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## AUSTRALIA'S NATIVE VEGETATION

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A summary of the National Land and Water Resources Audit's  
*Australian Native Vegetation Assessment 2001*

[www.environment.gov.au/atlas](http://www.environment.gov.au/atlas)



Murray Figg

## NATIONAL LAND AND WATER RESOURCES AUDIT

*Assessing the condition and capacity of Australia's natural resources*

The National Land and Water Resources Audit (Audit) is conducting Australia-wide assessments of:

- water availability and quality
- dryland salinity
- vegetation
- rangelands
- agricultural productivity and sustainability
- Australians in natural resource management
- catchments, rivers and estuaries
- biodiversity

It is the first time that the Commonwealth, States and Territories have collaborated on such a broad program.

*Australian Native Vegetation Assessment 2001:*

- provides information on the type and extent of Australia's pre-European and present native vegetation
- assesses change in extent and fragmentation since European settlement
- assesses native vegetation in protected areas
- describes 23 major vegetation groups
- describes the National Vegetation Information System
- presents an agreed technical framework and guidelines for collecting, compiling and reporting vegetation data Australia wide
- identifies key knowledge, data and information gaps

## PROVIDING ACCESS TO INFORMATION

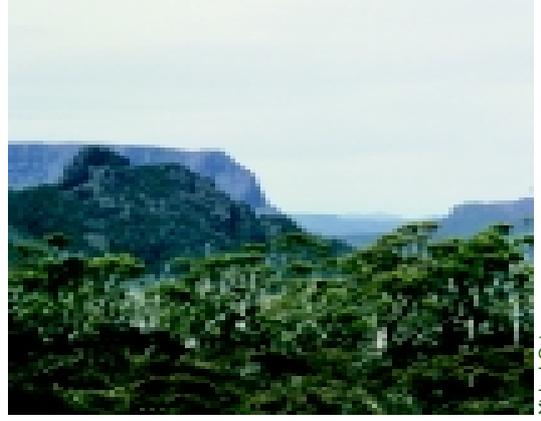
### Australian Natural Resources Atlas

The Australian Natural Resources Atlas (Atlas) provides information on Australia's natural resources including summary data and information at national, State/Territory and regional scales as well as the complete *Australian Native Vegetation Assessment 2001*.



[www.environment.gov.au/atlas](http://www.environment.gov.au/atlas)





Michael Quinn

## ASSESSING AUSTRALIA'S NATIVE VEGETATION

*Australian Native Vegetation Assessment 2001* is the first assessment of the extent of Australia's major native vegetation types. It is an Australia-wide assessment at the regional scale and is based on the National Vegetation Information System—an agreed framework for collating and presenting information on Australia's vegetation.

### Australia's native vegetation at a glance

- Australian native vegetation contains many regionally occurring species. It is dominated by *Acacia* and *Eucalyptus* species across the broad range of structural vegetation types including forests, woodlands, shrublands and grasslands (Table 1).
- 25 of Australia's 245 river basins (Figure 2) and 42 of Australia's 354 biogeographic subregions (Figure 3) have less than 30% native vegetation remaining.
- The intensive use zone covers 2 894 000 km<sup>2</sup> of the mainly agricultural and urban zones of southern and eastern Australia. Across this region approximately 68% (or 1 968 000 km<sup>2</sup>) of native vegetation remains.

**Table 1.** A snapshot of Australia's native vegetation types.

| Vegetation type  | Percent area of total native vegetation |
|--|---|
| Hummock grasslands   | 26                                      |
| Acacia forests, woodlands, open woodlands and shrublands   | 20                                      |
| Eucalypt woodlands and open woodlands  | 16                                      |
| Chenopod/samphire shrublands, other shrubs and forblands   | 10                                      |
| Tussock grasslands   | 8                                       |
| Tropical eucalypt woodlands/grasslands   | 4                                       |
| Eucalypt tall open forests, open forests and low open forests  | 4                                       |
| Mallee woodlands and shrublands  | 4                                       |
| Callitris, casuarina and melaleuca forests and woodlands   | 3                                       |
| Other forests and woodlands  | 2                                       |
| Other grasslands, herblands, sedgelands and rushlands  | 1                                       |
| Mangroves, tidal mudflats, samphires and bare areas, claypan, sand, rock, salt lakes, lagoons, lakes | 1                                       |
| Rainforests and vine thickets  | 0.5                                     |
| Heath  | 0.4                                     |
| Low closed forests and closed shrublands   | 0.1                                     |



## AUSTRALIA'S MAJOR VEGETATION GROUPS

There are 23 major vegetation groups in Australia (Table 2). Information on these has been collated and mapped for pre-European and present native vegetation. The groups incorporate a large number of vegetation types determined by a combination of:

- floristics—the dominant vegetation type (e.g. species); and
- structure—the dominant vegetation form (e.g. cover, growth form and height).

Information used to report on the major vegetation groups was based on:

- the National Vegetation Information System which stores data from over 100 projects and 25 government agencies across all jurisdictions; and
- other vegetation mapping.

A general description of the 23 groups, a distribution map and photograph is summarised on pages 5 to 18. Further information on the distribution, changes since European settlement and summary statistics are available on the Australian Natural Resources Atlas at [www.environment.gov.au/atlas](http://www.environment.gov.au/atlas).

**Table 2.** Australia's major vegetation groups—*Australian Native Vegetation Assessment 2001* defines 23 major vegetation groups.

| Major vegetation group   | Area (km <sup>2</sup> ) |
|--|-------------------------|
| Rainforest and vine thickets   | 30 231                  |
| Eucalypt tall open forests   | 30 129                  |
| Eucalypt open forests  | 240 484                 |
| Eucalypt low open forests  | 12 922                  |
| Eucalypt woodlands   | 693 449                 |
| Acacia forests and woodlands   | 560 649                 |
| Callitris forests and woodlands  | 27 724                  |
| Casuarina forests and woodlands  | 60 848                  |
| Melaleuca forests and woodlands  | 90 513                  |
| Other forests and woodlands  | 119 384                 |
| Eucalypt open woodlands  | 384 310                 |
| Tropical eucalypt woodlands/grasslands   | 254 228                 |
| Acacia open woodlands  | 114 755                 |
| Mallee woodlands and shrublands  | 250 420                 |
| Low closed forests and closed shrublands   | 8 749                   |
| Acacia shrublands  | 654 279                 |
| Other shrublands   | 98 947                  |
| Heath  | 25 861                  |
| Tussock grasslands   | 528 998                 |
| Hummock grasslands   | 1 756 104               |
| Other grasslands, herblands, sedgelands and rushlands  | 98 523                  |
| Chenopod shrubs, samphire shrubs and forblands   | 552 394                 |
| Mangroves, tidal mudflats, samphires and bare areas, claypan, sand, rock, salt lakes, lagoons, lakes | 106 999                 |
| Cleared/modified native vegetation   | 982 051                 |

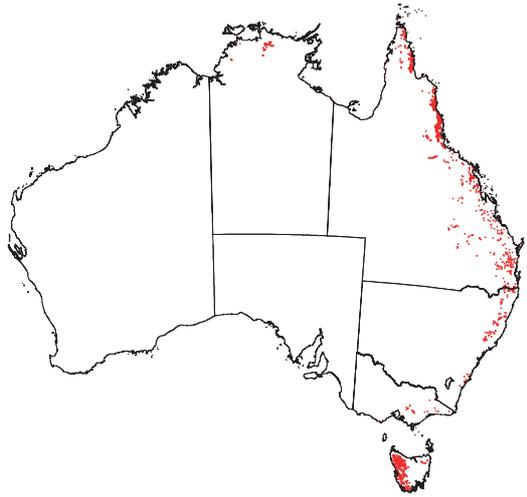


Murray Fagg

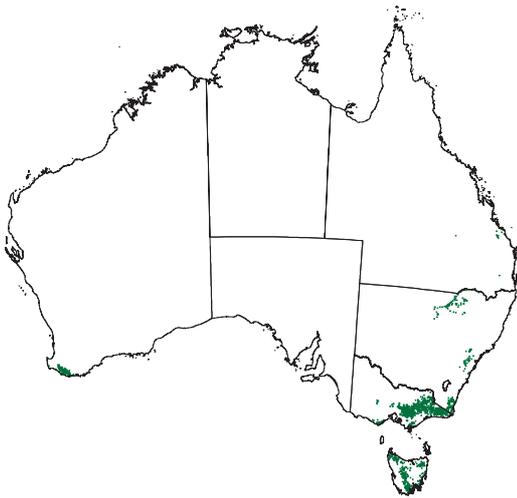
## Rainforest and vine thickets

- Closed forests characterised by dense foliage and a large diversity of plant species.
- Mostly confined to the wetter areas or climatic refuges in eastern Australia, with some in the semi-evergreen vine thickets of the Brigalow Belt and the monsoonal vine thickets of the seasonal tropics of northern Australia.
- Extent varies from a few hectares in sheltered gullies to hundreds of square kilometres in a mosaic, often with wet sclerophyll forests.
- Community types include cool temperate rainforest, subtropical rainforest, tropical rainforest, vine thickets, and semi-deciduous and deciduous vine thickets.

Rainforests were cleared extensively in the late nineteenth and early twentieth centuries for high value timbers, dairying, tobacco, sugar cane and other agricultural production.



## Eucalypt tall open forests



- Stand over 30 m tall and reach heights of 100 m.
- Restricted to all but the wetter areas of eastern Australia from the margins of the wet tropical rainforests of northern Queensland to Tasmania, and the south-west of Western Australia, often in rugged mountainous areas.
- Typified by a well-developed, often broad-leaved shrubby understorey or sometimes tree ferns.
- Mostly found adjacent to, or in association with, rainforest communities.

