THE STATUS AND FUTURE OF AUSTRALIAN GRASSLANDS*

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SUMMARY: The four major types of natural grasslands in Australia are described and their present status for preservation in national parks and nature reserves assessed. Management of the reserved areas for the future will require, in most cases, an increased level of understanding of community and species dynamics, especially in response to a range of fire and grazing regimes. An example is discussed for each of two grassland types in contrasting regions of Australia.

INTRODUCTION

Australian grasslands occur in a wide variety of environments, from the tussock grasslands found in cold, subalpine regions of south-eastern Australia to the hummock grasslands so widespread in hot, arid central Australia. They occur on seasonally-waterlogged soils in tropical areas near Darwin, in northern Australia and on heavy clay soils associated with Recent volcanic activity to the west of Melbourne, in the temperate southern areas. Such a variety of grasslands and environments makes it difficult to cover completely the different grassland types. Accordingly, in this paper, I shall assess the present conservation status of the main types of Australian grasslands and discuss the future of only two of those types occurring in contrasting regions of Australia.

Australian grasslands have been mapped by Moore and Perry (1970) and by Carnahan (1976). There is, however, very little information on the dynamics of the different types of grasslands to enable their future to be assessed adequately. In this regard, a comparable country like South Africa is in a more favourable situation because of the series of vegetation maps produced by Acocks (1975). His map of the contemporary vegetation may be compared with his reconstruction of the distribution of the main vegetation types at about 1400 A.D., close to the time when Da Gama rounded the Cape of Good Hope. In the same publication, Acocks (1975) also includes a map of the predicted vegetation in 2050 A.D. He suggests that there will be a continuation into the next century of the widespread increase in semi~arid shrubs (the so-called Karoo element of the flora) and a decrease in the area of grasslands in South Africa. Acocks drew two maps to show possible vegetation patterns in 2050 A.D.:one map shows what would happen if present trends continue, and the other shows what could happen given sound management programmes.

A comparable series of maps of Australian grasslands at different times is not available for any part of Australia, regrettably. The discussion following, especially that of future trends, is poorer because of this deficiency. Australian grasslands have been well described, however.

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AUSTRALIAN GRASSLAND TYPES

There are four grassland types in Australia, as recognised by Moore and Perry (1970), which together cover at least on~third of the land mass of Australia. Their distribution is shown in Figure 1.

The four types are:

1. *A rid tussock grassland-areas* of Mitchell grasses or *Astrebla* species extensively distributed in inland Queensland, Northern Territory and northern Western Australia in a zone receiving between 200 and 500 mm average annual rainfall and characterised by predominantly summer rain.
2. *Arid hummock grassland-dominated* by the genera *Triodia* and *Plectrachne* in areas with less than 200 mm average annual summer and/or winter rainfall. They cover over 20 per cent of Australia and most of arid Australia (Fig. 1).
3. *Coastal grassland-dominated* by the genera *Sporobolus* and *Xerochloa* and confined to the tropical summer-rainfall region of the northern coastline.
4. *Sub-humid grassland-these* were subdivided further by Moore and Perry (1970) into:

   a. *Tropical grassland9-dominated* by *Dichanthium* and *Eulalia,* and sometimes by *Bothriochloa* and *Heteropogon,* in eastern and northern

