

A U S T R A L I A N *Forest Profiles*

A series from the **National Forest Inventory** about forest types and major issues relating to them.

Key Issues

- There are over 500 000 hectares (ha) of river red gum forests along the Murray River and its tributaries in New South Wales and Victoria. River red gum is the most common tree species on the Murray.
- Over 200 000 ha of red gum forest are managed as State forest for timber production and other uses.
- River red gum forests generate over \$40 million annually in New South Wales and Victoria from timber and other forest products, and contribute greatly to regional tourism and recreation industries.
- The ecology of large sections of Australia's largest river system is intimately associated with river red gum forests. The survival and regeneration of the forest and its wildlife depend on water from the Murray.

- The Barmah and Millewa river red gum forests, covering about 68 000 ha, are listed on the Register of the National Estate in recognition of their Aboriginal and European cultural heritage and significant natural values.

This brochure is about river red gum (Eucalyptus camaldulensis), which forms dense forests in south-eastern Australia.



RIVER red gum is the most widely distributed eucalypt. It occurs naturally only in mainland Australia although it is widely planted overseas. It fringes inland streams and rivers and occasionally extends to hills and ranges in open forest and woodland. This brochure describes the dense river red gum forests (that is, forest with more than 50% crown cover) of southeastern Australia, and not the woodlands or the narrow stream-line communities. As well as outlining its importance as a timber resource and its role in biological diversity, the brochure provides some historical background to the river red gum's high heritage value.

About the Resource

RIVER red gum (often called simply 'red gum') is a massive tree that generally grows to a height of about 20 m with a broad trunk 1–2 m across. It can, however, grow to 45 m high and have a trunk 4 m in diameter. The forests of red gum occur mainly in New South Wales and Victoria, and cover about 530 000 ha. Along the Murray River and its tributaries the red gum extends over the flood plains, forming tall forests. Timber was first produced from these forests over 150 years ago. They are still an important timber resource supplying about 90 000 cubic metres (m³) of sawn timber and 250 000 railway sleepers a year. River red gum is planted in a large number of countries throughout the world; the forests along the Murray are an important part of the genetic resource of this species.

As well as being an important source of timber and fuel wood, the red gum forests are used by the honey and pastoral industries and are important for their heritage/tourism values and significance for biological diversity.

Biological Significance

Flora

A number of tree species are found with river red gum. One is black box (*Eucalyptus largiflorens*), although the main black box woodlands are found in areas near red gum forest where flooding occurs less often and for shorter periods. Yellow box (*E. melliodora*), grey box (*E. microcarpa*) and, less frequently, white cypress pine (*Callitris glaucophylla*), Murray pine (*C. preissii*), bull oak (*Allocasuarina luehmannii*) and belah (*Casuarina cristata*) occur on still higher ground between the main stream channels.

River red gum forests typically have dense grass cover but few shrubs. The few shrubs associated with red gum include silver wattle (*Acacia dealbata*), common fringe myrtle (*Calytrix tetragona*), and the semi-parasitic dwarf cherry (*Exocarpus strictus*). Introduced willows (*Salix* spp.) are common along stream banks.

