency and disaster messaging. *Australian Journal of Emergency Management,* 31**,** 31-35.

SO, J. 2013. A Further Extension of the Extended Parallel Process Model (E-EPPM): Implications of Cognitive Appraisal Theory of Emotion and Dispositional Coping Style. *Health Communication,* 28**,** 72-83.

SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016a. *Bushfire History* [Online]. Adelaide: South Australian Country Fire Service. Available:

https://www.cfs.sa.gov.au/site/about_cfs/history_of_the_cfs/bushfire_history.jsp [Accessed 12 September 2017].
SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016b. *Campaign material* [Online]. Adelaide: Government of South Australia. Available: https://www.cfs.sa.gov.au/site/prepare_for_a_fire/bushfire_management_planning.jsp [Accessed 12 September 2017].
ST JOHN AMBULANCE AUSTRALIA. 2016. *DRSABCD Action Plan* [Online]. Deakin Australian Capital Territory: St John Ambulance Australia. Available: http://www.stjohnnsw.com.au/drsabcd-action-plan/ [Accessed 12 February 2018].
STEFFEN, W., HUGHES, L., ALEXANDER, D. & RICE, M. 2017. Cranking up the Intensity: Climate Change and Extreme Weather Events. Potts Point: Climate Council of Australia.
TANNER, J. F., DAY, E. & CRASK, M. R. 1989. Protection motivation theory: An extension of fear appeals theory in communication. *Journal of Business Research,* 19**,** 267-276.
TAYLOR, G. W. & USSHER, J. M. 2001. Making Sense of S&M: A Discourse Analytic Account. *Sexualities***,** 293-314.
TEAGUE, B., MCLEOD, R. & PASCOE, S. 2010. 2009 Victorian Bushfires Royal Commission. Melbourne: State of Victoria.
TUASON, M. T. G., GÜSS, C. D. & CARROLL, L. 2012. The disaster continues: A qualitative study on the experiences of displaced Hurricane Katrina survivors. *Professional Psychology: Research and Practice,* 43**,** 288-297.
TUREM, J. S. & BORN, C. E. 1983. Doing More with Less. *Social Work,* 28**,** 206-210.
WESTCOTT, R. 2016. Port Lincoln Project - the bushfire research of Rachel Westcott. Available from: https://ptlincolnproject.wordpress.com/ [Accessed 12 September 2017].
WESTCOTT, R. 2017a. *How to become bushfire-prepared without really noticing: be fire-fit! Weekly is worth it!* [Online]. Melbourne: Bushfire and Natural Hazards Cooperative Research Centre. Available: http://www.bnhcrc.com.au/resources/presentation-audio-video/3834 [Accessed 12 September 2017].
WESTCOTT, R. 2017. Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study. Australian and New Zealand Disaster and Emergency Management Conference, 2017b Gold Coast. Nerang, Queensland: Australian and New Zealand Mental Health Association.
WESTCOTT, R. 2017c. Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives. *Australian Journal of Emergency Management,* 31**,** 37-41.
WESTCOTT, R. 2017d. What comes first? Building DRR by cultivating a preceding culture of preparedness as a 'social norm'. *PreventionWeb DRR Voices* [Online]. Available from: http://www.preventionweb.net/experts/oped/view/54363 [Accessed 12 September 2017].
WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017a. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science,* 4,34.

WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017b. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology,* 5**,** 13.
WILKINSON, C., ERIKSEN, C. & PENMAN, T. 2015. Into the firing line: civilian ingress during the 2013 "Red October" bushfires, Australia. *Natural Hazards,* 80.
WITTE, K. 1992. Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs,* 59**,** 329-349.

********** END APPENDIX B **********

Appendix C: AFAC paper for peer review, published in AJEM

The following pages (pp 174 – 187) contain the peer reviewed paper submitted to, and accepted for, the Australasian Fire and Emergency Service Authorities Council (AFAC) conference in 2017, and published as P3 in abridged form in the Australian Journal of Emergency Management.

NARROWING THE AWARENESS-ACTION GAP: CULTIVATING A CULTURE OF ROUTINE ALL-HAZARDS PREPAREDNESS THROUGH PUBLIC POLICY INITIATIVES

ABSTRACT

This presentation describes findings and recommendations from PhD research which is part of the BNHCRC project, Managing Animals in Disasters. It first outlines the proposed translation of research findings into practical applications and initiatives beneficial to individuals and communities, and then identifies new preparedness policies which aim to build adaptive capacity to improve human safety in all-hazards emergencies. By virtue of the nearly universal finding that public preparedness for natural, and other, hazard events is low, innovative preparedness policy and practices are a social imperative which must necessarily evolve to effectively manage the impact of fire and worsening severe weather events on human populations.

The research site for this pragmatic qualitative study was the Lower Eyre Peninsula in South Australia, an area selected for several distinguishing reasons including its recent and severe fire history. Working with emergency responders and animal owners, the primary factor driving the research was to effectively bridge, explore and problem-solve with key stakeholders to arrive at practical, realistic and achievable answers to the persistent and perennial issues of preparedness and the awareness-action gap. The interface of the two target groups thereby offers insights which break new ground to inform public policy and fire science.

Data analysis generated three initiatives of preparedness practice and policy development with the potential to enhance a culture of preparedness in society generally; (i) a new type of workplace leave, (ii) a restructured scheme of insurance policies and municipal fees and charges for fire-ready properties, and (iii) reviewing current agricultural practices on farms and on rural living blocks such as the use of firebreaks. The findings are thereby beneficial to improve human safety in all-hazards emergencies and their collaborative implementation could help narrow the awareness-preparedness gap overall, illuminate other research possibilities, and ultimately, help save human life.

Keywords: Bushfire; Preparedness; Public Policy, Adaptive Responses

INTRODUCTION

A serious fire affecting people, their livelihoods and microclimates, is a complex *non-routine social problem* (Drabek, 2004). Discerning how people and emergency managers can better equip communities to protect themselves, and the things they hold dear is an indisputable imperative given the evidence-based predicted changes to near-future global weather events. Recent severe natural hazards are acknowledged as an indicator of a 'new normal' of extreme weather (New Scientist, 2013, Beynon, 2016, Lewis, 2016) which require prioritisation of equally powerful, innovative preparedness initiatives.

In Australia, Europe and North America fire science explores an expanding spectrum of fire-related social, physical and agricultural science topics and has become a sophisticated research field in many (wild)fire prone countries. This knowledge contributes to the successful, dynamic management of increasingly complex fire problems affecting many aspects of human populations. The current study contributes to this knowledge base; it records, documents and analyses some of the experiences, expectations and needs of communities who have 'lived through' bushfire emergencies, and *expect to face this hazard again*. This paper's research question asks *what preparedness initiatives can be learnt from the emergency responder-animal owner interface which may be usefully applied to the greater public as a whole, and particularly in a bushfire at-risk community?*

Using a pragmatic qualitative approach, a case study of a bushfire at-risk regional area in South Australia – "the driest state in the driest continent" (Department of Environment Water and Natural Resources, 2016) - was chosen as the research site because of its recent, and severe, fire history and the breadth of animal ownership among the population (South Australian Country Fire Service, 2016). Fire can become an emergency when it impacts adversely upon people, property, the environment and other assets - including commercial viability, business continuity and family legacy to future generations. Experience of such an event, and loss of any kind can dramatically impact upon human physical and psychological health for variable timeframes, whether in an urban, semi-rural or pastoral environment (Gordon, 2009, Chur-Hansen, 2010, Gordon, 2015).

To ‘do’ preparedness effectively, and make people and properties ‘fire-fit’, requires its transition from a desirable, but time-consuming ‘optional extra’, to become a regular activity which is as routine as buying the groceries or putting fuel in a motor vehicle. In Australia and elsewhere, household levels of fire fitness are persistently suboptimal, and the awareness-preparedness gap is narrowing disproportionately slowly compared with the magnitude of public resources assigned to help people attain bushfire readiness (Ronan and Johnston, 2005, Paton, 2013, Westcott et al., 2017a). Actively cultivating sustainable patterns of behaviour to establish and maintain a culture of preparedness can be achieved through innovative public policies that build capacity and enhance resilience in the medium and long term. To do so requires careful consideration of what *precedes* preparedness messaging to create an environment conducive to adaptive action outcomes. Paradigm change to cultivate a routine culture of preparedness by means of public policy initiatives is achievable, resulting in a safer society burdened with less avoidable trauma and anxiety (Westcott et al., 2017b).

METHOD

The need for new, practical strategies to evolve and problem-solve natural hazard public policy and practice (Gibbs et al., 2013, Gibbs et al., 2016) identified a pragmatic approach within a critical realist ontology and contextualist, experiential epistemology as the most appropriate framing for the study (Cornish and Gillespie, 2009, Braun and Clarke, 2013, Savin-Baden and Major, 2013). Participant groups were Emergency responders (operational members of the South Australian Country Fire Service, State Emergency Service, Metropolitan Fire Service and South Australia Police) and the owners of any kind of animal – including farmers, small businesses, and owners of companion, recreational and assistance animals, or carers of wildlife. This demographic is important for two reasons: (i) group commonality (owning an animal) crosses the boundaries of many other groups, with 63% of Australian households owning a companion animal (Royal Society for the Prevention of Cruelty to Animals, 2014), and (ii) the need to investigate new and different groups to discover key reasons why awareness of bushfire hazards does not necessarily translate into proactive, effective prevention and preparedness behaviours, particularly among bushfire at-risk communities.

Data was collected using semi-structured interviews and focus group discussions with 67 participants in total. Thematic Analysis (TA) was used for data analysis because of its flexibility and suitability to this qualitative study. This descriptive and interpretative approach enabled straightforward answers to practical questions. The recursive process of analysis was managed with CAQDAS[1] software, NVivo 11, and a thematic map and table were generated to visualise thematic interrelationships in the data (Westcott et al., 2017a).

INTERPRETATIVE ANALYSIS AND DISCUSSION

In-depth analysis of the data on preparedness, categorised under the theme - *Be fire-fit: weekly is worth it!*, so-called to connect routine behaviour *(fire-fit)* with frequency *(weekly)* and net benefit *(is worth it)* - identified three areas of new policy (Table 1). These three areas have the potential to help establish pre-requisite conditions which favour good preparedness behaviour and improve longer-term public health and safety outcomes.

PROMOTING PREPAREDNESS through NEW POLICY
1. *Catastrophic Day Leave (CDL)*
2. *Financial incentives* • *Government fees and levies* • *New residents and rates discounts* • *Insurance policies* • *Community 'Best Practice' rewards* • *Property value-adding*
3. *Farming practices, fuels and firebreaks*

Table 1: Areas of new policy to facilitate effective routine preparedness

[1] Computer Assisted Qualitative Data Analysis System

1. Catastrophic Day Leave – a formal workplace agreement

In Australia, catastrophic days are declared at 4.00 pm the previous day by the Bureau of Meteorology (BOM) (Bierman, P. personal communication 2016). This information is freely and readily available to the public via the BOM website. At present however, people are faced with the dilemma of what to do on a catastrophic day even if they have a well written and established bushfire survival plan. A myriad of commitments can present as obstacles, including the requirements of the workplace.

To enact their plan, residents need time for that alone and the dilemma and problems employees can face when requesting leave of absence is reported by Wilkinson et al (2015) during the 2013 “Red October” bushfires in New South Wales, Australia. A formal contractual arrangement with employers could obviate this difficulty.

Catastrophic Day Leave (CDL) is proposed as a new workplace agreement which allows employers and employees to negotiate substituting another type of leave (e.g. recreation leave) with an agreed number of CDL days. Alternatively, CDL could be accrued in place of overtime, or other additional shifts. Potentially, colleagues, workmates and neighbours, encouraged by such a policy, would be prompted to instigate shared plans and arrangements within their community networks thereby promoting a culture of shared responsibility with mutual workplace benefits. Initiating this as a new form of workplace leave would have the dual effect of elevating a culture of bushfire preparedness to ‘business as usual’ status, and raise active awareness of the need to be prepared in the general community.

Senior firefighter, Shane, described the dilemma of time-poor families trying to juggle preparedness and their daily commitments:

> *Bush fires…to me are the greatest example of time and motion. The fire is in motion and you’ve never got enough time... there’s so much planning at an individual level and in the mosaic of a neighbourhood or a rural community to get every square ticked.*

CDL is not intended to replace leave already granted to employees who are emergency services volunteers for the purpose of participating in an emergency

response. Nor would it be used for out-of-season preparedness work as this should be done in a property owner's own time on non-catastrophic days. While CDL would not be particularly helpful to people who are self-employed, and catastrophic days could outnumber available days of leave, it recognises and proactively addresses the need to implement necessary societal-wide changes that are proportional to preparing for the 'new normal' of changing weather events (Council of Australian Governments, 2011, Gibbs et al., 2013, Gibbs et al., 2016).

2. Financial incentives – insurance, levies and rebates

Prevention and preparedness initiatives are vastly less costly than response, relief and recovery operations (Attorney-General's Department, 2014, McClean, 2017). In combination with CDL, financial incentives could further encourage the integration of widespread fire-fitness preparedness behaviours into daily routines. In the business focus group, Sandy said, *people respond very well to financial incentive. There needs to be an incentive for groups to actually come together and discuss and do things.*

2.1 Government fees and levies

At the current time, charges such as the *Emergency Services Levy (ESL),* or equivalent, are applied to landowners in all Australian States and in the Australian Capital Territory (State Custodians, 2017). These charges are frequently resented in rural areas where landowners (i) may have land and infrastructure assets but are 'cash poor', (ii) usually comprise a large proportion of the available fire-fighting personnel, and (iii) resource a response themselves with their own on-farm firefighting vehicles ('farm fire units'). Property owners therefore seem to pay the levy *and* for the privilege of fighting fires with their own equipment, often leaving their own farms and homes to contribute to community well-being. A separate scheme to negate the perceived adverse effects of charges like the ESL could reward best practice fire preparedness for everyone, including volunteer firefighters.