Extensive areas of eucalypt tall open forests were cleared for agriculture and grazing early in the twentieth century, particularly where they occurred on flatter land in areas associated with better agricultural soils. Major areas remain today in crown reserves as state forests or national parks.

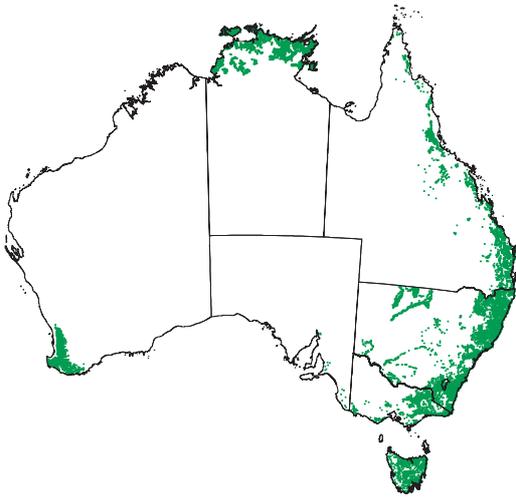


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Michael F Ryan

## Eucalypt open forests



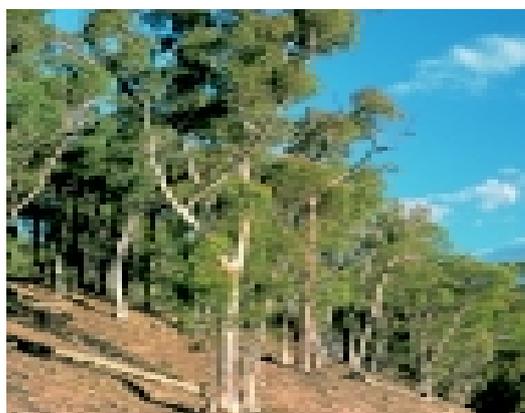
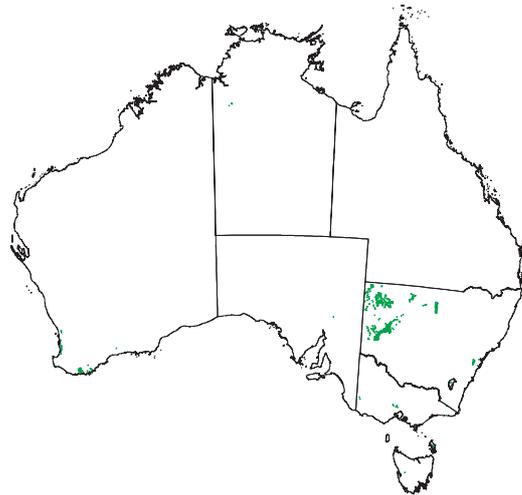
- Vary from 10 m to 30 m in height.
- Widespread along the subcoastal plains and foothills and ranges of the Great Dividing Range in eastern Australia; and the subcoastal ranges of the south-west of Western Australia.
- Generally have a shrubby understorey which is low to moderate in height, but in drier sites they may have a grassy understorey with scattered shrubs and/or cycads.

Clearing for grazing and agriculture in the major agricultural zones of eastern Australia and the south-west of Western Australia has been widespread. The rate of clearing in eucalypt open forests by the early twentieth century saw the development of crown reserves for their protection, either as national parks or as production forests, and the establishment of forestry departments.

## Eucalypt low open forests

- Can vary from 5–10 m in height.
- Grow on less favourable sites (e.g. under extreme cold or dry conditions; in heath areas; and steep rocky slopes).
- Eucalypt species may be the same as those occurring in the nearby more favourable sites that support open forests. In other stands of low open forests the dominant species may include a gradation in species type with change in growing constraints (e.g. the snow gum [*Eucalyptus pauciflora*] in subalpine areas).
- Exhibit a variety of subforms, with understoreys ranging from low trees and shrubs to tussock grasses or, in some cases, bare ground.

Some areas of eucalypt low open forests have been cleared. The remaining restricted areas may be relatively intact as a result of the extremes in site conditions.



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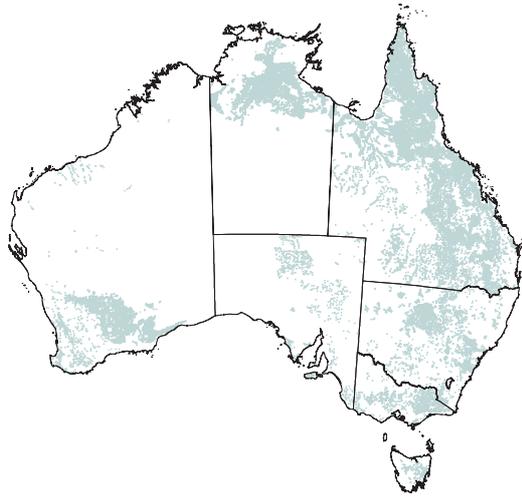


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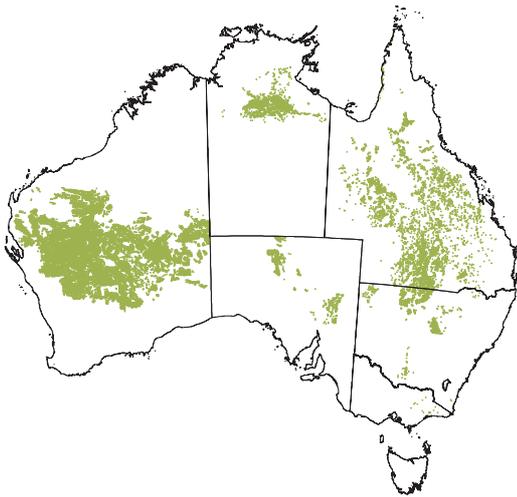
## Eucalypt woodlands

- Form a transitional zone between the higher rainfall, forested margins of the continent and the hummock grasslands and shrublands of the arid interior.
- Widespread throughout the mountain ranges and plains west of the Great Dividing Range in eastern Australia and east of the subcoastal ranges in the south-west of Western Australia.
- Include a series of communities, which have come to typify inland Australia (e.g. the box and ironbark woodlands of eastern Australia).

Eucalypt woodlands have been the most extensively cleared and modified vegetation group, particularly in the agricultural zones of eastern Australia and in the south-west of Western Australia. In many regions only small isolated fragments remain, often only along creeks and road verges.



## Acacia forests and woodlands



- Trees are generally stunted (often less than 10 m) but in some areas can grow to heights of 25 m.
- Dominant species include lancewood (*Acacia shirleyi*), bendece (*A. catenulata*), mulga (*A. aneura*), gidgee (*A. cambagei*) and brigalow (*A. harpophylla*). The most widespread species are mulga and brigalow.
- Climatic conditions are generally dry, hot summers with cool to warm winters.

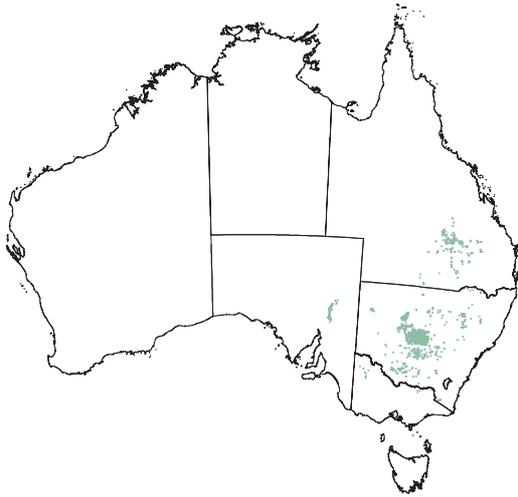
The mulga and brigalow communities of eastern Australia have been extensively cleared for grazing and agriculture. Mulga communities in the arid interior have not been cleared to the same degree. Many areas have been modified by the grazing of cattle/sheep and feral animals, and increased macropod populations supported by access to water from bores.



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## Callitris forests and woodlands



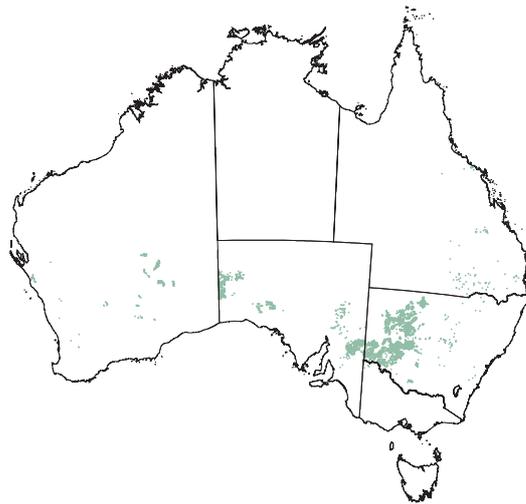
- Found mostly in a series of discrete regions, notably in the Brigalow Belt, but also in the arid areas of South Australia and in association with mallee communities near the South Australia – Victoria border.
- Generally dominated by an herbaceous understorey with only a few shrubs.
- Associated tree species include mulga (*Acacia aneura*), wilga (*Geijera* spp.), sugarwood (*Myoporum* spp.) and buloke or belah (*Casuarina* spp.). Associated shrub species include *Eremophila*, *Dodonaea*, chenopods (e.g. *Atriplex*, *Maireana*, *Sclerolaena*) and grasses (e.g. *Triodia*, *Plectrachne*, *Aristida* and *Austrostipa*).

