


Risk perception, preparedness and response of livestock producers to bushfires: a South Australian case study

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ABSTRACT

Animal ownership has been shown to be a risk factor for the survival of humans during emergencies and natural disasters largely due to evacuation failures. For livestock producers, it is often impossible to evacuate their animals given the need to ensure the safety of all persons, property (e.g. dwellings, equipment, paddocks), pets, and the welfare of their stock. To determine their use of information and warnings, and their planning and preparedness behaviour, 41 livestock producers from three field sites around rural South Australia that were threatened or impacted by significant bushfires in January 2014 were interviewed. The majority had a low level of concern for bushfire threat, with almost all opting to 'stay and defend' their property. Few had formally written 'bushfire risk management plans', adequate insurance for livestock, a contingency plan, or used information resources. However, they reported multiple other routine and ordinary practices contributing to their bushfire preparedness. Such activities used a more 'common sense' approach, conducted as part of everyday property management practices and farming culture. It is clear that livestock producers have different needs before and during bushfires, and have a different perception of risk than other animal owners or rural dwellers in general.

Introduction

Bushfires are a constant feature of the Australian landscape, posing significant threat to the environment, public and private infrastructure and human and animal lives (Gentle, Kierce & Nitz 2001, Johnston 2009, Liu, Stanturf & Goodrick 2010). For livestock producers, the threat and consequences are devastating (Berry

et al. 2011, Millar & Roots 2012). The shift to larger grazing areas and assets distributed over wider areas, and the diminishing population and fire-fighting capacity in regional areas further increases the vulnerability of livestock producers and their animals (Irvine 2009, Millar & Roots 2012, Whittaker, Handmer & Mercer 2012).

Animal ownership has been identified as a risk factor for the survival of humans during emergencies and natural disasters, largely through evacuation failure (Heath *et al.* 2001, Irvine 2009, Thompson 2013). Livestock producers or farmers however, represent a unique population of animal owners in that it is often impossible to evacuate their animals. They also have a responsibility to ensure the safety and welfare of all persons, property (e.g. dwelling, fences, paddocks, equipment), pets and livestock (Coll 2013a, Hall *et al.* 2004, Wilkie 2005). There are both ethical (i.e. to ensure the welfare of animals), and financial drivers for producers to reduce the potential impacts of disasters on their stock. They have invested significant time and resources in the health and growth of their animals, and the full economic potential of their animals cannot be realised until sale (Coll 2013a). Replacing lost animals can restore outputs lost to individual producers, but the output lost to the economy is far reaching (Berry *et al.* 2011, Gentle, Kierce & Nitz 2001). Between 1967 and 2011 in Australia, it is estimated that 1.6 million livestock were lost due to natural disasters or emergencies (Coll 2013b). The direct economic cost of livestock losses from the 2009 Black Saturday fires alone is estimated at more than \$18 million (Coll 2013a, 2013b).

There is increasing recognition of the importance of integrating livestock into disaster planning (for examples, see *National Planning Principles for Animals in Disasters* developed by the Australian Animal Welfare Strategy¹, and the *International Livestock Emergency Guidelines and Standards* (Watson 2011)). Such strategies can reduce losses to livestock and the economy. In turn, reducing livestock and economic loss contributes to human health and wellbeing of individuals and farming communities (Coll 2013b, Hall *et al.* 2004, Hunt *et al.* 2010, Zottarelli 2010). It also has

¹ Australian Animal Welfare Strategy.
At: www.australiananimalwelfare.com.au.

the potential to save human life, as people often risk their lives to rescue their animals (Coates 1999, Heath *et al.* 2001, Hunt *et al.* 2012, Irvine 2009).

It is important for livestock producers to prepare for emergency events. However landholders and farmers are often underprepared. For example, Eriksen, Gill and Head (2010) found that despite most landowners in rural southeast Australia perceiving a high bushfire threat, fewer than one in two (43 per cent) had prepared a bushfire action plan, and those who did, had not written it down or discussed it with family members. Whittaker, Handmer and Mercer (2012) also noted that while many livestock producers were insured for their home and property, many were either not insured at all, or underinsured for livestock, fencing and machinery.

While the preparation behaviour of Australians in rural areas has been considered in general (Eriksen & Gill 2010, Whittaker, Handmer & Mercer 2012), this paper presents the first attempt to single out livestock producers in Australia as a group requiring particular attention. In order to increase the preparedness of livestock producers, it is important to understand their levels of preparedness and determine any differences from rural dwellers in general. Such insight is provided by interviews with 41 livestock producers from three field sites around rural South Australia who were threatened by significant bushfires in January 2014.

