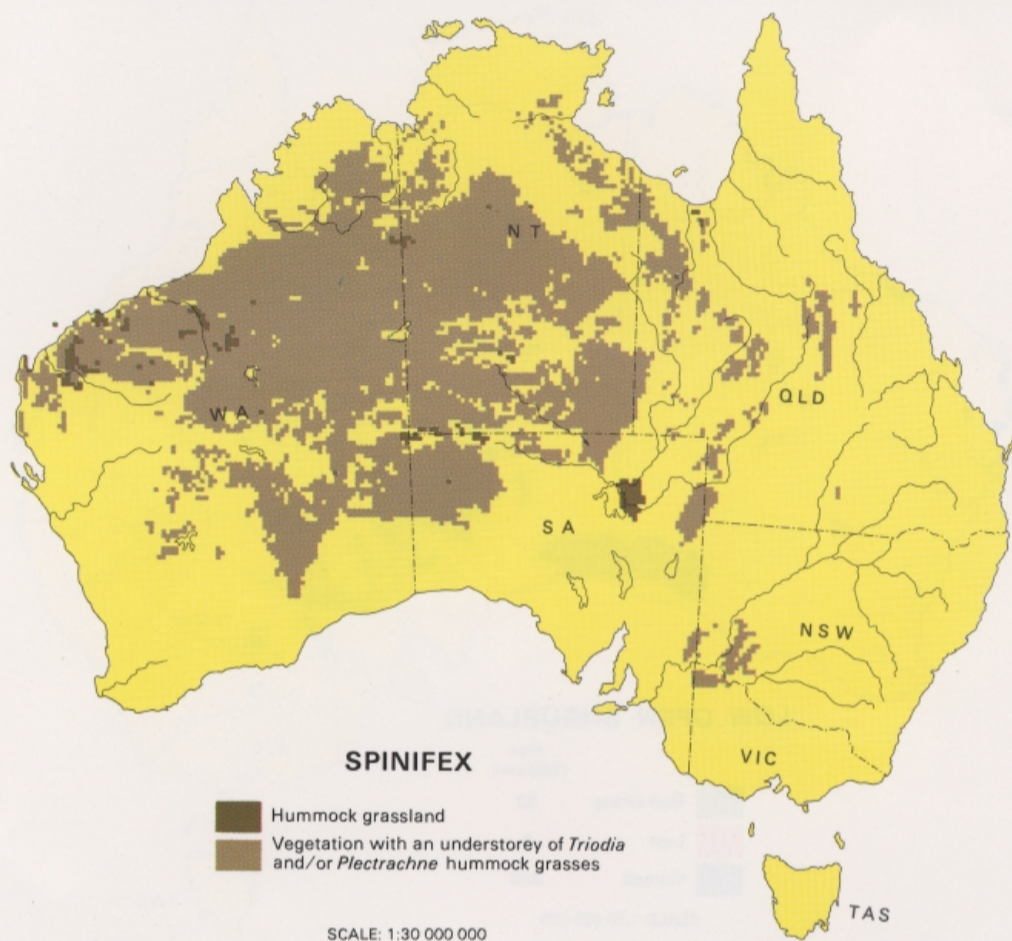


Grasses and graminoids

Hummock grasses

H



Snappy gum and spinifex

Snappy gum (*E. brevifolia*) is a common species of the low open woodlands of the north-west. It is shown here over *Triodia* on stony hills near Halls Creek (WA). There are about 35 species of *Triodia* and about 11 of *Plectrachne*. They can be divided into 'hard' and 'soft' groups depending on leaf anatomy. Many are highly flammable: the desert sandplains are therefore a mosaic of different stages of spinifex and shrub regrowth since the last fire.



Spinifex on rocky hill country in the Pilbara region (WA)

Hummock grassland with few trees or shrubs has been described as 'grass steppe' because of its visual similarity to the steppes of central Asia. The largest examples of this formation (**th2**) are in WA, but others occur on rocky ranges in the NT, Qld and SA. In terms of the vast areas where hummock grasses are the dominant understorey, grass steppe is a relatively limited vegetation type in Australia.



The evenly spaced mounds of spinifex so typical of Australia's desert country are usually quite spiny at close quarters. These hummock grasses are in fact members of the genera *Triodia* and *Plectrachne*, found only in Australia.

