Chapter 6
Native Grasslands in the NSW Riverina

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What is a native grassland?

Native grasslands are areas dominated by native grasses with few, if any, widely-spaced shrubs and trees. Many native grasslands in Australia were treeless before European settlement ('natural grasslands'), but others ('secondary' or 'derived grasslands') have been created since settlement, following clearing or heavy grazing. This chapter focuses on the botanical and conservation values of native grasslands in the Riverina. Grazing management is discussed in more detail in Chapter 7.

As well as grasses, grasslands contain a wide variety of small plants, including native chenopods (saltbushes), lilies, daisies, and sedges. Grasslands usually contain many more species of small herbs (daisies, lilies, peas, etc) than larger grasses. This diversity of small herbs adds to their pasture value for stock, as well as being important for biodiversity conservation. Although native species dominate, introduced species from other countries (including grasses, medics and other herbs) are usually common.

Native grasslands occupy large areas in the Riverina, especially in the 'Hay Plains' region bounded roughly by Hay, Deniliquin, Jerilderie and Narrandera. As well as the original natural grasslands, much of this region supported open woodlands and shrublands dominated by Old Man Saltbush (*Atriplex nummularia*), Boree (*Acacia pendula*) or Bladder Saltbush (*Atriplex vesicaria*). However, these species were depleted across large areas by heavy grazing in the late 1800's when sheep numbers were extremely high. The loss of these low trees and shrubs has created large areas of secondary native grasslands. Despite the loss of woody species, many native grasses and herbs survived this ecological calamity, and these large secondary grasslands are now very important for sustainable stock production and biodiversity conservation.

Grasslands – changing in space and time

Whilst most grasslands are superficially similar (flat and open), closer inspection reveals great variability in their composition across the Riverina. This variability is due to many natural and management influences, including underlying soil patterns, the effects of grazing and past landuse, and seasonal weather changes.

Soil patterns

Grassland composition often changes greatly with subtle soil changes. Most native grasslands in the Riverina occur on heavy clay soils, and a variety of

woodland communities (often very degraded) persist on lighter sandier soils. Subtle differences in clay soils, usually related to drainage patterns, cause different plant associations to grow. Thus, grey self-mulching clays in low-lying areas support different grassland plants to better-drained, red-brown clays. A common pattern is for White-top wallaby grasses (*Austrodanthonia* spp.) and fine spear-grasses (*Austrostipa* spp.) to dominate on well-drained, red-brown soils and other grasses, including tall Plains Grass (*Austrostipa aristiglumis*) and Rigid Panic (*Homopholis proluta*), to grow on grey clays in lower-lying areas. Many soils vary greatly over small areas, forming complex mosaics of different grassland plants. These mosaics are most pronounced on hummocky 'crabhole' or gilgai soils.

Figure 1: A diverse native grassland dominated by White-top (Common Wallaby-grass) on low productivity, red-brown clay soil.

Soil changes do not only control grassland composition, they also control patterns of grass productivity. Many hard, red-brown clay soils have very low nutrient levels (nitrogen, phosphorus and potassium) and are very impermeable to water. Consequently, grass biomass is held in check by the harsh conditions, and relatively little grass grows, even in good seasons. These areas often support short wallaby grasses and spear grasses and many small herbs, often with much open ground between the grass tussocks. Despite their low productivity, many of these areas are important for biodiversity conservation, and many uncommon plants and animals (including the Plains-wanderer) prefer these habitats.

By contrast, crumbly, self-mulching and cracking grey soils in low lying areas often contain more soil nutrients, and water can rapidly enter the cracked soil when it rains. Much of the rainfall that falls on impermeable red clays runs off and enters the cracking grey soils in low-lying areas, so these areas receive more effective rainfall than nearby red soil areas. Thus these areas usually support more grass growth than the harder red soils.

Grazing effects

As well as soil-induced patterns, grassland composition is also strongly affected by management, especially grazing. Heavy grazing in the past has greatly degraded grassland soils and plants in many areas. Heavy grazing often causes tall, long-lived, deep-rooted perennial species to be replaced by shorter, short-lived, shallow-rooted plants, especially annuals. Over the past 150 years, long-lived perennial grasses like Curly Windmill-grass (*Enteropogon acicularis*) and Kangaroo Grass

(*Themeda australis*) have declined in many areas, to be replaced in heavily grazed areas by annuals including fine Spear-grasses (eg. *Austrostipa scabra*) and introduced Barley-grass (*Hordeum leporinum*), Rye-grass (*Lolium* species), Wild Oats (*Avena fatua*) and others.