Extensive areas have been cleared for grazing in the Brigalow Belt and the Mallee bioregions. Major areas are included in state forests and other crown reserves in Queensland and New South Wales.

## Casuarina forests and woodlands

- Occur mainly on littoral and riverbank sites along the south-eastern, eastern and northern coasts of Australia and on rocky sites throughout the continent.
- In other inland areas, *Casuarina* occurs in association with *Acacia* and eucalypts.
- Containing both *Casuarina* and *Allocasuarina* genera. These occur in a series of quite distinct communities, notably foredune (*C. equisetifolia*), swamp (*C. glauca*), riverine (*C. cunninghamiana*) and desert (*C. cristata*) communities.

The casuarina forests and woodlands have been extensively cleared in many coastal areas for agriculture or for industrial or urban developments. Areas in the arid zone are modified by grazing from domestic stock and feral animals.



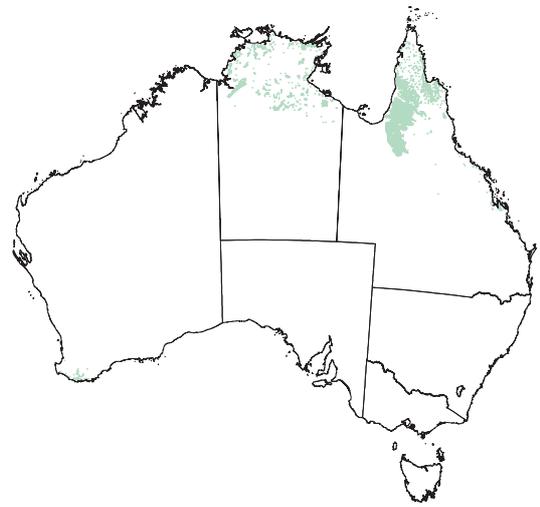


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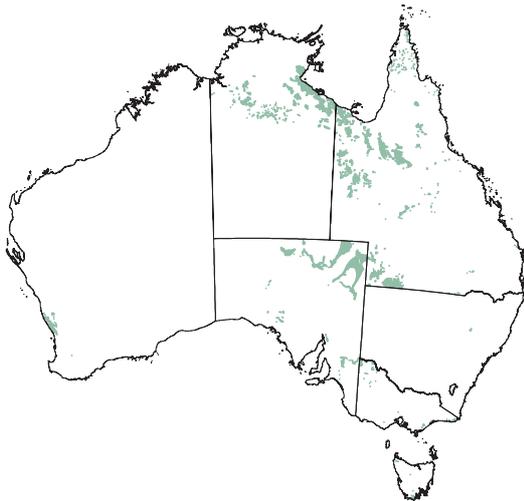
## Melaleuca forests and woodlands

- Cover substantial areas in the tropical north but are also found in temperate climates most often in or adjoining coastal or montane wetlands. Monsoonal melaleuca woodlands are found in the Northern Territory and in far northern Queensland on the areas adjacent to the Gulf of Carpentaria and on the Cape York Peninsula.
- Dominated by broad-leaved paperbark (*Melaleuca viridiflora*).
- In southern and eastern Australia the melaleucas are confined largely to the wetter watercourses and swamps with the paperbarked tea-tree (*M. quinquenervia*) the most widespread coastal species.
- In Western Australia the melaleuca forests and woodlands are restricted to pockets in specific sites, such as the swamp paperbark (*M. preissiana*) on subcoastal swamp areas and *M. raphiophylla* on creeklines and watercourses.

The melaleuca forests and woodlands have been extensively cleared on coastal floodplain areas for agriculture or housing near major cities. Extensive areas remain in the tropical north, in particular southern Cape York Peninsula.



## Other forests and woodlands



- Diverse group of communities, some of which (e.g. *Banksia* woodland and *Leptospermum* forests) are comparatively restricted in their extent but may be locally abundant.
- Includes a series of mixed communities of the arid zone that are not dominated by any particular species.
- Exhibit a variety of subforms, with understoreys ranging from low trees and shrubs, to low shrubs and to tussock grasses.

In many coastal areas this group has been extensively cleared for agriculture or urban uses. Extensive areas remain in the arid zone, often modified by grazing of domestic stock and feral animals.



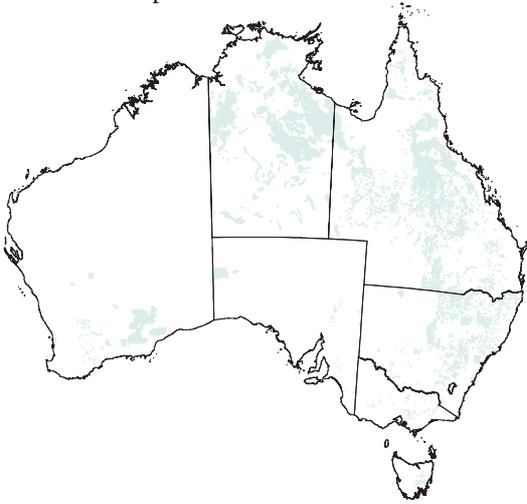
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Damian Shepherd

## Eucalypt open woodlands

- Characterised by broad spacing between canopy trees so that in many areas the understorey appears more dominant in the landscape.

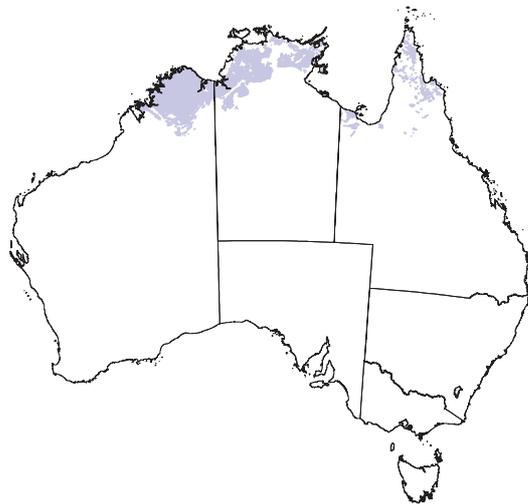


- Very extensive, particularly in the semi-arid interior and the tropics. Cover many dry inland plains and downs and some rocky outcrops.
- Contain many of the eucalypt species that occur in eucalypt woodlands.
- Understorey varies and includes shrubs, heaths, and tussock and hummock grasses. Variation in understorey reflects the variety of climatic zones and site conditions supporting these woodlands.

Large areas have been cleared in the south-east and far south-west of Australia for cereal cropping and grazing. In the northern parts of Australia eucalypt open woodlands have been modified by pastoral activities and changed fire regimes.

## Tropical eucalypt woodlands/grasslands

- Contains the tall bunch-grass savannas of northern Western Australia, and related eucalypt woodlands and eucalypt open woodlands communities in the Northern Territory and far north Queensland.
- Woodlands include a mix of species— Darwin box (*Eucalyptus tectifica*), Darwin stringybark (*E. tetradonta*), *E. miniata*, *Corymbia foelscheana*, *C. latifolia*, *C. flavescens*, *C. polycarpa*, *C. nesophila*, *C. clarksoniana*, *C. grandifolia*, *C. bleeseri*, *C. ferruginea*, *Erythrophleum chlorostachys*.
- Savannas and understorey typified by a suite of tall, annual grasses (notably *Sorghum* spp.) but does not include communities in more arid sites where *Triodia* spp. become more dominant.



Much of the occurrence is within Indigenous-held lands and most of the vegetation type is in substantially natural condition except for some grazing pressure, changes in fire regime and weed infestation.



Diane Napier

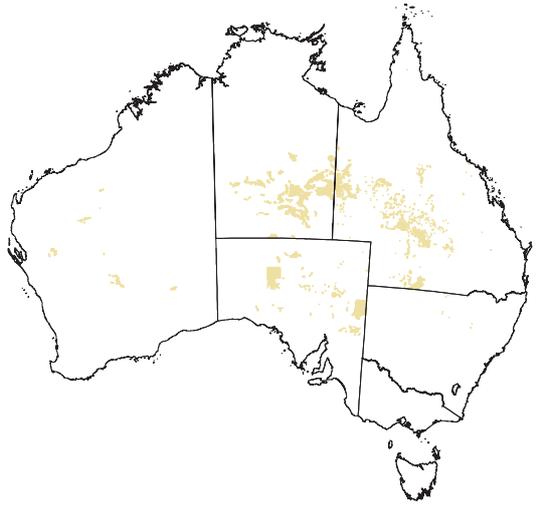


Murray Fagg

## Acacia open woodlands

- Usually occur in low undulating inland areas, with mainly summer rainfall (northern Australia) and winter rainfall (southern Australia).
- Cover extensive areas of the arid zone or drier tropical north mostly with a shrubby or grassy ground layer.
- Dominant acacias include mulga (*Acacia aneura*), Georgina gidgee (*A. georginae*), *A. tephрина*, *A. cambagei*, brigalow (*A. harpophylla*), *A. peuce* and *A. papyrocarpa*.
- The most widespread species is mulga.
- Ground layers are generally herbaceous or chenopod shrubs and grasses

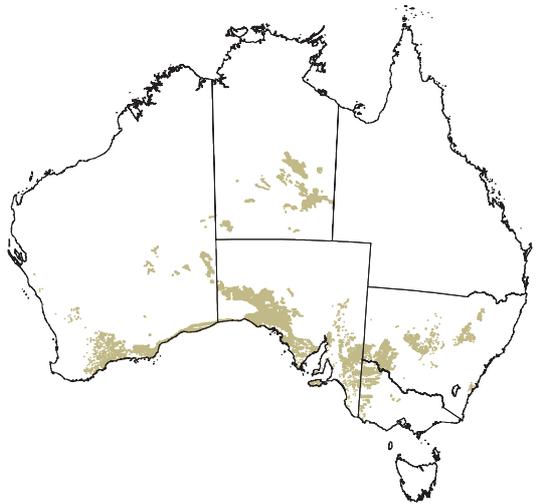
Little of the acacia open woodlands have been cleared. Many areas have been modified by grazing of domestic stock and feral animals.



