Native Grasses in South Western Australia

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Introduction

As South Western Australia has no significant areas of native grass pastures remaining (Rossiter and Ozanne 1970), this paper takes an historical look at their extent and composition in the past.

Prior to the introduction of European agriculture, selected areas of grassland were systematically encouraged and managed for game and for ease of movement by aborigines through the use of fire, particularly in the woodlands fringing the south western eucalypt forest (Hallam 1979). The movement of European agriculture followed this earlier seasonal pattern of exploitation, particularly into the woodland on the eastern margin of the forest (Fig. 1). The existing pattern of land use that connected water holes and open areas of woodland with a grass dominant understorey also allowed ease of movement through the country for the early settlers, pasture for their stock and some areas suitable for cultivation with little clearing (Hallam 1979).

The native grasses that were encouraged by burning apparently survived under shepherding of the original sheep flocks (Fels 1979) but did not persist under grazing following the introduction of fencing or after cultivation and are now restricted to roadsides, reserves and some uncultivated areas where they have been largely displaced by exotic grasses and herbaceous weeds (Piggott 1988).

Vegetation

The map (Fig. 1) shows the vegetation of the south western botanical province divided into seven broad groups (Beard 1980). The northern limit of the province coincides approximately with the 250 mm annual rainfall isohyet and the present limit of cultivation.

The flora of the south west is notable for two particular characteristics (Gardner 1944). Firstly, the great diversity of species and high degree of endemism amongst the sandplain flora (here represented by types 5,6 and 7). Secondly, the relative absence of herbaceous plants, particularly the grasses throughout the province (notably in types 5, 6, 7 and 1). Gardner (1944) recognised two distinct groups of grasses in Western Australia, based on their temperature requirements. A megathermic group of 63 genera found mainly in the north and a mesothermic group of 17 genera restricted to the south, with few genera common to both.

Genera typical of the southern element are *Danthonia, Monachather, Neurachne, Agrostis* and *Stipa*, of which *Monachather* and *Neurachne* extend into the north. Genera of the northern element that extend into the south are *Triodia, Eriachne, Eragrostis* and *Sporobolus*. There is only one grass endemic to the south west, *Diplopogon setaceus*, which is restricted to the sandy margins of fresh water swamps in the extreme south west.

The seven vegetation groups shown in Figure 1 reflect response to both climatic and edaphic factors. The heath and thicket vegetation that typifies the south western flora (Pate and Beard 1980) is found wherever there is sandplain, and dominates the types shown as 5 and 6; is the major feature of 7 (where it occurs with eucalypt woodland). It also occurs throughout the eucalypt woodland itself (type 2), particularly east of the Meckering line (Mulchay 1976) where the drainage pattern has resulted in the broad open valleys of the central wheatbelt separated by even broader divides of lateritic sandplain. Areas of heath also occur within the mallee (type 4) on residual sandplain generally higher in the landscape.

The true forest (type 1), is typified by the Jarrah (*Eucalyptus marginata*) and is