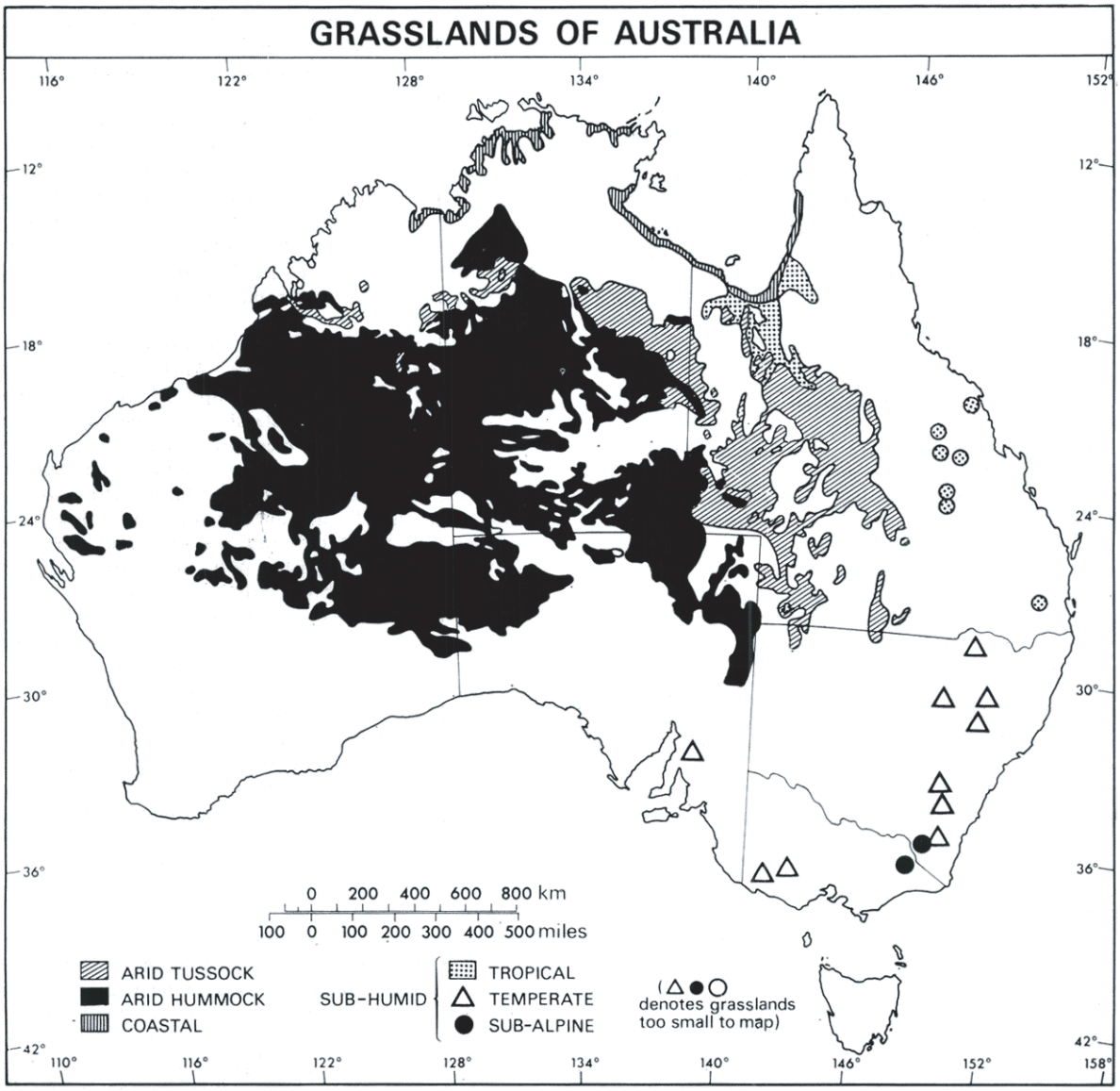

FIGURE 1. *Distribution of major grassland types in Australia (after Moore and Perry, 1970).*

Queensland in regions with predominantly summer rain.

b. *Temperate .grasslands-with* an irregular distribution from north of Adelaide around the zone of 500 to 1000 mm average annual winter and/or summer rainfall of south-eastern Australia to northern New South Wales. Dominant genera are *Themeda*. *Poa* and *Stipa*.

c. *Subalpine grasslands-confined* to the cold and wet mountain regions of the Monaro region of southern New South Wales and north-eastern Victoria. Dominant genera are *Poa* and *Danthonia*. These grasslands are similar in many respects to some of the New Zealand tussock grasslands.

CONSERVATION STATUS

Present

How well preserved are these different grassland types in Australia at the moment? Newsome (1973) estimated the percentage of the major grasslands contained in nature reserves as at 30 June 1971. Five per cent of the total area of; -hummock grasslands was preserved and over 4 per cent of the tropical coastal grasslands-the latter largely in Aboriginal reserves and not nature reserves in the strict sense. At that time, neither the sub-humid grasslands of eastern Australia nor the Mitchell grasslands were represented in nature reserves larger than 4 000 ha in area. Mitchell grasslands occupy about 6 per cent of the area of Australia (Fig. 1) and yet none was represented in reserves. Both this grassland type and the tropical sub-humid grasslands in Queensland are highly prized and fully leased for cattle raising. The contrast with the economically less useful, well-conserved hummock grasslands is immediately apparent and the reasons for the contrast immediately explicable in economic terms.