## Mallee woodlands and shrublands

- Grow from lignotubers and are multi-branched trees found on harsh sites usually with a flattened canopy.
- Located in the winter rainfall belts of semi-arid areas of southern Australia, in south-western New South Wales, north-western Victoria, southern South Australia and in the south-west of Western Australia.
- Widespread mallee species include white mallee (*Eucalyptus Dumosa*), red mallee (*E. socialis*), yorrell (*E. gracilis*), red mallee (*E. oleosa*), ridge-fruited mallee (*E. incrassata*) and soap mallee (*E. diversifolia*).
- Eucalypts are the most widespread tree component. Mallee rarely exceeds 6 m in height. Co-dominants can include species of *Melaleuca*, *Acacia* and *Hakea*.

Mallee woodlands and shrublands in Victoria and parts of South Australia have been extensively cleared, with only isolated remnants remaining in some areas. Mallee woodlands and shrublands are still widespread in the arid zone of South Australia and Western Australia.



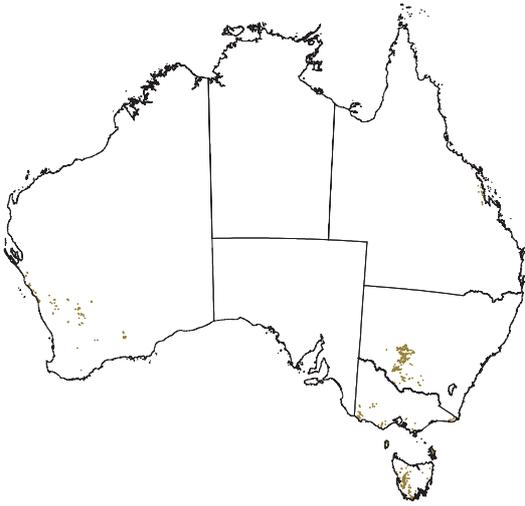
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Kathy Tracy

## Low closed forests and closed shrublands

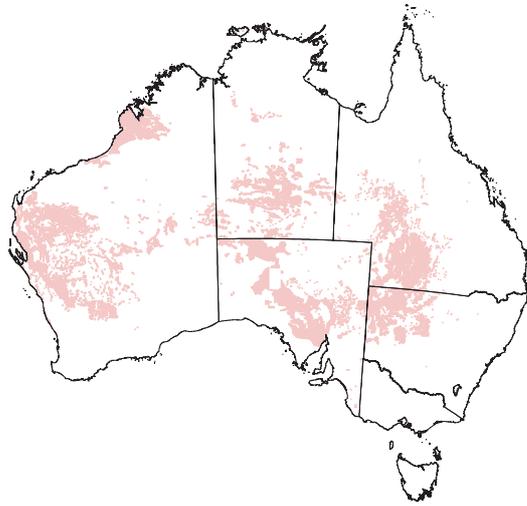


- Characterised by dense foliage in the upper layers and by low stunted species usually between 5–10 m in height—sometimes referred to as ‘scrub’.
- Occur in a range of climatic zones including coastal or subcoastal environments and alpine environments in Tasmania.
- Support a large range of species—dominated by *Banksia*, *Leptospermum* and *Kunzea* or by *Melaleuca* with a mix of other species.

Extensive areas have been cleared in many coastal areas for agriculture or urban development.

## Acacia shrublands

- Typified by an overstorey dominated by multi-stemmed acacia shrubs.
- Occur mainly in temperate semi-arid and arid regions of Australia, although they also extend into the tropical arid regions of north-western Queensland and eastern Northern Territory.
- Occur mainly on extensive undulating plains and downs, low hills and valleys of range country.
- Climatic conditions are generally dry, hot summers, with cool to warm winters.
- Dominated by mulga (*Acacia aneura*), gidgee (*A. cambadgei*) and mixed species communities of the central Australian deserts, but also include a series of other desert acacia communities.
- Associated species include *Grevillea* spp., emu bushes (*Eremophila* spp.) and a wide range of chenopod species including *Atriplex*, *Maireana*, *Sclerolaena* and *Senna* spp.



Little has been cleared outside the major agricultural zones. The acacia shrublands may be modified as a result of grazing from domestic stock and feral animals, introduced exotic weeds (e.g. buffel grass) and from altered fire regimes.

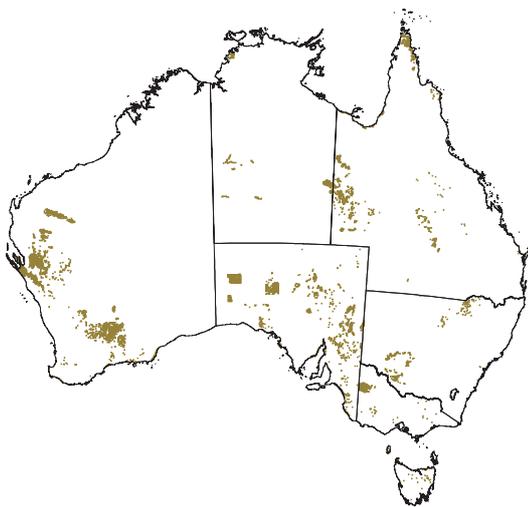


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## Other shrublands



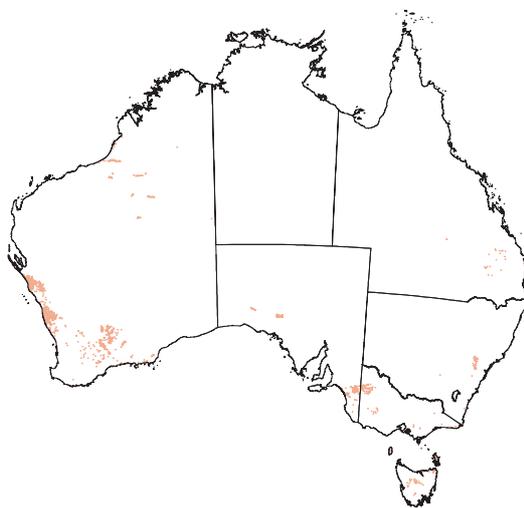
- Dominated by a broad range of shrub species that may include mixed species communities and mosaics of several communities. They do not fit well in other shrubland groups.
- Dominated by a range of genera including *Allocasuarina* (in some States and Territories still *Casuarina*), *Banksia*, *Bursaria*, *Dodonaea*, *Eremophila*, *Grevillea*, *Kunzea*, *Leucopogon*, *Muehlenbeckia*, *Persoonia*, *Thryptomene*, *Neofabricia*, *Nitraria* and *Melaleuca*.

These shrublands have been extensively cleared in the agricultural regions and in coastal areas adjoining major cities. In the arid zone, little of these shrublands have been cleared but many areas have been grazed by domestic stock and feral animals.

## Heath

- Open, closed or mixed shrublands dominated by plant genera typical of infertile or waterlogged sites, generally within the coastal, montane, sandy or laterite soils.
- Includes stunted (< 1 m tall) vegetation, typified by the family *Epacridaceae* and also other dense, low shrublands in subcoastal or inland environments.
- Dominant genera include *Allocasuarina*, *Baekea*, *Banksia*, *Calytrix*, *Hakea*, *Epacris*, *Grevillea*, *Leptospermum*, *Melaleuca*, *Leucopogon*, *Prostanthera*, *Richea* and *Xanthorrhoea*.

Heath communities have been cleared for sand mining, agriculture and urban development.

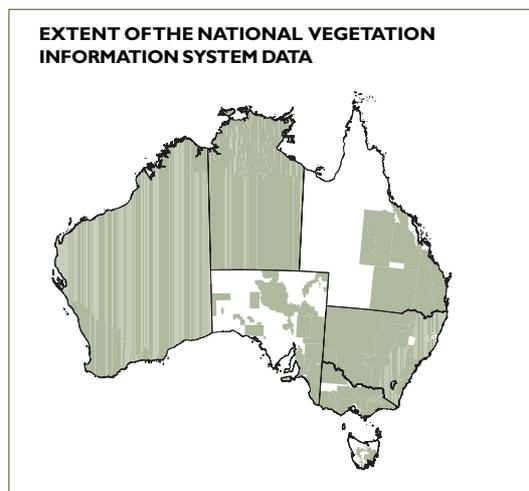


Murray Fagg



## AUSTRALIA'S MAJOR VEGETATION GROUPS (circa 1997)

- Cleared/modified native vegetation
- Rainforest and vine thickets
- Eucalypt tall open forests
- Eucalypt open forests and low open forests
- Acacia forests and woodlands
- Callitris, casuarina and other forests and woodlands
- Melaleuca forests and woodlands
- Eucalypt woodlands
- Eucalypt open woodlands
- Tropical eucalypt woodlands/grasslands
- Low closed forests, closed shrublands and other shrublands
- Mallee woodlands and shrublands
- Acacia open woodlands
- Acacia shrublands
- Chenopod shrubs, samphire shrubs and forblands
- Heath
- Tussock grasslands
- Other grasslands, herblands, sedgelands and rushlands
- Hummock grasslands
- Mangroves, samphires, sand, rock, salt lakes, freshwater lakes