While hummock grasslands without an overstorey of woody vegetation (**H2**) are quite restricted, other forms of vegetation with a hummock grass understorey cover about 25% of the continent. The most widespread mapped examples are **L1H** and **S1H**, where the hummock grasses may be more conspicuous than the scattered shrubs and low trees. They are also a frequent understorey in inland woodlands and shrublands. The 'Spinifex' map includes those formations with a hummock grass understorey.

Hummock grass understoreys occur as far north as the Kimberley region (WA) and Arnhem Land (NT).

In Qld they occur as far east as Jericho; in the south they extend from WA to north-western Vic. The actual distribution of the hummock grass genera extends beyond their mapped occurrences as '**H**'.

Of all Australian vegetation types, those with hummock grasses dominant in the ground layer are the least modified by European land use. This is because they occur over sandplains, dunefields and rocky ranges, largely unsuitable for any pastoral development other than sparse grazing. Much of the hummock grass vegetation lies within vacant Crown lands, undeveloped Aboriginal lands or nature conservation reserves.

Hummock grassland

10–30% foliage cover

H2

Virtually pure hummock grasslands (**H2**), described by Beard (1967) as 'grass steppe', are largely restricted to rocky ranges and some dune areas. There are also areas within the great expanses of sandy country mapped as **wS1tH** where the shrub stratum is virtually absent. Likewise, trees are absent from some steep and rocky places within the limits of **eL1tH** and **xL1tH** in north-western and central Australia.

Triodia pungens is widespread in the mapped examples of **th2**, but some species are regionally important, such as *T. clelandii* in central Australia and *T. wiseana* in the north-west. The plants are well spaced and the overall cover is therefore open; projective

foliage cover is generally within the 10–30% range, but may be outside these limits due to soil or regeneration differences. In general, these hummock grasslands occur in inhospitable or inaccessible situations and are little used.

An area of low sand dunes on the eastern side of Lake Eyre is stabilised by a sparse cover of the grass *Zygochloa paradoxa* with some *Triodia* and occasional shrubs of *Acacia ligulata*. *Zygochloa* resembles *Triodia* in forming a mass of repeatedly branched stems up to a metre in height, but has shorter leaves which are not spine-like. This somewhat anomalous grass is, however, regarded as a hummock grass and the vegetation is mapped as **xH2**.

Tussocky or tufted grasses and graminoids

G

Almost endless plains of tussock grasses are as much a distinctive Australian vegetation type as are the eucalypt woodlands or desert hummock grasslands. In Qld and on the Barkly Tableland of the NT the treeless Mitchell grass downs cover many thousands of square kilometres.

This category of herbaceous plants also includes the grass-like sedges and extends over the full range of cover classes. It dominates vegetation as diverse as the Top End floodplain sedgeland and the very

sparse grasses of the arid inland plains. The advent of European land uses has seen a large increase in the extent of grassland involving both native and exotic species.