Methods

Description of fires

In January 2014 multiple bushfires affected South Australia. Three of the largest fires originated in Eden Valley in the Barossa Valley (Jan 17 – Jan 20), Bangor in the Southern Flinders Ranges (Jan 14 – Feb 14), and Rockleigh to the north behind the Adelaide Hills (the Murraylands, Jan 14 – Jan 17). See Rogers (AGD 2015) for locations of each fire. All were particularly demanding of Country Fire Service resources and caused extensive damage to land and some structures (total of 64 5000 hectares burnt, 11 houses destroyed, and 4 840 sheep and 80 cattle lost (Rogers in AGD 2015).

Procedure

The South Australian Country Fire Service (CFS) and the Bushfire and Natural Hazards Cooperative Research Centre assembled a community taskforce with the aim of measuring the community perspective at each of the three fire sites. Interviews were conducted in Eden Valley, Bangor, and Rockleigh during April and May 2014. The data used in this research was collected through semi-structured face-to-face interviews (*n* = 41). Research teams consisted of an experienced researcher and a CFS community engagement officer (in uniform and marked vehicle). Participants were interviewed on their properties, either at their house or a nearby part of the property. For full research methodology, including the interview questions, see Trigg *et al.* (2014).

Participants

Of the 171 interviews conducted (five households declined to participate), 41 households (Bangor *n* = 18, Eden Valley *n* = 14, Rockleigh *n* = 9) were identified as being a livestock producer (sheep and cattle). Only full-time producers with at least 200 sheep or 20 cattle were included in the sample. Gender of participants was evenly split (49 per cent male, 39 per cent female, 12 per cent multiple interviewees). The mean age of the sample was 57.46 years of age (± 13.86). Most (81 per cent) owned pets as well as livestock. A high proportion (82 per cent) had experience with bushfires in the past. Just over half (54 per cent) had never been a member of the local volunteer fire service (CFS), 26 per cent were current members, and 21 per cent had previously been a member. One quarter (27 per cent) reported having participated in community bushfire safety activities.

Property

Most livestock producers lived on a farm or agriculture business (93 per cent), with the remainder residing in a residential block or large lifestyle block (i.e. lived in town and kept livestock on property nearby). The size of the properties ranged from 247 acres to 4 500. The number of years residing at the bushfire-affected address included 22 per cent less than ten years, 34 per cent between 11–30 years, 20 per cent between 31– 50 years, and 24 per cent over 50 years).

Results

Concern for bushfire

Prior to the January bushfires, over half (68 per cent) of livestock producers believed their home or family was at risk of bushfire threat. When asked to rate their level of concern about bushfires in the past on a Likert scale from 1 = 'not at all' to 5 = 'extremely', the mean response was 2.75 (± 1.25 S.D). The level of concern about bushfires during the January bushfires did not change drastically, with the mean response = 3.0 (± 1.30 S.D). See Table 1.

Table 1: Level of concern regarding the threat of bushfire prior to, and during the 2014 January bushfires.

Relative to Jan 2014	Level of concern				
	1 Not at all	2	3	4	5 Extremely
Prior to 2014 fires	23%	18%	30%	23%	8%
During 2014 fires	15%	23%	25%	23%	15%

Bushfire plans

Three quarters of the livestock producers had some form of action plan (the rest had no plan at all). While 70 per cent had a 'mental' bushfire action plan, only five per cent of livestock producers had a written plan. Most householders had discussed the plan (65 per cent), 14 per cent had practised the plan, 56 per cent included pets in the plan, and 34 per cent included a backup plan. One quarter used CFS materials to develop their plan (26 per cent), including the CFS 'Bushfire Survival Plan' template (18 per cent), the 'Guide to Bushfire Safety' brochure (32 per cent), the CFS website (11 per cent) or CFS App (six per cent) to develop plans.

The highest cited bushfire action plan prior to the bushfire was to 'stay and defend', and was the most prevalent behaviour during the bushfire, with 73 per cent of householders ultimately choosing at least one member to 'stay and defend'. A quarter initially planned for some members of the household to leave early and others to stay and defend, however the number of householders who opted for this course of action doubled. Table 2 outlines the action plans prior to, upon hearing about the fire, and what the householders eventually chose to do.

Table 2: Bushfire action plans prior to, upon hearing (initially) and what actually happened (ultimately) in response to the bushfires.

