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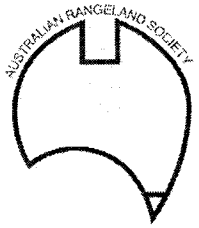

The Australian Rangeland Society

CONSERVATION AND THE MAINTENANCE OF BIODIVERSITY IN THE RANGELANDS

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ABSTRACT

Twenty native mammals have become extinct from Australia's rangelands in the last 200 years. That is not the end of the problem: unfortunately, declines in biodiversity continue across most of the rangelands. We argue that this is detrimental to all rangeland users: that we are sullying an international asset; that we are undermining the basis of a major rangeland industry, tourism; that we are sabotaging the potential for the development of alternative rangeland uses (most notably sustainable use of native wildlife); that such losses provide evidence that we are poor managers; that such losses diminish our lives; that such losses indicate that at least some of our environments are operating at reduced functionality; and that such losses take away or reduce important and wide-ranging environmental services.

Things need to improve. We see the pathway to such improvement as involving (i) the development of a clear goal for biodiversity conservation in the rangelands (maintenance of viable populations of all native species of plants and animals at appropriate spatial and temporal scales), (ii) the development of explicit targets relating to this goal, and set at continental, jurisdiction, regional and property scales; and (iii) monitoring progress towards this goal. While we recognise that our existing knowledge base is imperfect, such limitation should not delay the implementation of these steps. We consider that there is sufficient management expertise to realise a rangeland biodiversity goal. However, there are two more serious impediments in achieving the goal: current lack of resources and of societal agreement.

INTRODUCTION

The rangelands are a critical reservoir for Australia's biodiversity. They harbour much of Australia's most distinctive biodiversity, including centres of endemism, refugia and "hotspots" (areas of unusually high species richness) for some plant and animal groups (e.g. Morton and James 1988; Abrahams *et al.* 1995; Ingwersen 1995; Morton *et al.* 1995a). They provide still the vast arena for the long-term retention of biodiversity and for the workings of ecological processes, now largely compromised in the cut-apart landscapes of the non-rangeland coastal fringe. In the rangelands, the pulse of the continent still beats, driving an ebb and flow of recruitment events, population expansion and contraction and, for some species, dispersal over continental scales.

Most Australians regard the rangelands as timeless, as wilderness little changed since European settlement and little affected by Aboriginal management before then. Sadly, this is a delusion. Superficially, we see the structure intact - we are readily beguiled by the glorious peaks of the MacDonnell Ranges, Flinders Ranges, the Kimberley, Uluru, the vast deserts, the seemingly endless open forests across northern Australia - but to an increasing extent these are a façade, masking the far less conspicuous loss of biodiversity across all those landscapes. Here, we argue that we all must recognise these losses, identify their causes and remedy the problem.

Now, we don't want especially to be sanctimonious about biodiversity loss. We happen to like biodiversity, and as professional biologists have an abiding interest in the workings of natural systems. While we'd like others to share our value systems, we recognise that this can't be imposed. Instead, we argue that the retention of biodiversity is important for all landholders and users of the rangelands, for moral and practical reasons:

- on world terms, the Australian rangelands offers a chance to get it right, to maintain a vast functioning environment. This chance has been forfeited in most rangelands overseas, because of high (and rapidly increasing) human population density, gross disturbance, and the impoverishment of many rangeland nations. We have an internationally important asset that we shouldn't sully.
- biodiversity underpins a major rangeland industry, tourism;
- biodiversity offers potential for diversification of rangeland enterprises, and opportunity for economic self-reliance for otherwise impoverished rangeland communities, through such enterprises as bush-tucker farming and commercial use of wildlife (Bomford and Caughley 1996);
- protection of biodiversity measures our performance as responsible land managers;
- many residents of the rangelands, and especially Aboriginal people, are diminished by biodiversity loss: few of us want to live in graveyards;
- species loss or decline is a sign of dysfunction, and most rangeland users want our environments functioning properly. Healthy diverse systems are more likely to benefit all rangeland users than are simplified and impoverished systems, especially so in our rangelands which are characterised by extreme climatic fluctuations, that are more likely to unplug simple than complex systems (Griffin and Friedel 1985; Friedel *et al.* 1990; Stafford Smith and Morton 1990);
- more broadly, biodiversity provides ecosystem services (including, by some components of biodiversity, pollination, seed dispersal, soil improvement, shade, protection from erosion, control of pests and weeds, and many other functions), whose economic value remains ill-defined but unarguably substantial.