Closed tussock grassland or sedgeland

>70% foliage cover

G4

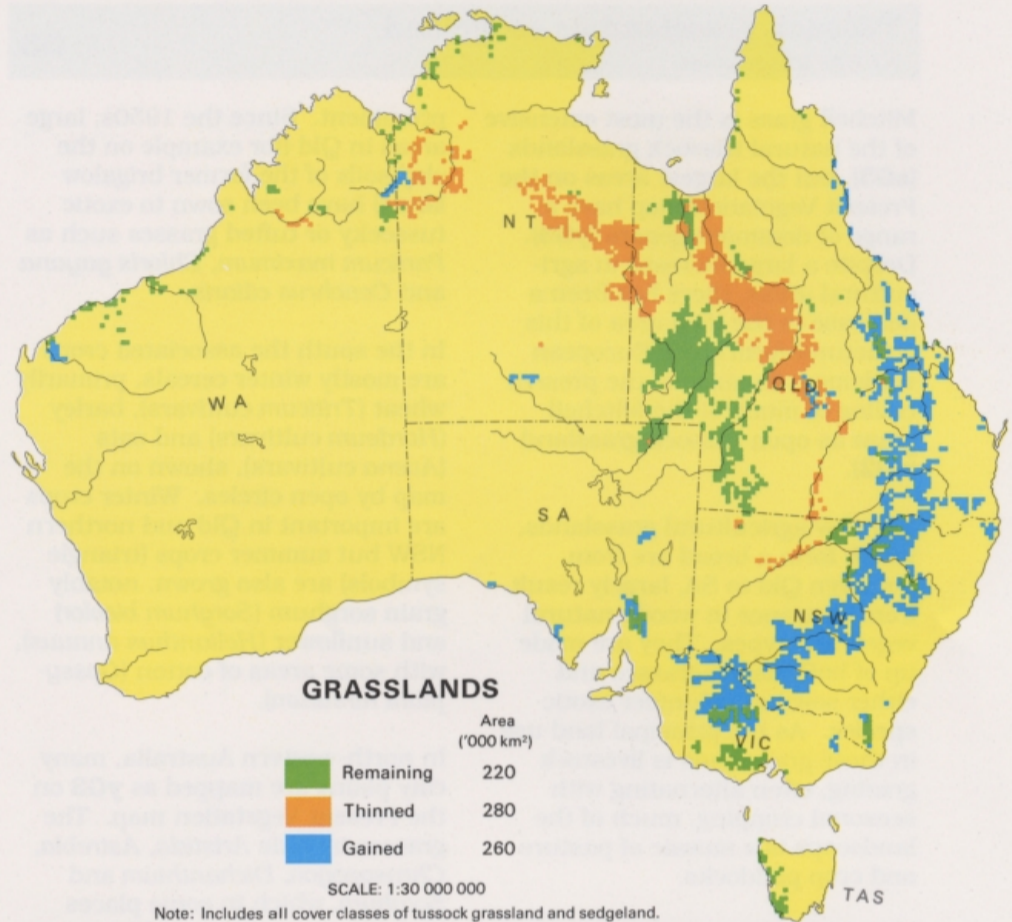
The largest areas of this formation, which includes both natural and cultural vegetation types, are found on floodplains and lowlands in coastal regions across northern Australia. In the Top End of the NT the lower courses of many streams are bordered by wide estuarine plains that are flooded throughout the wet season. The heavy soils of these plains are covered by dense stands of tussocky or tufted grasses and sedges. The principal grasses include *Oryza rufipogon* and *O. australiensis*, with several species of *Eleocharis* and *Cyperus* prominent among the sedges.

Some examples are dominated by the sedges (Cyperaceae) and are mapped accordingly (gG4), but in the areas south-west of Darwin the grasses are co-dominant (gyG4). Feral water buffaloes may have reduced the grass component in some areas, and may also have contributed to the spread of such exotic volunteer species as the thorny shrub *Mimosa pigra* and the forb *Hyptis suaveolens* (Considine 1985a, 1985b).

Tropical coastal saline soils adjacent to some littoral areas support

grasslands that vary in both composition and density, but appear in general to belong to this structural form. These have a wide range of tussocky or tufted grasses (yG4), including *Sporobolus virginicus* and species of *Xerochloa*, and some sedges. The areas mapped as yG4 near Rockhampton are more extensive in the present vegetation because of the clearing of adjacent wooded areas. In these extended areas the saline grasses, such as *Sporobolus*, are mixed with other species, including the native *Themeda australis* and *Heteropogon contortus*, the sown exotics *Chloris gayana* and *Panicum maximum*, and some summer crops, especially grain sorghum (*Sorghum bicolor*).

On the Present Vegetation map, plantations of sugar cane (*Saccharum* cultivars) are shown as vG4 because they are structurally classed as tall dense tussock grasslands. These plantations are now the principal vegetation on many lowlands along the east coast of Qld, though they are often associated with areas of sown or native pasture. They have been established on sites formerly occupied by closed forest, open forest or woodland.



Fields of sugar cane

A new and distinctive vegetation type—sugar cane—has replaced the former forests and woodlands of many fertile coastal areas in Qld. The cultivated and irrigated fields of sugar cane are coded as dense tussock grassland (vG4), although taller than other grasslands. Sugar cane belongs to the grass genus *Saccharum*. A small amount is also grown in NSW, but about 95% of the 3000 km² annually planted to sugar cane is in Qld.



Kakadu Wetlands

The seasonally inundated floodplains of many northern Australian rivers carry dense stands of grasses and sedges. The highest density of this wetland vegetation follows flooding and reaches a peak with 'the Wet'. *Eleocharis dulcis*, a spike-rush (pictured), is a common graminoid plant of the wetter areas and lagoons, often bordered by *Pandanus* on higher ground.