Bushfire plan	Prior	Initially	Ultimately
Everyone stay and defend	39%	44%	43%
Wait and see how bad it is before deciding	8%	12%	14%
Some people leave early, other stay and defend	15%	17%	30%
Whole household leaves	18%	2%	14%
No concrete plan	21%	12%	-

Specific bushfire preparations

During the interview, specific bushfire preparations conducted before the January fires were noted (that is, participants were not prompted for specific actions). Of note, 66 per cent had a water supply independent of mains, 66 per cent had cleared space around the house and clear gutters, 34 per cent had identified a safe destination and evacuation route, 32 per cent had talked about bushfire risk with neighbours, 24 per cent had protective clothing, 29 per cent had a power supply independent of mains, 27 per cent had identified safe destination and evacuation routes for pets and livestock, 15 per cent had a bushfire sprinkler system, 12 per cent had an emergency kit ready, seven per cent had the CFS FireApp on their mobile phone or tablet, and seven per cent had supplies ready for pets and livestock.

During the bushfire

The majority of livestock producers first became aware of the fire (unprompted responses) by witnessing smoke (68 per cent), receiving a call from neighbours or a friend (51 per cent), seeing flames (37 per cent), hearing it on the radio (22 per cent), finding out through emergency alert on the landline telephone (17 per cent), and from the CFS website (17 per cent). When first hearing of the bushfire in the area (unprompted responses), 37 per cent relocated pets and livestock, 27 per cent arranged for the safety of pets and livestock, and 15 per cent collected valuables to take to safety. For those who decided to leave, the triggers to decide to leave included seeing flames (15 per cent), phone information from family/friends/neighbour (12 per cent), seeing smoke (10 per cent), face-to-face information/advice from neighbours (nine per cent), and, lastly, emergency alert message (seven per cent).

Fire damage

The majority (81 per cent) of properties were directly impacted by the fire (i.e. located within or near the 'fire scar'), with 19 per cent residing outside of the scar. According to householder assessments, while 15 per cent suffered no damage or loss, the fire threatened but did not damage 20 per cent of properties, 39 per cent sustained minor damage, 23 per cent sustained major damage, and three per cent lost their primary residence. Two thirds (66 per cent) reported other aspects of their operation were impacted or destroyed, including paddocks, fencing, piping, stock feed (e.g. hay bales), tractors, sheds, and equipment. One third (37 per cent) of producers interviewed lost pets or livestock, with losses ranging from 14 to 520 animals. Some producers lost stock indirectly due to the fire, for example, forced to sell healthy animals due to lack of feed.

Insurance

The majority of interviewees had appropriate insurance cover for their house (84 per cent), contents (83 per cent), and machinery/equipment (68 per cent). However, as shown in Table 3, only half (55 per cent) had cover for livestock, pets, other animals, with the other half being inadequately insured (six per cent) or having no insurance at all (39 per cent). Often fencing was not covered in insurance.

Table 3: Type and level of insurance covering bushfire damage.

Type of cover	Level of insurance		
	Fully covered	Under insured	No insurance
House	84%	8%	8%
Contents	83%	10%	8%
Machinery/equipment	68%	18%	13%
Livestock, pets, other animals	55%	6%	39%

Future plans

When livestock producers were asked if they had changed their bushfire plan as a result of the January fires, 80 per cent reported that they had not ultimately changed their plan (e.g. to stay and defend, or leave), however over half (56 per cent) stated that they had altered their original plan. Things they reported changing included the use of alternative (fire proof) fencing material, digging pipes deeper, grazing around the house more, keeping house clear of trees and bushes, insuring livestock, staying away longer until the fire is completely cleared, upgrading communication devices, and purchasing more sprinklers and firefighting units. Asked if there was additional information they wished they had, 51 per cent indicated 'yes', mostly concerning accurate, detailed and timely information and warnings in relation to the fire.

Discussion

The majority of livestock producers chose to 'stay and defend' their property. This bushfire plan is likely to reflect their financial and emotional investment in their residence, property, and animals. Livestock producers are often highly active in the defence of their own and neighbouring properties, typically by fighting fires with small farm fire units. Given extensive social networks of livestock producers, and their shared sense of identity and solidarity (Whittaker, Handmer & Mercer 2012), there was little reliance on information outside of the property and local community for either developing plans, or seeking information during disasters.