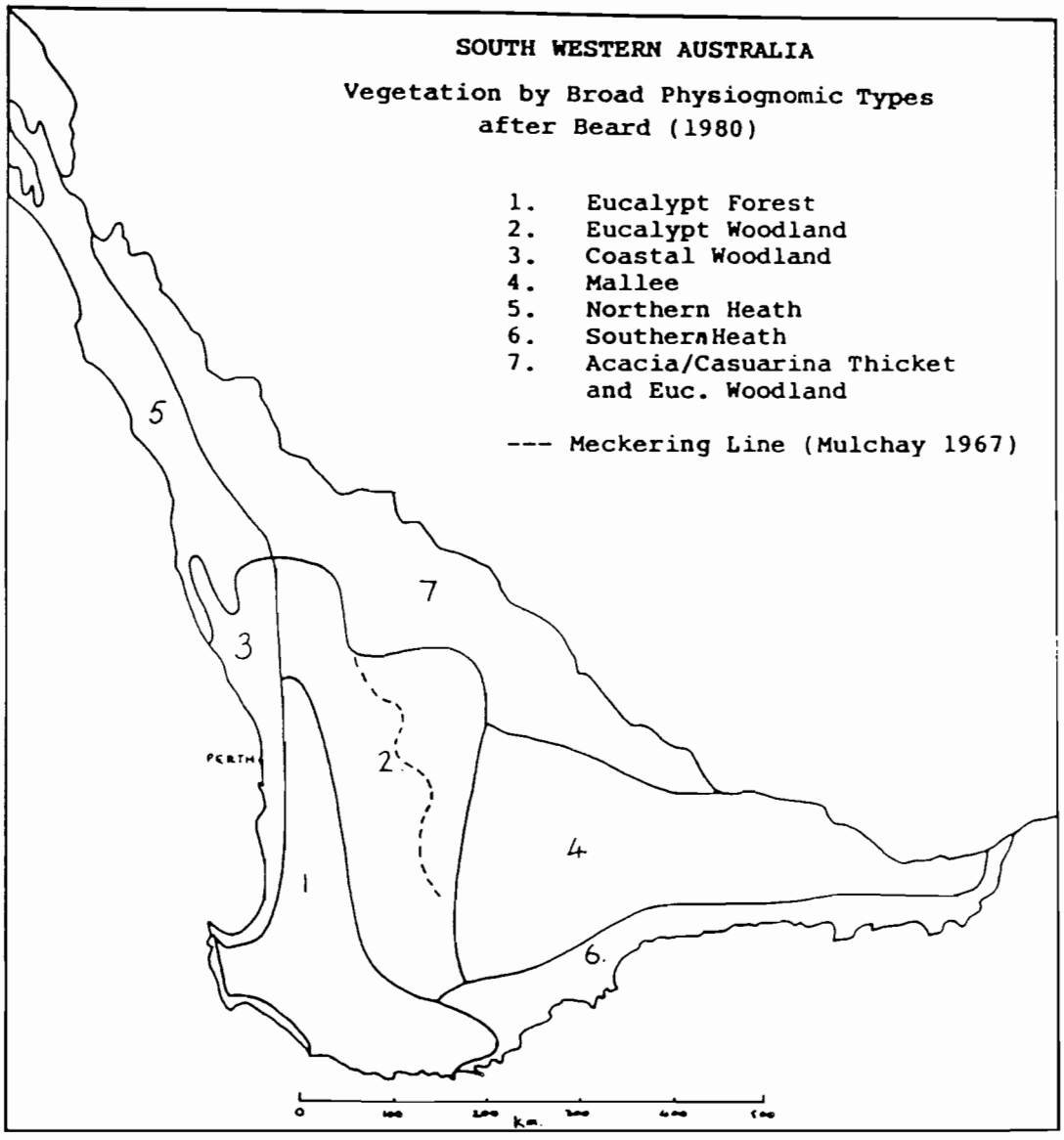
SOUTH WESTERN AUSTRALIA
Vegetation by Broad Physiognomic Types
after Beard (1980)
1. Eucalypt Forest
2. Eucalypt Woodland
3. Coastal Woodland
4. Mallee
5. Northern Heath
6. Southern Heath
7. Acacia/Casuarina Thicket and Euc. Woodland
--- Meckering Line (Mulchay 1967)
PERTH
0
km.

FIGURE 1.

restricted to lateritic soils with an annual rainfall greater than 600–700 mm. This rainfall limit marks the eastern and northern extent while the western boundary is the Darling scarp which divides the soils formed on the Archean Yilgarn block from those of more recent marine origin on the coastal sandplain. The forest area has few grasses and has seen the least agricultural development of all areas.

Bounding the forest to east and west are the woodland formations that are of most interest in terms of grass species.

Coastal Woodland

The trees that dominate the coastal woodland include species of *Eucalyptus, Banksia* and *Agonis*. The only true grassland that developed was either associated with Tuart (*Eucalyptus gomphocephela*) on limestone soils in the southern half of the coastal plain (Gardner 1944), or in association with Jarrah (*E. marginata*) and Marri (*E. calophylla*) on the areas of alluvial soil at the foot of the Darling scarp as described by McArthur and Bettenay (1960). Gardner (1944) noted in the case of the Tuart woodland that grasses dominate once the shrub understorey is destroyed, ".....indicating a succession towards a pure savanna forest". Cobalt deficiency was a limiting factor of all grazing lands on coastal sands including the Tuart woodland until it was identified in 1935.

These two areas, Tuart savannah woodland and the alluvial piedmont soils, became the foci for the first development of European agriculture. In areal extent they were probably no more than 1 500 km^2 and 2 000 km^2 respectively [estimated from Beard (1980) and by extrapolation from McArthur and Bettenay (1960)].

Eucalypt Woodland

The woodland fringing the eastern margins of the Jarrah forest is dominated by the York gum (*Eucalyptus loxophleba*) and Jam (*Acacia acuminata*) association on the valley slopes and floors giving way to Wandoo (*E. wandoo*), higher in the landscape. This pattern is particularly evident west of the Meckering line (see Fig. 1). To the east, the valleys are broader, the drainage more sluggish and the Salmon gum (*E. salmonophloia*) and Gimlet (*E. salubris*), form a woodland on the fine textured alkaline soils with an understorey of Bluebush (*Maireana brevifolia*) and Saltbush (*Atriplex* spp.).

