

# Major vegetation change

No species in Australia has had a more far-reaching effect upon the environment than humans. For thousands of years Aborigines changed vegetation patterns, mainly through the use of fire, but the advent of European settlement brought rapid and fundamental changes to the land cover. The changes to the flora are permanent and agricultural land use continues to encroach on areas of largely natural vegetation. The introduction of exotic flora and fauna also placed new pressures upon native ecosystems, the impacts of which are continuing and some of which are only now being realised.

This section deals with the major vegetation changes that are the result of European land use practices and treats some of the more significant examples in detail. The changes in the area occupied by different kinds of vegetation from before European settlement to the present are summarised in tables. They are discussed below under broad structural groupings of natural vegetation types.

The problem of identifying the extent of the changes which have taken place is linked to the lack of

information on the original flora. Many areas were affected by pastoralism before botanical surveys were undertaken and even today our knowledge of the existing flora of many regions is incomplete.

The direct impacts upon the landscape, such as the transformation of forests into pastures, are obvious and are shown on the 'Major Vegetation Changes' map. More subtle shifts in floristic composition or structure within the thresholds of the classification system may not have been detected. Other

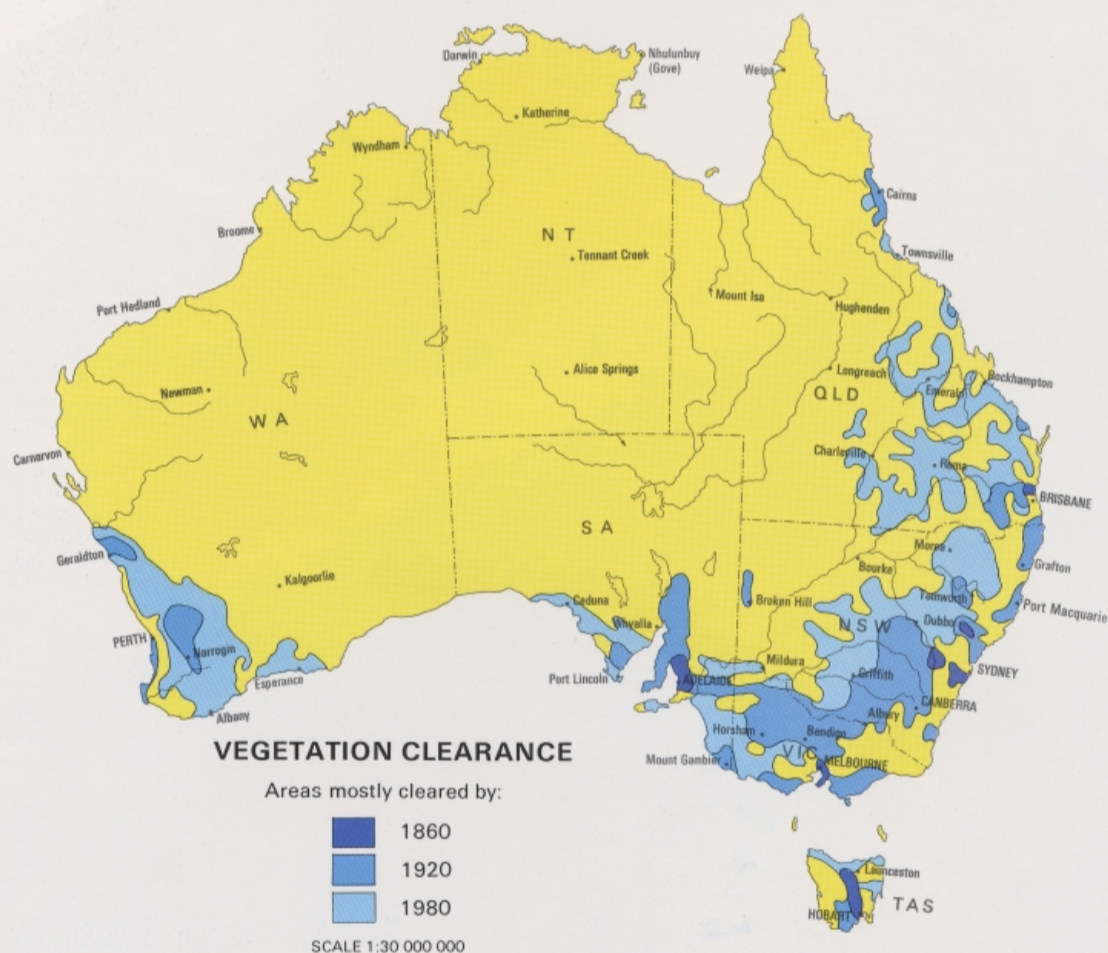
potentially more significant effects of these changes on the environment are only now becoming apparent. The unforeseen consequences of large-scale vegetation clearance include widespread land salinisation and dieback, which are explained in more detail in the following pages.

