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HIERARCHICAL DESIGN FOR CONSERVATION OF BIODIVERSITY IN AUSTRALIA'S RANGELANDS.

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ABSTRACT

The conservation of biodiversity in the rangelands cannot occur solely in National Parks - the arid lands environment is too risky and too extensive. Deciding what level of protection is needed outside parks must be based on an understanding of how the rangelands function. Many plant and animal species in the rangelands depend on special resources at critical times, like drought, but there is evidence that the persistence of native plants and animals outside critical refugia can be compatible with appropriate pastoral management. We therefore outline how an hierarchical design of rangelands reserves could be integrated with other land uses; complete insulation of major refugia areas would be combined with special management of important smaller areas at critical times, and with sustainable pastoral or other management on the broader landscape. We offer this design framework for discussion as one element of the long term development of a National Rangelands Management Strategy.

INTRODUCTION

The jargon of the 1990's is set to be '*conservation of biodiversity*' and '*ecologically sustainable development*'. These ideas may be intuitively nice but what do they mean, how do we integrate them and, most especially, how do we put them into operation in the rangelands? In this paper we take *conservation of biodiversity* to mean the regional maintenance of the diversity of our flora and fauna, and *ecologically sustainable use* of the rangelands to mean use that does not cause land degradation, that is, a loss of long-term potential productivity. The total use of the rangelands must evidently also be economically viable, whether as production in industries like pastoralism and tourism, or through support from the taxes of the rest of Australian society.

How can conservation and sustainable production be integrated in the rangelands? We are all well aware that there have been serious problems with both species loss and land degradation in the past. If there were infinite management resources, the national park system could theoretically be expanded to the point where all necessary ecosystems and ecosystem functions were included in reserves managed solely for this purpose. There are at least two problems in this suggestion. Firstly, even to include all vegetation types properly would require the reservation of an enormous proportion of the rangelands (Pressey & Nicholls 1989) - we doubt that society will ever have the resources available to pay for the management of this huge area as National Parks; secondly, even this area will not be enough to protect the flora and fauna of the rangelands because organisms depend on being able to use the intervening habitat, especially for recolonisation after droughts. As a consequence, a different management strategy is required for the rangelands nationally. Based on our current understanding of how the rangelands function, this paper sets out for discussion one possible approach to this strategy.

ECOLOGICAL FUNCTION

The functioning of Australia's enormous arid zone has been reviewed in various places (eg. Stafford Smith & Morton 1990); some key points are summarised in Fig. 1.

The Australian rangelands experience an extremely unpredictable climate by world standards. Any management strategy must allow for the fact that extreme droughts will occur from time to time. The biota has coped with this problem in the past by accepting a degree of local extinction and re-invasion. This means that organisms must continue to be able to move across the landscape.

The rangelands are spatially diverse in several ways. Some areas of the rangelands (especially the chenopod shrublands and mitchell grasslands) are based on reasonably rich soils. The majority, however, is based on ancient, leached, infertile soils which have been greatly sorted over many millenia; in this sea of infertility, most production is concentrated in rich pockets - run-on areas close to small ranges, the major river systems and their floodplains, and other areas where raised water tables make the environment a little more reliable. In these generally poor landscapes, the fertile patches are the main source of pastoral production, especially during dry periods. They are also the main focus for introduced feral animals such as rabbits, horses, goats and donkeys. Whilst biodiversity is in no way limited to these pockets, they are a source for resource use conflict since certain types of native plants and animals also use them.

It is likely that moderate levels of grazing of introduced stock or tourism impact are compatible with the movement of native organisms across the majority of the landscape. The major resource conflicts probably occur in the drought refugia themselves, and it is these refugia, which occur at all scales from the microscopic to the mountain range, that require special management.

AN HIERARCHICAL APPROACH TO DESIGN

For a national conservation and land management strategy to be more objectively defined than present, it will need to be based on an understanding of how the landscape functions. We see three critical points - (i) some areas of soil are more uniformly fertile than others, (ii) in generally infertile areas, resource conflicts and consequent conservation problems will be concentrated in richer pockets, and (iii) the entire landscape is subject to intermittent severe drought.

The fourth socio-political factor is that we cannot, as a society, afford to turn the entire rangelands into a national park: a substantial part of the conservation of biodiversity must take place on lands which are not dedicated solely to conservation. This means that whatever measures are needed to contribute to conservation on these lands must be integrated with other broadscale land uses, such as pastoralism, tourism or aboriginal homelands. In fact these land uses will be necessary to generate the funds to justify the presence of land managers on these lands; society could not afford to pay a 'park ranger' to live on every pastoral property and carry out feral animal and weed control, nor indeed would it be easy to find people who have the depth of local knowledge and long-term commitment needed to carry out such management effectively. The questions then become, firstly, which lands *should* be dedicated as pure national parks, and, secondly, what measures are critical in the management of the remaining lands ?