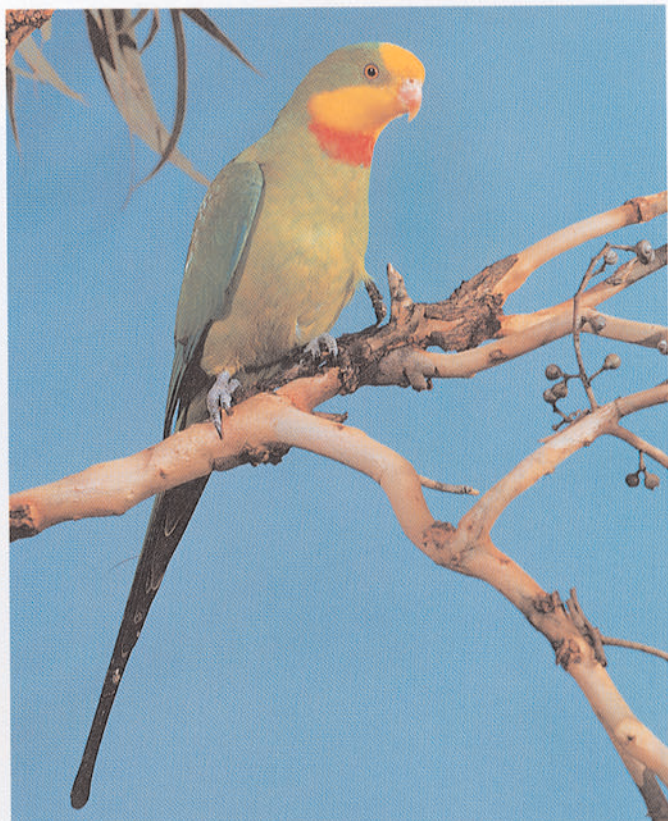
Ground cover plants that occupy frequently flooded areas of red gum forest include Moira grass (*Pseudoraphis spinescens*), rush sedge (*Carex tereti-*

caulis), Warrego summer grass (*Paspalidium jubiflorum*) and wallaby grasses (*Danthonia* spp.). Introduced annual grasses such as oats (*Avena* spp.) and bromes (*Bromus* spp.) now dominate infrequently flooded sites.

Areas of the forests that are frequently flooded contain the wetland plants giant rush (*Juncus ingens*), cumbungi (*Typha* spp.) and common reed (*Phragmites communis*). Reed beds of these plants, which require alternating phases of flooding and drying to maintain their viability, are important breeding and feeding places for waterbirds.

Fauna

About 50 species of bats, possums, gliders, snakes and birds rely on hollows in the red gums for protection and breeding. Birds include the colourful superb parrot (*Polytelis swainsonii*) and regent parrot (*P. anthoepus*).



Superb parrot (*Polytelis swainsonii*)

The red gum forests and swamps provide a habitat for about 26 reptile species including the carpet python (*Morelia spilotes*), garden skink (*Lampropholis guichenoti*), rare blind snakes (*Ramphotyphlops* spp.), and broad-shelled tortoise (*Chelodina expansa*).

Ten frog and 24 fish species also live in the swamps and waters of the red gum forests. The most well known of the fish is the Murray cod (*Maccullochella peelii*) which can grow to weigh over 50 kg.

Invertebrates occur in the forests and swamps in vast numbers and striking diversity with over 500 types of springtails, termites, beetles, mites and worms being recorded. Many of these are essential food for fish and other wildlife.

Use of the Resource

RED gum forests have played a significant role in the culture of Aboriginal and more recent Australians. The value of river red gum forests for timber was recognised in the mid-1800s, when grazing was controlled to allow greater regeneration. There was a strong demand in Victoria last century for river red gum for piers, sleepers and gold-mining timber, as well as for export. Licensing systems had variable success in controlling timber harvesting, but did not attempt to achieve sustainable yields or conservation. We now know that the red gum forests provide a diverse habitat for a wide range of plants and animals. In recent years, management plans have addressed the issue of sustainable yield, and conservation has been assisted by establishing reserved lands.

Ownership

There is a marked difference in ownership of red gum forests between New South Wales and Victoria. New South Wales has the largest area of red gum forest (324 000 ha) by State. About a third of this is State forest, and most of the rest is freehold and leasehold. A relatively small amount (13 000 ha) is in national parks and conservation reserves. Victoria

has a smaller area, 208 000 ha, of red gum forest. Of this, about half is State forest. The area in national parks and reserves in Victoria is about five times the area reserved in New South Wales (Table 1).

Cultural and economic values

Timber

Red gum timber is dark red, strong and durable, and is favoured for bridge bearers and decking. The floors of many houses in Victoria and southern New South Wales are supported by red gum stumps.

