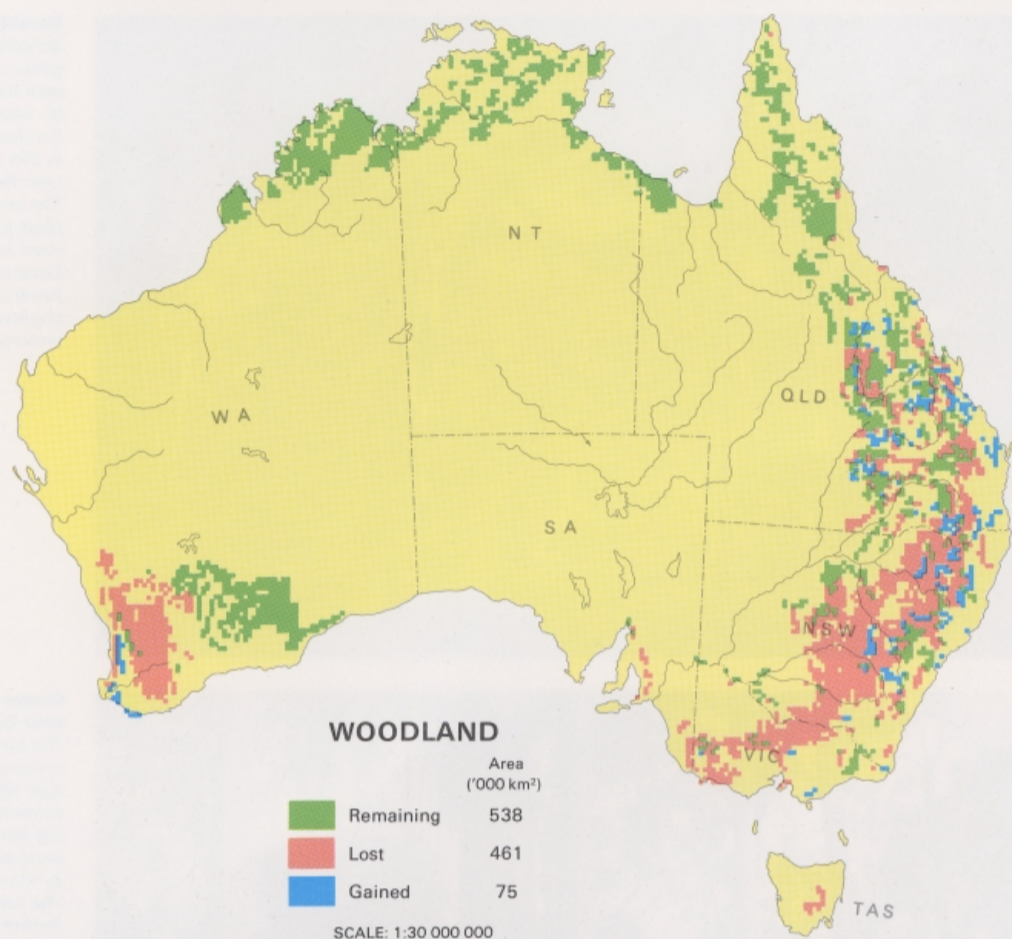


Woodland Trees 10–30 m high; 10–30% foliage cover

M2



Layered woodland of grey box and cypress pine

Woodlands having a low tree and tall shrub understorey, the 'layered woodlands', are related to and often as dense as the drier forests. This photo of a remnant patch of natural layered woodland (eM2L), near Coolamon (NSW), shows grey box (*Eucalyptus microcarpa*) over white cypress pine (*Callitris glaucophylla*). This vegetation type was formerly widespread over the area now occupied by the wheatbelt in NSW.



Darwin stringybark woodland with mixed understorey of low trees

This species (*Eucalyptus tetradonta*) dominates woodlands and open forests right across the wetter parts of northern Australia. In the Top End of the NT it is commonly associated with Darwin woollybutt (*E. miniata*) in woodlands with a distinct understorey layer of low trees (eM2L). In this stand, south of Darwin, there is a variety of low trees including *Acacia*, *Planchonia* and *Terminalia*. *Livistona* palms, seen here in the foreground, are also a feature of this vegetation type.



Woodlands form a transitional zone between the higher rainfall forested margins of the continent and the arid interior. *Eucalyptus* is the most widespread tree component, though there is a wide range of understorey types.

Woodlands have been almost entirely removed from the cereal cropping lands in the south-east and the far south-west of Australia. Pasture improvement and tree

thinning have been extensively employed within the grassy woodlands, while the shrubby understorey of others has been removed to increase pasture growth.