Fig. 2 provides a simplified landscape classification to help to answer these questions. Our first step is to separate generally fertile and generally infertile landscapes; the land use conflict issues are very different on these different landscapes, although in reality they fall along something of a continuum. Biodiversity occurs everywhere, so the first priority for National Parks - that is, areas dedicated solely to conservation of biodiversity - should be to include representative regions of all landscapes. However, in landscapes which are generally infertile, organisms will be under threat primarily in fertile pockets; therefore the second focus should be on areas with a high concentration of fertile pockets, which can be managed efficiently as traditional National Parks.

At some point, the resources available for managing National Parks will be exhausted. The remainder of the landscape will be available for other land-uses; however, there will still be critical parts of this landscape that require special management to ensure the overall maintenance of ecosystem function. We suggest that some areas will be excised from the surrounding land use but still be managed by the local land user - we have termed these *Excised Management Units* (EMUs), which may be too small and dispersed to manage efficiently as part of the main National Park system; other areas will be managed as part of the land-use but with special intervention at critical times - *Restricted Use Units* (RUUs), which will be even less able to be

handled as part of the National Park system; the remainder of the landscape will be managed simply on the basis of normal sustainable production objectives. Fig. 2 indicates how these different parts of the landscape would be identified.

The importance of this approach is that it provides an objective way of setting land use priorities. The total availability of government resources will ultimately balance the number of parks against less expensive, broadscale conservation management which can be integrated with other land uses. It also highlights some of the research questions that need answering - what levels of grazing (at what times) are compatible with the maintenance of RUUs, what are the processes of local extinction and re-invasion, and what level of grazing will allow the necessary movement of organisms across the intervening landscape ?

DISCUSSION

The scheme described above is very much a proposal for discussion. Furthermore, it takes a broad view and there will be many regional factors which must be allowed for. However, if accepted, it would have many implications for land management in Australia's rangelands. Firstly, there would be legislative issues: it implies that land uses within a defined unit such as a lease need to be far more flexible than is generally permitted today. At present in most states different productive land uses come under different legislation and even different departments. This is already changing.

Secondly, it has many implications for the primary land managers, whether pastoralists, state conservation agencies or Aboriginal people. Outside parks, one would see those living on an area of land adopting a land stewardship role towards that land, exchanging certain production rights for certain management obligations. This also already happens, but not always in a clearly-defined way, and rarely in the context of deliberately mixed land uses.

We have spoken to managers who were quite happy with this concept of a broader land stewardship role. For example, one manager described how, ideally, he would like to cut his stock numbers in half, to allow himself more flexibility in spelling and maintaining the country. He would then aim to supplement his reduced income firstly from a small tourist enterprise, and secondly by acting as manager of a small conservation reserve adjoining his lease for half a day a week (at present the reserve is serviced from 300 km away). He would obviously expect to be paid some sort of modest 'conservation salary' for the reserve management. This mixed management approach has not been implemented in the Australian rangelands, but equivalent moves have occurred widely in Europe in the last decade.

Pastoralists reading this might feel that they are already achieving the same ends. Nonetheless, we contend that there are considerable legislative blocks which prevent the approach being taken to its logical conclusion, mainly because grazing tends to be separated from other land uses. We see the need for a new concept of land stewardship in Australian lands legislation, which encompasses productive use, conservation management and lifestyle enjoyment in an mix which is appropriate to individual areas of land.

Conservation managers reading this might also feel that it is merely a re-statement of what has been done for many years. We believe that this is not so. Firstly, past park acquisitions have tended to focus on land that was not needed for other purposes, which means that the functionally-critical fertile parts of the landscape are generally greatly under-represented in the existing network. Secondly, we identify a more explicit role for conservation management by other land users. Thirdly, whilst concepts such as regional reserves are certainly moving towards allowing the appropriate integration of different management regimes, there is still a need for the further development of a clear management rationale which separates land with different management requirements. Margules *et al.* (1988) have argued that their reserve selection procedures need to be tuned by an understanding of

what landscape components should have different priorities. We believe that this functional approach partly fulfils their need.