The area now used for agriculture and forestry covers more than 5 million km<sup>2</sup> or nearly 70% of the continent, a scale of change barely imaginable to the first settlers. Although the maps suggest that the vegetation over much of this area has not been significantly altered, almost all of the grazing lands have been modified by the new selective forces imposed by exotic herbivores.

These changes have had least impact in rugged and remote areas; those lands that are largely unusable. The pastoral expansion of the last century saw virtually all suitable grazing land taken up. What remained has largely determined

the distribution of today's conservation areas. For example, the vegetation of the sandstone tablelands surrounding the country's first and largest city, Sydney, was bypassed as non-productive and was left largely intact. The forested ranges of eastern Australia remain mostly uncleared, but to a large extent are devoted to another land use—timber production.

The sphere of European influence on the vegetation extends beyond the direct impacts of new land uses. The effects of the spread of feral animals and plants go far beyond the limits of agricultural location. The encroachment of grazing into Australia's desert areas, for example, has gone little further than the boundaries established before 1900, and has even contracted in places. The unoccupied areas offer little feed to the grazier but increasing numbers of feral animals, notably rabbits, horses, donkeys, camels and goats, are modifying the vegetation of these regions.



SOURCES: Adapted from maps in *Australians: A Historical Atlas* (1987) and 1:5 million map 'Present Vegetation'.

**Cleared woodland**  
Prior to the 1860s, most clearing was confined to the vicinity of settlements. With the move to wheat production and the extra available labour after the gold rush, large-scale ring-barking and clearing with axe and fire began. The advent of heavy machinery for clearing and pulling greatly accelerated agricultural expansion in the 20th century.



**Table 1: Mapped area of vegetation structural forms**

| Code         | Structural form                 | Natural area         |            | Present area         |            |
|--------------|---------------------------------|----------------------|------------|----------------------|------------|
|              |                                 | '000 km <sup>2</sup> | %          | '000 km <sup>2</sup> | %          |
| T4           | Tall closed forest              | 1                    | —          | —                    | —          |
| T3           | Tall open forest                | 62                   | 0.8        | 51                   | .7         |
| M4           | Closed forest                   | 37                   | 0.5        | 34                   | 0.4        |
| M3           | Open forest                     | 547                  | 7.1        | 274                  | 3.5        |
| M2           | Woodland                        | 1003                 | 13.1       | 614                  | 8.0        |
| M1           | Open woodland                   | 174                  | 2.3        | 402                  | 5.2        |
| L4           | Low closed forest               | 8                    | —          | 2                    | —          |
| L3           | Low open forest                 | 33                   | 0.4        | 34                   | 0.4        |
| L2           | Low woodland                    | 571                  | 7.4        | 452                  | 5.9        |
| L1           | Low open woodland               | 1476                 | 19.2       | 1583                 | 20.6       |
| S3           | Open scrub                      | 90                   | 1.2        | 28                   | 0.4        |
| S2           | Tall shrubland                  | 1138                 | 14.8       | 741                  | 9.6        |
| S1           | Tall open shrubland             | 1363                 | 17.7       | 1623                 | 21.1       |
| Z3           | Open heath                      | 13                   | 0.2        | 26                   | 0.3        |
| Z2           | Low shrubland                   | 372                  | 4.8        | 57                   | 0.7        |
| Z1           | Low open shrubland              | 101                  | 1.3        | 401                  | 5.2        |
| H2           | Hummock grassland               | 45                   | 0.6        | 45                   | 0.6        |
| G4           | Closed grassland/sedgeland      | 14                   | 0.2        | 25                   | 0.3        |
| G3           | Tussock grassland/sedgeland     | 359                  | 4.7        | 326                  | 4.2        |
| G2           | Open tussock grassland          | 115                  | 1.5        | 348                  | 4.5        |
| G1           | Sparse grassland                | 14                   | 0.2        | 15                   | 0.2        |
| F4           | Dense sown pasture              | —                    | —          | 73                   | 0.9        |
| F3           | Sown pasture                    | —                    | —          | 363                  | 4.7        |
| F1           | Sparse open herbfield           | 59                   | 0.8        | 59                   | 0.8        |
|              | Littoral complex                | 22                   | 0.3        | 22                   | 0.3        |
|              | Urban complex                   | —                    | —          | 7                    | 0.1        |
|              | Horticulture/intensive cropping | —                    | —          | 11                   | 0.1        |
|              | No vegetation                   | 65                   | 0.8        | 66                   | 0.8        |
| <b>Total</b> |                                 | <b>7682</b>          | <b>100</b> | <b>7682</b>          | <b>100</b> |