**Source:**

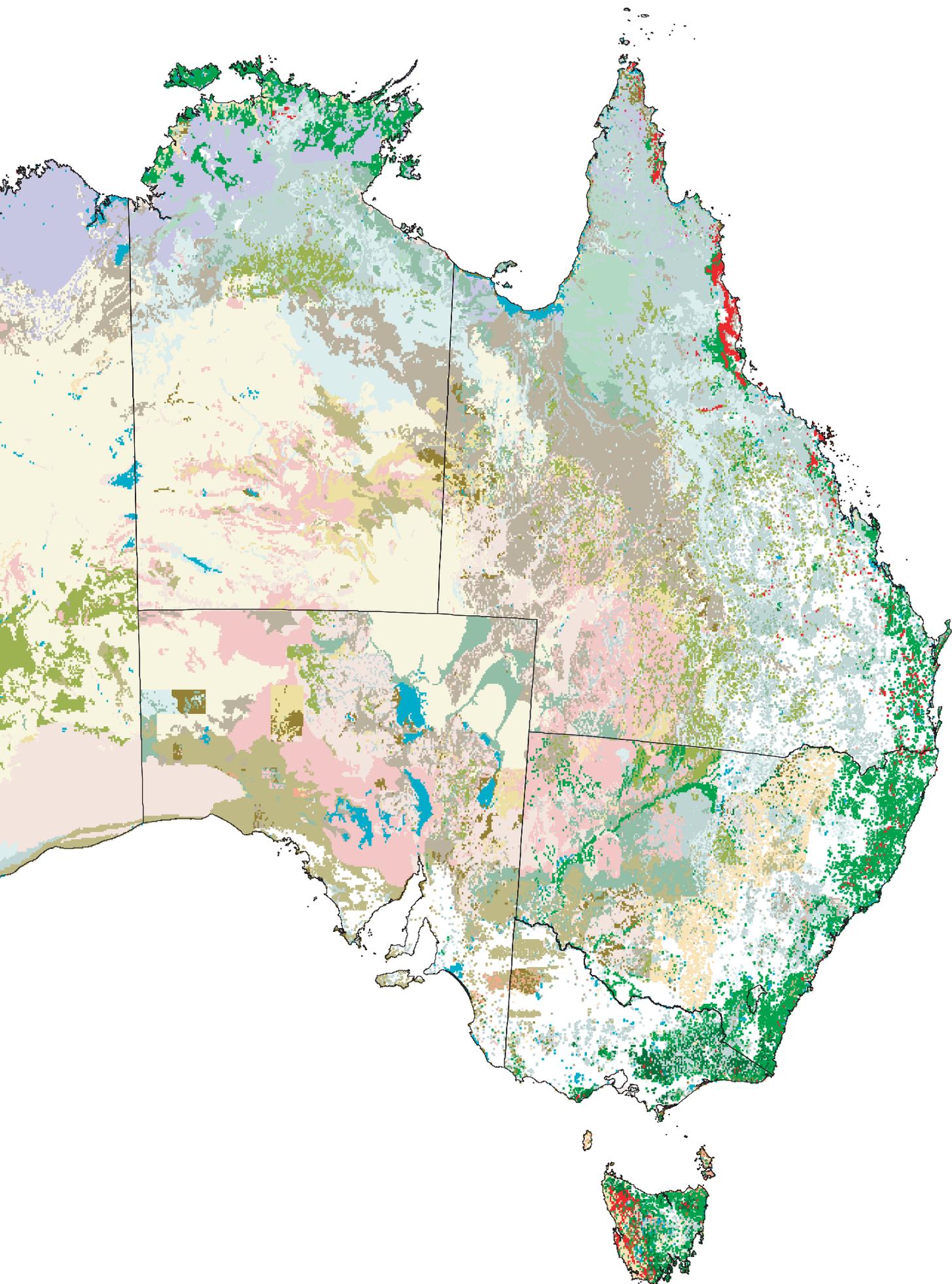
National Land and Water Resources Audit 2001.

Data used are assumed to be correct as received from the data suppliers.

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These summary maps provide information on Australia's native vegetation collated within the National Vegetation Information System at July 2001 and with additional mapped information where not available from the National Vegetation Information System. The National Vegetation Information System will be updated continuously as vegetation mapping data becomes available from States and Territories.

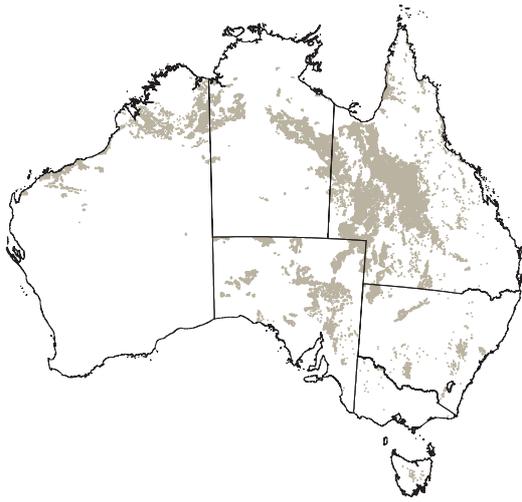
The map is a compilation of data collected at different scales by different organisations. Further information is available from the Australian Native Vegetation Assessment 2001, National Land and Water Resources Audit.





Murray Fagg

## Tussock grasslands



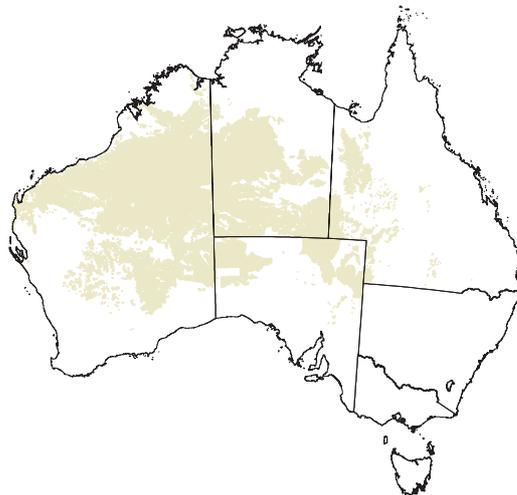
- Contain a broad range of native grasslands from the blue grass and Mitchell grass communities in the far north to the temperate grasslands of southern New South Wales, Victoria and Tasmania.
- Contain many widespread genera including *Aristida*, *Astrebla*, *Austrodanthonia*, *Austrostipa*, *Chrysopogon*, *Dichanthium*, *Enneapogon*, *Eragrostis*, *Eriachne*, *Heteropogon*, *Poa*, *Themeda*, *Sorghum* and *Zygochloa*, and many mixed species communities.

Extensive areas of tussock grasslands have been cleared and replaced by exotic pasture species. Most other areas have been modified by grazing, weed invasion and land management practices associated with grazing domestic stock (e.g. frequent fire and the application of fertilisers).

## Hummock grasslands

- Hummock-forming, evergreen perennials that appear as mounds up to 1 m in height. In between the mounds or hummocks the ground is usually bare or exposed.
- Typified by spinifex (*Triodia* and *Plectrachne* spp.) communities of the arid lands, characteristic of the Australian outback.
- Cover extensive areas as the dominant growth form with the occasional emergent shrub or small tree (either *Acacia* or eucalypt).
- Also a conspicuous element of other vegetation types (e.g. open woodlands).

Little of the hummock grasslands have been cleared but many areas have been modified by grazing of domestic stock and feral animals.

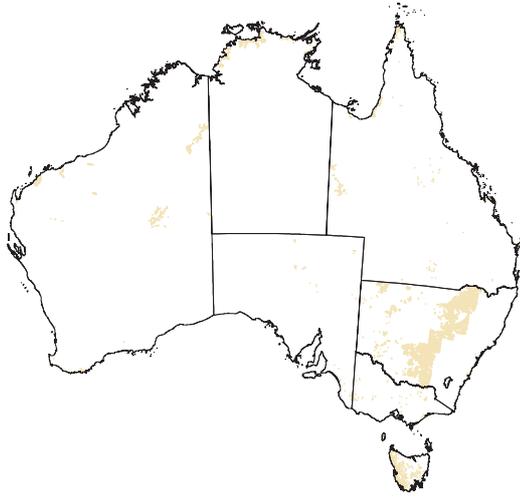


Murray Fagg



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## Other grasslands, herblands, sedglands and rushlands



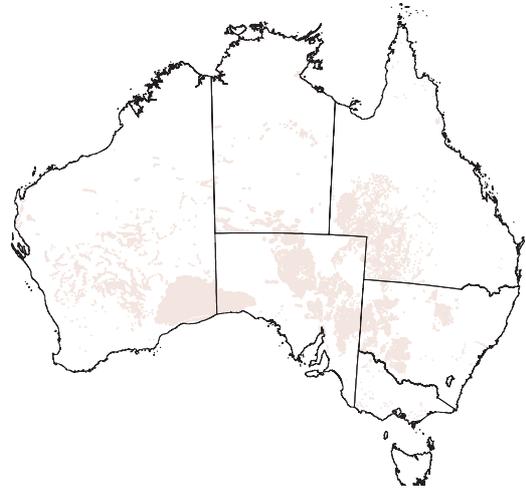
- Dominated by non-woody or herbal species (e.g. grasses, sedges, rushes, ferns or a mixture of these). The sedge and rushland communities (wetlands) support a large range of species, partly as a result of geographical range and partly as a result of the variation in soils and site conditions.
- Occur on a range of sites from shallow soils to seasonally inundated areas both saline and freshwater (e.g. sedglands are located on seasonally or periodically inundated, waterlogged and wet areas). Ferns tend to dominate specific humid areas where the environment is less variable between seasons.