The same datum Year, 1971, was used by Specht *et al*. (1974) to assess the conservation status in Australia of the 900 major plant communities (or alliances) at a level much finer than the 18 vegetation formations assessed by Newsome (1973). If We take hummock grassland as an example, we see that its present conservation status is not satisfactory. Of the 23 alliances recognised within the hummock grassland category, 16 were preserved to some extent, but 7 of the 23 were not represented in reserves. The conservation status of one of the 16 communities conserved was considered precarious.

The point of citing these data-the best presently available for Australian grasslands-is that, while on a gross level of classification the present conservation status of this distinctively Australian grassland type, which occupies 20 per cent of the surface area of the continent, is adequate (i.e., greater than 5 per cent of it is reserved), at a finer level of classification some eight communities of hummock grassland still were not preserved adequately in 1971. Eight years later, the situation may- not have changed greatly, except perhaps in Queensland. Another "Specht Report" will soon be needed to assess the trends over time and whether the preservation status of Australian grasslands is improving or deteriorating. Only then will we be able to make reaHstic predictions about the conservation status of Australian grasslands in the year 2079.

Implicit in what has been discussed so far is the *preservation* status of some Australian grassland types-that is, the "locking up" of representative areas of different grasslands and, perhaps, their associated animals, in medium to large reserves set aside for the specific purpose of future study. What, however, of their *conservation* status? How should these grasslands be managed so that the grasses will not become moribund and die out, and the rare associated herbs persist? Will these areas go on being suitable habitat for some of the rarer marsupials, such as the Brown or Desert Hare-wallaby *(Lagorchestes hirsutus),* which is known only from a large reserve in hummock grassland and two islands off Western Australia (Newsome, 1973)? These are among the critical questions to pose if the same grasslands are to be present in 20, 50 or 100 years' time. Whilst it is relatively easy to ask them, it will require a much greater effort to provide good answers, and especially a much greater effort from the scientific community. A much closer liaison between land manager and professional ecologist will also be required.

Future

One example of a grassland type which probably will be more important in 2079 than it is in 1979 is temperate grassland. It used to be widespread in the landscape but is now confined to small "relict" pockets in ungrazed areas close to towns and cities. Most of the large grassland reserves are in arid Australia well away from settled urban areas; in fact, they are usually in areas not even wanted by graziers. However, the only areas of temperate grassland occurring at present are small "islands" (often only 1 hectare or less in area) along roadsides, or railway lines, in cemeteries or in so-called "open spaces" between suburbs. Because they are often the only areas now remaining of these grasslands (Stuwe and Parsons, 1977), we should be actively concerned about their preservation status and their management. As well as their botanical interest, they are the habitat for some endangered, wingless