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Sleeper cutting in a river red gum forest

TABLE Ownership categories for river red gum
1

	New South Wales (ha)	Victoria (ha)	Australia (ha)
State forest	105 000	93 000	198 000
National parks and conservation reserves	13 000	65 000	78 000
Freehold	123 300	50 000	173 000
Leasehold, Western Division, NSW	52 700		52 700
Leasehold, Central Division, NSW	30 000		30 000
Total	324 000	208 000	531 700

Distribution of River Red Gum

River red gum is the most wide-spread Australian eucalypt. It occurs in all mainland States, but forms dense stands only along the middle reaches of the Murray River and its tributaries.

Elsewhere it occurs as woodland or as long lines of trees along watercourses. It grows where local rainfall alone is generally insufficient to support forest growth of this magnitude — these forests rely upon periodic flooding and underground water to satisfy their needs.

There are about 530 000 ha of river red gum forests in Australia (Table 1). These forests occur mainly in New South Wales and Victoria. The area reported by the Resource Assessment Commission in 1992 was 456 000 ha; the higher figure given here is due largely to better, more comprehensive mapping information now available, especially for private land. The 6000 ha of Queensland river red gum forest reported by the Resource Assessment Commission is woodland, not dense forest, and therefore has not been included here.

The forests of river red gum occur in areas with rainfalls of around 400 to 500 mm, and yet resemble forests occurring in rainfall zones of 1000 mm or more. The soils on which the forests grow have been developed by deposition in floods. Typically, the soils consist of a layer of silty clay passing into interleaved beds of clay and sand aquifers.

Red gums flower in late spring to mid-summer, and mature seed is mostly shed about twelve months later. The success of germination is influenced by temperature, moisture and the type

of seedbed. Moisture, temperature, competition from grasses and other plants and grazing by insects and other fauna all affect seedling establishment and growth.

Along the Murray, river red gum grows into a picturesque spreading tree. Some of the largest trees may be 350–400 years old.

River red gum has been planted widely in north Africa, the Middle East and southern Europe for fuel and timber. Trees from southern Australia are more frost hardy than those from the north. Some forms appear to be tolerant of salty soils. Trials with seed collected throughout its natural range ('provenance trials') have been carried out to find the best seed source for different climates and soils in other countries.



Open
provid
pelica



Openwater within river red gum forest provides habitat for waterbirds such as pelicans

Most eucalypts have been named from specimens collected in the wild. River red gum has the rare distinction of being named from a tree growing in a monastery garden near Naples, Italy. The garden belonged to the Camalduli religious order and Friedrich Dehnhardt, chief gardener at the botanic gardens in Naples from 1823 to 1845, honoured the order by naming the species *Eucalyptus camaldulensis* in 1832.



Data supplied as part of the National Forestry Inventory by NSW State Forests, Victorian Department of Conservation and Natural Resources, and the Murray-Darling Basin Commission.

(continued from page 4)

Over 86 000 m³ of sawn timber (Table 2) and nearly a quarter of a million railway sleepers are cut from river red gum forests on public and private land each year. The forests also produce charcoal which is used by the chemical industry, for fuels in some smelting processes and for domestic barbecues. Chipwood for use as industrial fuel and firewood is also an important product.

In recent years, the quantity of sawlogs harvested from State forests has been generally stable but demand for firewood is increasing. Production of chipwood, charcoal and sleepers from red gums on public land is decreasing and the number of sleepers being milled from red gums on private land in New South Wales is also decreasing.

Heritage value and tourism

Red gum forests are rich in Aboriginal and European cultural and heritage features. Burial grounds, canoe trees, shell middens and mound sites are reminders of many thousands of years of Aboriginal occupation. Aborigines used river red gum wood as fuel for cooking and warmth, and its bark for canoes, shelters and carrying dishes. Canoes up to six metres long were made from a single piece of bark which had been softened and bent into shape. Many

old trees still carry scars where bark was removed. Other scars were caused when toeholds were cut into the bark to assist in climbing trees to catch possums and birds for food and skins. Aboriginal title rights and interests over parts of the river red gum forest around Echuca are currently being examined by the Native Title Tribunal, as part of their consideration of the native title determination application by Yorta Yorta Murray and Goulburn River Clans Incorporated.