Local councils already have inspectors with the power to issue fines to land owners on residential or rural living blocks, who fail to make their properties fire ready. A relatively simple extension of this existing system could see preparedness rebates

issued, as well as fines. Alternatively, a ‘rewards’ system could translate to insurance premium discounts.

Volunteer rescue officer June spoke with respect to her role as a local government inspector:

> *We have to assess properties annually in October and send notices. I inspect 2,500 properties, rural living and residential properties in my area, and I only send about 120 notices. I hardly ever have to act on any of the notices. But I don’t visit farms, only residential. No-one visits farms, you’d just never get around to them all.*

An expansion of the inspectorate would be necessary to include farms. This could be facilitated by the use of ‘drone’ technology - Unmanned Aerial Vehicles (UAV’s) - or by land owners up-loading their own photographic or video evidence for assessment. Sheep and wheat farmer Paul’s opinion is that as good property preparedness does not attract a fine, it is, in itself, a financial incentive:

> *It's in their [Local Government’s] power to enforce people to clean up their blocks and they'll get a couple of notices if they haven't cleared the grass and eventually the council could do it and send them the bill. So, I guess there's a financial business incentive*.

However, a more rewards-based method of acknowledging best-practice preparedness would arguably be more effective in promoting widespread adoption of preparedness measures than the absence of a negative deterrent.

2.2 New residents and rates discounts

People are increasingly moving to peri-urban areas yet often they know little about fire preparedness. New people in at-risk fire areas could readily receive current information and assistance by attending non-compulsory community fire safety information sessions. They could be encouraged to do so via an invitation accompanying their first Council (Shire) rates notice, that offers all attendees a meaningful discount on the second year’s rates. To qualify, participation in a given number of fire information seminars would be required, which could be spread over a

12 month period to give maximum opportunity for people to attend. This kind of education could overcome new residents' misconceptions, as noted by Shane:

> *And then they [in the subdivision] remind me that it is incumbent upon us to actually go in there and save their house and horses… But we point out there are three fire trucks sitting in that shed and six hundred homes over that hill.*

2.3 Insurances

To complement these initiatives, a sliding scale of insurance premium discounts could be linked to them. This is part of a more holistic approach that recognises individuals' contribution to the common good, as well as to themselves, and emphasises the importance of local resilience practices (Poussin et al., 2013, Poussin et al., 2014). Fostering this paradigm would further help contribute to building preparedness as a routine behaviour, and could encourage wider uptake of appropriate insurances, as well as assisting those for whom affording a policy is challenging.

Self-responsibility and understanding of the impact good management and husbandry has in a broader societal context should be recognised. In recent Australian fire emergencies, uninsured landowners have occasionally been perceived as receiving Government relief benefits ahead of others who were well prepared and fully insured (Pinery Fire Local Recovery Committee 2017, personal communication). Proactively addressing this disparity is another avenue to promote prevention and preparedness initiatives and thereby reduce the costs to all stakeholders of response, relief and recovery operations (Attorney-General's Department, 2014, McClean, 2017). .

2.4 Community 'Best Practice' rewards

Extending existing community achievement and award programs to proactively promote a culture of bushfire safety and help build strong relationships with emergency services would be relatively simple to implement. A national or state public program of community recognition similar to the "Tidy Towns"[2] program, such

[2] "Tidy Towns" is an initiative of the Keep South Australia Beautiful (KESAB) campaign which began in 1978. It is now known as the Sustainable Communities program. See: http://www.kesab.asn.au/programs/sustainable-communities/program-information/

as “Bushfire Best-Prepared Towns”, could attract additional funding from government or corporate sources. Such initiatives have been shown to enhance community pride and collaboration, and have the potential to boost the local tourist economy as a preferred holiday destination for visitors due to increased public profile.

2.5 Property value-adding

At the individual level, identifying ‘bushfire-safer properties’ that comply with current Australian Standards (Standards Australia, 2009) could be readily achieved by the addition of a standard icon or symbol on notices and listings of properties for sale, or on the property entrance or gateway. This could be advantageous for vendors, and encourage other property owners to similarly ‘value-add’. This strategy would need to be aligned with a formal system of acknowledging eligible properties, such as described above. Qualifying properties could join a community ‘open house’ style program, similar to ‘open gardens’, to showcase and educate others to do likewise. As this concept is already established and understood by the community, extending it to fire safe properties is an achievable extrapolation.

3. Farming practices, fuels and firebreaks

Most farmer respondents agreed that modern farming techniques could influence fire behaviour. ‘Conservation farming’ practices such as no-till cropping, greater crop productivity, density of crop per hectare, improved plant structure and reduced farm firebreaks all contribute.

Sheep and wheat farmer Paul noted:

> *I think with our modern farming and agricultural techniques we’re achieving crop yields that are way and above what we’ve ever been able to do in the past…. 30 years, I’ve seen cereal yields double, and what that means, of course, is that there’s double the amount of crop residue over the summer period after the crops have been taken off, and the proportion of arable land going into crops has increased also. So we’ve got two contributing factors there [to heightened fire risk] - increased area of crop and also a greater crop residue, which adds to the fuel load.*

Retired wheat and sheep farmer Trevor added: *Everyone's intense cropping so you've got a lot more stubble, and so being able to stop the fire once they start is very difficult.* He went on to discuss the differences between types of crops, including options which might be more suitable adjacent to livestock: *Pasture or legume crops, they wouldn't carry a fire as quickly as canola stubble would, so that's an option that the farmer would have, if there's stock nearby.*

From a wheat and sheep property further north, Bob agreed with Paul and Trevor, adding:

There's been a huge increase in oil seed with canola predominantly, which burns very, very fast [and] very, very hot and that's pretty hard to stop, and there's continuous cropping. Now, every effort is made to retain stubble so the loads on the ground are just enormous. Crop yields have increased I would suggest by 50 percent over the last 20 years at least, so you've doubled the burnable material that's there to go up and so, of course, it goes like nuts.

Firebreaks have fallen out of favour, but as wheat and sheep farmer Paul noted, some compromise may be indicated.

> *The other thing I think that's contributed is that there are fewer fire breaks across the landscape. Once upon a time, farmers were quite diligent about preparing fire breaks right across their properties and with the greater amount of area cropped, that becomes problematic and farmers are less likely or less willing to do it, I think. So, all those things add up…*
>
> *Firebreaks give you something to burn back to. This could be made mandatory with a council by-law, so everyone has to do it. A little bit of loss could mean that a lot of people are safer. So, I think that's something that we could consider going forward – a by-law type of arrangement for strategic fire breaks.*

CONCLUSION

Making good preparedness behaviour and practises routine requires all stakeholders to undertake a proactive reassessment of how to 'do' preparedness and become fire-fit. Multi-media advertising campaigns, public information and freely accessible

resources already exist – but the premise on which they are founded needs re-evaluation to establish a culture of preparedness as 'business as usual' in society generally. Until that culture becomes established, this research suggests that more of the same messaging, however professional and sophisticated, will not significantly, nor sufficiently, narrow the awareness-preparedness gap. Uptakes of new social and workplace policies, such as Catastrophic Day Leave, reductions in insurance premiums or municipal fees, rewarding best practice and mandatory fire breaks on farms are more likely to influence and implement the necessary changes. Additionally, further fire science research to determine how changes in farming practices and crop types and density influence fire behaviour is needed to unequivocally manage and balance productivity versus safety. Given the predicted increase in extreme weather and fire severity, the challenge of fortifying community wellbeing in a bushfire emergency requires a dynamic, problem-solving paradigm melded from science, government and those most directly impacted, the at-risk communities themselves.

ACKNOWLEDGEMENTS

I would like to sincerely thank my PhD Supervisors, Dr Mel Taylor, Prof Kevin Ronan and Prof Hilary Bambrick for their help and support during this project.

Grateful thanks also to Dr Susan Mowbray and the Western Sydney University on-line Thesis Writing Group.

REFERENCES

ATTORNEY-GENERAL'S DEPARTMENT 2014. Productivity Commission inquiry into natural disaster funding arrangements. *In:* ATTORNEY GENERAL'S DEPARTMENT (ed.). Canberra: Australian Government.

BEYNON, H. 2016. *Extreme weather the "new normal"* [Online]. New York: United Nations Office for Disaster Risk Reduction. Available: https://www.unisdr.org/archive/49634 [Accessed 1 November 2016].

BRAUN, V. & CLARKE, V. 2013. *Successful Qualitative Research,* London, Sage.

CHUR-HANSEN, A. 2010. Grief and bereavement issues and the loss of a companion animal: People living with a companion animal, owners of livestock and animal support workers. *Clinical Psychologist,* 14**,** 14-21.

CORNISH, F. & GILLESPIE, A. 2009. A Pragmatist Approach to the Problem of Knowledge in Health Psychology. *Journal of Health Psychology,* 14**,** 800-809.

COUNCIL OF AUSTRALIAN GOVERNMENTS 2011. National Strategy for Disaster Resilience: Building Our Nation's Resilience to Disasters. DEPARTMENT OF

THE PRIME MINISTER AND CABINET. Canberra: Commonwealth of Australia.
DEPARTMENT OF ENVIRONMENT WATER AND NATURAL RESOURCES. 2016. *Managing natural resources* [Online]. Adelaide: Government of South Australia,. Available: http://www.environment.sa.gov.au/managing-natural-resources/water-resources [Accessed 10 August 2016].
DRABEK, T. E. 2004. *Social Dimensions of Disaster,* Emmitsburg, Emergency Management Institute, Federal Emergency Management Agency.
GIBBS, L., BRYANT, R., HARMS, L., FORBES, D., BLOCK, K., GALLAGHER, H. C., IRETON, G., RICHARDSON, J., PATTISON, P., MACDOUGALL, C., LUSHER, D., BAKER, E., KELLETT, C., PIRRONE, A., MOLYNEAUX, R., KOSTA, L., BRADY, K., LOK, M., VAN KESSELL, G. & WATERS, E. 2016. Beyond Bushfires: Community Resilience and Recovery Final Report. Melbourne: University of Melbourne.
GIBBS, L., WATERS, E., BRYANT, R. A., PATTISON, P., LUSHER, D., HARMS, L., RICHARDSON, J., MACDOUGALL, C., BLOCK, K., SNOWDON, E., GALLAGHER, H. C., SINNOTT, V., IRETON, G. & FORBES, D. 2013. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health,* 13**,** 1036.
GORDON, R. 2009. Community impact of disaster and community recovery. *InPsych - Australian Psychological Society*.
GORDON, R. 2015. How do people and communities react and recover after the fires. Melbourne: Dr Rob Gordon.
LEWIS, S. 2016. *Time to adapt: 2015's record-breaking temperatures will be normal by 2030* [Online]. Sydney: Australian Broadcasting Corporation. Available: http://www.abc.net.au/news/2016-11-07/record-breaking-temperatures-will-be-new-normal-by-2030/8001720 [Accessed 8 November 2016].
MCCLEAN, D. 2017. *Australia integrates climate and disaster risk* [Online]. Geneva: United Nations Office for Disaster Risk Reduction. Available: https://www.unisdr.org/archive/52874 [Accessed 1 May 2017].
NEW SCIENTIST. 2013. *Wild weather: extreme is the new normal* [Online]. Available: https://www.newscientist.com/article/mg21729003-200-wild-weather-extreme-is-the-new-normal/ [Accessed 1 November 2016].
PATON, D. 2013. Disaster Resilient Communities: Developing and testing an all-hazards theory. *Journal of Integrated Disaster Risk Management,* 3**,** 1-17.
POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2013. Stimulating flood mitigation through insurance: an assessment of the French CatNat system. *Environmental Hazards,* 12**,** 258-277.
POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2014. Factors of influence on flood damage mitigation behaviour by households. *Environmental Science & Policy,* 40**,** 69-77.
RONAN, K. R. & JOHNSTON, D. M. 2005. *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families*, Springer US.
ROYAL SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS. 2014. *How many pets are there in Australia?* [Online]. Available: kb.rspca.org.au/How-many-pets-are-there-in-Australia_58.html [Accessed 29 December 2014].
SAVIN-BADEN, M. & MAJOR, C. H. 2013. *Qualitative Research,* Abingdon, Routledge.

SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016. *Bushfire History* [Online]. Adelaide: South Australian Country Fire Service. Available: http://www.cfs.sa.gov.au/site/about/history/bushfire_history.jsp [Accessed 1 December 2016].

STANDARDS AUSTRALIA 2009. Australian Standard® Construction of buildings in bushfire prone areas. Sydney: Council of Standards Australia.

STATE CUSTODIANS. 2017. *Changes to fire services levy to affect home owners* [Online]. Charlestown: State Custodians. Available: https://www.statecustodians.com.au/changes-to-fire-services-levy-to-affect-home-owners [Accessed 8 May 2017].

WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017a. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science,* 4, 34.

WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017b. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology,* 5**,** 13.

********** END APPENDIX C **********

Appendix D - ANZDMC 2017 Table of Contents – *Peer reviewed papers*

The following pages of Appendix D are included to demonstrate this paper has been peer reviewed.