In this paper, we briefly review the status of rangeland biodiversity and of factors determining that status, and then outline some mechanisms for promoting the retention of rangeland biodiversity. We recognise here that we are by no means the first to tread this path: important precedents for all or parts of biodiversity in all or parts of the rangelands include Morton and Mulvaney (1996) for changes in biodiversity in central Australia over the century since the Horn Expedition of 1894; Whitehead *et al.* (2001) for a review of biodiversity status across the rangelands as a whole and for consideration of priorities for biodiversity monitoring; and Morton *et al.* (1995b) for guidelines for conservation management in the arid rangelands. We also admit to delivering related addresses, at the International Rangelands Congress in 1999 (Woinarski 1999) and at the Northern Grassy Landscapes conference in 2000 (Woinarski *et al.* 2000): the message bears repeating.

THE STATUS OF BIODIVERSITY IN THE RANGELANDS

Our rangelands still support much biodiversity, that continues to nurture and delight most rangeland residents and visitors. But, much has been lost and more is being lost now. The most evident component of this decay is among the mammals of the arid and semi-arid rangelands, widely recognised as the most odious example of biodiversity loss the world has witnessed in historic times (Finlayson 1961; Burbidge *et al.* 1988; Burbidge and McKenzie 1989; Morton 1990; Lunney *et al.* 1994). A total of 20 rangeland mammal species have become extinct over the last 200 years, with a further six rangeland species now restricted to captive populations or wild populations on one or a handful of offshore islands (McKenzie and Burbidge 2002). In many rangeland areas, these species constituted around half of the terrestrial mammal fauna, and many of the lost species had important ecological functions (Noble 1999) and/or cultural significance (Burbidge *et al.* 1988; Tunbridge 1991). Many were extraordinarily common, occurred across a broad spectrum of habitats, were by most definitions highly successful, and were an integral and distinctive part of the fabric of the rangelands. Their loss has been related particularly to feral predators (cats and foxes); to changed fire regimes; to the impacts of livestock, especially in the relatively resource-rich and most stable pieces of the landscape; and to environmental change wrought by weeds and feral herbivores, especially rabbits. Most of those losses occurred over the period between the 1890s and 1950s, largely before our society valued environmental responsibility, and largely before we had the information to appreciate that not all was well. We can almost excuse those losses: they happened in a

different era, and went almost unnoticed. However, mammal declines continue in the arid and semi-arid rangelands, most notably the loss of the last wild mainland population of mala *Lagorchestes hirsutus*, in the last decade. Recent evidence (Woinarski *et al.* 2001; Burbidge and McKenzie 2001) suggests that comparable losses of mammal fauna may be occurring now in the rangelands of northern Australia, a region until recently considered relatively "safe".

Broad-scale losses have also been reported for a high proportion of the birds of the arid rangelands (Reid and Fleming 1992) and the northern rangelands (Woinarski 1993; Franklin 1999). Losses of rangeland birds are continuing, and the semi-arid rangelands of south-eastern and south-western Australia are currently suffering some of the most substantial declines of bird fauna for the whole continent (Barrett *et al.* 2002).

A series of recent studies (Landsberg *et al.* 1997; Read 1999; Fisher 2001; Woinarski and Ash 2002; Woinarski *et al.* 2002) has examined the relationships between biodiversity and grazing pressure, through cross-fence and/or grazing gradient approaches. Although there is some inconsistency in results from these studies, relating in part to the environments and grazing regimes considered, the general conclusion is that something like 15 to 40% of species are likely to decrease with increasing grazing pressure, with this conclusion reasonably general across a range of plant, invertebrate and vertebrate groups. Such studies suggest broad-scale decline for many groups, whose trends would otherwise be unknown, given the extremely thin historical baseline record for much of the rangelands biota.