**Table 2: Mapped area of understorey growth forms**

| Code | Growth form             | Natural area         |      | Present area         |      |
|------|-------------------------|----------------------|------|----------------------|------|
|      |                         | '000 km <sup>2</sup> | %    | '000 km <sup>2</sup> | %    |
| M    | Medium trees            | 11                   | 0.2  | 9                    | 0.15 |
| L    | Low trees               | 647                  | 8.5  | 341                  | 4.4  |
| S    | Tall shrubs             | 248                  | 3.3  | 208                  | 2.7  |
| Z    | Low shrubs              | 1433                 | 19.0 | 946                  | 12.3 |
| H    | Hummock grasses         | 2045                 | 26.9 | 2065                 | 26.8 |
| G    | Tussock grasses         | 2385                 | 31.0 | 2308                 | 30.0 |
| F    | Other herbaceous plants | 64                   | 0.8  | 141                  | 1.8  |

The tables give estimates, based on the Natural Vegetation and Present Vegetation maps, of the area occupied by each structural form of

vegetation and by the different understorey types. The maps were digitally scanned and the data resampled to a 4 x 4 km grid. For the widespread vegeta-

tion forms the estimates are accurate to within a few percent of the actual mapped areas, but for forms which cover a small area they are only

approximate. The area figures are rounded to the nearest 1000 km<sup>2</sup> and are expressed as a percentage of the total area of Australia.

