

The Senate Environment and Communications References Committee is currently inquiring into Australia's faunal extinction crisis

David Bowman, Professor of Pyrogeography and Fire Science
University of Tasmania

How the demise of fine-grained burning has contributed to the Australian extinction crisis

Globally, Australia is distinguished by high numbers of endemic plants and animals, reflecting a long period geographic isolation that enabled independent evolutionary processes. Australia is also globally renowned for vertebrate extinctions associated with the waves of human colonisation. The causes of the late Pleistocene extinction of large animals, mostly marsupials, remain intellectually contested, but is likely related to Aboriginal colonisation that commenced around 45,000 years ago. The causes of the modern-day extinction crisis, particularly of small to medium sized mammals, are also scientifically debated, but are unquestionably related to European colonisation. Fixation on the Pleistocene extinctions by some authors has distorted the debate about appropriate responses to the current, ongoing extinction crisis. Indeed, understanding the contemporary extinction crisis is likely to inform debate about the Pleistocene 'megafaunal extinctions' rather than vice versa.

The contemporary extinction crisis is unusual given it is concentrated in northern and central Australia where landscapes are little affected by land clearance, which is a well-recognised threatening process globally. Introduced predators (particularly cats and foxes), changed fire regimes, and degradation of habitats by domestic and feral stock, and their interactive effects, are increasingly recognised as important contributors to small mammal extinctions in outback Australia. Of prime importance is the shift from fine grained burning mosaics that were created under Aboriginal traditional fire management practices, which burned small areas frequently.

Traditional Aboriginal fire management has been disrupted under European management, resulting in large areas burnt frequently. This degrades habitat quality by removing small unburnt areas with dense cover, which amplifies the effects of introduced predators because small mammals are unable to evade detection. Contemporary fire management approaches, even in comparatively well-resourced national parks such as Kakadu, have failed to create fine grained burn mosaics. This explains why even these very large nature reserves are experiencing population declines and local extinctions of small mammals.

Current management has failed to prioritise create fine-grained fire mosaics in nature reserves. In my opinion, this is due to the mistaken but commonly-held belief that only two elements of a fire regime matter for protecting biodiversity. These factors are (a) fire frequency and (b) fire season, that is used as a proxy for fire intensity. The belief that a third key fact of a fire regime, the spatial pattern of burning, does not matter stems from three factors:

First, managers often assert that there is no compelling evidence for the critical role of fire-grained mosaics in conserving biodiversity. The limited evidence for the importance of fire-

grained mosaics reflects the limited research and research investment into this topic, which has created an intellectual feedback loop where the absence of research findings and published scientific evidence is interpreted by managers as an absence of an important effect.

Second, much of the research testing the importance of fine-grained mosaics has been conducted in landscapes where the extinction crisis has already played out, such as the mallee region in south-eastern Australia. Studies in such defaunated landscapes tend to show little linkage between biodiversity and fire mosaics, because the extant biodiversity has been filtered to tolerate changed fire regimes, and the species that cannot tolerate the change have become locally extinct.

Third, to a large degree fire management has become captured and driven by simple metrics such as area burn targets, and burning before a set date. The simplest way to achieve these targets is to use aircraft to burn large areas, with little consideration of creating a fine-grained mosaic. Further, schemes for 'carbon farming' on Aboriginal Lands have hinged around achieving burning before an arbitrary calendar date used to define early dry season 'low intensity' fires. The focus on achieving externally imposed burning targets has also resulted in the perverse outcomes where long unburnt vegetation is intentionally burnt to achieve these externally imposed targets. Long unburnt vegetation is exceptionally rare in north Australian landscapes, and provides a valuable refuge for fire-sensitive species. The failure of managers to prioritise its conservation, and indeed the tendency to deliberately burn it, is, I believe, an invidious contributor to the extinction crisis.

The reimposition of fine-grained fire mosaics has benefits beyond biodiversity. These include improving fire management by encouraging more on-ground targeted burning (as opposed to broad-scale aerial burning) that is specifically designed to protect biological, cultural and economics assets, and also creating employment for crews that can be tasked to undertake burning outside the fire season, and trained to fight fires during the fire season. Such ground-based burning presents meaningful employment for Aboriginal people because it helps preserve, or rekindle, their ancient fire management traditions. Such work has been shown to improve their psychosocial and physical well-being, as well as the health of the natural environment.

To conclude, landscape scale trials and associated scientific evaluation of fine-scale patch burning, including the health and social benefits for Aboriginal people, is of critical importance in stemming the current Australian extinction crisis. There is urgency to do this given the scale of the extinction crisis, and the likely synergistic effects of climate change in driving defaunation.