Woodland with low trees and tall shrubs

M2L–M2S

These 'layered woodlands' (eM2L, eM2S) are widespread in the coastal regions of northern Australia and are also found further inland in eastern Australia. They formerly occurred in the south-west of WA but today there are only a few scattered remnants.

guished by the presence of hummock grasses.

Across northern Australia the characteristic woodland trees include *Eucalyptus dichromophloia*, *E. miniata*, *E. tetradonta* and *E. polycarpa*. Other major species include *E. crebra*, *E. populnea* and *E. melanophloia* in Qld and NSW; *E. microcarpa* (*E. woollsi*) in NSW; *E. ovata* and *E. sieberi* in Vic.; and *E. loxophleba* and *E. gomphocephala* in south-western WA.

Some of these woodlands can be regarded as extensions of adjacent *Eucalyptus* forests into less favourable environments, where they are both structurally and floristically similar. In general, these woodlands occur where annual rainfall is lower (down to <400 mm in temperate Australia), though in some cases the relative distribution of forests and woodlands is also related to soil factors.

The distribution of the northern woodlands is unchanged except where they have been replaced by sugar cane (vG4) in the Ayr district, near Townsville. However, the present distribution of the eastern and southern woodlands is much reduced from their natural extent. In better watered areas these woodlands have been cleared for pasture and cereal crops. Others have been cleared or thinned to increase the growth of native grasses. Horticulture has replaced woodland in some places.

The lower stratum is marked by its floristic diversity and in places by its high density. *Acacia*, *Callitris* and *Casuarina* are prominent in the lower stratum in some areas, and indeed may be taller and co-dominant with *Eucalyptus* (e.g. ewM2L, peM2S), especially in southern Qld and northern NSW. *Melaleuca* dominates the understorey of some northern units; others contain numerous genera including *Terminalia*, *Erythrophleum* and *Planchonia*. While the ground layers in general are herbaceous, some northern examples are distin-

Some areas shown as eM2L or eM2S on the Present Vegetation map represent the results of the modification of open forests, for example the partly cleared ranges running south from Dubbo in central NSW.

Woodland with low shrubs

M2Z

Again, some of these woodlands (eM2Z) are extensions of adjacent 'dry sclerophyll forests' but others are quite distinct. The main occurrences are in the south-east and south-west, with one isolated example near Cape York. The numerous dominant species include *Eucalyptus tetradonta* in northern Qld; *E. sieberi*, *E. macrorhyncha* and *E. sideroxylon* in NSW and Vic.; *E. leucoxyton* in SA and Vic.; and *E. wandoo* and *E. salmonophloia* in WA. Woodlands dominated by *E. salmonophloia* occur in areas where the annual rainfall ranges down to 200 mm.

the shrub understorey of the *Eucalyptus largiflorens* and *E. camaldulensis* woodlands (eM2Z) on some floodplains of the Murrumbidgee River system.

The natural distribution of woodland with low shrubs has been much reduced, especially in south-western WA. Here, a large proportion, which included some *E. loxophleba* woodland (eM2S), has been cleared and sown to seasonal pastures (yF3, yF4) and crops.

The low shrub layer is typically sclerophyllous but semi-succulent *Chenopodiaceae*, including *Atriplex* and *Maireana*, are dominant on the alkaline soils that are widespread in the lower rainfall woodland areas of WA. *Chenopods* also form

Some areas of eM2Z represent modifications to former open forests, including the notable example of dieback of *E. marginata* forest in WA. The areas mapped as peM2Z and epM2Z in the present vegetation of northern NSW are probably remnants of more dense former woodlands.

M2

Woodland with hummock grasses

M2H

This woodland type (**eM2H**) is mapped only in central Qld. The tallest stratum is dominated by *Eucalyptus similis*, which tends to occur in groves, and the characteristic hummock grass is *Triodia mitchellii*.

Patches of similar vegetation occur within the grassy *Eucalyptus* wood-

lands (**eM2G**) in the Kimberley region of WA and the Top End of the NT. *Plectrache pungens* is frequent in the ground layer of many of these woodlands and, although it tends to occur in the tussock form where tussock grasses are dominant, it becomes a dominant hummock grass under lower rain-falls and on poorer soils.

Woodland with tussock grasses

M2G

Eucalyptus woodlands of this sub-form (**eM2G**) occur in many places in the better watered parts of northern and eastern Australia, from the Kimberley region of WA to south-eastern SA. Within the broad areas mapped as grassy woodland, however, there may be localised variations in both tree height and density. In the broken sandstone country of the Kimberley region, for example, there are many poorer sites which carry only sparse low open woodland vegetation.