CHANGE IN AREA OF VEGETATION TYPES, 1780s-1980s

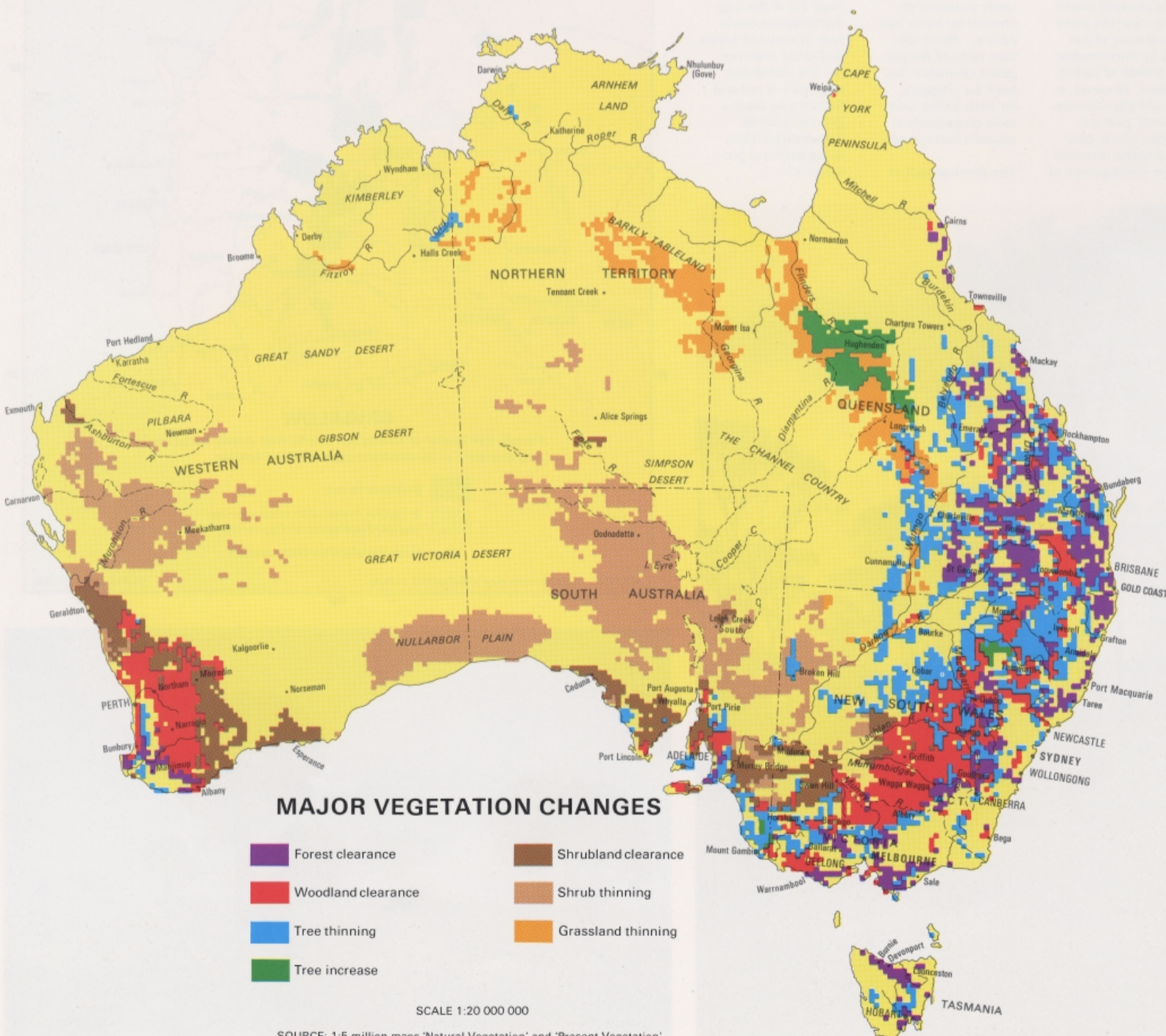
|                                 | Forest | Woodland | Open Woodland | Tall Shrubland | Tall Open Shrubland | Low Shrubland | Low Open Shrubland | Grassland (and Pasture) |
|---------------------------------|--------|----------|---------------|----------------|---------------------|---------------|--------------------|-------------------------|
| <b>NATURAL VEGETATION 1780s</b> | 690    | 1570     | 1650          | 1230           | 1370                | 380           | 100                | 500                     |
| <b>LOSSES</b>                   | 75     | 95       |               | 280            |                     | 300           |                    | 20                      |
| <b>GAINS</b>                    | 100    | 260      | 400           |                |                     |               |                    | 40                      |
| <b>NET CHANGES</b>              | 140    | 320      | 50            | 155            | 30                  | 15            |                    | 710                     |
| <b>PRESENT VEGETATION 1980s</b> | 390    | 1070     | 2000          | 770            | 1620                | 90            | 400                | 1150                    |

Notes: Changes of less than 10 000km<sup>2</sup> are not shown. Total area figures are rounded to nearest 10 000km<sup>2</sup> and, for smaller losses and gains, to nearest 5 000km<sup>2</sup>.

This diagram summarises the area of the major changes to vegetation structure in the last 200 years. The structural forms are aggregated into broader groupings: forest for example covers both open and closed forests and all tree heights. Hummock grassland and open herbfield are not included as their areas are unchanged.

The total change in each broad vegetation

type is broken down into the respective losses and gains in area from other types, shown by the horizontal lines. Open woodland, for example, has increased from 1650 000 km<sup>2</sup> to 2000 000 km<sup>2</sup>. The gain of 410 000 km<sup>2</sup> comes from former forest (100 000), woodland (270 000) and grassland (40 000), offset by a loss of 50 000 km<sup>2</sup> to grassland and pasture.



The major historical changes in vegetation structure are identified on this map. The most dramatic change in terms of biomass loss has been that from forest to grassland or pasture. The clearing of eucalypt woodland, and of shrubland in drier areas, has given rise to the wheatbelt in the south-east and south-west. Most of the cleared shrubland was mallee, with some areas of scrub and mallee-heath in WA.

Areas where the natural vegetation has been thinned but not entirely cleared are shown in separate categories. The change from forest to woodland or woodland to open wood-

land by partial clearing, thinning or regrowth is shown as tree thinning. The reduced shrub cover in the mulga tall shrublands and the chenopod low shrublands accounts for most of the area of shrub thinning.

The most extensive natural grassland, the Mitchell grass, is subject to large seasonal fluctuations, but continuous grazing has brought about an overall reduction in foliage cover over much of its range. This is shown as grassland thinning. The most significant example of tree increase is the area now occupied by the exotic *Acacia nilotica* in north-central Qld.