Notwithstanding the degradation caused by over-grazing, conservative stock grazing appears to be compatible with many grassland conservation values. Many high quality grasslands have traditionally been grazed without obvious degradation or conservation problems. Indeed in some cases, conservative grazing has positive outcomes for biodiversity conservation. If grazing is totally excluded for long periods on productive soils, the dominant grasses can increase in stature and smother out smaller species, forming poorer associations with fewer species, and making the grassland less suitable for some fauna. There is more potential for this negative change to occur in productive low-lying areas than on dry unproductive soils (eg. hard-packed red earths) where grass cover does not increase greatly even in good years. Strategic grazing regimes can maintain sustainable production returns and biodiversity values in many cases.

Seasonal changes

The only thing that stays the same in grasslands is continual change. Native grasslands are always changing in response to grazing management, seasonal rainfall and long-term weather changes. Seasonal weather changes create rapid changes in grassland composition and structure. Some of these rapid changes have very lasting after-effects. The long-lived, Curly Windmill-grass is abundant in wet years, and few new plants germinate in intervening years. Thus, the brief periods that are favourable to germination create a new generation of plants which may appear to be relatively stable for long periods thereafter.

Grasslands also change rapidly in dry periods (especially when heavily grazed), and productive species like low saltbushes can rapidly disappear. Such changes can occur extremely quickly, and can be effectively permanent thereafter, especially if there are few seeds in the soil to enable later regeneration. As in many Australian environments, extreme weather conditions (both dry and wet) can trigger massive changes in grassland vegetation, which might then remain relatively stable for long periods.

Exotic grassland plants

Introduced species are often abundant in native grasslands, especially in degraded and heavily grazed areas. Exotic species include undesirable plants, such as noxious weeds (eg. Bathurst Burr, *Xanthium spinosum*), and also many species that provide useful feed in rangeland pastures. Exotic annuals such as Wimmera Rye-grass and Barrel Medic (*Medicago truncatula*) provide feed during the autumn feed gap before perennial species begin to grow rapidly.

Whilst some exotic species are useful from a pastoral perspective, conservation managers usually wish to promote native species and minimise exotic species, as exotic plants compete for water, nutrients and space against native species. The impact of this competition is illustrated in an historical quote from northern Victoria, where Audas (1950) considered that the spread of Wimmera Rye-grass in the 1940s, "*must be considered a blessing, were it only to redeem the*

interminable acres which are now given over to Helipterums or Sunrays" (both are paper-daisies). Unfortunately the "interminable" native paper-daisies are now very rare on the plains of northern Victoria, although many remain abundant across large areas of the Riverina.

Managing grasslands for biodiversity conservation

A primary aim of this Native Vegetation Management Guide is to promote biodiversity conservation in the Riverina. Consequently, this chapter focuses on managing native grasslands for conservation purposes, rather than for production values. Grazing management issues are discussed in Chapter 7 and many superb extension materials describe sustainable grazing strategies (see References and further reading). The good news is that – despite historical overgrazing – grassland conservation and rangeland grazing are often highly compatible activities. Diverse native grasslands provide more reliable and productive pastures than degraded impoverished areas.

The major conflicts between grassland conservation and agricultural pursuits occur under more intensive forms of agricultural production. Irrigation and fertilisation can boost grass production levels, but this production increase usually causes a decline in native species diversity, as many smaller plants cannot survive under more productive conditions, and exotic pasture species (eg. medics) increase in abundance.

Irrigation development also poses threats to fauna such as the threatened Plains-wanderer. These threats are both direct, through loss of habitat, and indirect, as irrigated crops promote foxes that eat native fauna. These conflicts are regrettable but real. Conservation and development benefits can be maximised by obtaining comprehensive advice on biodiversity values as part of the development process. The recent declaration of grassland conservation reserves such as Terrick Terrick National Park in northern Victoria and Oolambeyan National Park in NSW will provide further benefits for conservation and ecotourism in the region.

Monitoring grassland changes

Grasslands are always changing. Some changes are good, others bad, and many driven by weather are unavoidable. Regardless of the management purpose, grassland managers need to know how their management is affecting grassland composition and structure. Otherwise, pasture and range degradation are likely outcomes.

Regular monitoring of grasslands is essential. On grazing properties this usually occurs as part of the weekly routine of checking watering points. A number of excellent guides for range management are available which, if used well, will maintain production and conservation values of grasslands. The recently produced, "Glove Box Guide to Tactical Grazing Management for the Semi-arid Woodlands" is equally as useful for grassland and woodland management.

Because of variable weather conditions, it is often difficult to monitor grazing impacts simply by watching a paddock change over time, as it is hard to separate the effects of grazing and weather (eg, 'is

there more wallaby grass because I rested the paddock or because there was more autumn rain than last year?'). A simple way to monitor grazing impacts (or the impacts of any other activity) is to compare grasslands across fence-lines, as both sides of the fence are subject to the same weather conditions. Small temporary exclosures erected in larger paddocks enable grazing impacts to be assessed in individual paddocks. Under well managed, conservative stocking levels, many grazed grasslands will continue to provide reliable and sustainable benefits for production and conservation in the future.

References and further reading

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