Biodiversity in the rangelands is affected by many factors additional to pastoralism. These include altered fire regimes, spread of pests and exotic plants, hunting or other forms of use, mining and pollution, changes in water availability and/or quality, vegetation clearance, climate change, and compounded combinations of these.

THE FUTURE STATUS OF BIODIVERSITY IN THE RANGELANDS

Our task is not to bemoan the extinction and decline of our rangeland biodiversity, but rather to learn what we can from that history, and plan to maintain and enhance what we still have. We suggest that this forward planning involves six components, listed below as key questions.

1. *What state do we want for biodiversity?*

It is possible to set a goal for rangeland biodiversity. One recent attempt is that of the Tropical Savannas Cooperative Research Centre (Whitehead *et al.* 2000), which included three components in their definition of "healthy" country:

- maintenance of basic functions at all spatial scales including: nutrient cycling; water capture; provision of food and shelter for animals;
- maintenance of viable populations of all native species of plants and animals at appropriate spatial and temporal scales; and
- reliably meeting long-term needs (material, aesthetic, and spiritual) of people with an ongoing interest in the savannas.

In particular, the second of these component provides a sound basis for a future direction for biodiversity conservation in the rangelands. The next step in this process is to move from the somewhat imprecise "viable populations" to more explicit targets. This step is currently being considered within the framework for regional delivery of the next stage of the Natural Heritage Trust. But we also must consider how our biodiversity goals are established at, and translated to, national, jurisdiction, region, property and paddock scales.

2. *Have we the knowledge to know what to do to achieve that state?*

Our knowledge of rangeland ecology and management is far from complete. But such ignorance cannot be used as an excuse for inaction or for failing to include biodiversity as a major component of rangeland land use planning and management. We have detailed knowledge of the ecology, distribution and population size for many rangeland species; we have comprehensive inventories for at least some (arguably representative) rangeland regions, and we have a reasonable understanding of the responses of a broad spectrum of rangeland biota to many land management factors.

Our knowledge tends to become less precise at finer scales: we are less likely to be able to use existing knowledge to document the biota of any specified paddock than for any specified region.

We cannot measure the state of all biodiversity, so must find some mechanism for simplifying the task. This requires sound judgement to select representative and sensitive species and ecological communities to set targets for and monitor, and ecological analysis to determine what constitutes a viable population of any rangeland taxon or an adequate area for any rangeland ecological community.

3. Have we the practical skills to apply that knowledge?

For the many species for which we know response patterns to a range of land management factors, there should be no insuperable practical barrier to moulding the management to benefit the species concerned. Most managers have the practical skills to manipulate fire regimes and stocking rates, and there are sound and well-established procedures for combating many rangeland weeds and pests. Neither lack of knowledge nor lack of management skills should be a major impediment for the maintenance of rangeland biodiversity.

4. Are there sufficient resources to implement those practices?

Currently there is neither the money nor the personnel to develop an ideal biodiversity conservation program across the rangelands. Large extents of rangeland areas are almost empty: this is so even on many Aboriginal lands, which have suffered depopulation or major change in population dispersion. In such areas, the intricate fire regimes which formerly sustained high levels of biodiversity are no longer achievable (Yibarbuk *et al.* 2001).

In response to this shortfall of resources to achieve a rangeland biodiversity goal, we need to carefully prioritise existing needs, to be as strategic and efficient as possible with the available directed resources, to attempt to seek collateral benefits from other rangeland users and management goals, and to attempt to increase the amount of resources available. We also need to improve the coordination across rangeland jurisdictions, and to improve the linkages between conservation management across tenures.

5. Can we measure how well we are doing, our approach towards the goal?

Where it exists, biodiversity monitoring in the rangelands is currently highly idiosyncratic and piecemeal (Whitehead *et al.* 2001). In contrast, many rangeland jurisdictions have substantial monitoring programs for pastoral "condition". There is substantial scope for broadening and bolstering these existing plot-based programs to include at least some representative and/or sensitive elements of biodiversity (Table 1: Whitehead *et al.* 2001). An integrated rangeland monitoring program should also consider a range of indicators that can be assessed without the need for plot-based studies. These include the comprehensiveness and adequacy of the conservation reserve system; the extent of vegetation clearance; fire history; and trends in land use condition. Assessment of such indicators needs to be related to trends

in biodiversity through the establishment of linkage studies, such that it becomes possible to interpret how biodiversity is faring with change in these remotely-sensed factors.