Tussocky or tufted grasses and graminoids

G

Tussock grassland or sedgeland

30–70% foliage cover

G3

Mitchell grass is the most extensive of the natural tussock grasslands (**aG3**), but the largest areas on the Present Vegetation map have a range of dominant genera (**yG3**). Despite a large increase in agricultural areas, there has been a decrease in the total area of this structural form since European settlement because of the present coding of much of the Mitchell grass as open tussock grassland (**aG2**).

The new agricultural grasslands, which form a broad arc from northern Qld to SA, largely result from clearance in woody natural vegetation types. They are made up of both native grasses and either sown or volunteer exotic species. As the principal land use in these grasslands is livestock grazing, often alternating with seasonal cropping, much of the landscape is a mosaic of pasture and crop paddocks.

Many genera are represented in the induced or modified native grasslands, including *Astrelba*, *Dichanthium* and *Heteropogon* in the north and *Stipa*, *Danthonia* and *Poa* in the south, with *Aristida*, *Bothriochloa* and *Panicum* being fairly widespread. On the formerly forested land on Flinders Island, in Bass Strait, sedges (**ygG3**) are also

prominent. Since the 1950s, large areas in Qld (for example on the clay soils of the former brigalow lands) have been sown to exotic tussocky or tufted grasses such as *Panicum maximum*, *Chloris gayana* and *Cenchrus ciliaris*.

In the south the associated crops are mostly winter cereals, primarily wheat (*Triticum* cultivars), barley (*Hordeum* cultivars) and oats (*Avena* cultivars), shown on the map by open circles. Winter crops are important in Qld and northern NSW but summer crops (triangle symbols) are also grown, notably grain sorghum (*Sorghum bicolor*) and sunflower (*Helianthus annuus*), with some areas of cotton (*Gossypium hirsutum*).

In north-western Australia, many clay plains are mapped as **yG3** on the Present Vegetation map. The grasses include *Aristida*, *Astrelba*, *Chrysopogon*, *Dichanthium* and *Sorghum*, which in some places have been supplemented by sowing *Cenchrus ciliaris*. Some stands are naturally occurring but may have been extended by the removal of former shrub cover, as in the area south of Onslow. Others result from former stands of **aG3** or **dG3** becoming more mixed under grazing. Along the Fitzroy River grazing has reduced the overall

cover to **yG2**. Some seasonal crops are grown in the mapped grassland area in the lower Ord valley.

On the basaltic plains west of Melbourne the former *Themeda*, *Danthonia*, *Poa* and *Stipa* grasslands are largely replaced by sown pastures (**yff3**). The natural grassland of the shallow stony soils around Jamestown (SA) was made up of *Danthonia*, *Stipa* and species of the graminoid *Lomandra*. Some parts of this vegetation have been modified but others are still recognisable.

There are only a few areas of *Astrelba* grassland in the north and east which remain as **aG3** on the Present Vegetation map. Much larger areas of *Astrelba* grassland are now coded as open tussock grassland (**aG2**) because of the effects of grazing. *Astrelba* is replaced in higher rainfall areas by *Dichanthium* (**dG3**), together with *Eulalia fulva* and species of *Aristida* and *Bothriochloa*. There is much more overlap in the distributions of the genera than might be implied from the small mapped areas of **daG3**.

A large part of the *Dichanthium* grassland (**dG3**) is also now mapped as **dG2**. On the Darling Downs of south-eastern Qld an area of former *D. sericeum* grassland is now used for an alternation of summer and winter crops. Grassland is now only a minor component

