

## Rangelands, weeds and biodiversity

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*Abstract.* Australian rangelands are important for the diverse assemblages of native plants and animals that they support as well as for the wide variety of products and services that they provide. These assemblages are of national and international, cultural, social, ecological and economic significance. Woinarski (2001) identified several processes that are threatening the biodiversity of Australian rangelands, including grazing pressure, the proliferation of artificial watering points, vegetation clearing, predation by introduced animals and inappropriate fire regimes. His review also highlighted the importance of invasion by non-native plant species, a threatening process for ecosystems in other parts of Australia and around the world. Biological invasions pose a major risk for individual native species, communities and the ecological processes upon which they depend. The papers in this Special Issue of The Rangeland Journal consider non-native plant species in relation to the threats that they pose to the biodiversity of Australian rangelands and how those threats may be managed.

In general terms, rangelands occupy about 70% of the Australian continent, an area of about 6 million km<sup>2</sup> (Foran *et al.* 1990), although statistics available on the biodiversity, invasive species, or other elements often relate to somewhat different boundaries (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, ANZECC and ARMCANZ 1999). Of the 85 Interim Biogeographical Regions (IBRA) regions into which the continent has been divided (Environment Australia 2000), 53 are found in the rangelands. Similarly, 15 biodiversity hotspots have been defined as areas ‘rich in plant and animal species, particularly many endemic species, and under immediate threat from impacts such as land clearing, development pressures, salinity, weeds and feral animals’ (Department of Environment and Heritage 2003); five of these hotspots (Einiasleigh and Desert Uplands, Brigalow, Carnarvon basin, Hamersley/Pilbara and North Kimberley) are located in the rangelands. At the species level, the rangelands support 67% of Australia’s reptiles, 62% of birds, 47% of frogs, 33% of mammals, a large variety of invertebrates (Smyth and James 2004) and perhaps 7–10% of the continent’s plants (George 1981; Department of Environment and Heritage 1999).

The lands on which this diversity of species, communities and ecosystems exists are exploited for many purposes under a variety of tenure arrangements. Of the 6.6 million km<sup>2</sup>

of land defined as rangelands by the Australian Bureau of Statistics (ABS) (National Land and Water Resources Audit 2000), about 30% is crown land owned and managed directly by the States or Commonwealth. Around 50% of this crown land is unallocated while the remainder is allocated primarily for defence training, transport corridors, stock routes, forest, conservation or other reserves. Only about 8% of ABS-defined rangelands are either national parks or other conservation reserves so that much of the biodiversity of Australian rangelands exists on land used primarily for other purposes. The predominant tenure arrangement is pastoral and mining lease with over half of the rangelands used principally for livestock production. At least 20% of the rangelands are under indigenous land tenure, including 2.4% under indigenous pastoral lease (National Land and Water Resources Audit 2000). The management of the biodiversity of Australian rangelands must address this variety of tenure arrangements and land uses.

Various terms of overlapping meanings are used to refer to unwanted plants. The term ‘weed’ is used generally to refer to any unwanted plant, making it more a socio-economic term rather than a biological one. In a biodiversity context, any plant that has deleterious consequences for biodiversity can be regarded as a weed, although this series of papers concentrates on non-native species. This does not deny the possibility that native Australian plants may be weeds from some perspectives, including an environmental one.

In this Special Issue, the term 'non-native species' is used to refer to species that are not native to the Australian continent. The term 'naturalised [species]' (*sensu* Richardson *et al.* 2000) is used to refer to non-native species that 'reproduce consistently and sustain populations over many life cycles'. The expression 'invasive plants' is used to refer to any naturalised species that has a demonstrated capacity to spread in the area to which it has been introduced (Richardson *et al.* 2000). An 'introduced' or 'alien' plant is a species that has been deliberately or accidentally brought to Australia, directly or indirectly as a result of human activity. This latter category is often referred to as 'exotic' plants and in this sense is synonymous with the term 'non-native species'.

The papers that follow were initially prepared as part of a project conducted by the Co-operative Research Centre for Australian Weed Management on behalf of the Australian Commonwealth Department of Environment and Heritage (DEH). They were presented at a workshop held in Brisbane in April 2005 and material from them was integrated into a report prepared for DEH. The first paper in this Special Issue (Martin *et al.* 2006) identifies the non-native plants of Australian rangelands and their geographical distribution, while the second (Grice 2006) reviews currently available information on their impacts. The next two papers discuss the challenges of managing non-native plants in the rangelands and the approaches available for doing so (Vitelli and Pitt 2006; Julien 2006). Spafford-Jacob and Randall (2006) discuss issues of policy and procedure for minimizing weed risks through border control. The final two papers (Martin and van Klinken 2006; Martin and Grice 2006) discuss investment in weed management activities in rangelands and how the value of those investments can be assessed.

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