The area best suited to the development of grassland then lies between the eastern limit of the forest and the Meckering line. In the southern part of this area, *E. loxophleba* is replaced by the Flat Topped Yate (*E. occidentalis*). This southern area, with summer rainfall in the vicinity of 125 mm, is more suited to the development of grassland than the northern section.

Areas of woodland also occur throughout the adjacent mallee area to the east and it is in the more southern of these, that small isolated but permanent areas of grassland exist (Gardner 1944). The best known of these is the locality of Grasspatch, originally some 240ha in size. Other examples occur but of much smaller size. Small areas of *Stipa* grassland also occur on lunettes on the south east side of salt lakes in this area (van der Moezel 1985).

In summary, the grass flora is best developed in the woodland to the east of the Jarrah forest. The area extends from Walebing in the north to Gnowangerup in the south east, a total area of some 36 000 km^2 of which possibly one third (12 000km^2) is occupied by the *E. loxophleba* or *E. occidentalis* alliances. This area represents the second main focus of European agriculture after the limited areas on the coastal plain.

A list of the probable species occurring in each of these areas is given in Table 1.

Table 1. Native Grass species in Eucalypt Woodland and Coastal Woodland Vegetation Zones in South West Australia.

Eucalypt Woodland	Grasses
North and Central (*E. loxophleba*) and Southern (*E. occidentalis*)	*Danthonia caespitosa* *D. penicillata* *Monachather paradoxa*[1] *Neurachne alopecuroides* *Stipa juncifolia* *S. semibarbata* *S. variabilis* *Themeda triandra*
South Eastern (Grass patch)	*Stipa* spp.
(salt lake margins)	*Stipa eremophila*[3]
Coastal Woodland	
Southern (*E. gomphocephala*)	*Stipa elegantissima*[2] *S. semibarbata*[2]
and North and Eastern (*E.marginata*)	*Tetrarhena laevis*[2] *Microlaena stipoides*[2]

Sources
[1] Mulchay 1976
[2] Merrillees 1968
[3] van der Moezel 1985
others Rossiter and Ozanne 1970

Fire

All of the areas referred to above as grassland would have been dependent on repeated firing for their continued existence. It is assumed that this was carried out by aborigines and a case for this is put by Hallam (1979) through examination of written accounts of explorers and early settlers, and more recent floristic studies and evidence from satellite photography.

The picture that emerges from botanical studies is that the prominence of species that resist fire and of those dependent on fire within the south western flora would require fire over a very long period of time (Gardner 1957) and more frequently than that caused by lightning (Sparrow and Ney 1971). One estimate of how long that period may have been is given by Merrillees (1968). In explaining the extinction of large marsupials from the south west during the last 20 000 years, he puts a case from archaeological evidence for man-made fires as opposed to a trend towards a more arid environment as a prime factor.

The accounts of many explorers and settlers (Hallam 1979) refer to the ease of access through well grassed woodland free of fallen timber and shrub understorey, as opposed to the forest areas. In many cases this is attributed to the observed practice of regular

burning. The use of fire before European settlement, together with indigenous knowledge of water sources and network of tracks connecting them, was instrumental in the exploration and establishment of grazing industries in the woodland areas.

Further east of this zone, sandalwood cutters followed the same pattern of firing and waterholes, to be followed in turn by those in search of gold and later still, by wheat farmers. It was the development of agriculture and in particular, the practice of growing wheat in rotation with sown annual pastures, that reduced the area of native grasses.

The failure of native grasses to persist under grazing can be attributed to several factors. Rossiter and Ozanne (1970) suggest it is a characteristic of perennial grasses in a Mediterranean climate. More specifically it is likely to be the practice of set stocking as opposed to shepherding following the introduction of fencing in the 1870s and 1880s and possibly also the different grazing habits of sheep as opposed to endemic fauna that caused this in uncultivated areas. An important factor in these south western woodlands was the need to cultivate large areas to eliminate toxic plants such as *Gastrolobium* and *Oxylobium*. Finally a dependence on fire may have been significant with some of these species.

Future Use of Native Grasses

A possible future role for native grasses is seen with the current interest in the use of perennial forage plants in south Western Australia. Some 15 000 ha of forage shrubs were planted in 1989 and 10 000 ha in 1988. These were planted on unproductive deep sands and on saline soils to both provide feed in autumn and to overcome the cause and the consequences of dryland salinity. A factor that presently limits the value of forage shrubs is the lack of an easily digestible, high energy component. To date, this role is being filled to a very limited extent by the use of exotic species, namely *Erharta calycina* cv. Mission and *Eragrostis curvula* cv. Consol on sandy soils and *Puccinellia ciliata* on saline soils.

Endemic species such as *Danthonia caespitosa, Monachather paradoxa* and several *Eragrostis* species may be useful in similar situations where they can be managed under a system of deferred grazing.

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