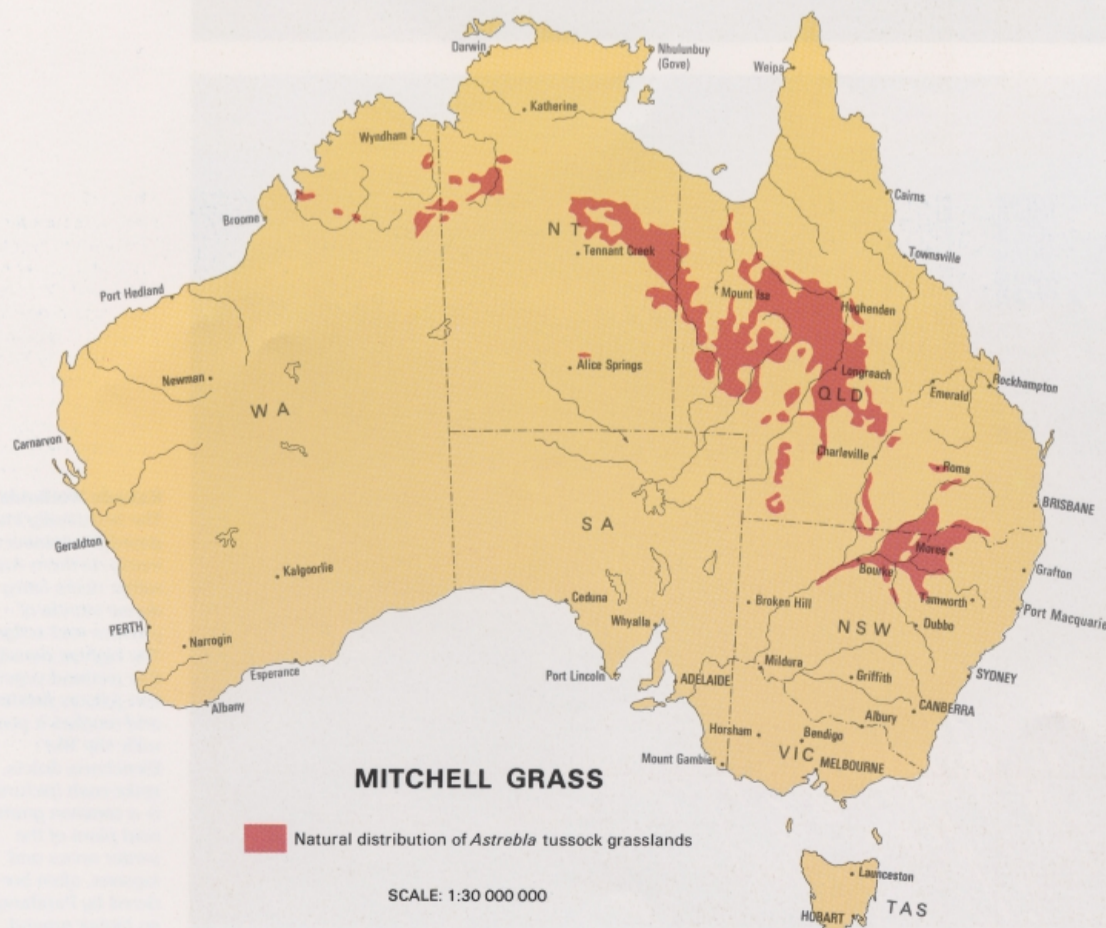
and is therefore not shown on the Present Vegetation map.

Some areas of natural grassland, such as the *Stipa* (**sG3**) areas in the south-east and parts of the *Dichanthium* (**dG3**) and *Astrelba* (**aG3**) grasslands further north, have retained the same structure, but are now more mixed (**yG3**).

Two examples of this form are sedgelands dominated by large tussock members of the Cyperaceae (**gG3**). One is in the natural vegetation of south-eastern SA where species of *Gahnia*, other graminoids and grasses grew in seasonally flooded coastal lowlands. These have been drained and now carry sown pastures which are generalised within the wider open woodlands on the Present Vegetation map (**eMlyfF**, **eLlyfF**).

The other example is in western Tas. and extends from coastal plains to mountainous areas, associated with peat-covered bleached sands. The distinctive sedge *Gymnoschoenus sphaerocephalus* is a constant species (see photo opposite), but it occurs in a mosaic with other graminoids, especially Cyperaceae and Restionaceae, and small shrubs including Epacridaceae and Myrtaceae. Fire has been a significant factor in the environment of this type, both under Aboriginal occupation and since European settlement (Jackson 1981).

MITCHELL GRASS



The natural extent of the *Astrelba* tussock grasslands is shown on this map, including areas where the species occur as understorey components. Mitchell grass is primarily associated with self-mulching cracking clay soils across northern Australia. The four species of *Astrelba* are *A. lap-*

pacea, *A. pectinata*, *A. squarrosa* and *A. elymoides*.

On the Natural Vegetation map the Mitchell grass downs stand out clearly as areas coded **aG3**, with areas of Queensland bluegrass (**dG3**) on their wetter margins. The Present Vegetation map shows most of these

areas as **aG2**, reflecting the lower foliage cover under grazing. This is a result of grazed tussocks being kept compact under continuous grazing and of an actual reduction in tussock numbers. However, Mitchell grass has proved to be a highly resilient plant community, even after more than a century

of grazing by both sheep and cattle.