Table 1: list of indicators proposed by Whitehead *et al.* (2001) for a national rangeland biodiversity monitoring program

Monitoring Component	*Elaboration*
progress to a comprehensive adequate and representative reserve system	area (and %) by vegetation type in conservation reserves
extent of vegetation clearance	rate (and cumulative extent and %) of clearing, in all rangeland vegetation types
landscape functionality	extent of change in landscape functionality analysis scores, measured at pastoral monitoring plots
cover of key vegetation life forms (native perennial grasses, shrubs)	extent of change in total cover (and diversity) of native perennial grasses (or shrubs for some communities, such as chenopod shrublands), measured at enhanced set of pastoral monitoring plots
cover of exotic plant species	extent of change in total cover (and species richness) of exotic plant species, measured at enhanced set of pastoral monitoring plots; and mapped distributions of selected significant weed species
status of fire-sensitive plant species and communities	area burnt, by frequency and intensity of burning and vegetation type; age-structure and abundance of populations of fire-sensitive plant species, measured at enhanced set of pastoral monitoring plots; change in woody cover, derived from pastoral monitoring plots and imagery
status of susceptible plant species	change in abundance and/or cover of selected set of non-resilient ("decreaser") plant species, measured at enhanced set of pastoral monitoring plots
status of susceptible mammal species	change in abundance of selected suite of mammal species, as derived from repeating selected landmark surveys
status of susceptible bird species	change in abundance and/or distribution of bird species, as derived from repeat Atlases
status of threatened species and ecological communities	change in abundance and/or distribution of nationally listed threatened rangeland species and ecological communities
trends in land-use intensity	measures of human pressure on rangeland landscapes (e.g. trends in regional population, pastoral infrastructure, road network, etc.)

6. Have we got society's support for a rangeland biodiversity goal?

We suspect that all rangeland users would accept the broad goal suggested above. However, there is likely to be more problem when the issue becomes more specific and spatially restricted, most particularly when biodiversity conservation is focused at the property and/or enterprise level. And there is likely to be more problem with the issue of adequate resourcing.

There are many contentious elements of rights and responsibilities associated with holding, using and deriving income from rangeland properties. These differ appreciably across jurisdictions and tenure types. Ideally, landholders should be rewarded (or at least encouraged) when their management contributes to the conservation of that component of biodiversity that is associated with their holding: conversely, they should be penalised (or at least discouraged) when their management results in detriment to that biodiversity. The application of this simple ideal is the nub of much of the problem in rangeland

biodiversity management. One element of this problem is the mathematics of defining and trading-off conservation value versus economic production. This element can be resolved: Fisher (2001) provides economic costings for a range of explicit biodiversity outcomes achieved across a range of stocking rates and pastoral infrastructure developments for properties in the mitchell grasslands; and Dyer and Stafford Smith (in press) have evaluated economic and conservation costs and benefits for a range of fire regimes on pastoral lands in the Victoria River District of northern Australia. These examples provide the objective means for resolving conflict. But much of the problem remains unresolved: how much is "duty of care" accepted by landholders, and what does this cover?; who pays for the control of weeds, pests and fire management?; who pays for reduced economic offtake associated with reducing stock numbers in order to protect a threatened species that happens to occur on the property?; can and should explicit conservation covenants be placed on title? The example of Roxby Downs uranium mine, provided in this conference by John Read, suggests a reasonable philosophical approach: if substantial biodiversity detriment is caused by the enterprise, then those achieving economic gain from that detriment should use some of that profit to improve biodiversity outcomes elsewhere. Read's paper suggests that in this case, the biodiversity gains outweigh the losses.

The other main element of biodiversity conservation in the rangelands is the opportunity that this provides for meaningful work - a rare commodity in many economically marginal rangeland areas. The best example of this is the extraordinary growth of community ranger programs on Aboriginal lands across northern Australia, funded mainly by the CDEP scheme ("work for the dole"). Workers in this program make major contributions to the management of weeds, feral animals and fire, thereby providing substantial biodiversity outcomes.

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