AUSTRALIAN & NEW ZEALAND DISASTER AND EMERGENCY MANAGEMENT CONFERENCE

22 -23 May 2017 I Jupiters Hotel, Gold Coast

anzdmc.com.au

ANZDMC 2017

Australian & New Zealand Disaster and Emergency Management Conference

Proceedings

ISBN: 978-1-922232-60-1

Publisher Details
Publisher Australian and New Zealand Mental Health Association Inc.
Contact Tara Smith
Address PO Box 29, Nerang QLD 4211
Telephone +61 7 5502 2068
Fax +61 7 5527 3298
Email: conference@anzdmc.com.au

Table of Contents

Peer Review Papers		
Skeffington, P	**Factors impeding resilience research with Australian first responders:**	**4**
Stern, H	**Developing financial market instruments to protect against what could be dramatically escalating costs, should certain possible future climate change scenarios be realised.**	**12**
Westcott, R	**Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study.**	**26**

Appendix E: Recruitment posters and flyers

University of Western Sydney

bushfire&natural HAZARDSCRC

MAiD

YOU ARE INVITED TO TELL US ABOUT YOUR EXPERIENCES IN BUSHFIRES

Adelaide veterinarian Rachel Westcott is conducting research from June 2015 in **Port Lincoln** and **Lower Eyre Peninsula** about how **animal owners** and **emergency services** help each other **manage animals in a bushfire** so that we can find better ways to do this.

Research will take place in small discussion groups.

For more information contact Rachel on

0427 70 70 44 (message, text or call) or

Email **R.Westcott@uws.edu.au**

Blog: **ptlincolnproject.wordpress.com**

University of Western Sydney

bushfire&natural HAZARDSCRC

MAID

HORSE OWNERS!

YOU ARE INVITED TO DISCUSS

YOUR EXPERIENCES AND IDEAS ABOUT MANAGING HORSES IN BUSHFIRES

With researching vet Rachel Westcott

WHERE: WHEATSHEAF HOTEL

WHEN: TUESDAY 25 AUGUST

AT: 7.00 PM

For more information contact Rachel on

0427 70 70 44 (message, text or call) or

Email **R.Westcott@uws.edu.au**

Blog: **ptlincolnproject.wordpress.com**

University of Western Sydney

THE PORT LINCOLN PROJECT
BUSHFIRE RESEARCH

by
ADELAIDE HILLS VETERINARIAN
Rachel Westcott
in
PORT LINCOLN & LOWER EYRE PENINSULA

Animal owners and Emergency Responders are invited to discuss experiences and ideas about managing animals in bushfires.

For more information contact Rachel

M: 0427 70 70 44
Email: R.Westcott@uws.edu.au
Blog: ptlincolnproject.wordpress.com

Volunteers are invited to join bushfire research project

Adelaide veterinarian Rachel Westcott is conducting research in Port Lincoln and Lower Eyre Peninsula during Winter 2015, about how animal owners and emergency services help each other manage animals in a bushfire so that we can find better ways to do this, and help the community too.

Research will take place in small discussion groups, followed later by a survey. You may join one, or both parts of the research.

For more information contact Rachel on **0427 707 044** or email **R.Westcott@uws.edu.au**

This project is funded by the University of Western Sydney and the Bushfire and Natural Hazards Cooperative Research Centre.

ptlincolnproject.wordpress.com

THE PORT LINCOLN PROJECT
BUSHFIRE RESEARCH

Rachel Westcott
BVMS(Hons)

Mobile: 0427 70 70 44
Email: R.Westcott@uws.edu.au
Blog: ptlincolnproject.wordpress.com

'about animals, their owners and Emergency Services in bushfire on Lower Eyre Peninsula'

Appendix F: Participant information and consent forms

The following pages of Appendix F contain, sequentially, the participant information and consent forms for:

Emergency Responders

Animal owners

Animal related small businesses

The pilot survey

Centre for Health Research
School of Medicine
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia
Telephone: (02) 4620 3669
Email: R.Westcott@uws.edu.au

University of Western Sydney
Bringing knowledge to life

Participant Information Sheet - Responders

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

Project Summary: This project will study the interaction between animal owners and emergency responders in a bushfire. The aim of the study is to find improvements in how animals can be managed, and their owners and emergency responders assisted, in a bushfire emergency, and as well, to improve public and community safety and well-being.

You are invited to participate in a research study being conducted by Rachel Westcott, PhD candidate in the Centre for Health Research, School of Medicine, under the Supervision of Dr Melanie Taylor, Senior Research Fellow, Centre for Health Research, School of Medicine.

How is the study being paid for?
The study is being sponsored by the Bushfire and Natural Hazards Cooperative Research Centre, and is part of Dr Taylor's larger BNHCRC project: *Managing Animals in Disasters*.

What will I be asked to do?
You will be asked to agree to an interview with the researcher, or to take part in a small discussion group, which will be audio recorded. There will be a framework of questions, but with plenty of scope for you to answer without feeling restricted or constrained by the questions. If you think of things you'd like to add afterwards, there will be the opportunity to do this. We want to hear what *you* have to say about animals in bushfires, from the perspective of emergency responders. The audio recording will be transcribed prior to data analysis, but you will not be identified in the transcript.

How much of my time will I need to give?
The interview or group discussion will take about 60 minutes (interviews) to 90 minutes (group discussions) to complete, and if convenient can take place at your workplace in Port Lincoln for interviews, or in a mutually agreed location central to all participants for discussion groups.

What specific benefits will I receive for participating?
The main benefits for you will be the satisfaction of knowing that you have contributed to a study which aims to help the whole of your community and its animals, and hopefully benefit other communities interstate or overseas as well. You also have the opportunity to learn about the experiences and needs of animal owners in your region, and how emergency responders and animal owners can collaborate effectively in a bushfire.

Will the study involve any discomfort for me? If so, what will you do to rectify it?
No, the study will not involve any physical discomfort for you. If there is anything you don't wish to talk about, you are free to leave, or withdraw from the study at any time. Should you feel any emotional distress about topics discussed, we will stop the interview or discussion immediately and make sure you have the support you need before continuing, or terminating, your participation.

How do you intend to publish the results?
Please be assured that only the researchers will have access to the raw data you provide.

The findings of the research will be published in the candidate's PhD thesis, in journals such as the Australian Journal of Emergency Management, Journal of Contingencies and Crisis Management, and the International Journal of Disaster Risk Reduction, and in conference proceedings, such as the Australasian Fire & Emergency Services Authorities Council.

*Please note that the minimum retention period for data collection is five years.

Can I withdraw from the study?
Participation is entirely voluntary and you are not obliged to be involved. If you do participate, you can withdraw at any time without giving a reason.

If you do choose to withdraw, any information that you have supplied in an interview will not be included in the results. It will be as though you did not take part. If you choose to withdraw from a discussion group, the information you have contributed will remain in the audio recording and transcript, but you will not be identified.

Can I tell other people about the study?
Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

Data storage
There are a number of government initiatives in place to centrally store research data and to make it available for further research. For more information, see **http://www.ands.org.au/** and **http://www.rdsi.uq.edu.au/about**. Regardless of whether the information you supply or about you is stored centrally or not, it will be stored securely and it will be de-identified before it is made to available to any other researcher.

What if I require further information?
Please contact the researcher, Rachel Westcott, or her Supervisor, Dr Melanie Taylor, should you wish to discuss the research further before deciding whether or not to participate.

Rachel Westcott	R.Westcott@uws.edu.au	0427 70 70 44
Dr Melanie Taylor	mel.taylor@mq.edu.au	(02) 4620 3669

What if I have a complaint?
This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0905 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form.

Participant Consent Form

This is a project specific consent form. It restricts the use of the data collected to the named project by the named investigators.

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

I,_____ , consent to participate in the research project titled *Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.*
.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to taking part in an interview or a small discussion group, and for that interview or group to be audio recorded for research purposes.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher now or in the future.

Signed:

Name:

Date:

Return Address: PO Box 1 Bridgewater SA 5155

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229
Fax +61 2 4736 0905 or email humanethics@uws.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Centre for Health Research
School of Medicine
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia
Telephone: (02) 4620 3669
Email: R.Westcott@uws.edu.au

University of Western Sydney
Bringing knowledge to life

Participant Information Sheet – Groups/interviews, Animal Owners

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

Project Summary: This project will study the interaction between animal owners and emergency responders in a bushfire. The aim of the study is to find improvements in how animals can be managed, and their owners and emergency responders assisted, in a bushfire emergency, and as well, to improve public and community safety and well-being.

You are invited to participate in a research study being conducted by Rachel Westcott, PhD candidate in the Centre for Health Research, School of Medicine, under the Supervision of Dr Melanie Taylor, Senior Research Fellow, Centre for Health Research, School of Medicine.

How is the study being paid for?
The study is being sponsored by the Bushfire and Natural Hazards Cooperative Research Centre, and is part of Dr Taylor's larger BNHCRC project: *Managing Animals in Disasters*.

What will I be asked to do?
You will be asked for an interview, or to join a small discussion group, comprising animal owners of a similar type of animal to those you own. The discussion will be given direction by the researcher with a series of questions, but we want to hear what *you* have to say about animals in bushfires. If you think of things later that you would like to include, you will have the opportunity to do that if you wish. The discussions will be audio recorded so that we can transcribe the information, but you will not be identified in the transcript.

How much of my time will I need to give?
The discussion will take about 60 to 90 minutes to complete, with a break in the middle of the session. You may need to allow for travel to and from the venue, which could be in Port Lincoln, other nearby towns, your workplace or home.

What specific benefits will I receive for participating?
The main benefits for you will be the satisfaction of knowing that you have contributed to a study which aims to help the whole of your community and its animals, and hopefully other communities interstate or overseas as well. You also have the opportunity to perhaps increase your own knowledge of how to manage your own animals in a bushfire and meet people you can effectively collaborate with.

Will the study involve any discomfort for me? If so, what will you do to rectify it?
No, the study will not involve any physical discomfort for you. If there is anything you don't wish to talk about, you are free to leave, or withdraw from the study at any time. Should you feel any emotional distress about topics discussed, we will stop the discussion immediately and make sure you have the support you need before continuing, or leaving the group.

How do you intend to publish the results?
Please be assured that only the researchers will have access to the raw data you provide.

The findings of the research will be published in the candidate's PhD thesis, in journals such as the

Australian Journal of Emergency Management, Journal of Contingencies and Crisis Management, and the International Journal of Disaster Risk Reduction, and in conference proceedings, such as the Australasian Fire & Emergency Services Authorities Council.

*Please note that the minimum retention period for data collection is five years.

Can I withdraw from the study?
Participation is entirely voluntary and you are not obliged to be involved. If you do participate, you can withdraw at any time without giving a reason.

If you do choose to withdraw, any information that you have supplied will remain as part of the recording and transcript of the discussion, but you will not be identifiable.

Can I tell other people about the study?
Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

Data storage
There are a number of government initiatives in place to centrally store research data and to make it available for further research. For more information, see **http://www.ands.org.au/** and **http://www.rdsi.uq.edu.au/about**. Regardless of whether the information you supply or about you is stored centrally or not, it will be stored securely and it will be de-identified before it is made to available to any other researcher.

What if I require further information?
Please contact Rachel Westcott, or Dr Melanie Taylor, should you wish to discuss the research further before deciding whether or not to participate.

Rachel Westcott	R.Westcott@uws.edu.au	0427 70 70 44
Dr Melanie Taylor	mel.taylor@mq.edu.au	(02) 4620 3669

What if I have a complaint?
This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0905 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form.

Human Research Ethics Committee
Office of Research Services

Participant Consent Form

This is a project specific consent form. It restricts the use of the data collected to the named project by the named investigators.

Project Title: Investigating the interactions of animal owners and emergency responders in a bushfire natural hazard.

I,_____ , consent to participate in the research project titled *Investigating the interactions of animal owners and emergency responders in a bushfire natural hazard.* .

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to taking part in a small discussion group or interview, and for that group to be audio recorded for research purposes.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher now or in the future.

Signed:

Name:

Date:

Return Address: PO Box 1 Bridgewater SA 5155

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is: H11118

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229
Fax +61 2 4736 0905 or email humanethics@uws.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Centre for Health Research
School of Medicine
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia
Telephone: (02) 4620 3669
Email: R.Westcott@uws.edu.au

University of Western Sydney
Bringing knowledge to life

Participant Information Sheet - Businesses

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

Project Summary: This project will study the interaction between animal owners and emergency responders in a bushfire. The aim of the study is to find improvements in how animals can be managed, and their owners and emergency responders assisted, in a bushfire emergency, and as well, to improve public and community safety and well-being.

You are invited to participate in a research study being conducted by Rachel Westcott, PhD candidate in the Centre for Health Research, School of Medicine, under the Supervision of Dr Melanie Taylor, Senior Research Fellow, Centre for Health Research, School of Medicine.

How is the study being paid for?
The study is being sponsored by the Bushfire and Natural Hazards Cooperative Research Centre, and is part of Dr Taylor's larger BNHCRC project: *Managing Animals in Disasters*.

What will I be asked to do?
You will be asked to agree to an interview with the researcher, or to take part in a small discussion group, which will be audio recorded. There will be a framework of questions, but with plenty of scope for you to answer without feeling restricted or constrained by the questions. If you think of things you'd like to add afterwards, there will be the opportunity to do this. We want to hear what *you* have to say about animals in bushfires, from the perspective of emergency responders. The audio recording will be transcribed prior to data analysis, but you will not be identified in the transcript.