The recent invasion of the exotic prickly acacia (*Acacia nilotica*) has had a major impact on the appearance of the Mitchell grass downs. It forms an open tree savanna coded as **wL1aG** over the north-eastern section of the former treeless plains.



Tussock grasses

G

Open tussock grassland

10–30% foliage cover

G2

Most of the Mitchell grass (*Astrelbia*) country across eastern and northern Australia is coded as open tussock grassland (**aG2**) on the Present Vegetation map. The effects of grazing have led to an overall reduction in cover on the Mitchell grass downs, while in the drier inland areas of south-western Qld Mitchell grass is naturally less dense and more mixed in composition.

Astrelbia grasslands are found mainly on cracking clay soils in summer rainfall areas within the 200–600 mm annual rainfall range. They are widespread on the downs of north-central Qld and on the Barkly Tableland extending into the NT. There are lesser areas further to the north-west, for example around Inverway in the NT. *Astrelbia* species extend much further into the arid zone than the mapped areas of **aG2** and are a component of the vegetation of the gibber country in Qld and SA, where they occur in depressions.

The principal species are *Astrelbia lappacea* and *A. pectinata*, the former being prominent in the east and the latter in the north and in the lower rainfall areas. Some stands contain few other grasses but in others there is a range of species of such genera as *Aristida* and *Eragrostis*.

Astrelbia grasslands are favoured pasture for beef cattle in the north and west, and for sheep in the south-east of their range. They have been reduced in some areas but in general they have proved remarkably persistent under grazing. Foliage cover may fluctuate greatly under the combined influences of grazing and seasonal conditions, and their present coding as **aG2** is a broad generalisation.

Many natural *Dichanthium* grasslands (**dG3**), particularly in the NT and on the lower floodplains of the Flinders River system in Qld, have also suffered a decline in cover as a result of continued grazing and are now coded as **dG2**. Some present areas of **yG2** also

result from the grazing of former tussock grasslands (**aG3**, **yG3**). Others result from the clearing of a range of natural vegetation types dominated by trees or shrubs and in some of these areas the native grasses have been supplemented by sowing drought-tolerant exotic grasses.

A notable example of **yG2** is on part of the catchment of the Ord River, where the former *Eucalyptus* grassy low open woodland (**eL1yG**) was largely eliminated under grazing, leaving the ground bare, unproductive, and eroded. To rehabilitate this area the small exotic shrub *Aerva javanica* has been planted as a coloniser, along with the exotic buffel (*Cenchrus ciliaris*) and birdwood (*C. setiger*) grasses.

Along the broad floodplains of the rivers in south-western Qld (the Channel Country), a fluctuating and largely herbaceous natural vegetation type is coded as **yG2**. These alluvial plains up to 60 km wide carry intermittent floodwaters through the western interior of Qld and, with the local annual rainfall below 250 mm, this has a major influence on vegetation growth.

The well defined Channel Country watercourses are marked by lines of low trees, notably *Eucalyptus microtheca*, *Acacia cambagei* and *A. stenophylla*, and the moister depressions carry stands of such species as the tall perennial grass *Eragrostis australasica* and the low shrub *Muehlenbeckia cunninghamii*.

The greater part of the Channel Country floodplains has a mixed herbaceous cover of grasses, such as *Chloris*, *Eragrostis* and *Panicum*, and forbs, including species of *Ptilotus* and members of the Chenopodiaceae and Asteraceae. Certain species, notably the grasses *Echinochloa turnerana* and *Panicum whitei* and the legume *Trigonella suavissima*, are particularly prominent after flooding and, while they last, provide valuable feed for beef cattle.

Sparse open tussock grassland

<10% foliage cover

G1

The name 'sparse open tussock grassland' is based on the terminology of Specht (1970) but was not used by him. Most of the mapped examples of this structural form (**yG1**) occur towards the western margins of the vegetation of the Channel Country (**yG2**) and may reflect the combined effects of lower rainfall and less flooding.