European settlers occupied land in red gum forests. Evidence that European clearing in red gum forests started more than 150 years ago is seen in stumps and ringbarked trees. River red gum will not float but the introduction of river transport solved most of the problem of moving the logs to the sawmills.



River red gum showing evidence of bark removal for the construction of an aboriginal canoe

TABLE Recent annual production from river red gum forests
2

Product	New South Wales Crown land	New South Wales freehold land	Victoria Crown land ^c	Total
Sawlogs (m ³)	41 800	27 500	16 812	86 112
Railway sleepers (m ³) ^a	12 000	35 000	4 000	51 000
Piles and poles (no.)	50		220	270
Fence posts (no.)			130 000	130 000
Firewood (t)	30 000	25 000	60 000	115 000
Charcoal (t)	1 000	2 000		3000
Landscape timbers (m ³)	1 500	6 000		7 500
Chipwood (t) ^b	15 000	16 000		31 000
Grazing	used selectively for fire hazard reduction		35 000 dry sheep equivalents ^d	
Beekeeping permits	> 430	n/a	>240	>670
No. of visitor days	500 000		1 000 000+	1 500 000 +

- Notes:**
- a** sleeper conversion: in NSW 1 m³ of round log yields 4.76 sleepers, in Victoria 1 m³ of round log yields 6 sleepers
 - b** chipwood is used as fuel within the region, not exported
 - c** no information available for Victorian freehold land
 - d** one dry sheep equivalent equals one wether
 - n/a not available

Paddle-steamers needed 1–4 tonnes of wood a day to fire their boilers. River red gum was also used for wharf timbers, in building the paddle-steamers themselves, and for paving blocks in major city streets.

River red gum was favoured for railway sleepers. By the time the Melbourne to Echuca railway was completed in 1864, hundreds of thousands of sleepers had been cut from the red gum forests along the Murray River to provide its foundation.

The parkland landscape and extensive river and gum tree scenery of red gum forests provide a contrast to relatively barren drier regions through which the river passes. With their associated wildlife and Aboriginal sites, the forests are places of great cultural and heritage significance and retreats for enjoyment and reflection. Many people visit red gum forests for recreation, particularly activities associated with water (Table 2).

Fishing is a traditional activity in red gum forests, and many people travel long distances to enjoy the thrill of fishing for Murray cod and Macquarie perch (*Macquaria australasica*).

Forest management

THE aim of forest management for multiple uses including wood production is to allow dense stands of well formed trees, suitable for timber, to develop. Tree form tends to be more uniform if initial regeneration is dense. When trunks have reached a millable length, some are harvested and others are left to grow larger.

River red gum regenerates either as seedlings or as shoots from cut stumps (called coppice). Seedlings are preferred for wood production because they develop into better formed trees than does coppice growth. Flooding facilitates seedling regeneration, and thus the management of adjacent river systems is fundamental to sustainable use of the forest.

Management also includes fire protection (see Threats). Limiting the amount of potential fuel on the forest floor is the main fire protection strategy. For example, in New South Wales forests, grazing is now practised primarily for fire hazard reduction rather than revenue, as red gum seedlings may be damaged by grazing animals. The animals maintain an open understorey with greatly reduced potential for burning. There is some evidence that open forest was also the condition in which the Aborigines maintained river red gum forests by burning before European settlement.

Conservation

THE Barmah Forest wetlands in Victoria are listed on the Register of the Convention on Wetlands of International Importance. They support breeding colonies of sacred ibis (*Threskiornis molucca*) and straw-necked ibis (*T. spinicollis*) and smaller colonies of great egret (*Egretta alba*) and royal spoonbill (*Platalea regia*). These wetlands, together with the Millewa forests in New South Wales, are on the Register of the National Estate.

The forests are habitat for migratory birds protected under the Japan–Australia Migratory Birds Agreement and the China–Australia Migratory Birds Agreement.