How much of my time will I need to give?
The interview or group discussion will take about 60 minutes (interviews) to 90 minutes (group discussions) to complete, and if convenient can take place at your workplace in Port Lincoln for interviews, or in a mutually agreed location central to all participants for discussion groups.

What specific benefits will I receive for participating?
The main benefits for you will be the satisfaction of knowing that you have contributed to a study which aims to help the whole of your community and its animals, and hopefully benefit other communities interstate or overseas as well. You also have the opportunity to learn about the experiences and needs of animal owners in your region, and how emergency responders and animal owners can collaborate effectively in a bushfire.

Will the study involve any discomfort for me? If so, what will you do to rectify it?
No, the study will not involve any physical discomfort for you. If there is anything you don't wish to talk about, you are free to leave, or withdraw from the study at any time. Should you feel any emotional distress about topics discussed, we will stop the interview or discussion immediately and make sure you have the support you need before continuing, or terminating, your participation.

How do you intend to publish the results?
Please be assured that only the researchers will have access to the raw data you provide.

The findings of the research will be published in the candidate's PhD thesis, in journals such as the Australian Journal of Emergency Management, Journal of Contingencies and Crisis Management, and the International Journal of Disaster Risk Reduction, and in conference proceedings, such as the Australasian Fire & Emergency Services Authorities Council.

*Please note that the minimum retention period for data collection is five years.

Can I withdraw from the study?
Participation is entirely voluntary and you are not obliged to be involved. If you do participate, you can withdraw at any time without giving a reason.

If you do choose to withdraw, any information that you have supplied in an interview will not be included in the results. It will be as though you did not take part. If you choose to withdraw from a discussion group, the information you have contributed will remain in the audio recording and transcript, but you will not be identified.

Can I tell other people about the study?
Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

Data storage
There are a number of government initiatives in place to centrally store research data and to make it available for further research. For more information, see **http://www.ands.org.au/** and **http://www.rdsi.uq.edu.au/about**. Regardless of whether the information you supply or about you is stored centrally or not, it will be stored securely and it will be de-identified before it is made to available to any other researcher.

What if I require further information?
Please contact the researcher, Rachel Westcott, or her Supervisor, Dr Melanie Taylor, should you wish to discuss the research further before deciding whether or not to participate.

Rachel Westcott	R.Westcott@uws.edu.au	0427 70 70 44
Dr Melanie Taylor	melanie.taylor@uws.edu.au	(02) 4620 3669

What if I have a complaint?
This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0905 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form.

Participant Consent Form

This is a project specific consent form. It restricts the use of the data collected to the named project by the named investigators.

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

I,_____ , consent to participate in the research project titled *Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.*
.

I acknowledge that:

I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher.

The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

I consent to taking part in an interview or a small discussion group, and for that interview or group to be audio recorded for research purposes.

I understand that my involvement is confidential and that the information gained during the study may be published but no information about me will be used in any way that reveals my identity.

I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher now or in the future.

Signed:

Name:

Date:

Return Address: PO Box 1 Bridgewater SA 5155

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229
Fax +61 2 4736 0905 or email humanethics@uws.edu.au. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Centre for Health Research
School of Medicine
University of Western Sydney
Locked Bag 1797
Penrith NSW 2751
Australia
Telephone: (02) 4620 3669
Email: R.Westcott@uws.edu.au

University of Western Sydney
Bringing knowledge to life

Participant Information Sheet – Surveys

Project Title: Investigating the interaction of animal owners and emergency responders in a bushfire natural hazard.

Project Summary: This project will study the interaction between animal owners and emergency responders in a bushfire. The aim of the study is to find improvements in how animals can be managed, and their owners and emergency responders assisted, in a bushfire emergency, and as well, to improve public and community safety and well-being.

You are invited to participate in a research study being conducted by Rachel Westcott, PhD candidate in the Centre for Health Research, School of Medicine, under the Supervision of Dr Melanie Taylor, Senior Research Fellow, Centre for Health Research, School of Medicine.

How is the study being paid for?
The study is being sponsored by the Bushfire and Natural Hazards Cooperative Research Centre, and is part of Dr Taylor's larger BNHCRC project: *Managing Animals in Disasters*.

What will I be asked to do?
You will be asked to complete a survey in hard copy, or on-line. If preferred, arrangements can be made to complete the survey over the telephone. The survey will comprise some questions which require you to choose an option on the form or answer a direct question, and others which are "open", that is, you can answer freely with no constraints on your responses. We want to learn about *your* opinions and experiences. If you think of things later after submitting your survey that you would like to mention, you will have the opportunity to do that if you wish. The survey is anonymous, and you will not be identified on the survey document.

How much of my time will I need to give?
The survey will take about 30 minutes to complete. If completing the survey on paper, you will be provided with a reply paid envelope to return it in.

What specific benefits will I receive for participating?
The main benefits for you will be the satisfaction of knowing that you have contributed to a study which aims to help the whole of your community and its animals, and hopefully other communities interstate or overseas as well.

Will the study involve any discomfort for me? If so, what will you do to rectify it?
No, the study will not involve any physical discomfort for you. If you complete the survey by telephone, and there is anything you don't wish to talk about, you are free to terminate the survey conversation, or withdraw from the study at any time. Should you feel any emotional distress due to the topics discussed, we will make sure you have the support you need before continuing, or terminating the conversation.

How do you intend to publish the results?
Please be assured that only the researchers will have access to the raw data you provide.

The findings of the research will be published in the candidate's PhD thesis, in journals such as the

Australian Journal of Emergency Management, the Australian Veterinary Journal, the Journal of Contingencies and Crisis Management, and the International Journal of Disaster Risk Reduction, and in conference proceedings, such as the Australasian Fire & Emergency Services Authorities Council.

*Please note that the minimum retention period for data collection is five years.

Can I withdraw from the study?
Participation is entirely voluntary and you are not obliged to be involved. If you do participate, you can withdraw at any time without giving a reason.

If you do choose to withdraw, any information that you have supplied will not be included in the results. It will be as though you did not take part.

Can I tell other people about the study?
Yes, you can tell other people about the study by providing them with the chief investigator's contact details. They can contact the chief investigator to discuss their participation in the research project and obtain an information sheet.

Data storage
There are a number of government initiatives in place to centrally store research data and to make it available for further research. For more information, see **http://www.ands.org.au/** and **http://www.rdsi.uq.edu.au/about**. Regardless of whether the information you supply or about you is stored centrally or not, it will be stored securely and it will be de-identified before it is made to available to any other researcher.

What if I require further information?
Please contact the researcher, Rachel Westcott, or Dr Melanie Taylor, should you wish to discuss the research further before deciding whether or not to participate.

Rachel Westcott	R.Westcott@uws.edu.au	0427 70 70 44
Dr Melanie Taylor	melanie.taylor@uws.edu.au	(02) 4620 3669

What if I have a complaint?
This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H11118.

If you have any complaints or reservations about the ethical conduct of this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229 Fax +61 2 4736 0905 or email humanethics@uws.edu.au.

Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree to participate in this study, you will be asked to sign the Participant Consent Form. You will find this at the beginning of the survey if you are completing the paper version. If you have made arrangements to answer the survey by telephone, we will post you a consent form with a reply paid envelope in advance of the appointed telephone call, with enough time to return it. The consent process for the on-line survey will be fully explained in the information preceding the beginning of the survey, and after reading that information you can proceed to the survey if you wish to continue.

Appendix G: Interview guides

The following pages of Appendix G contain the Interview Guides for:

Emergency responders

Animal owners (including farmers)

APPENDIX G: INTERVIEW GUIDE - Primary responders

1. Background: Hazard severity

- How does "fire season" seem to have changed over the last 10 -15 years?
- How does a response begin?
    - Resources available and/or deployed
    - 'Situation reports' and communications
    - Decision making – local knowledge, prior experience, precautionary actions, intelligence from first-on-site, influence of ambient conditions
    - Is it assumed that a fire *could* reach (the highest) Level 3
- Likelihood of occurrence –how are prevention and preparedness messages communicated in off-season? Are particular demographics targeted?
- As a community member, how does being trained as a firefighter/Emergency services member change attitudes to a bushfire hazard?
- Are firefighters/first responders as individuals, each a conduit of information out into the community?
- How do firefighters/responders deal with being away on a fire truck, when their own homes or properties may be under bushfire threat?
- Hypothetically, if a fire crew goes to the assistance of a household who have stayed to defend, but for whatever reason that is no longer tenable, and the crew and the residents are in danger as a single group - the fire crew would take control of the situation - how collaborative can such an action be between both parties, or can it?
- How do the fire crew enforce "life, property, environment" in circumstances when people may be attempting to gather possessions, or save animals?

2. With respect to animals

- What kinds of animal issues have arisen during a bushfire response?
    - companion animals
    - assistance animals
    - horses
    - livestock
    - wildlife
    - animals wandering at large

    - businesses e.g. boarding kennels
- Getting back to *Life, Property, Environment*: How do you manage the ‘grey’ areas, such as livestock as property
- Have fire crews picked up animals in field, or are they given animals (especially wildlife) by members of the public?
- What do they do with them?
- Does this detract from core business?
- Fire crews can be distressed by issues of animal welfare during a fire – how do you manage this?
    - Debrief/After Action Review
    - Can it detract/distract from response/team efficacy?
- What about home owners – wanting to return home to attend to livestock/pets/animals in their care?
- How do primary responders perceive animal owners, with respect to expectations of behaviour in a fire, and their capabilities?
- Have animal owners caused difficulties for responders in-field? e.g. with well-meaning people (with disregard for their own safety) attempting to rescue animals from a fire? Are these people animal owners? Others unauthorised? Media?
- What interaction or support has there been locally with existing animal agencies – Primary Industries and Resources SA (PIRSA), Royal Society for the Prevention of Cruelty to Animals (RSPCA), Department of Environment, Water and Natural Resources (DEWNR), Council or Shire Ranger etc?
- What are your observations of animal owners in the field? e.g. Levels of preparation, eagerness to cooperate?
- Are there challenges for responders with respect to assistance they may be called upon to give, or wish to give, animal owners or to animals directly; or with respect to what they should do, what they can do, and what they actually do? (behaviour in the field vs policy)

3. <u>Information gathering and organisational cohesion/communication</u>

- How is information sourced in a response, as an input (e.g. field intelligence) and an output (information and advocacy back to community)?

- Within the organisation, how is local knowledge integrated with centralised directives?
- How is information given to the community assessed for accuracy and timeliness?
- How is accuracy balanced with giving the community information early in the event timeline?
- Is organisational credibility (e.g. public perception of the “brand”) consciously used to engage community?
- Have problems with animals and/or their owners presenting in-field adversely affected community relations?
- Has this been addressed in After Action Reviews?
- How well does inter-organisational cooperation/collaboration work – primary responders with PIRSA, RSPCA, DEWNR, Council Ranger etc?
- Individual and community knowledge base – are there particular groups or demographics which are difficult to engage?
- Are there groups which could benefit from bespoke response options?
- What training courses or workshops are available for the public, and do these include identified special groups, such as animal owners?

OPPORTUNITY FOR OPEN DISCUSSION, CLOSING COMMENTS AND THANKS

APPENDIX G: INTERVIEW GUIDE - Animal owners (companion, assistance, recreational, wildlife, business oriented or large-scale primary production animals)

1. Background and introduction

- How long have you lived in the area?
- Where do you live:
    - Town
    - on farm
    - moved from farm to town
    - other
- Do you have a bushfire survival plan for your family and animals?
- For the property?
- Are you a member of community groups/clubs/service clubs?
- Other volunteer Emergency groups such as CFS?
- What have been your experiences with bushfires over the last 10 years?
- Just as an overview:
- Have you have been directly affected (e.g. evacuated, fought the fire), or indirectly affected (prepared to evacuate, family/friends directly affected)

2. Sources of information before a fire

- How confident do you feel about your own knowledge about bushfire preparedness?
- Where would you go for more or for current information?
- Which sources of information do you see as providing accurate and reliable information? Why?
- Are there sources of information you would not go to? Why?
- Previous experience with relevant agencies – does past experience affect who you go to for accurate information?
- What information have you sought in the past?
- Are there gaps or queries still to fill or answer?
- What information do you think you may need in the future? Do you think that will be readily available?
- Have gaps been identified that need filling?

- Is there usually enough up to date information available early in the timeline of a fire event?
- Where does that usually come from?
- Of these, what are the most significant issues relevant to you as an animal owner?

3. Organisational trust

- How helpful have various agencies been when you have approached them for information generally, i.e. not necessarily with animals?
- You may have multiple experiences with multiple agencies - have they been consistent within the same agency?
- How do previous responses from those agencies affect your readiness to approach them again?
- If your animals have been involved, did that affect how agencies were able to assist you, and how?

4. Turning information into action, and uncertainty into confidence

- Perhaps you feel completely confident you could effectively cope with a future bushfire event. But if not, what do you think needs to happen so you can reach that point, or make progress towards reaching that point?
- How confident are you that you have sufficient resources, and the practical ability to carry out your plan, given your own personal or domestic circumstances?
- How different would this be if you were home alone, or if you had your usual family members present? What different resources would you need?
- Bushfire preparation is an annual necessity. Do you collaborate with neighbours, other social groups, or with groups of like-minded people, such as you might meet at a training course like the CFS Fiery Women program?
- Do you make arrangements with remote safe locations in a “buddy” system?
- *Outcome expectancy – positive or negative*
- How do you think you’d go with a bad fire nearby next fire season?
- How ready are you? Confident?

- From the perspective of owning animal(s) what specific resources or information would make you feel more able to prepare for bushfire?