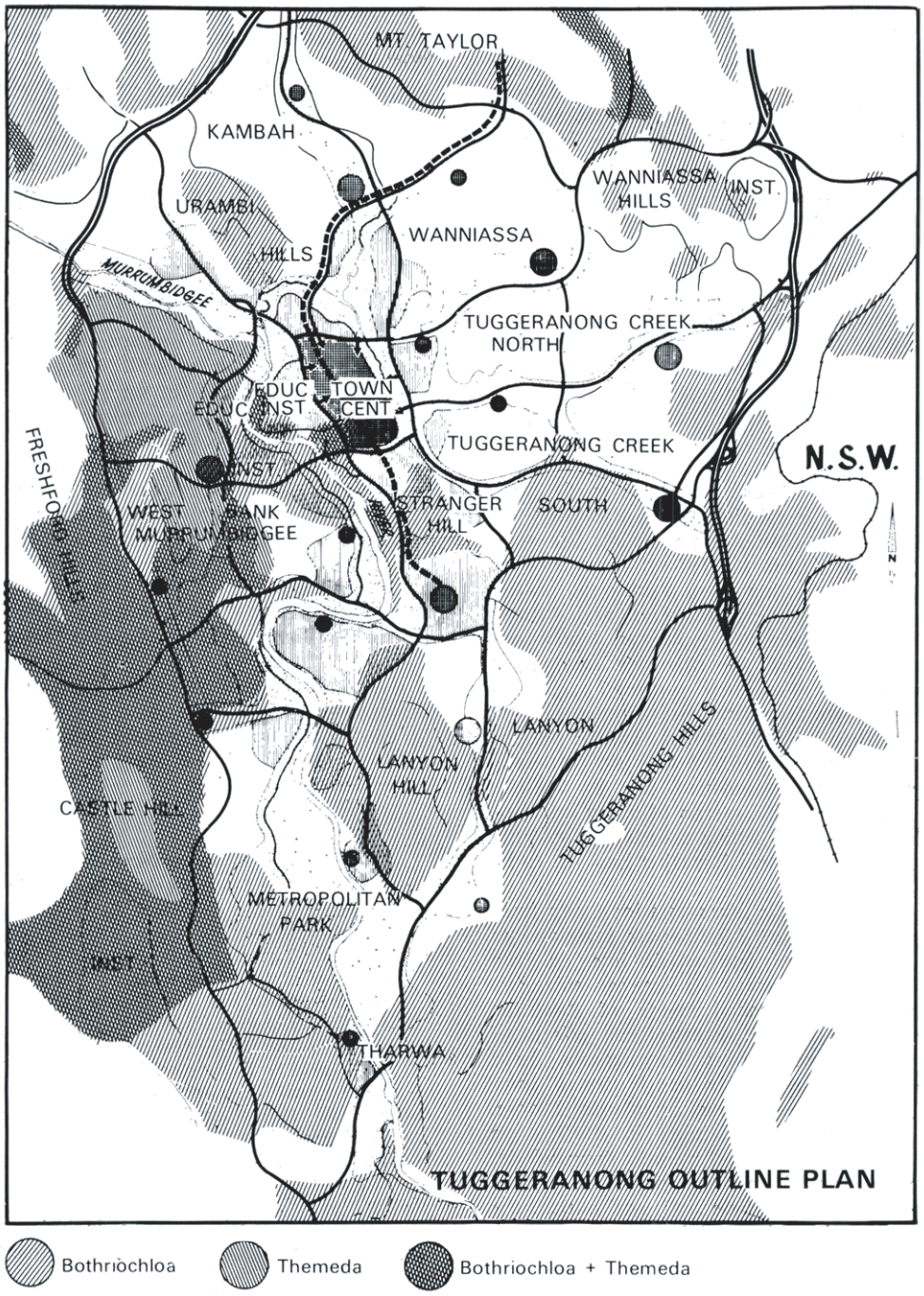

FIGURE 2. *Distribution of* Themeda-dominant *and Bothriochloa-dominant temperature grasslands in relation to planned suburban development in an area to the south of Canberra City, A.C.T., Australia.*

grasshoppers (Key, 1978) in regions such as the Southern Tablelands of New South Wales.

Canberra is built on a series of valleys originally vegetated by grassland (the temperate sub-humid grassland described earlier). A map is presented in Figure 2 of one area of Canberra which is being changed from rolling plains covered with woodlands and natural grasslands grazed lightly by sheep to rolling plains covered with houses and freeways and grazed by motor mowers. Despite over 100 years of sheep grazing, some small patches of the indigenous *Themeda* grassland remain. Other areas of grazed natural pasture were dominated at the time of survey of the region (Chan, 1978) by another summer-growing native grass, *Bothriochloa,* or red-leg grass. Some of the region on the west bank of the river system flowing through the region had both species present as co-dominants in the grasslands.

The question posed was: how best to fit these remnant areas into a subdivision plan so that the future residents can obtain some feeling for what the vegetation was like in the 1970s? How to blend the "natural" areas so that these indigenous grasses could add their unique seasonal colours and textures to the otherwise rather dull, suburban landscape? Perhaps some city and suburban landscapes can even be revegetated with these indigenous grasses. Results of a recent research programme (Hagon, Groves and Chan, 1975), funded jointly by the planning commission for Canberra (the National Capital Development Commission) and by CSIRO, have provided the scientific means of doing just that, although the problem of getting a sufficient quantity of seed onto the commercial market has yet to be overcome.