CONCLUSION

An Australian Rangelands Society audience will be well aware that the management of the rangelands must be a cooperative effort. All users and society at large have a vested interest in maintaining the long-term condition of our heartlands. The government cannot afford to manage this vast area as a park. Yet the sustainability of different, potentially conflicting private uses, including tourism, grazing, aboriginal homelands and even simple national appreciation, could be fundamentally compromised if these conflicts are not resolved. We offer this set of ideas for discussion as one possible element of a future National Rangelands Management Strategy.

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FIGURES (ON NEXT PAGE)

Figure 1: A division of Australian rangeland landscapes according to the fertility of soil and availability of soil moisture for plant growth, and the implications of these categories for use by introduced herbivores. Areas of potential conflict with native organisms are thereby highlighted. Note that these different types of country are on continua conceptually, although the boundaries between areas can be quite abrupt in real landscapes.

Figure 2: Our view of how different parts of the Australian rangelands might be managed in an ideal world where an understanding of ecological function determines land use. In this circumstance, we suggest that regional conservation of biodiversity could be achieved through the creation of an hierarchical system of reserves aimed at protecting patches of productive country, with sustainable productive use of the intervening land.

Figure 1

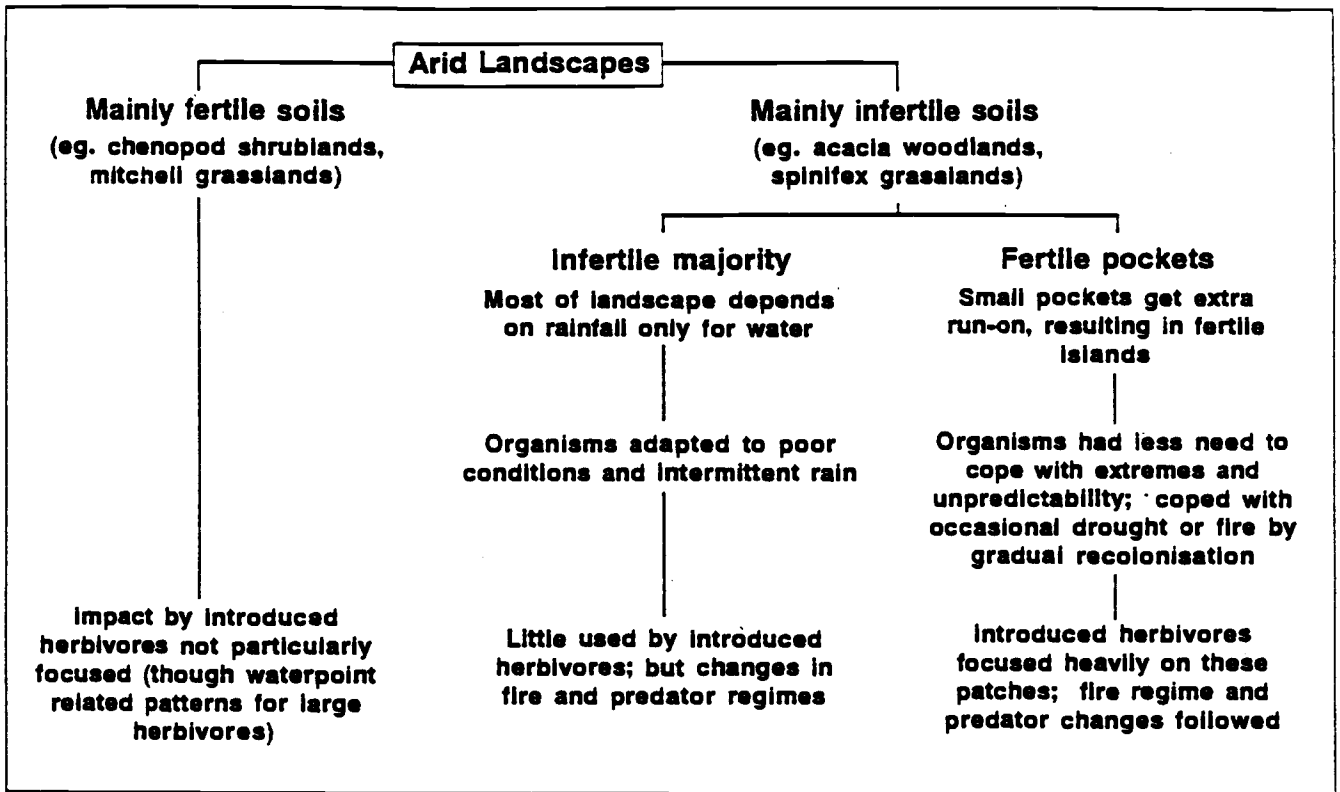


Figure 2