5. Hazard severity and likelihood, mitigation measures and self-efficacy

- With respect to severity, that is, how severe you perceive the threat of a fire to be – do you think you would stay and defend, or leave early? What criteria would you apply to make that decision?
- How likely do you think a serious fire is to occur near Pt Lincoln again?
- Does thinking that change what you, as an individual, would do?
- With respect to the likelihood that a bushfire will occur – do you think bushfires might be more or less dangerous in the future? More or less frequent?
- Mitigation available – do you believe there are appropriate responses to a bushfire that are realistically available and attainable by you, that will promote your safety, and effectively reduce the harmful, or undesirable consequences of a fire?
- Do you think you could carry out these responses?
- From the perspective of an animal owner?

6. Special circumstances and the need for bespoke adaptive solutions

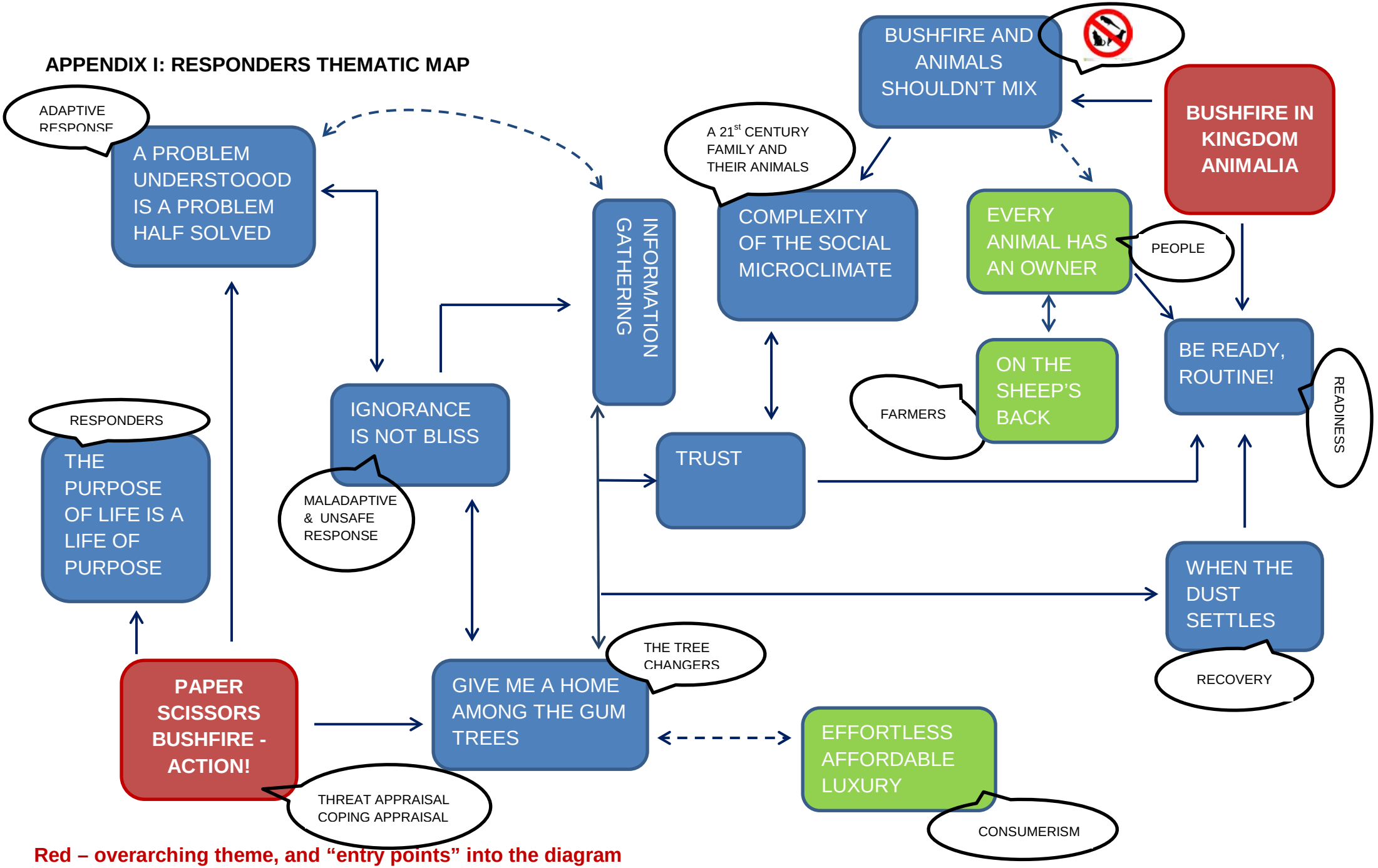
- Do you think you need any additional mitigation/response options or measures with respect to your animals?
- Remembering the different animals that could be owned by, or cared for, by you.
- How does your behaviour differ when you are looking after others, rather than just yourself?
- This can include human family, with or without animals
- e.g. do you need more time to get organised, or does having other people around speed things up?

OPPORTUNITY FOR OPEN DISCUSSION, CLOSING COMMENTS AND THANKS

Appendix H: CODING EXAMPLES, Interviews and Focus groups

Raw data code →	NVivo code →	(Named) Theme →	Overarching theme
• Animals add complexity to people's life and bushfire planning. • Animal behaviour changes in events such as bushfire • Some people make bookings at the local kennels on extreme days • External gates should not be opened, but do open internal gates • Horses sometimes are released to run free on the road	Animal issues and bushfire plans Animals wandering at large	**Animals and bushfires shouldn't mix**	**Bushfire in *Kingdom Animalia***
• Most people don't have a bushfire survival plan (BSP) • Enacting your BSP can easily take 24 hours • Not preparing is dangerous regardless of what others do or don't do • Preparedness needs to become routine	Bushfire survival plans Preparedness	**Preparedness – Be fire-fit! Weekly is worth it!**	
• The more complex the social situation, the narrower the response options which are themselves more complex • It's unrealistic to think you can be bushfire ready in just one day • Keys to successful community engagement include being known and trusted	Complexity of the social microclimate Trust	**Complexity of the social microclimate**	
• People who don't prepare can act unsafely at the last minute • There will always be a group of people in society who do make unsafe decisions and act undesirably • Optimistic bias - we overestimate that bad things happen to others, and good things happen to us • Some people don't convert intention to action until a trigger appears	Unsafe behaviour Maladaptive response	**Ignorance is not bliss!**	**Paper, Scissors, Bushfire, Action!**
• Sharing arrangements with neighbours can be very helpful • People should remember to use old fashioned corded phones, and use their eyes, nose and ears • Being bushfire ready isn't that different from solving other life problems • Plan for children - schools are closed for a large portion of fire danger season	Response- and self-efficacy Adaptive response	**A problem understood is a problem half solved!**	

APPENDIX I: RESPONDERS THEMATIC MAP



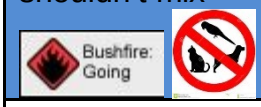
Red – overarching theme, and "entry points" into the diagram

Blue – theme

Green - subtheme

Appendix J

Appendix J includes the thematic table as published in Paper 2 on page 45 of this thesis, followed by a second table briefly outlining the content of each named theme. Naming themes frequently occurs in a Thematic Analysis (Braun and Clark 2013, p 258).

<table>
<tr><th colspan="2">BUSHFIRE IN KINGDOM ANIMALIA
(the taxonomic subject of this research)</th><th colspan="2">PAPER, SCISSORS, BUSHFIRE, ACTION!
(threat appraisal, coping appraisal)</th></tr>
<tr><td>BLUE = theme</td><td>GREEN = subtheme</td><td></td><td>RED = overarching theme</td></tr>
<tr><td>1.Bushfire and animals shouldn’t mix  </td><td>1a. (Nearly) every animal has an owner (people)</td><td>6. The purpose of life is a life of purpose (responders)</td><td></td></tr>
<tr><td></td><td>1b. On the sheep’s back (farmers)</td><td>7. A problem understood is a problem half solved (adaptive response)</td><td></td></tr>
<tr><td>2. Be ready, routine! (readiness)</td><td></td><td>8.Ignorance is not bliss (maladaptive & unsafe response)</td><td></td></tr>
<tr><td>3. Complexity of the social microclimate (the 21st century family & their animals)</td><td></td><td>9. Give me a home among the gum trees (the tree-changers)</td><td>9a. Effortless affordable luxury (consumerism)</td></tr>
<tr><td></td><td colspan="2">4. Trust</td><td></td></tr>
<tr><td></td><td colspan="2">5. Information gathering</td><td></td></tr>
<tr><td>10. When the dust settles (recovery)</td><td></td><td></td><td></td></tr>
</table>

Theme number	Theme name	Notes
1	Bushfire and animals shouldn't mix	The overview theme – analysed to narrow the research focus.
1a	(Nearly) every animal has an owner	Animal owners and managers – the people associated with animals. Group 2 of participants. Some animals are un-owned, such as wildlife or stray animals.
1b	On the sheep's back	Farmers, farming practices, fuels and firebreaks. Also part of Group 2. Sheep are numerically the largest livestock species farmed in the research site. Colloquially, Australia is said to have developed an early prosperous economy "on the sheep's back", largely due to wool production.
2	Be fire-fit! Weekly is worth it! (Renamed from *Be ready, routine!* when the original term "fire-fitness" was first used).	The preparedness theme – the theme of the major results and strategies listed in this thesis. Fire-fitness is an original term meaning normalised, every-day, routine preparedness.
3	Complexity of the social microclimate	Implicated in the aetiology of decision making. Understanding this social unit illuminates its potential possibilities to effect proactive and positive response choices to attain fire-fitness.
4	Trust	Both implicated in policy and decision making. Relationships with Emergency Services, and other relief or recovery agencies is influenced by prior experience. Accurate and timely communications are important to achieve adaptive response choices.
5	Information gathering	
6	The purpose of life is a life of purpose	Emergency responders – Group 1 of participants. Salaried and volunteer first responders choose their role for reasons including the ability to contribute to the common good of their communities and to the well-being of society.
7	A problem understood is a problem half solved	Adaptive rewards as opposed to costs – achieving a net gain: e.g. spending time and money to value-add to a property and making a profit at point-of-sale, instead of taking a holiday.
8	Ignorance is not bliss	Maladaptive costs negate maladaptive rewards, e.g. attracting fines and criticism for failing to clean up a property, due to lack of time caused by choosing to take extra shifts at work.
9	Give me a home among the gum trees	The "tree-changers" – people who move from an urban to a rural environment for lifestyle reasons. New or novice land owners may need help, support and education about their new responsibilities.
9a	Effortless, affordable luxury	Consumerism – linked to maladaptive responses. Failure to recognise that fire-fitness is everyone's responsibility. The belief that individual effort is not required.
10	When the dust settles	Recovery- and long term change. Recovery begins at the same time as Response, but may never end. This may be positive, e.g. redesigning farms or planting a watered garden – or negative, e.g. mental ill-health or severe financial loss.

Appendix K: Farmer pilot survey

The following pages of Appendix K contain the pilot survey written using *SurveyMonkey*.

BACKGROUND INFORMATION

BACKGROUND INFORMATION FOR THIS SURVEY

Thankyou for taking the time to read this information.

This survey is part of veterinarian Rachel Westcott's bushfire research on Lower Eyre Peninsula, which is funded by the Bushfire and Natural Hazards Cooperative Research Centre. The overall purpose of the research is to find new ways to narrow the bushfire awareness-preparedness gap, and ultimately to save more human life in a bushfire emergency. We want people and communities, with their animals, to be safer in a bushfire event, to protect life, property and the environment.

The purpose of this survey is to contribute to the overall study aim by focussing on farmers' bushfire knowledge and experience. Participation is *not* conditional on having been involved in a fire response - we value your input whether or not a fire has impacted on you or your farm. The only requirement is that you are a current or retired primary producer - as a farm owner, manager or worker. Farmers generally have a reputation for being resourceful and self-reliant, and we would like to know more about your bushfire knowledge and management strategies because we hope to translate some of your wisdom to other less knowledgeable groups.

The survey should take about 15-25 minutes to complete, depending on how much written comment you'd like to provide, and we would greatly value your participation. The survey "saves" as you go by clicking the "next" button, so you can complete it in more than one session. There are no compulsory questions, other than the consent page below, and where you need to answer a question to take you to your next relevant page, which will skip over some questions which don't apply to you. These are marked with an asterisk (*). Other than these, you may skip any question you would rather not answer. We have designed the survey like this because we are aware that you might prefer not to recall some bushfire experiences in detail.

We understand that harvest is approaching, and that recent severe weather events in South Australia in late September-early October 2016 have put additional pressure on many regions. This makes us even more appreciative of your help and contribution. If possible, would you please consider sharing the link to this survey with other farmers in your neighbourhood and networks. The survey will be conducted on-line in the first instance, but if internet connections prove to be a limiting factor, we will make arrangements for a hard copy to be made available via your regular postal service with a Reply Paid option. If you would prefer a paper copy, please ring, text or email Rachel at the contact details listed on the next page.

Any information or personal details gathered in the course of the study are confidential. You don't need to give us your personal details unless you would like feedback, or for us to contact you in the future about the study. No individual will be identified in any publication of the results. Please

be assured that only the researchers will have access to the information you provide. The findings of the research will be published in peer-reviewed journals, Rachel's PhD thesis, and presented at conferences. In general we will discuss themes and issues identified by groups of respondents from combined data.

As a regular procedure in University research we will retain a copy of all survey responses for a period of five years, along with all the other information collected during the research. This will be stored on a password-protected server at Macquarie University.