Similar to the South Australian community interviewed as part of the larger study (Trigg *et al.* 2014), few had formally written 'bushfire risk management plans', or planned for contingencies. Perhaps a point of difference to the general community however, is that the livestock producers appeared to incorporate bushfire preparation into their routine practices of property management. Such activities used a more 'common sense' approach developed over time and with experience, and were implemented as part of the day-to-day management of the property. This included property maintenance (e.g. creating fire breaks, maintaining low 'fuel' load around house), infrastructure (e.g. mobile fire units, tanks, pumps), and providing 'safe' paddocks for livestock (e.g. minimising areas of dry grass, timber or other fuel). To some, these activities may not be distinguished from everyday farming practice as part of bushfire planning and preparation, but part of routine farming activity and culture (Whittaker, Handmer & Mercer 2012). In general, livestock producers are used to dealing with risk, hazard and uncertainty (e.g. drought, stock yields, disease, predators) and are usually highly self sufficient and equipped to defend their properties.

Undertaking routine preparatory activities in combination with their extensive knowledge and awareness of the land and local fire behaviour may

lead livestock producers to believe they are well prepared, i.e. self efficacy (people's belief in their ability to influence events that affect their lives, Bandura 1977). The high self-efficacy to defend against bushfire reported by some livestock producers might be a direct result of comprehensive mitigation strategies in response to feelings of vulnerability and threat to bushfire. However, for some, this may lead to an unrealistic evaluation of risk, and place some livestock producers in high-risk situations for which they are not adequately prepared. For example, assessment and movement of livestock should be implemented well in advance of a fire front passing through the property. Yet, due to the unpredictable nature of fire, this is not possible until the last minute, leaving little opportunity for the producer to find safety if conditions change.

As reported by Whittaker, Handmer and Mercer (2012), few livestock producers had adequate insurance cover for their livestock. It is uncertain whether this reflects an underestimation of the risks of natural disasters and/or the value of livestock-oriented preparation activities in the face of competing demands for their time and energy (Coll 2013b). Alternatively, insurance premiums may simply be cost prohibitive, and/or producers may be prioritising expenditure in difficult times on necessities such as animal feed during drought (Whittaker, Handmer & Mercer 2012).

Knowledge of the characteristics of how livestock producers perceive risk and prepare and act during bushfires (e.g. no formal plans, low level of concern, high self efficacy and complacency, under utilisation of warnings and information, resistant to change) present several challenges to firefighting agencies in managing landholders and livestock producers. Agencies need to work collaboratively with landholders to develop management strategies, and be aware that in some cases there is likely to be resistance to change or advice from sources outside of the community. There is a need for education programs that support decision-making in terms of weighing up the costs of time and money against the potential loss as a result of inaction (Coll 2013b). It may also be useful to encourage flexible contingency plans (i.e. Plan B, C and D), community champions (respected community members promoting bushfire planning), and engage pre-existing networks in the recovery phase (e.g. vet care, land sharing, fodder donations, community/neighbour debrief, Thompson *et al.* 2014).

Community-wide bushfire preparation can be enhanced through knowledge transfer via social networks and mentoring (Anikeeva, Steenkamp & Arbon 2015, Stelling *et al.* 2011). This is particularly important given increasing peri-urban development, boutique property holdings and first generation land ownership in the face of traditionally closed farming communities. Given that the loss of livestock is also of national economic significance (Coll 2013a, b), encouraging the development of an emergency plan by offering financial assistance or subsidising insurance to those with a registered plan may be worthwhile.

The particular attitudes, values, risk perceptions, bushfire assumptions, insurance decisions, mitigation behaviours etc. that underpin the objectively measured bushfire preparedness (i.e. planning and insurance) of livestock producers are far from trivial. They need to be identified and addressed to ensure the effective translation of existing policy and guidelines, and to facilitate the development of successful communication and engagement initiatives. Further qualitative research could provide the insight required to understand the full significance of findings reported in this paper.