Many of these communities are intact because they occur on extreme sites. Changes tend to be related to the effects of different hydrological conditions, changes to fire regimes, impacts from feral animals and localised development.

## Chenopod shrubs, samphire shrubs and forblands

- Overstorey is dominated by a range of hardy, low, shrub species. In damp and waterlogged areas (e.g. on drainage areas and fringes of salt lakes) samphires dominate.
- Widespread in the near-estuarine, arid and semi-arid areas; occur often as extensive flats.
- Site conditions tend to affect the type of shrub species that occur.
- Species in samphire communities include *Halosarcia*, *Salicornia*, *Sclerostegia* and *Sarcocornia* genera.
- Species in chenopod communities are drought- and salt-tolerant and include the *Sclerolaena*, salt bush (*Atriplex*), blue bush, cotton bush (*Maireana*), *Chenopodium* and *Rhagodia* genera.

Generally these communities have remained intact since European settlement. In some cases the communities have increased in extent because of increased salinity and waterlogging. Foremost among threats for coastal occurrences are infilling for urban areas, changes to tidal regimes and isolation from the estuary by roads and infrastructure.



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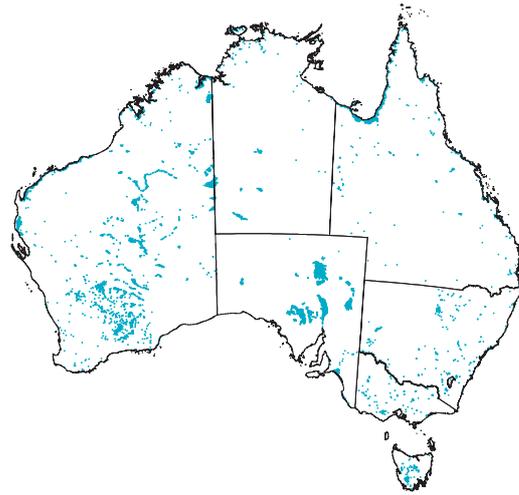


Maria Coffins

## Mangroves, tidal mudflats, samphires, claypans, salt lakes, bare areas, sand, rock, lagoons, freshwater lakes and reservoirs

- Occur over a wide range of site conditions, from near coastal and estuarine, to salt lakes and freshwater lakes.
- Mangroves vary from extensive, tall, closed, forest communities on Cape York Peninsula to low, closed forests or shrublands in southern regions.
- Samphires are found in the coastal mudflats and marine plains, adjoining mangrove areas in many instances, but also cover extensive marine plains inland from the southern Gulf of Carpentaria and other parts of the tropical north.
- Extensive areas devoid of vegetation can be found as bare ground—either sand dune, claypans or salt lakes—in the harsh environments of the arid interior.
- Coastal sand masses can often contain extensive areas of bare sands, mostly as active dunes.

Clearing or infilling of mangroves and tidal mudflats has occurred in coastal areas near urban major centres for industrial uses or urban developments.



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## CHANGES IN VEGETATION EXTENT

Since European settlement, approximately 13% of Australia has been cleared of native vegetation—mostly in the higher rainfall areas of the south-east and far south-west of the continent. The condition of the remaining vegetation varies.

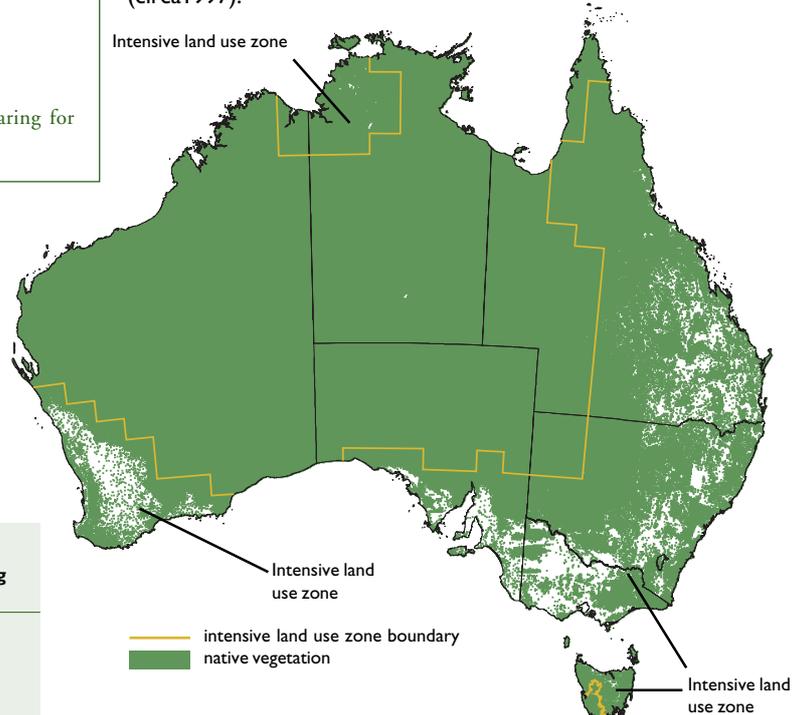
Approximately 32% of native vegetation in the **intensively used areas** (mainly the agricultural and urban zones) is cleared or highly modified (see Figure 1).

In general, data on vegetation clearing are presented by State and Territory (Table 3). Another method of reporting this information considers natural boundaries such as river basins (Figure 2) or biogeographic regions (Figure 3). Using natural boundaries emphasises the need to manage remnant vegetation as part of catchment and biodiversity planning.

### Key impacts on native vegetation (last 200 years)

- clearing for broadacre agriculture and grazing on improved pastures
- logging, harvesting or disturbing selected forest species
- grazing native pastures
- changing fire regimes
- weeds and feral species, or exotics plants
- filling of wetlands in urban areas and clearing for transport corridors

**Figure 1.** Extent of native vegetation in Australia (circa 1997).



**Table 3.** States and Territories: the area and percentage of native vegetation remaining in the intensively used areas of Australia (circa 1997).

|                             | Area native vegetation remaining (km <sup>2</sup> ) | Percent remaining |
|-----------------------------|---|-------------------|
| ACT                         | 1 620   | 69                |
| NSW                         | 470 604   | 67                |
| NT                          | 186 629   | 98                |
| Qld                         | 772 452   | 72                |
| SA                          | 174 966   | 64                |
| Tas                         | 42 520  | 80                |
| Vic                         | 84 541  | 37                |
| WA                          | 234 423   | 56                |
| Total (Intensive use zone*) | 1 967 754   | 68                |

\* Defined by Graetz R.D., Wilson M.A. & Campbell S.K. 1995, *Landcover disturbance over the Australian continent: a contemporary assessment*, Biodiversity Series Paper No. 7, Department of the Environment, Sport and Territories, Canberra.

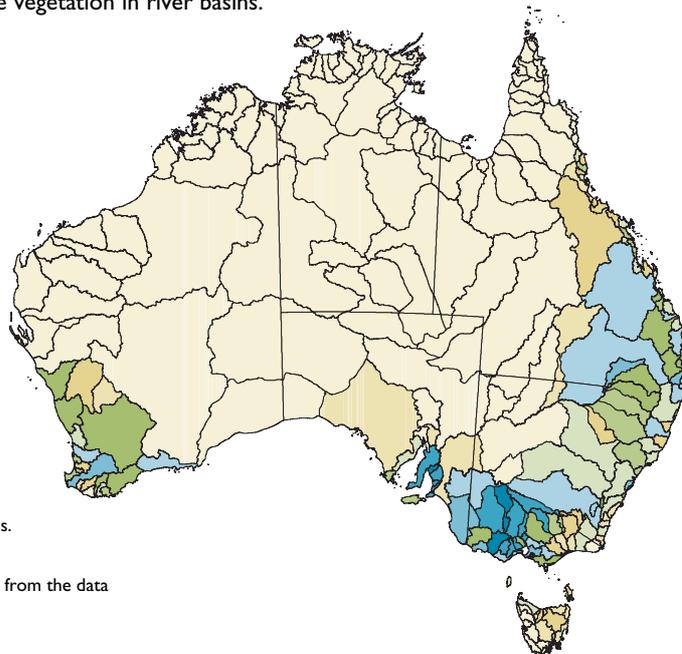
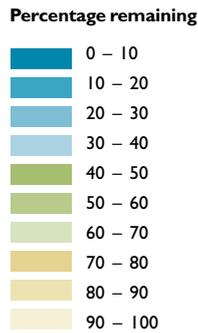
### Source:

National Land and Water Resources Audit 2001.

Data used are assumed to be correct as received from the data suppliers.

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**Figure 2.** Percentage remaining native vegetation in river basins.



**Source:**

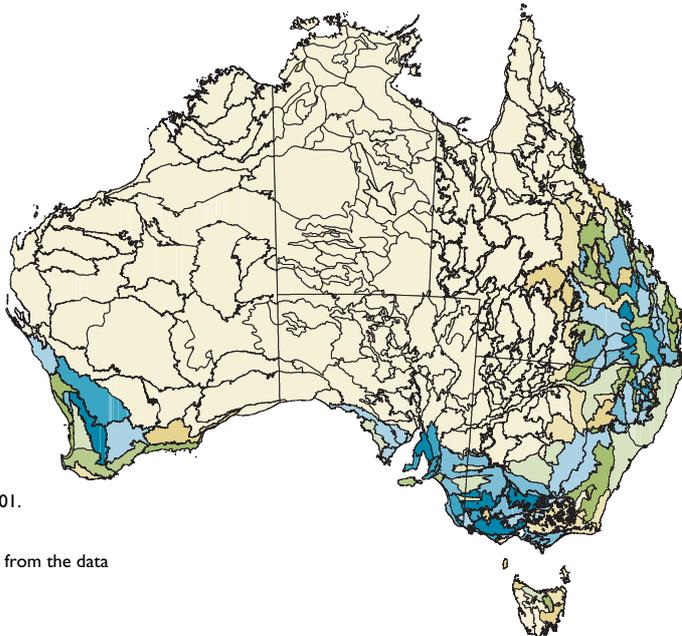
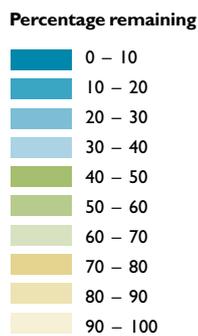
Derived from AUSLIG 1997 Australia's river basins.