Farmers, fire and animals

SURVEY CONSENT TO PARTICIPATE

CONSENT INFORMATION

Participation in this study is entirely voluntary: you are not obliged to participate. If you decide to participate, you are free to withdraw at any time - by exiting the survey and not sending your responses - without having to give a reason and without consequence. Return of the survey or pressing the 'done' button on completion will be regarded as your consent to use the information for this research.

As we are asking about emergency bushfire incidents it is possible that you may be reminded of distressing events. If this occurs please don't feel that you need to continue with the survey. You will find a list of local counselling and mental health resources below, and at the end of the survey, in case you wish to use any of these services at a later date.

Country Health SA Mental Health Team in Port Lincoln, phone (08) 8683 2083, or 13 14 65 after hours.
Port Lincoln Hospital in Oxford Terrace has an Accident & Emergency Department, open 24 hrs 7 days,
phone (08) 8683 2284.
Port Lincoln SA Ambulance Station 1300 136 272
Lifeline 13 11 14
Beyond Blue 1300 22 46 36

Please contact Rachel Westcott or Dr Mel Taylor (Rachel's PhD Supervisor) should you wish to discuss the research further before deciding whether or not to participate.

Dr Mel Taylor: Phone: 02 9850 8105 / Email: mel.taylor@mq.edu.au

Rachel Westcott: Phone: 0427 70 70 44 / Email: R.Westcott@westernsydney.edu.au
PO Box 1, Bridgewater SA 5155

What if I have a complaint?

The ethical aspects of this study have been approved by the Western Sydney University Human Research Ethics Committee, approval number H11118. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Ethics Committee through the Office of Research Services on Tel +61 2 4736 0229, Fax +61 2 4736 0905 or Email HumanEthics@westernsydney.edu.au

Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Consent statement (please read and tick the circle to consent)

* I have read and understood the information above. I agree to participate in this research, knowing that I can withdraw from the research at any time by exiting the survey. If I submit my responses at the end of the survey, this will be taken as my consent to have my responses included in the research.

- ◯ I Agree

Farmers, fire and animals

Demographic information

This first section relates to some information about you and your farm.

1. Where in regional South Australia is your farm located? (e.g. Eyre Peninsula, Kangaroo Island, Murraylands etc).

2. Do you farm on one property only, or on multiple blocks at different locations? (Farms on multiple adjacent titles are considered "one block").

- ◯ One only
- ◯ More than one location

3. What is the *approximate* size of your farm In total? (Please indicate acres or hectares).

4. How long have you worked as a farmer, or if retired, how many years were you farming?

- ◯ Less than 10 years
- ◯ 10-20 years
- ◯ 21-30 years
- ◯ More than 30 years

5. How many generations of your family have been farmers?

6. How many generations of your family *currently* work on your farm?

7. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Prefer not to say

Farmers, fire and animals

Farm produce or industry

This page asks about your farm produce and diversity.

8. What *general* categories of primary industry apply to your farm? Please select all that apply.

- ☐ Livestock
- ☐ Crops
- ☐ Aquaculture
- ☐ Stock transport
- ☐ Agistment
- ☐ Feedlot

Other (please specify)

9. What species of livestock and *approximate* numbers do you run? (Please total sub-categories of any one species e.g. Add total of beef and dairy cattle or superfine and non-superfine fleece sheep).

	0	1-50	51-100	101-500	501-1000	More than 1000
Sheep	○	○	○	○	○	○
Cattle	○	○	○	○	○	○
Horses	○	○	○	○	○	○
Pigs	○	○	○	○	○	○
Poultry	○	○	○	○	○	○
Alpacas	○	○	○	○	○	○
Goats	○	○	○	○	○	○
Deer	○	○	○	○	○	○
Camel	○	○	○	○	○	○

Other, such as aquaculture, or beekeeping (number of hives).

10. What type of crops do you produce? Please select all that apply.

- ☐ Cereal
- ☐ Legume
- ☐ Oilseed
- ☐ Fruit and vegetables (including olives)
- ☐ Vines
- ☐ Not applicable

Other (please specify)

11. What is the *approximate* area sown to crop? (Please specify acres or hectares).

12. What other enterprises are there on your property? Please select all that apply.

- [ ] Solar power generation
- [ ] Wind power generation
- [ ] B&B or Farm Stay
- [ ] Camping ground

Other (please specify)

13. Do you have land on your farm that is heritage listed, or do you have a particular conservation project(s)?

- ◯ Yes
- ◯ No

If Yes, please briefly describe

14. What level of insurance to you have on your property?

	Fully insured	Partially insured	Not insured	N/A
Homestead and other dwellings	◯	◯	◯	◯
Sheds and outbuildings	◯	◯	◯	◯
Farm machinery	◯	◯	◯	◯
Fencing and yards	◯	◯	◯	◯
Bores, silos and power plant	◯	◯	◯	◯
Crops	◯	◯	◯	◯
Livestock	◯	◯	◯	◯
Hay and other feed	◯	◯	◯	◯

15. Have you or your family permanently moved your home or farm to a different geographical location in order to avoid or reduce your bushfire risk? (i.e. other than as a temporary evacuation procedure).

- ◯ Yes
- ◯ No

If 'yes', please briefly describe where and when this occurred.

* The next page of questions asks about how and when you have experienced fire on your current or a previous property. If you do not have prior experience of fire on your farm, you will be directed to the next relevant question.

16. Do you have prior experience of fire on your property?

- ◯ Yes
- ◯ No

Farmers, fire and animals

Fire impact or prior experience

This page asks you about your prior experience of fire, and the impact of fire on your property. In the first question on this page (question 17) please indicate the year of the most serious fire. Questions 19 - 23 relate to that fire.

17. When did you experience a fire event on your property? Please list if more than one, and indicate which fire was the most serious.

18. If you have farmed another property that has been affected by fire, where and when did that happen?

19. In general terms, in the*most serious* fire, what *farm infrastructure* was affected? Please select all that apply.

- [ ] Homestead or other dwellings
- [ ] Sheds and outbuildings
- [ ] Farm machinery
- [ ] Fencing and yards
- [ ] Bores, silos and/or power plant
- [ ] Crops
- [ ] Hay and other feed
- [ ] Garden

Other (please specify)

20. If you made an insurance claim after the fire, how satisfied were you with your insurance company's response?

- ◯ Very satisfied
- ◯ Satisfied
- ◯ Dissatisfied
- ◯ Very dissatisfied
- ◯ Not applicable - didn't make a claim

21. In the most serious fire, where did you obtain assistance from? Please select all that apply.

	Initially	Immediately afterwards	Next 6 months	Greater than 6 months
Friends and neighbours	☐	☐	☐	☐
Community groups and local networks	☐	☐	☐	☐
Local council	☐	☐	☐	☐
Government agencies	☐	☐	☐	☐
Non-government organisations (NGO's) e.g. Red Cross	☐	☐	☐	☐

Please add a comment if you wish

22. In the most serious fire, how would you rate the assistance you received from all sources? Please answer all that apply.

	Friends and neighbours	Community groups and local networks	Local Council	Government agencies	Non-Government organisations (NGO's) e.g. Red Cross
Was the assistance adequate					
Was the assistance of sufficient duration					
Were there sufficient services to meet your needs					
Did you have an opportunity to provide feedback					

Other, or any comment you wish to add

Farmers, fire and animals

Animals on-farm at the time of a fire

This page asks about your livestock, working animals, pets and companion animals on your property at the time of the *most serious* fire.

23. What animals were on the property at the time? Please select all that apply.

- [ ] Livestock
- [ ] Horses
- [ ] Working dogs
- [ ] Pets
- [ ] Assistance animals
- [ ] Wildlife (contained or free-range)
- [ ] Not applicable - no animals on the property

Other, or any details you may wish to add

24. Animals affected - please list approximate numbers and species. Please select all that apply.

	Survived - no injury	Died or euthanased	Recovered	Salvaged for slaughter	Sent to agistment
Sheep					
Cattle					
Horses					
Pigs					
Poultry					
Alpacas					
Goats					
Deer					
Camel					
Working dogs					
Pets or assistance animals					
Wildlife (if known or estimated)					

Other animals, including aquaculture and bees

25. Please briefly list any flora or fauna of environmental significance on your property e.g. threatened species, or local iconic wildlife.

26. Did you need outside or additional help to manage your animals before, during or after the fire? Please select all that apply. ("Before the fire" means as the fire approaches, or when you know a fire has started).

- [ ] Yes, before the fire
- [ ] Yes, during the fire
- [ ] Yes, after the fire
- [ ] No, no assistance required

27. Was help available if necessary? e.g. farm staff, family, neighbours, CFS, PIRSA?

- ( ) Yes
- ( ) No
- ( ) No additional help was required

If "yes" please list

Farmers, fire and animals

Bushfire survival plans

Your answer to this question will direct you to the next relevant page.
In answering this question, "bushfire survival plan" means a plan that is*not necessarily* written down or printed out.

* 28. Do you have a bushfire survival plan for your property?

- ( ) Yes - up to date
- ( ) Yes - but needs updating
- ( ) No, not yet
- ( ) No, I don't think I need one

Farmers, fire and animals

Bushfire survival plans

This page contains questions about your bushfire survival plan.

29. How well prepared are you to manage a bushfire threat?

- ◯ Extremely well prepared
- ◯ Very well prepared
- ◯ Moderately well prepared
- ◯ A little prepared
- ◯ Unprepared

30. How well defined and developed is your plan? Please select all that apply.

- ☐ Written down/printed paper copy readily available
- ☐ Written but not printed out
- ☐ Known intuitively - "in my head"
- ☐ Well established and discussed with family and/or farm workers
- ☐ A "work in progress"

31. How was it informed? Please select all that apply.

- ☐ Generations of farming family “inherited” knowledge
- ☐ Local knowledge and collaboration with neighbours
- ☐ Attended workshop with CFS
- ☐ Information from other service providers such as rural suppliers or Council
- ☐ Direct result of experiencing an on-farm fire

Other (please specify)

32. Does your plan include assistance to/from neighbours if you, and they, are able to do so?

- ◯ Yes
- ◯ No
- ◯ Neighbours are too far away

33. Does your plan include provision for animals (all species and types – e.g. pets as well as livestock)?

- ◯ Yes - all
- ◯ Yes - most, or as many as possible
- ◯ Yes - some of them
- ◯ No - I don't think I could do anything with my animals
- ◯ No - I would concentrate on human safety
- ◯ Unsure
- ◯ I don't have animals on my property

34. *In general*, what strategies would you use to protect your animals? Please select all that apply.

- ☐ Move to a low-fuel paddock or paddock with dam, irrigation or firebreaks
- ☐ Bring into yards with sprinklers
- ☐ Selectively bring some animals to safety, e.g. breeding animals of high genetic value
- ☐ Relocate stock to agistment in a safer location
- ☐ Pets – leave the property with people
- ☐ Pets – remain in a place of safety on-farm
- ☐ Use a pre-arranged “buddy” system with family/friends in a safer location
- ☐ Not applicable - I don't have any animals on my property

Other (please specify)

35. If you have activated your plan, how useful or effective was it?

- ◯ Very effective
- ◯ Moderately effective
- ◯ Of some value
- ◯ Ineffective
- ◯ I had to modify the plan as circumstances dictated
- ◯ Haven't activated

Other (please specify)

36. Have you modified or updated your plan?

- ◯ This season
- ◯ 1-5 years ago
- ◯ 5-10 years ago
- ◯ More than 10 years ago
- ◯ Never

Other (please specify)

37. Why did you update your plan? Please select all that apply.

- [ ] Routine review
- [ ] Change or addition to farm produce
- [ ] New infrastructure, plant or equipment
- [ ] Recent fire experience
- [ ] Thought I should
- [ ] Family encouragement
- [ ] Not applicable

Other (please specify)

38. When do you practise your plan on-farm? Please select all that apply.

- [ ] Annually
- [ ] At the start of fire season
- [ ] Occasionally when we have time
- [ ] Never

Other (please specify) e.g. outside fire season, or when new guests arrive

39. At what point would you activate your plan? Please select all that apply.

- [ ] According to the fire danger rating, issued by the Bureau of Meteorology forecast at 4.00 pm
- [ ] On the day of a total fire ban
- [ ] It would depend on my commitments/workload
- [ ] I would be ready to activate my plan at any time during fire season
- [ ] I would consider reports from neighbours and other local sources
- [ ] Don't know

Other (please specify)

Farmers, fire and animals

Farm fire management and information gathering

This page has questions about general farm fire management practices and sources of information.

40. Do you have a farm fire unit? Please select all that apply.

- [ ] Yes - one only
- [ ] Yes - more than one
- [ ] Yes - on a ute
- [ ] Yes - on a trailer
- [ ] No

Other (please specify)

41. Is your farm fire unit(s) registered with the CFS?

- ◯ Yes - all units registered
- ◯ Partial - not all registered
- ◯ No - none registered
- ◯ Not applicable

Other (please specify)

42. What sources of information and means of communication do you use on a fire ban day, or if a fire starts? Please select all that apply.

- ☐ Phone or phone "tree"
- ☐ UHF radio
- ☐ Public information (e.g. ABC radio, TV stations)
- ☐ CFS Website

Other (please specify)

43. How important for managing your fire risk is local knowledge of things like weather, wind, or topography of the land?

- ◯ Extremely
- ◯ Very important
- ◯ Of some importance
- ◯ Little importance
- ◯ Not important

Other (please specify)

44. Do you cut firebreaks in your paddocks?

- ◯ Yes
- ◯ No
- ◯ Sometimes

If 'yes' or 'sometimes' please describe the form and size.