References

- Anikeeva O, Steenkamp M & Arbon P 2015, *The future of social media use during emergencies in Australia: insights from the 2014 Australian and New Zealand Emergency Management Conference social media workshop*, *Australian Journal of Emergency Management*, vol. 30, no. 1, pp. 22–26.
- Bandura A 1977, *Self-efficacy: toward a unifying theory of behavioural change*, *Psychological Review*, vol. 84, no. 2, pp. 191–215.
- Berry H, Hogan A, Owen J, Rickwood D & Frager L 2011, *Climate change and farmers mental health: risks and responses*, *Asia-Pacific Journal of Public Health*, vol. 23, no. 2, suppl., pp. 119–132.
- Coates L 1999, *Flood fatalities in Australia, 1788–1996*, *Australian Geographer*, vol. 30, no. 3, pp. 391–408.
- Coll E 2013a, *Quantification of Production Losses Due to Livestock Deaths from Disasters in New Zealand*, *Journal of Commonwealth Veterinary Association*, vol. 29, no. 2, pp. 13–18.
- Coll E 2013b, *The case for preparedness: quantification of production losses due to livestock deaths from disasters in Australia*, *World Society for the Protection of Animals*.
- Eriksen C & Gill N 2010, *Bushfire and everyday life: examining the awareness-action gap in changing rural landscapes*, *Geoforum*, vol. 41, no. 5, pp. 814–825.
- Gentle N, Kierce S & Nitz A 2001, *Economic costs of natural disasters in Australia*, *Australian Journal of Emergency Management*, vol. 16, no. 2, pp. 38–43.
- Hall M, Ng A, Ursano R, Holloway H, Fullerton C & Casper J 2004, *Psychological impact of the animal-human bond in disaster preparedness and response*, *Journal of Psychiatric Practice*, vol. 10, no. 6, pp. 368–374.
- Heath S, Kass P, Beck A & Glickman L 2001, *Human and pet-related risk factors for household evacuation failure during a natural disaster*, *American Journal of Epidemiology*, vol. 153, no. 7, pp. 659–665.
- Hunt M, Al-Awadi H & Johnson M 2008, *Psychological sequelae of pet loss following Hurricane Katrina*, *Anthrozoos*, vol. 21, no. 2, pp. 109–121.
- Hunt M, Bogue K & Rohrbaugh N 2012, *Pet ownership and evacuation prior to Hurricane Irene*, *Animals*, vol. 2, no. 4, pp. 529–539.
- Irvine L 2009, *Filling the ark: animal welfare in disasters*, Temple University Press, Philadelphia, PA.
- Johnston F 2009, *Bushfires and human health in a changing environment*, *Australian Family Physician*, vol. 38, no. 9, pp. 720–724.
- Liu Y, Stanturf J & Goodrick S 2010, *Trends in global wildfire potential in a changing climate*, *Forest Ecology and Management*, vol. 259, no. 4, pp. 685–697.
- Millar J & Roots J 2012, *Changes in Australian agriculture and land use: implications for future food security*, *International Journal of Agricultural Sustainability*, vol. 10, no. 1, pp. 25–39.
- Rogers J, Scholz T & Gillan A 2015, *Dealing with livestock affected by the 2014 bushfires in South Australia: decision-making and recovery*, *Australian Journal of Emergency Management*, vol. 30, no. 2, pp. 13–17.
- Stelling A, Millar J, Millar J, Boon H, Cottrell A, King D & Stevenson B 2011, *Recovery from natural disasters: community experiences of bushfires in North East Victoria 2003–2009*, ILWS Report No. 65, Charles Sturt University, Albury, Australia.
- Thompson K 2013, *Save me, save my dog: Increasing natural disaster preparedness and survival by addressing human-animal relationships*, *Australian Journal of Communication*, vol. 40, no. 1, pp. 123–136.
- Thompson K, Every D, Rainbird S, Cornell V, Smith B & Trigg J 2014, *No pet or their person left behind: increasing the disaster resilience of vulnerable groups through animal attachment, activities and networks*, *Animals*, vol. 4, no. 2, pp. 214–240.
- Trigg J, Rainbird S, Thompson K & Bearman C 2014, *Capturing community experiences: South Australian bushfires January 2014*, *Bushfire and Natural Hazards Cooperative Research Centre*, Melbourne, Australia.
- Watson C 2011, *Protecting livestock, protecting livelihoods: the Livestock Emergency Guidelines and Standards (LEGS), Pastoralism: Research, Policy and Practice*, vol. 1, no. 9.
- Whittaker J, Handmer J & Mercer D 2012, *Vulnerability to bushfires in Australia: A case study from East Gippsland, Victoria*, *Journal of Rural Studies*, vol. 28, no. 2, pp. 161–173.
- Wilkie R 2005, *Sentient commodities and productive paradoxes: the ambiguous nature of human-livestock relations in Northeast Scotland*, *Journal of Rural Studies*, vol. 21, no. 2, pp. 213–230.
- Zottarelli L 2010, *Broken bond: An exploration of human factors associated with companion animal loss during Hurricane Katrina*, *Sociological Forum*, vol. 25, no. 1, pp. 110–122.

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