The grassy woodlands tend to be associated with heavier or more fertile soils than those with a shrubby or hummock grass understorey; large areas have therefore proved favourable for agriculture. Besides the mapped areas, grassy woodlands also occur on alluvial flats along rivers throughout much of the country.

The wide distribution of grassy woodlands is reflected by the numerous dominant species, as can be seen on the map of *Eucalyptus* species groups on page 14. Again, *Eucalyptus tetrodonta* and *dichrophloia* are widespread across northern Australia, with *E. miniata* common in the NT and *E. polycarpa* in Qld.

Eucalyptus crebra, *E. populnea* and *E. melanophloia* are prominent west of the coastal ranges in Qld and NSW, with *E. tereticornis* more common in coastal valleys. *E. albens* and *E. melliodora* favour the inland side of the ranges in NSW and Vic., with *E. microcarpa* on the plains further west. *E. viminalis* is common on the ranges from NSW to SA and in Tas. *E. leucoxylon* and *E. camaldulensis* are major species in SA and western Vic.

Species of *Callitris* and *Acacia* are co-dominant with *Eucalyptus* in some places (**epM2G**, **ewM2G**), or even dominant as in the case of a small area of *Callitris* near Goondiwindi in Qld (**pM2G**).

Some grassy woodlands in monsoonal northern Australia contain some of the few deciduous species of *Eucalyptus*, including *E. alba*, *E. grandifolia* and *E. latifolia*.

Eucalyptus camaldulensis occurs on plains and even some hill slopes

in western Vic. and south-eastern SA. It is also common along rivers in many parts of the country and, with *E. largiflorens*, is dominant along the Murray and Murrumbidgee rivers.

There are many tussock grass species in the woodlands. Prominent grasses include species of *Sorghum* (annual and perennial), *Heteropogon* and *Chrysopogon* across northern Australia; *Bothriochloa* and *Aristida* from tropical northern Australia to NSW; and of *Poa*, *Danthonia* and *Stipa* in the south-east including Tas. *Themeda australis* occurs in all of these areas.

The distribution of the northern grassy woodlands is largely unchanged, except for a small area of regrowth on formerly cleared land south of Darwin (**xs1yG**), and one of grasses and summer crops in the Mareeba district near Cairns (**yG3**). Many of these woodlands are grazed by cattle, usually on grasses that are fired annually. This combination of burning and grazing appears to have led to floristic changes among the grasses, including a decline in *Themeda australis* and an increase in the less desirable *Heteropogon contortus* (Isbell 1969).

In contrast, most of the eastern and southern grassy woodlands have been extensively changed, either through clearing for pastures and seasonal crops or thinning to increase native grass growth (**eM1yG**). In some places the partial removal of timber has been followed by many deaths among the remaining trees.

Some present stands of vegetation shown as **M2G** are the result of changes to former open forests or shrubby woodlands. Some woodlands along the Murray and Murrumbidgee rivers that are shown as **eM2G** on both maps may formerly have had an understorey of low shrubs, notably *Chenopodiaceae*.

An area of patchy *Melaleuca* open forest in the Arafura Swamp of north-eastern Arnhem Land is generalised as woodland (**mM2G**). The ground cover throughout consists of grasses and sedges of such genera as *Oryza* and *Eleocharis*.



Wandoo woodland over low shrubs in the Darling Range (WA)

Wandoo (*Eucalyptus wandoo*) is a large crowned tree of up to 25 m in height, occurring on gravelly soils inland from the Darling Range. *Xanthorrhoea* stands out among other low shrubs in the sclerophyllous understorey (**eM2Z**). Associated eucalypts are jarrah, marri and, further inland, York gum. Parts of the original wandoo woodland and open forest have been cleared for agriculture.



River red gum fringing woodland on the Lachlan River (NSW)

Eucalyptus camaldulensis is the most widespread of all eucalypts, occurring along almost all seasonal watercourses throughout inland Australia. It is the principal tree along the Murray River and its tributaries, where it forms ribbon-like woodlands and open forests on the floodplains. Many areas have a tussock grass ground cover (**eM2G**), but introduced forbs are also common.



Grassy woodland of Poplar box

One of the most widespread trees of inland eastern Australia is the poplar box (*Eucalyptus populnea*). This species occurs in a variety of woodland types, including those with low tree, shrub or tussock grass understoreys. Its main range extends from Narrandera (NSW), north to near Mackay (Qld) and as far inland as Quilpie and Barcardine in central Qld. Poplar box is frequently co-dominant with cypress pine, mulga or other eucalypts. Grassy poplar box woodland (**eM2G**), such as this example from north of Emerald (Qld), is found mostly on alluvial plains in the northern and eastern parts of its range.