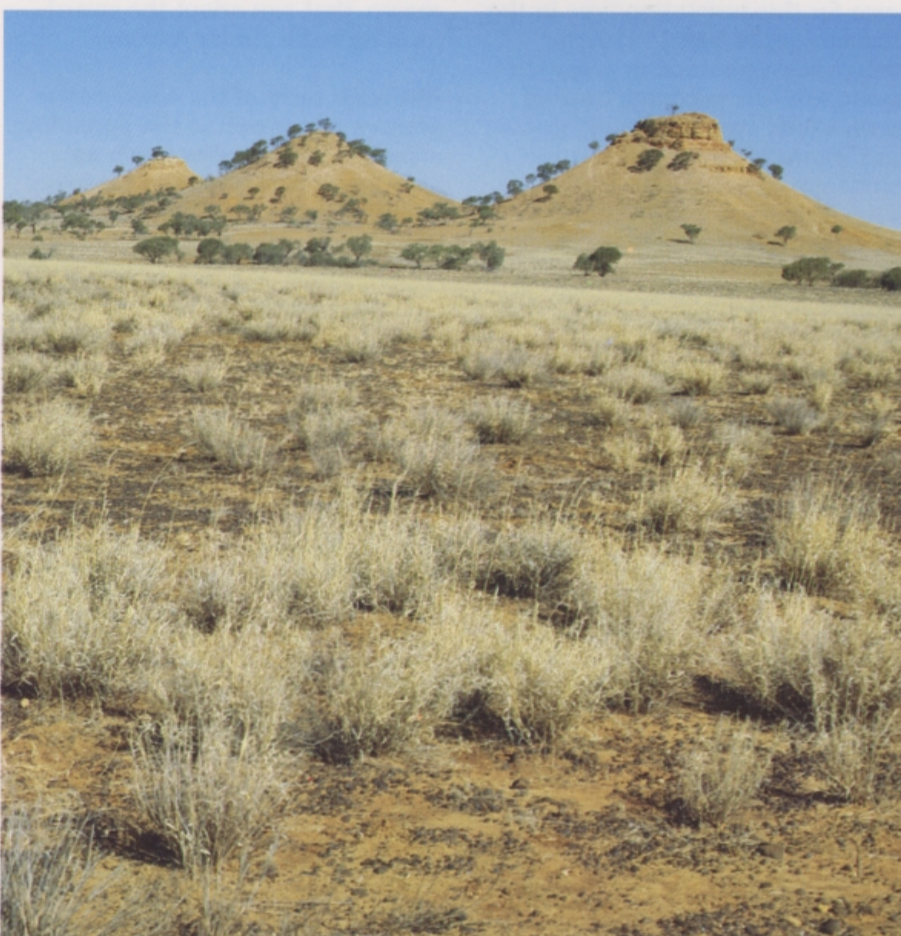
This vegetation type occurs mainly on clay plains, which are crossed by sand dunes in some areas (**yG1**). Foliage cover fluctuates

with seasonal conditions, but is generally very sparse. The tussock grasses include species of *Aristida*, *Sporobolus* and *Eragrostis*, and also *Astrelbia* in some places; the forb component includes species of *Atriplex* and *Sclerolaena* and members of the Asteraceae.

One small area shown as **yG1** on the Present Vegetation map, on the Bulloo River overflow to the east of Tibooburra (NSW), appears to reflect the effects of grazing on former open tussock grassland.



Buttongrass moor in western Tas. *Gymnoschoenus sphaerocephalus* is a prominent tussocky sedge throughout the vegetation mapped as (**gG3**) in western Tas. It is also found in swampy situations on the mainland. Plants of this species are up to one metre in height, with the distinctive flowering spikes projecting even higher.



Open tussock grassland of Mitchell grass

Astrelbia occurs naturally as open tussock grassland (**aG2**) over wide areas on the plains of south-western Qld. This open Mitchell grass country (pictured) is found on red and brown cracking clay soils, mostly in areas receiving less than 300 mm annual rainfall. *Astrelbia pectinata*, or barley Mitchell grass, is the dominant species in these drier areas.



The Ord Regeneration Area

The original vegetation of the plainlands of the Ord River catchment was a grassy low open woodland dominated by *Eucalyptus terminalis*. Parts of this area became severely degraded as a result of overgrazing, with a loss of both tree and ground cover. A large area was progressively destocked and revegetated during the 1960s. Rehabilitation efforts have involved the sowing of exotic grasses such as buffel (*Cenchrus ciliaris*) and the small exotic shrub *Aerva javanica*.