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# SCIENCE IN MOTION: KNOWLEDGE PRACTICES AND PRESCRIBED BURNING IN SOUTHWEST VICTORIA

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**Dr Timothy Neale and Dr Jessica Weir**
Western Sydney University
Bushfire and Natural Hazards CRC

Corresponding author: timothy.neale@westernsydney.edu.au

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# ABSTRACT

The Scientific Diversity, Scientific Uncertainty and Risk Mitigation Policy and Planning BNHCRC project examines three case studies in which scientific knowledges and scientific uncertainties play a significant role in the mitigation of bushfire and/or flood risk. Through these case studies, the project examines how diverse knowledge practices—including scientific knowledge, professional experience, local knowledge, and Indigenous knowledge—and key scientific uncertainties are encountered, managed and utilised by practitioners and decision-makers involved in bushfire and/or flood risk mitigation. This paper suggests that a better understanding of the interaction and evaluation of different knowledges and forms of uncertainty in such mitigation practices will enable industry to better articulate decisions to stakeholders, inquiries, and other audiences.

Scientific uncertainties are those ‘known unknowns’ and ‘unknown unknowns’ that emerge from the development and utilisation of scientific knowledges. They are the things we have comparatively limited knowledge about, whether we know it or not, because of limits in available data or modelling methods. These uncertainties are an irreducible component in any practice that utilises scientific knowledges, and, as such, they play a significant role in bushfire and flood risk mitigation professionals’ attempts to anticipate hazard behaviour within non-linear dynamical systems such as weather and climate. This is not to suggest these uncertainties are overwhelming, but that, as Moore et al. suggest (2005), risk mitigation professionals must ‘embrace uncertainty’ if they hope to comprehensively manage a given risk. This paper will survey both the key findings of the project’s literature review of relevant scientific uncertainties and the initial results of interviews and a scenario exercise involving mitigation professionals from the project’s first case study in the Barwon-Otway area of southwest Victoria. Over the past decade, this region has been the site of multi-agency efforts to reduce the residual bushfire risk using ensemble forecast modelling and fuel reduction burning.



# EXTENDED ABSTRACT

The Scientific Diversity, Scientific Uncertainty and Risk Mitigation Policy and Planning (RMPP) BNHCRC project examines three case studies in which scientific knowledges and scientific uncertainties play a significant role in the mitigation of bushfire and/or flood risk. Through these case studies, the project examines how diverse knowledge practices—including scientific knowledge, professional experience, local knowledge, and Indigenous knowledge—and key scientific uncertainties are encountered, managed and utilised by practitioners and decision-makers involved in bushfire and/or flood risk mitigation. This paper suggests that a better understanding of the interaction and evaluation of different knowledges and forms of uncertainty in such mitigation practices will enable industry to better articulate decisions to stakeholders, inquiries, and other audiences (see also Neale and Weir 2015). To this end, this paper will survey both the key findings of the project’s literature review of relevant scientific uncertainties and the initial results of interviews and a scenario exercise involving mitigation professionals from the project’s first case study in the Barwon-Otway area of southwest Victoria.

All scientific knowledges are necessarily probabilistic and, therefore, absolute universal reliability is a false standard against which to judge scientific knowledges (see Latour 1999). The nature of scientific inquiry is to produce knowledge or facts verified by their reproducibility, a task that also involves attempts to falsify existing theories and to perfect the data and theories on which these verified and reproducible facts are based. Scientific uncertainties are, in turn, those ‘known unknowns’ and ‘unknown unknowns’ that emerge from the development and utilisation of scientific knowledges. They are the things we have comparatively limited knowledge about, whether we know it or not,

because of limits in available data or modelling methods. These uncertainties are an irreducible component in any practice that utilises scientific knowledges, and, as such, they play a significant role in bushfire and flood risk mitigation professionals' attempts to anticipate hazard behaviour within non-linear dynamical systems such as weather and climate. This is not to suggest these uncertainties are overwhelming, but that, as Moore et al. suggest (2005), risk mitigation professionals must 'embrace uncertainty' if they hope to comprehensively manage a given risk.