About 78 000 ha of national parks and nature conservation (flora) reserves in New South Wales and Victoria carry river red gum forest managed for habitat conservation (Table 1). This is about 15% of the total area of river red gum dense forest.

Management plans for State forests exclude logging from some areas identified for special protection or conservation. These areas are additional to those located in national parks and nature conservation reserves.

Selected mature trees with possible nesting hollows are retained as wildlife habitat in State forests when logging takes place. Trees showing signs of Aboriginal marking or use by endangered fauna for nesting are also protected during harvesting.

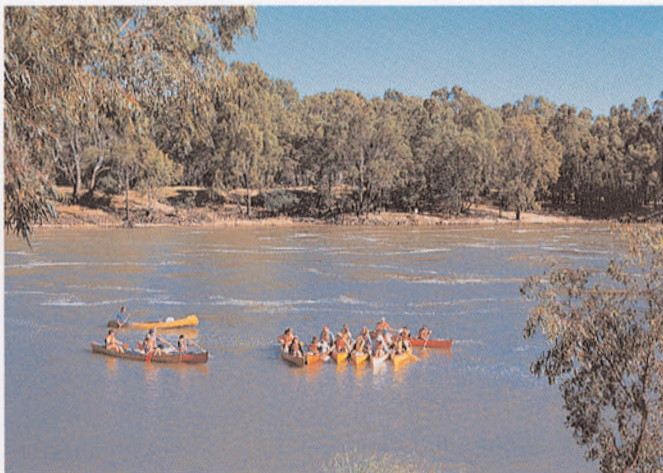
River red gum forest includes some rare and threatened plants such as winged pepper-cress (*Lepidium monophloides*), variable spike-sedge (*Eleocharis minuta*) and Mueller's daisy (*Brachyscome muelleroides*).

The Barmah and Millewa forests provide the habitat for rare and endangered fauna including the squirrel glider (*Petaurus norfolcensis*), a bat called the large-footed myotis (*Myotis adversus*) and several birds including the plains wanderer (*Pedionomus torquatus*), freckled duck (*Stricktonetta naevosa*), masked owl (*Tyto novaehollandiae*) and superb parrot (*Polytelis swainsonii*).

Threats

THE greatest hazard to the survival and growth of the red gum forest is lack of water at the right time. Water regulation for crop irrigation over the past fifty years has changed the timing of forest flooding and reduced the extent and duration of flooding.

Problems arising from these changes include poor tree health and growth rates, and changes to the types of plants found in the wetlands, grasslands and



The Murray River and its river red gum forests provide an ideal location for water-based recreation

on the forest floor. Reductions in breeding habitats for fish and waterbirds and altered wetland hydrology can reduce species richness.

Another threat, indirectly caused by decreased flooding, is the gum leaf skeletoniser insect (*Uralea lugens*). This insect builds up to massive numbers about every ten years, causing widespread defoliation. Flooding, however, creates favourable conditions for *Aspergillus* fungi which kill the larvae before they develop.

Other insects that feed on river red gum leaves and affect tree growth include sawfly (*Perga* spp.), lerp insects (*Cardiaspina* spp.) and Christmas beetles (*Anoplognathus* spp.).

River red gum regeneration may be prevented or destroyed by fires which burn fiercely close to, and sometimes below, the soil surface. Fires also promote formation of gum veins in older trees (devaluing the timber) and cause scars which aid entry of destructive fungi and insects.

Outlook

THE outlook for Murray River red gum forests depends on complex community choices on the balance between water for habitat conservation, crop irrigation and domestic use. If crop irrigation is favoured at the expense of habitat conservation the forests will decline. Their decline would mean the loss of valuable timber resources, traditional recreation activities and significant parts of our cultural and natural heritage.

Cooperation between the Commonwealth and the States along the river through the Murray–Darling Basin Ministerial Council provides the best opportunity to ensure that the rich resources of the river red gum forests are used in a sustainable way and heritage and cultural features conserved.

Other titles in this series

Tropical rainforest Lancewood

Other proposed titles in this series

Cool temperate rainforest Karri

Key References

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Acknowledgments

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