45. Do you think changes to farming practices could contribute to altered fire behaviour, e.g. no-till cropping and increased crop density?

- ◯ Yes, definitely
- ◯ Yes, possibly
- ◯ Unsure
- ◯ No, probably not
- ◯ No, not at all

Other (please specify)

46. What type of vegetation is *nearest* your home? Please select all that apply.

- ☐ Scrub or native vegetation
- ☐ Crops
- ☐ Watered garden
- ☐ Exotic trees

Other (please specify)

Farmers, fire and animals

Your bushfire response

This page asks about your perception of the fire threat to your property, and how effectively you think you could manage in a fire situation.

47. Please rate the topics on the left side according to the scale.

	Extreme	Very high	High	Medium	Low
The *likelihood* of fire on your farm within the next 5 years	○	○	○	○	○
The likely *severity* of that fire	○	○	○	○	○
Your level of confidence that *effective firefighting options* are available to you	○	○	○	○	○
Your level of confidence in *your ability* to carry out effective options	○	○	○	○	○

48. Please indicate the extent to which you agree or disagree with the following statements

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Fire is inevitable and that's just the reality	○	○	○	○	○
There is nothing I could do to change the impact of a fire on my farm	○	○	○	○	○
No-one else bothers to prepare for bushfires so why should I?	○	○	○	○	○
The Government won't listen to local people's suggestions and feedback about fires	○	○	○	○	○
The CFS will come and defend my property	○	○	○	○	○
After a bad fire another one won't happen soon	○	○	○	○	○
Areas that have never had a fire will be safe	○	○	○	○	○

49. To what extent has there been engagement about fire preparation within your local community?

- ◯ A lot of engagement
- ◯ Some engagement
- ◯ Very little engagement
- ◯ None

Other (please specify)

50. Would the presence of any of the following (at the time of a fire) change what you would do when responding to a fire threat? Please select all that apply.

- ☐ Number of adults *familiar with your property and plan* able to assist with response
- ☐ Number of adults *unfamiliar with your property and plan* but available to assist
- ☐ Young children or elderly family members present
- ☐ School age children who may or may not be at school
- ☐ Pets or assistance animals belonging to family members
- ☐ Guests, visitors, holiday makers or WWOOFers

Other (please specify)

51. Farmers in regional areas are generally regarded as a resourceful and self-reliant group. In a few dot points or sentences, what would your best advice be to people who are new to farming, or hobby farming, to help them prepare and respond appropriately to living with the threat of bushfire?

This page is for additional relevant information.

52. Please use the space below to include any other information.

53. Please include your contact details if you would like ongoing information about this project.

Appendix L: FUTURE RESEARCH: CROPLAND FIRES

Research topic	Notes
What is the relationship between modern conservation farming techniques and fire?	Do conservation farming methods and techniques influence the severity of a crop fire, and if so, how does this occur?
How does the amount of soil organic matter influence fire behaviour?	How does soil organic matter recover from a severe fire insult?
How do different crop types carry a fire?	Can crop type, crop density and crop placement (such as proximity to dwellings or other infrastructure) be managed to treat and reduce risk and increase safety?
Review of the use of firebreaks	Can the use of routine strategic firebreaks pre fire season help reduce risk, and promote more effective management of crop fires? How and where are they most likely to be beneficial?
What are the potential economic losses due to firebreak use?	Compare potential losses from reduced land under cultivation with costs of the Response and Recovery phases of a cropland fire emergency.
What plants and/or trees should be planted adjacent to assets?	Do “European” trees damp down an approaching fire front?
Should the farmers’ harvest code of practice be updated?	Risk reduction strategies to manage and treat risk need to be trialled and evaluated.
How is climate change expected to affect the potential hazard of cropland fires?	

REFERENCES

AKAMA, Y. 2012. *Birds of a Feather* [Online]. Melbourne: RMIT University. Available: https://vimeo.com/49646137 [Accessed 15 March 2018].

AKAMA, Y. 2014. Passing on, handing over, letting go – the passage of embodied design methods for disaster preparedness. *Service Design and Innovation Conference.* Lancaster University: Linköping University Electronic Press.

ASSENG, S. & PANNELL, D. J. 2013. Adapting dryland agriculture to climate change: Farming implications and research and development needs in Western Australia. *Climate Change,* 118**,** 167-181. DOI: 10.1007/s10584-012-0623-1

AUSTRALASIAN FIRE AND EMERGENCY SERVICE AUTHORITIES COUNCIL 2013. Risk Management. *The Australasian Inter-Service Incident Management System.* 4 ed. East Melbourne: Australasian Fire and Emergency Service Authorities Council Limited.

AUSTRALIAN BROADCASTING CORPORATION. 2015. *Insurance claims for Pinery bushfire reach $75m* [Online]. Adelaide: Australian Broadcasting Corporation. Available: http://www.abc.net.au/news/2015-11-30/insurance-claims-for-pinery-bushfire-reach-75-million/6987562 [Accessed 15 March 2018].

AUSTRALIAN BUILDING CODES BOARD. 2014. *Private Bushfire Shelters Performance Standard* [Online]. Canberra: Commonwealth of Australia. Available: https://www.abcb.gov.au/Resources/Publications/Education-Training/Private-Bushfire-Shelters [Accessed 15 March 2018].

BANWELL, C., DIXON, J., BAMBRICK, H., EDWARDS, F. & KJELLSTROM, T. 2015. The sociocultural context of climate change adaptation in Australia, with a focus on hot weather. *In:* BUTLER, C. D., DIXON, J. & CAPON, A. G. (eds.) *Health of People, Places and Planet: Reflections Based on Tony McMichael's Four Decades of Contribution to Epidemiological Understanding.* Canberra: Australian National University.

BAUM, N. 2016. *Pinery Fire South Australia 2015 - Lessons learned* [Online]. Sydney: Government of New South Wales. Available: http://www.flockandherd.net.au/other/reader/pinery-fire-south-australia.html [Accessed 15 March 2018].

BENEDEK, D. M., FULLERTON, C. & URSANO, R. J. 2007. First Responders: Mental Health Consequences of Natural and Human-Made Disasters for Public Health and Public Safety Workers. *Annual Review of Public Health,* 28**,** 55-68. DOI: 10.1146/annurev.publhealth.28.021406.144037

BEYONDBLUE. 2016. *National Mental Health and Wellbeing Study of Police and Emergency Services* [Online]. Melbourne: beyondblue. Available: https://www.beyondblue.org.au/about-us/about-our-work/workplace-mental-health/pes-program/national-mental-health-and-wellbeing-study-of-police-and-emergency-services [Accessed 15 March 2018].

BLOOR, M., FRANKLAND, J., THOMAS, M., AND ROBSON, K. 2001. *Focus Groups in Social Research,* London, England, SAGE Publications Ltd.

BRADSTOCK, R. A. 2010. A biogeographic model of fire regimes in Australia: current and future implications. *Global Ecology and Biogeography,* 19**,** 145-158. DOI: 10.1111/j.1466-8238.2009.00512.x

BRADSTOCK, R. A., HAMMILL, K. A., COLLINS, L. & PRICE, O. 2010. Effects of weather, fuel and terrain on fire severity in topographically diverse landscapes of south-eastern Australia. *Landscape Ecology,* 25**,** 607-619. DOI: 10.1007/s10980-009-9443-8

BRAUN, V. & CLARKE, V. 2006. Using thematic ananlysis in psychology. *Qualitative Research in Psychology,* 3**,** 77-101.DOI: 10.1191/1478088706qp063oa

BRAUN, V. & CLARKE, V. 2013. *Successful Qualitative Research,* London, Sage.

CHADWIN, R. 2017. Evacuation of Pets During Disasters: A Public Health Intervention to Increase Resilience. *American Journal of Public Health***,** e1-e5. DOI: 10.2105/AJPH.2017.303877

CHRONBACH, L. J. 1975. Beyond the two disciplines of scientific psychology. *American Psychologist,* 30**,** 116-27.

COCHRANE, M. A., MORAN, C. J., WIMBERLY, M. C., BAER, A. D., FINNEY, M. A., BECKENDORF, K. L., EIDENSHINK, J. & ZHU, Z. 2012. Estimation of wildfire size and risk changes due to fuels treatments. *International Journal of Wildland Fire,* 21**,** 357-367. DOI: 10.1071/WF11079

COLLINS, L., BRADSTOCK, R. A. & PENMAN, T. D. 2014. Can precipitation influence landscape controls on wildfire severity? A case study within temperate eucalypt forests of south-eastern Australia. *International Journal of Wildland Fire,* 23**,** 9-20. DOI: 10.1071/WF12184

CRUZ, M. G., KIDNIE, S., MATTHEWS, S., HURLEY, R. J., SLIJEPCEVIC, A., NICHOLS, D. & GOULD, J. S. 2016. Evaluation of the predictive capacity of dead fuel moisture models for Eastern Australia grasslands. *International Journal of Wildland Fire,* 25**,** 995-1001. DOI: 10.1071/WF16036

DAY, A. M. 2017. Companion animals and natural disasters: A systematic review of literature. *International Journal of Disaster Risk Reduction,* 24**,** 81-90. DOI: 10.1016/j.ijdrr.2017.05.015

DELAINE, D. & RURAL SOLUTIONS SA 2012. *Landscaping for Fire Protection,* Adelaide, Government of South Australia.

DILLMAN, D. A., SMYTH, J. D. & CHRISTIAN, L. M. 2014. Internet, Phone, Mail, and Mixed-Mode Surveys : The Tailored Design Method. 4 ed. Hoboken: Wiley.

EGAN, J. 2006. TECHNICAL RESOURCE MANUAL FOR FARM FIRE RECOVERY.

EL-MASRI, S. & TIPPLE, G. 2002. Natural Disaster, Mitigation and Sustainability: The Case of Developing Countries *International Planning Studies,* 7**,** 157-175. DOI: 10.1080/1356347022013223 6

ERIKSEN, C. & WILKINSON, C. 2017. Examining perceptions of luck in post-bushfire sense-making in Australia. *International Journal of Disaster Risk Reduction,* 24**,** 242-250. DOI: 10.1016/j.ijdrr.2017.06.017

FLYNN, M. F., LYMAN, R. D. & PRENTICE-DUNN, S. 1995. Protection Motivation Theory and adherence to medical treatment regimens for muscular dystrophy. *Journal of Social and Clinical Psychology,* 14**,** 61-75.

GIBBS, L., WATERS, E., BRYANT, R. A., PATTISON, P., LUSHER, D., HARMS, L., RICHARDSON, J., MACDOUGALL, C., BLOCK, K., SNOWDON, E., GALLAGHER, H. C., SINNOTT, V., IRETON, G. & FORBES, D. 2013. Beyond Bushfires: Community, Resilience and Recovery - a longitudinal mixed method study of the medium to long term impacts of bushfires on mental health and social connectedness. *BMC Public Health,* 13**,** 1036. DOI: 10.1186/1471-2458-13-1036

GORDON, R. 2004. Community Process and the Recovery Environment Following Emergency. *Environmental Health,* 4**,** 19-34.
GORDON, R. 2016. People and communities: how do they react and recover after fire? Adelaide: Government of South Australia and Australian Red Cross.
GOVERNMENT OF SOUTH AUSTRALIA 2005. Wangary Coronial Investigation Findings Summary. South Australian Fire and Emergency Services Commission (SAFECOM) Adelaide: Government of South Australia.
GOVERNMENT OF SOUTH AUSTRALIA. 2008. *Grain Harvesting Code of Practice* [Online]. Adelaide: Government of South Australia. Available: http://www.pir.sa.gov.au/__data/assets/pdf_file/0018/235701/grain_harvesting_code_of_practice.pdf [Accessed 15 March 2018].
GOVERNMENT OF SOUTH AUSTRALIA. 2011. *Farming Guidelines for the Reduction of Bushfire* [Online]. Adelaide: Government of South Australia. Available: http://pir.sa.gov.au/__data/assets/pdf_file/0005/159332/Farming_Guidelines_for_the_Reduction_of_Bushfire_Risk.pdf [Accessed 15 March 2018].
GOVERNMENT OF SOUTH AUSTRALIA. 2016. *Wangary Bushfires* [Online]. Adelaide: Government of South Australia. Available: http://www.safecom.sa.gov.au/site/initiatives_reviews/wangary_bushfires.jsp [Accessed 15 March 2018].
GROTHMANN, T. & REUSSWIG, F. 2006. People at Risk of Flooding: Why Some Residents Take PrecautionaryActon While Others do not. *Natural Hazards,* 38**,** 101-120. DOI 10.1007/s11069-005-8604-6
GUBA, E. G. 1981. Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication & Technology,* 29**,** 75-91.
GUBA, E. G. & LINCOLN, Y. S. 1986. But Is It Rigorous? Trustworthiness and Authenticity in Naturalistic Evaluation. *In:* WILLIAMS, D. (ed.) *Naturalistic Evaluation. New Directions for Evaluation.* San Francisco: Jossey-Bass.
GULLIVER, S. B., CAMMARATA, C. M., LETO, F., OSTIGUY, W. J., FLYNN, E. J., CARPENTER, G. S. J., KAMHOLZ, B. W., ZIMERING, R. T. & KIMBREL, N. A. 2016. Project Reach Out: A training program to increase behavioral health utilization among professional firefighters. *International Journal of Stress Management,* 23**,** 65-83. DOI: 10.1037/a0039731
HALLIDAY, L. G., CASTLEY, J. G., FITZSIMONS, J. A., TRAN, C. & WARNKEN, J. 2012. Fire management on private conservation lands: knowledge, perceptions and actions of landholders in eastern Australia. *International Journal of Wildland Fire,* 21**,** 197-209. DOI: 10.1071/WF10148
HUGHES, L. & STEFFEN, W. 2013. *Be prepared: climate change and the Australian bushfire threat.* [Online]. Climate Council. Available: http://www.climatecouncil.org.au/uploads/c597d19c0ab18366cfbf7b9f6235ef7c.pdf [Accessed 15 March 2018].
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC). 2014. *Fifth Assessment Report* [Online]. IPCC. Available: https://www.ipcc.ch/report/ar5/ [Accessed 15 March 2018].
JANMAIMOOL, P. 2017. Application of Protection Motivation Theory to Investigate Sustainable Waste Management Behaviors. *Sustainability,* 9**,** 1079. DOI: 10.3390/su9071079
KINGWELL, R. 2006. Climate change in Australia: agricultural impacts and adaptation. *Australasian Agribusiness Review.* Perth: Department of Agriculture, Western Australia and University of Western Australia.