Using geographer John Handmer's (2008) tripartite analysis of flood risk, we can think of bushfire and flood risk mitigation as an intermediary stage between risk creation and residual risk. Risk creation involves those processes, such as urban planning, through which populations, values and assets are placed in relation to a natural hazard. Consequences of various magnitudes are created in relation to events of various probabilities. Subsequently, risk mitigation involves those processes through which agencies, many of which are involved in risk creation, attempt to limit vulnerabilities to that hazard. Residual risk, in this schema, is therefore the processes though which remaining vulnerability is distributed to, and borne by, emergency management, citizens, insurance companies and others. Such a definition differs from broader definitions of risk management as, for example, 'the culture, processes and structures that are directed towards effective management of potential opportunities and adverse effects' (see Renn 2008, 145), but it is useful in the context of this paper for reasons of analytical clarity. Further, risk mitigation itself is divisible between processes aimed at likelihood reduction, consequence reduction or risk transference (e.g. Ellis et al., 2004). Given that risk transference involves distributing responsibility to non-state actors, this paper focuses on scientific practices related to likelihood reduction and consequence reduction.

Having staked out a field of inquiry in this way, this paper will proceed first by summarising the major uncertainties that are a necessary component of predicting and mitigating bushfire and flood risk. These major uncertainties are categorised as historicist, instrumental and interventionist uncertainties. Historicist uncertainties emerge from the reliance of scientific knowledges on archives of historical data, which can itself be scarce and variable in its reliability. As Lane et al. suggest (2011), in hazard prediction 'the futures imagined are tied to pasts experienced' and their availability in the present. Instrumental uncertainties emerge from the limitations of a given apparatus, heuristic or theory brought to bear to mitigate a risk. Each such 'instrument' brings with it inherent limits of confidence owing to its parameters, design and development. Interventionist uncertainties emerge from any effort to predict and/or calculate the effect of an intervention, such as legal reforms, policy changes, and engineering works, amongst others. All such interventions are themselves wellsprings of uncertainty with effects that can and should be scientifically quantified in advance but that nonetheless cannot be wholly predicted by scientific methods.

But how are such multiple uncertainties understood and managed by risk mitigation professionals? To answer this question, the second section of this paper will draw upon the project's first case study in the Barwon-Otway area of southwest Victoria. Like other comparable regions in Australia's southeast, the region is a high bushfire risk area because it is at risk of bushfires that are low probability but high consequence. More specifically, the region's abundance of old-growth eucalypts, the geographic proximity of resident and tourist populations to forested areas, and the prevailing weather pattern capable of creating intense firestorms that first burn in a narrow southerly direction through contiguous forest to create what, following a perpendicular 'cool change', can turn into a wide fire front along the coastline. Several of the disastrous post-settlement fires to affect the region followed this pattern, such as the Dean's Marsh (or Ash Wednesday) fire in February 1983, a firestorm that burnt through 41,000 hectares between Lorne and Anglesea (Bardsley et al., 1983; Mills, 2005).

Over the past decade, the Barwon-Otway area has been the site of multi-agency efforts to reduce this bushfire risk to assets and values using ensemble forecast modelling and fuel reduction burning. Drawing upon qualitative research, this paper asks how risk professionals utilising advanced scientific methods understand and prioritise knowledges in practice. What other knowledges—including professional experience, local knowledge, and Indigenous knowledge—are brought to bear in calculating and mitigating risk, and how are these knowledges ordered and judged as salient, credible and authoritative? Are the uncertainties they encounter historicist, heuristic or interventionist? The preliminary findings of this case study suggest that risk mitigation takes the form of cycles of self-reflexive pragmatic reasoning—cycles in which logical inferences from available data and knowledges are made self-reflexively to produce functioning hypotheses in light of known uncertainties. As such, while mitigation professionals' are generally alert to the limits of scientific confidence, they exhibit a variety of perspectives about how such limits can and should be communicated.

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