National Land and Water Resources Audit 2001.

Data used are assumed to be correct as received from the data suppliers.

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**Figure 3.** Percentage remaining native vegetation in Interim Biogeographic Regionalisation of Australia subregions.



**Source:**

IBRA Subregions V. 5.1, Environment Australia 2001.

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These summary maps provide information on Australia's native vegetation collated within the National Vegetation Information System at July 2001 and with additional mapped information where not available from the National Vegetation Information System. The National Vegetation Information System will be updated continuously as vegetation mapping data becomes available from States and Territories.

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## Before European settlement

Before European settlement, Australia's vegetation was dominated (in decreasing area) by:

- hummock grasslands;
- acacia forests, woodlands and shrublands;
- eucalypt woodlands;
- grasslands, chenopod and samphire shrubs;
- eucalypt open woodlands;
- eucalypt forests;
- mallee woodlands and shrublands; and
- tropical eucalypt woodland/grasslands.

Melaleuca, casuarina and callitris forests and woodlands, heath, rainforest and vine thickets, and low closed forests and closed shrublands occurred in localised areas.

## After European settlement

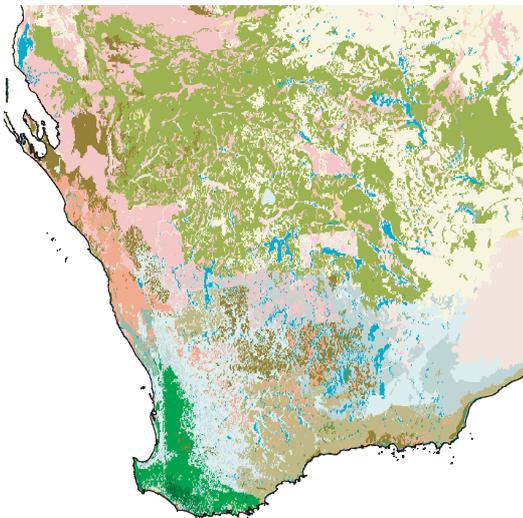
Australia's native vegetation continues to be dominated by the same mix of vegetation groups. However, large areas of land have been cleared or modified in the agricultural and urban zones. The most affected of the major vegetation groups (where greater than 30% of the native vegetation has been removed) are:

- heath;
- low closed forests and closed shrublands;
- mallee woodlands and shrublands;
- eucalypt tall open forests;
- eucalypt woodlands; and
- rainforests and vine thickets.

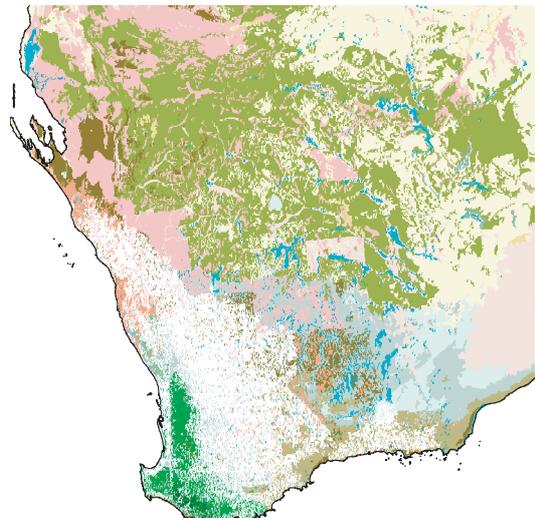
Much of the remaining native vegetation in the intensively used areas is fragmented and, in many areas, occurs as isolated trees or narrow strips along old stock routes or road and rail reserves. These remnants are often on unproductive land or land specifically set aside for conservation.

### Example of native vegetation clearing: South-west Western Australia

Pre-European major vegetation groups



Present major vegetation groups



## KEY MAJOR VEGETATION GROUPS AFFECTED BY CLEARING

| Major vegetation group   | Percent of pre-European extent cleared (%) | As a percent of all vegetation clearing in Australia (%) |
|--|--|--|
| <b>Heath</b> —heavily impacted by clearing for sand mining, agriculture, grazing or development mainly in southern coastal areas. Mallee communities, that occur in association with some heath communities, have similarly had extensive areas cleared, mainly for pastoral development in Victoria and South Australia.  | 45   | 2  |
| <b>Low closed forests and closed shrublands</b> —heavily impacted in coastal areas often as a result of urban development and clearing for agriculture.  | 45   | 0.7  |
| <b>Mallee woodlands and shrublands</b> —clearing of temperate mallee woodlands was encouraged by government over the last 50 years as part of the development drive for cereal cropping and pastoralism.   | 35   | 14   |
| <b>Eucalypt tall open forests</b> —largely cleared for forestry activities, agriculture, grazing and dams particularly where they occurred on flatter land in areas associated with better agricultural soils.   | 33   | 1.5  |
| <b>Eucalypt woodlands</b> —an important remnant component of cereal cropping and pastoral zones. Cleared areas are very extensive, with the broad fabric of the landscape from a native vegetation perspective lost.   | 31   | 32   |
| <b>Rainforest and vine thickets</b> —most lowland occurrences have been cleared. The broad range of communities across Australia found within this major vegetation group masks the level of regional depletion of some rainforest and vine thicket communities.   | 30   | 1  |
| <b>Eucalypt open forests</b> —clearing for grazing and agriculture in the major agricultural zones of eastern Australia and the south-west of Western Australia has been widespread.   | 29   | 10   |
| <b>Eucalypt open woodlands</b> —an important remnant component of cereal cropping and pastoral zones. Cleared areas are extensive, with the broad fabric of the landscape from a native vegetation perspective lost.   | 25   | 13   |
| <b>Inland acacia forests and woodlands</b> —agricultural and pastoral development has led to major changes in extent and condition of these landscapes, especially in brigalow ( <i>Acacia harpophylla</i> ) and mulga ( <i>A. aneura</i> ) communities.   | 15   | 10   |
| <b>Tussock grasslands</b> —many of the tussock grasslands of eastern Australia have been either substantially cleared or heavily modified by grazing. The mapping of this vegetation type reflects where there is good information on native grasslands. There are known to be many other areas either not mapped or subject to change through grazing and introduced pasture grasses. | 10   | 6  |



Murray-Darling Basin Commission

## FRAGMENTATION OF AUSTRALIA'S NATIVE VEGETATION

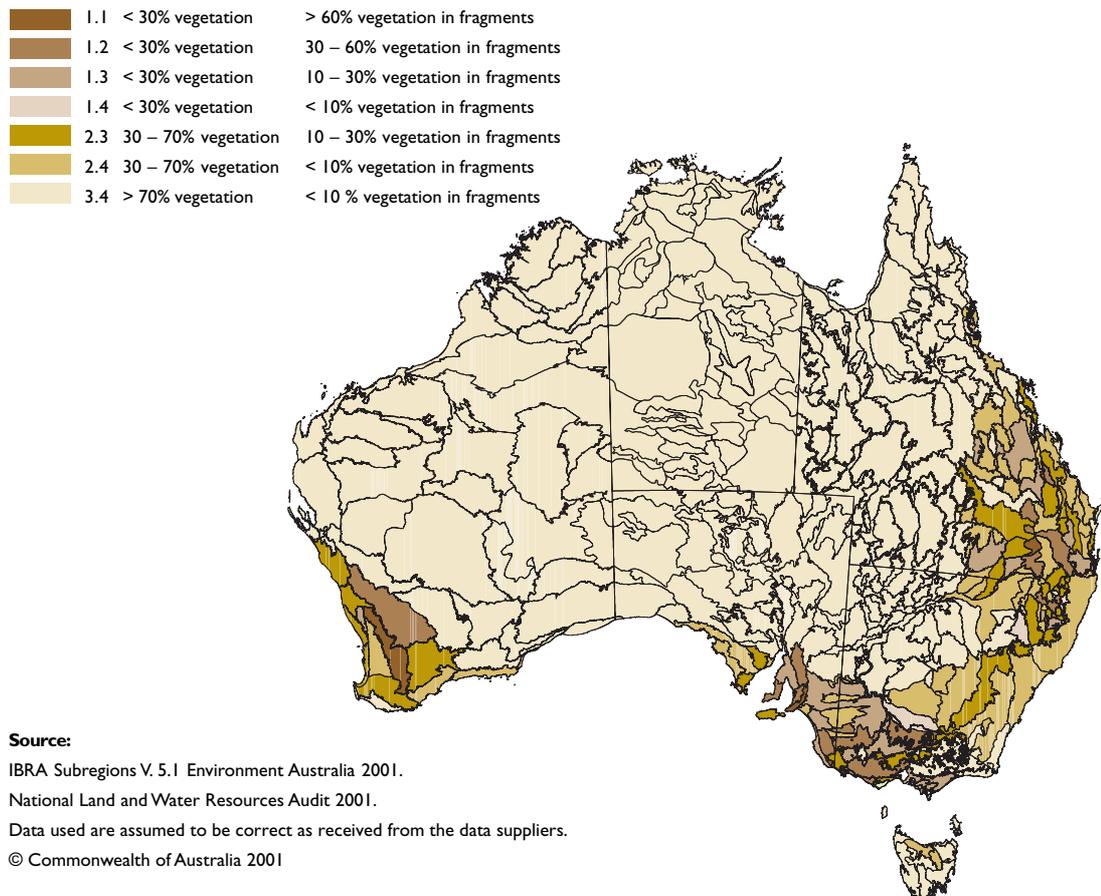
Fragmented patches of vegetation are often the only remaining examples of particular vegetation groups or ecosystems in a region. As well as contributing to the healthy functioning of that system they provide a source of material for any re-vegetation or restoration. These vegetation remnants are critical to maintaining ecosystem health, landscape function and species diversity within ecosystems.