KITCHING, R. 2014. *IPCC: Australia and New Zealand face greater fire and flood risk, damage to coral reefs* [Online]. Available: https://theconversation.com/ipcc-australia-and-new-zealand-face-greater-fire-and-flood-risk-damage-to-coral-reefs-24642 [Accessed 15 March 2018].
KRISTOFFERSEN, A. E., SIROIS, F. M., STUB, T. & HANSEN, A. H. 2017. Prevalence and predictors of complementary and alternative medicine use among people with coronary heart disease or at risk for this in the sixth Tromsø study: a comparative analysis using protection motivation theory. *BMC Complementary and Alternative Medicine,* 17, 1. DOI: 10.1186/s12906-017-1817-x
KRUSEL, N., PACKHAM, D. & TAPPER, N. 1992. Wildfire Activity in the Mallee Shrubland of Victoria, Australia. *International Journal of Wildland Fire,* 3**,** 217-227. DOI: 10.1071/WF9930217
LAWRENCE, G., RICHARDS, C. & LYONS, K. 2013. Food security in Australia in an era of neoliberalism, productivism and climate change. *Journal of Rural Studies,* 29**,** 30-39. DOI: 10.1016/j.jrurstud.2011.12.005
LINCOLN, Y. S. & GUBA, E. G. 2013. *Constructivist Credo,* Walnut Creek, CA, USA, Left Coast Press.
LWIN, M. O. & SAW, S. M. 2007. Protecting Children from Myopia: A PMT Perspective for Improving Health Marketing Communications. *Journal of Health Communication,* 12**,** 251-268. DOI: 10.1080/10810730701266299
MCCLEAN, D. 2017. *Australia integrates climate and disaster risk* [Online]. Geneva: United Nations Office for Disaster Risk Reduction. Available: https://www.unisdr.org/archive/52874 [Accessed 15 March 2018].
MORGAN, D. L. 1993. *Successful Focus Groups: Advancing the State of the Art,* London, Sage.
NATION CREATIVE. 2017. *SA CFS launches new complacency bushfire campaign* [Online]. Adelaide: Government of South Australia. Available: http://www.campaignbrief.com/2017/11/sa-cfs-launches-new-complacenc.html [Accessed 15 March 2018].
NEALE, T., WEIR, J. K. & MCGEE, T. K. 2016. Knowing wildfire risk: Scientific interactions with risk mitigation policy and practice in Victoria, Australia. *Geoforum,* 72**,** 16-25. DOI: 10.1016/j.geoforum.2016.03.008
NORMAN, P., SEARLE, A., HARRAD, R. & VEDHARA, K. 2003. Predicting adherence to eye patching in children with amblyopia: An application of protection motivation theory. *British Journal of Health Psychology,* 8**,** 465-474.
ONWUEGBUZIE, A. J., & LEECH, N. 2005. On Becoming A Pragmatic Researcher: The Importance of Combining Quantitative and Qualitative Research Methodologies. *International Journal of Social Research Methodology,* 8**,** 375-387.
PALMER, D. 2016. *Sampson Flat Bushfire: the Paracombe Experience,* Adelaide, Daniel Palmer.
PENMAN, T. D., ERIKSEN, C. E., HORSEY, B. & BRADSTOCK, R. A. 2016. How much does it cost residents to prepare their property for wildfire? *International Journal of Disaster Risk Reduction,* 16**,** 88-98. DOI: 10.1016/j.ijdrr.2016.01.012
PINERY FIRE COMMUNITY ACTION GROUP 2016. *Reflections on the Pinery Fire,* Gawler, Pinery Fire Community Action Group .

POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2013. Stimulating flood mitigation through insurance: an assessment of the French CatNat system. *Environmental Hazards,* 12**,** 258-277. DOI: 10.1080/17477891.2013.832650

POUSSIN, J. K., BOTZEN, W. J. W. & AERTS, J. C. J. H. 2014. Factors of influence on flood damage mitigation behaviour by households. *Environmental Science & Policy,* 40**,** 69-77. DOI: 10.1016/j.envsci.2014.01.013

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA. 2015. *Cropping losses for Pinery fire estimated at $24m* [Online]. Adelaide: Government of South Australia. Available: http://www.pir.sa.gov.au/alerts_news_events/news/primary_industries/cropping_losses_from_pinery_fire_estimated_at_24m [Accessed 6 November 2017].

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA. 2017a. *South Australia's crop estimate revised upwards* [Online]. Adelaide: Government of South Australia. Available: http://www.pir.sa.gov.au/alerts_news_events/news/primary_industries/crops_pastures/south_australias_crop_estimate_revised_upwards [Accessed 15 March 2018].

PRIMARY INDUSTRIES AND REGIONS SOUTH AUSTRALIA 2017b. South Australian Grain. Adelaide: Government of South Australia.

RAMSAY, G. & RUDOLPH, L. 2003. *Landscape and building design for bushfire areas,* Melbourne, CSIRO.

RICHARDS, G. D. 2000. The mathematical modelling and computer simulation of wildland fire perimeter growth over a 3-dimensional surface. *International Journal of Wildland Fire,* 9**,** 213-221. DOI: 10.1071/WF00019

ROGERS, R. 1983. Cognitive and physiological processes in fear-based attitude change: A revised theory of protection motivation. *In:* J. CACCIOPPO & R. PETTY (EDS.) (ed.) *Social psychophysiology: A sourcebook.* New York: Guilford.

RONAN, K. R. & JOHNSTON, D. M. 2005. *Promoting Community Resilience in Disasters: The Role for Schools, Youth, and Families*, Springer US.

SANDELOWSKI, M. 2000. Whatever Happened to Qualitative Description? *Research in Nursing & Health,* 23**,** 334-340.

SAVIN-BADEN, M. & MAJOR, C. H. 2013. *Qualitative Research,* Abingdon, Routledge.

SCHAPEL, A. E. 2007. Inquest conducted by Mr Anthony E Schapel, Deputy State Coroner, South Australia. Adelaide: Government of South Australia,.

SIKES, P. 2008. Researching Research Cultures *In:* SIKES, P. & POTTS, A. (eds.) *Researching Education from the Inside.* Abingdon: Routledge.

SILVERMAN, D. 2005. *Doing Qualitative Research,* London, Sage.

SO, J. 2013. A Further Extension of the Extended Parallel Process Model (E-EPPM): Implications of Cognitive Appraisal Theory of Emotion and Dispositional Coping Style. *Health Communication,* 28**,** 72-83. DOI: 10.1080/10410236.2012.708633

SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2015. *South Australian Country Fire Service Annual Report 2014-2015 p19* [Online]. Adelaide: Government of South Australia. Available: https://www.cfs.sa.gov.au/site/about_cfs/publications.jsp [Accessed 15 March 2018].

SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2016a. *Bushfire History* [Online]. Adelaide: South Australian Country Fire Service. Available:

https://www.cfs.sa.gov.au/site/about_cfs/history_of_the_cfs/bushfire_history.jsp [Accessed 16 March 2018].
SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2017a. *Be bushfire ready* [Online]. Adelaide: Government of South Australia. Available: https://www.cfs.sa.gov.au/bebushfireready/index.html [Accessed 15 March 2018].
SOUTH AUSTRALIAN COUNTRY FIRE SERVICE. 2017b. *Complacency Kills* [Online]. Adelaide: Government of South Australia. Available: https://www.youtube.com/watch?v=6WHxq0da9fM&feature=youtu.be [Accessed 15 March 2018].
SPENCE, R. 2004. Risk and regulation: can improved government action reduce the impacts of natural disasters? *Building Research & Information,* 32**,** 391-402. DOI: 10.1080/0961321042000221043
STEFFEN, W., HUGHES, L., ALEXANDER, D. & RICE, M. 2017. Cranking up the Intensity: Climate Change and Extreme Weather Events. Potts Point: Climate Council of Australia.
STEFFENS, R. 2016. *Wicked (fire) problems, sweet (and messy) solutions* [Online]. Portland: International Association of Wildland Fire. Available: https://vimeo.com/167323188 [Accessed 15 March 2018].
TALEB, N. N. 2010. *The Black Swan: The Impact of the Highly Improbable.,* London, Penguin.
TANNER, J. F., DAY, E. & CRASK, M. R. 1989. Protection motivation theory: An extension of fear appeals theory in communication. *Journal of Business Research,* 19**,** 267-276. DOI: 10.1016/0148-2963(89)90008-8
TAYLOR, M. R. 2017. *Managing animals in disasters: improving preparedness, response, and resilience through individual and organisational collaboration* [Online]. East Melbourne: Bushfire and Natural Hazards Cooperative Research Centre. Available: http://www.bnhcrc.com.au/research/hazard-resilience/237 [Accessed 15 January 2018].
TEDDLIE, C. & TASHAKKORI, A. 2009. *Foundations of Mixed Methods Research,* London, Sage.
THE PREMIER OF SOUTH AUSTRALIA THE HON. JAY WEATHERILL. 2015. *Parliament of South Australia, Hansard, Ministerial Statement by the Premier on Pinery Fire* [Online]. Adelaide: Government of South Australia. Available: http://hansardpublic.parliament.sa.gov.au/Pages/HansardResult.aspx#/docid/HANSARD-11-21663 [Accessed 15 March 2018].
THOMPSON, K. R., HAIGH, L. & SMITH, B. P. 2017. Planned and ultimate actions of horse owners facing a bushfire threat: Implications for natural disaster preparedness and survivability. *International Journal of Disaster Risk Reduction*. DOI: 10.1016/j.ijdrr.2017.11.013
UNITED NATIONS INTERNATIONAL STRATEGY FOR DISASTER RISK REDUCTION. Sendai Framework for Disaster Risk Reduction. Geneva: United Nations Office for Disaster Risk Reduction; 2015. Available: http://www.unisdr.org/we/coordinate/sendai-framework
VAN DEN BERGH, R. & FAURE, M. 2006. Compulsory Insurance of Loss to Property caused by Natural Disasters: Competition or Solidarity? *World Competition,* 29**,** 25-54.
VARELA, E., GIERGICZNY, M., RIERA, P., MAHIEU, P.-A. & SOLIÑO, M. 2014. Social preferences for fuel break management programs in Spain: a choice

modelling application to prevention of forest fires. *International Journal of Wildland Fire,* 23**,** 281-289. DOI: 10.1071/WF12106
WALLACE, B. 2017. A framework for adapting to climate change risk in coastal cities. *Environmental Hazards,* 16**,** 149-164. DOI: 10.1080/17477891.2017.1298511
WESTCOTT, R. 2017a. *How to become bushfire-prepared without really noticing: be fire-fit! Weekly is worth it!* [Online]. Melbourne: Bushfire and Natural Hazards Cooperative Research Centre. Available: http://www.bnhcrc.com.au/resources/presentation-audio-video/3834 [Accessed 15 March 2018].
WESTCOTT, R. 2017b. Mitigating Action Inertia and the Bushfire Awareness-Action Gap: Findings from a South Australian Case Study. Australian and New Zealand Disaster and Emergency Management Conference, 2017. Gold Coast, Queensland. Nerang, Queensland: Australian and New Zealand Mental Health Association.
WESTCOTT, R. 2017c. Narrowing the awareness-action gap: cultivating fire-fitness as a social norm through public policy initiatives. *Australian Journal of Emergency Management,* 31**,** 37-41.
WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017a. Don't Just Do Something…..Stand There! Emergency Responders' Peri-Incident Perceptions of Animal Owners in Bushfire. *Frontiers in Veterinary Science,* 4,34. DOI 10.3389/fvets.2017.00034
WESTCOTT, R., RONAN, K., BAMBRICK, H. & TAYLOR, M. 2017b. Expanding protection motivation theory: investigating an application to animal owners and emergency responders in bushfire emergencies. *BMC Psychology,* 5**,** 13. DOI: 10.1186/s40359-017-0182-3
WILKINSON, S. 1999. FOCUS GROUPS. *Psychology of Women Quarterly,* 23**,** 221.
WIRTZ, P. W. & ROHRBECK, C. A. 2017. The dynamic role of perceived threat and self-efficacy in motivating terrorism preparedness behaviors. *International Journal of Disaster Risk Reduction*. DOI: 10.1016/j.ijdrr.2017.10.023

THE PURPOSE OF LIFE

IS A

LIFE OF PURPOSE

Stuart Ellis, AM

Chief Executive Officer, Australasian Fire and Emergency Service Authorities Council (AFAC)