The use of this example takes us a long way from the large nature reserve of hummock grassland in central Australia where few people live, or even visit, to a pocket-sized reserve in between suburban developments on the coastal fringe of Australia where most people dwell. Because the effects of over 100 years of continuous sheep grazing have led to irreversible changes in the botanical composition of most of these natural grasslands (Moore, 1970), the only option remaining in 1979 is to reserve these "relict" areas and manage them wisely. If we do not reserve them now, even these pockets of a remnant vegetation type will not outlast the next 10 years, let alone the next 100 years.

CONCLUSIONS

The present and future conservation status of two examples of very different types of Australian grasslands have been discussed briefly. One type, the temperate grassland, was never very widespread and has been almost eliminated as a community by the effects of over a century and a half of sheep grazing. It exists now only as small "remnants" in south-eastern Australia. Already the chance to conserve significant areas of it has been lost, and an that can be done now is to manage those small areas remaining as best we can. The level of public recognition of this grassland type may be increased by getting some of the dominant grasses back in the landscape and thereby, perhaps, ensuring the survival of the few natural areas remaining.

The other example is at the opposite end of the spectrum-the very widespread hummock grassland covering much of arid Australia and fairly well conserved in 1979 for the year 2079-although, there are no grounds for complacency if we consider different floristic associations of this grassland type.

Management of this grassland will depend very much on a better understanding of species dynamics, especially in relation to fire and subsequent grazing regimes, as was shown by Suijdendorp (1979) for the Pilbara region of Western Australia in relation to sheep grazing at a very low intensity, and by Bolton and Latz (1978) for the continued survival of one rare mammal in the Tanami Desert in central Australia.

It was, after all, Acocks' (1975) understanding of the dynamics of South African vegetation, especially in relation to fire and grazing, which enabled him to draw a map of the likely vegetation of South Africa in the year 2050.

REFERENCES

ACOCKS, J. P. H. 1975. Veld types of South Africa. *Memoirs of the Botanical Survey of South Africa* No. 40 (2nd edn.).

BOLTON, B. L.; LATZ, P. K. 1978. The Western Hare-wallaby, *Lagorchestes hirsutus* (Gould) (Macropodidae), in the Tanami Desert. *Australian Wildlife Research* 5: 285-93.

CARNAHAN, J. A. 1976. Natural vegetation. In: *Atlas of A ustralian Resources, Second Series*. Department of National Resources, Canberra.

CHAN, C. W. 1978 (Unpublished). *Natural grasslands* in *Canberra: their distribution, phenology and effects of mowing*. M.Sc. Thesis, Australian National University.

HAGON, M. W.; GROVES, R. H.; CHAN, C. W. 1975. Establishing native grasses in urban parklands. *Australian Parks and Recreation, November* 1975, 11-14.

KEY, K. H. L. 1978. The conservation status of Australia's insect fauna. *Australian National Parks and Wildlife Service Occasional Paper* No. l.

MOORE, R. M. 1970. South-eastern temperate wood-

lands and grasslands. In: Moore, R. M. (Editor) *Australian Grasslands*. pp. 169-90. Australian National University Press, Canberra

MOORE, R. M.; PERRY, R. A. 1970. Vegetation. In: Moore, R. M. (Editor) *Australian Grasslands*. pp. 59-73. Australian National University Press, Canberra.

NEWSOME, A. E. 1973. The adequacy and limitations of flora conservation for fauna conservation in Australia and New Zealand. In: Costin, A. B. and Groves, R. H. (Editors) *Nature Conservation in the Pacific*. pp. 93-110. Australian National University Press, Canberra.

SPECHT, R. L.; ROE, E. M.; BOUGHTON, V. H. (Editors) 1974. Conservation of major plant communities in Australia and Papua New Guinea. *Australian Journal of Botany Supplement* No.7, 1-667.

STUWE, J.; PARSONS, R. F. 1977. *Themeda austra/is* grasslands on the Basalt Plains, Victoria: floristics and management effects. *A ustralian Journal of Ecology* 2: 467-76.

SUIJDENDORP, H. 1979. Responses of the hummock grass lands of north-western Australia to fire. In: Gill, A. M., Groves, R. H. and Noble, I. R. (Editors) *Fire and the A ustralian Biota* (in press). Australian Academy of Science, Canberra.