Analysing fragmentation shows that native vegetation reduced to relic patches are clearly under threat—particularly if a large proportion of the total native vegetation is fragmented (Figure 4). Overall:

- 42 of Australia's subregions have less than 30% of native vegetation remaining; and
- 22 are very highly or highly fragmented.

These subregions occur in the south-west of Western Australia, south-eastern South Australia, central and western Victoria, the New England Tablelands bioregion in New South Wales, and inland and coastal south-eastern Queensland.

**Figure 4.** Proportion of native vegetation remaining and its level of fragmentation by Interim Biogeographic Regionalisation of Australia subregions.



**Source:**

IBRA Subregions V. 5.1 Environment Australia 2001.

National Land and Water Resources Audit 2001.

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## THE NATIONAL VEGETATION INFORMATION SYSTEM

The National Vegetation Information System is the Australia-wide system developed by the Audit and its partners to describe and compile information and data on Australia's vegetation. It is the result of collaboration between all States, Territories and the Commonwealth. Fundamentally the National Vegetation Information System establishes an Australia-wide framework to collect data and information across jurisdictions and creates a seamless information resource.

The *Australian Native Vegetation Assessment 2001* is the first major product of this collaboration.

### A hierarchy of information

The National Vegetation Information System presents information as a hierarchy, defining structural and floristic patterns of Australia's vegetation. The hierarchy is made up of six levels presenting information from a broad vegetation classification (levels I to III) to a detailed level of vegetation classification (levels IV to VI).

Further information and definitions can be found in the *Australian Native Vegetation Assessment 2001*.

**Table 5.** The National Vegetation Information System: showing the structural and floristic components at each level of the information hierarchy.

| Level | Description               | National Vegetation Information System structural/floristic components required  | Example  |
|-------|---------------------------|--|--|
| I     | Class                     | Dominant growth form of the ecologically dominant stratum  | Tree   |
| II    | Structural Formation      | Dominant growth form, cover and height of the ecologically dominant stratum  | Open forests   |
| III   | Broad floristic formation | Dominant growth form, cover, height and broad floristic code usually dominant land cover genus of the uppermost or dominant stratum                    | Acacia open forests  |
| IV    | Sub-formation             | Dominant growth form, cover, height and broad floristic code usually dominant genus and family of the three traditional strata (upper, mid and ground) | Acacia open forests/mixed tall open shrubland/grassy sparse tussock grassland  |
| V     | Association               | Dominant growth form, height, cover and species (three species) of the three traditional strata (upper, mid and ground)                                | U+ <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> , <i>Eucalyptus orgadophila</i> /tree/7/c; M <i>Eremophila mitchellii</i> , <i>Geijera parviflora</i> , <i>Capparis lasiantha</i> /shrub/4/i; G <i>Ancistrachne uncinulata</i> , <i>Aristida ramosa</i> , <i>Paspalidium caespitosum</i> /tussock grass, forb/2/r   |
| VI    | Sub-association           | Dominant growth form, height, cover and species (five species) of all layers/strata  | U1+ <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> , <i>Eucalyptus orgadophila</i> , <i>Eucalyptus populnea</i> , <i>Atalaya hemiglauca</i> /tree/7/c; M1 <i>Eremophila mitchellii</i> , <i>Geijera parviflora</i> , <i>Capparis lasiantha</i> , <i>Canthium oleifolium</i> , <i>Santalum lanceolatum</i> /shrub/4/i; G2 <i>Ancistrachne uncinulata</i> , <i>Aristida ramosa</i> , <i>Paspalidium caespitosum</i> , <i>Paspalidium criniforme</i> , <i>Sporobolus caroli</i> /tussock grass, forb/2/r; G1 <i>Carissa ovata</i> , <i>Enchylaena tomentosa</i> , <i>Myoporum deserti</i> /shrub, chenopod shrub/2/r |



Murray Fagg

## WAYS FORWARD

### Stocktake and evaluation—ensuring continued client relevance

The *Australian Native Vegetation Assessment 2001* is underpinned by a standard Australia-wide framework for collating and reporting on vegetation type and extent—the National Vegetation Information System. This system, in itself, is a major achievement, providing both a benchmark and way to facilitate regular updates of information and assessments of change (including trends) in the extent and types of native vegetation.

The information and assessments will guide governments and the community in natural resource management and biodiversity planning by providing access to comprehensive and up-to-date information on Australia's native vegetation.

To ensure the system is up-to-date and remains relevant, the system should be evaluated and reviewed across seven key areas.

- **Data management**—assessing progress of the National Vegetation Information System including all aspects of data upgrading, management, standards, distribution and access.
- **Information use and the ability to meet client needs**, especially at local, regional and catchment management scales.
- **Integration** and further opportunities to link data sets such as land use, exotic vegetation, the National Forest Inventory and the National Vegetation Information System.
- **Extension**—using the National Vegetation Information System for capacity building by local, regional and catchment management groups (e.g. compiling an Australia-wide clearing register as an additional component of the National Vegetation Information System framework).

- **Adoption**—using National Vegetation Information System guidelines and protocols in vegetation mapping, and data storage and transfer Australia wide.
- **Program impact**—using the National Vegetation Information System to support decisions made in re-establishment and management of native vegetation.
- **Gap analysis**—inputting knowledge, data and information gaps into setting of research and information collection priorities (see below).

### Filling the information gaps

The *Australian Native Vegetation Assessment 2001* is based on the best available information on the type and extent of pre-European and present native vegetation. Not all areas of Australia have been mapped and much of the data is incomplete. The information compiled in the National Vegetation Information System can be used to identify knowledge, spatial and classification gaps. The guidelines will ensure that data is collected to a common standard and that partnerships enable information to be updated.

A number of gaps exist in our knowledge of vegetation and the data. They include:

- defining *what is native vegetation?* for the information collated into the National Vegetation Information system;
- improving knowledge, mapping and monitoring of grassland and riparian areas;
- mapping remnant vegetation;
- adding marine and estuarine vegetation data; and
- mapping, assessing and reporting changes and trends in native vegetation extent, structure, floristics and condition; weed and feral animal invasion; and other attributes of condition considered priorities in vegetation management.

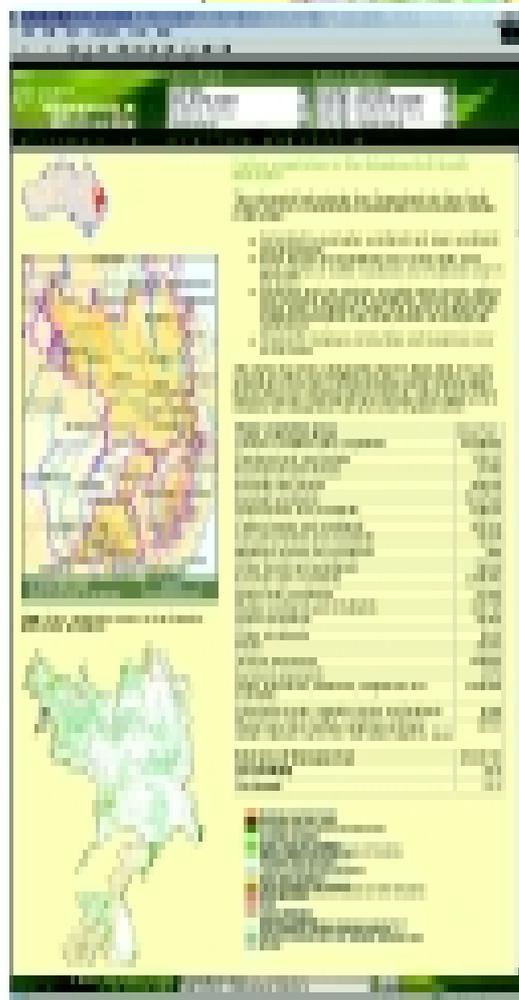


## ACCESS TO INFORMATION

The native vegetation assessment forms part of the Australian Natural Resources Atlas (Atlas) at <[www.environment.gov.au/atlas](http://www.environment.gov.au/atlas)>—an internet-based source of data, maps, information and links to related sites. The Atlas contains information on land, water and vegetation resources.

The National Vegetation Information System is a fundamental component of the Atlas. This database draws on the extensive vegetation mapping information collected and collated by the State and Territory agencies and the information products developed to support the Australian Native Vegetation Assessment 2001.

The Atlas provides access to fact sheets on each of the major vegetation groups including detailed description, distribution maps, species list, information on change since European settlement, key values and a discussion of management considerations.



[www.environment.gov.au/atlas](http://www.environment.gov.au/atlas)

## IN PARTNERSHIP

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*Australian Native Vegetation Assessment 2001* was prepared by the National Land and Water Resources Audit in partnership with:

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