

## 5. NATIVE VEGETATION

Since European settlement most of the catchment has been cleared for agriculture, the main exceptions being in areas with steep slopes and poor soils. Some land apparently suitable for agriculture remains forested, particularly in the south.

The aim of this chapter is to describe the composition, structure and distribution of the indigenous vegetation. In areas that have been cleared the original structure (and to a lesser extent species composition) may be difficult to determine, and assessment is based on the trees remaining in road reserves and on farms and, where possible, on historic records.

The vegetation has been grouped into units that characterize the land types, based on the dominant stratum. The units are more uniform than the alliance of Beadle and Costin (1952) and closely represent subdivisions of the major alliances described by Frankenberg (1971). A number of sub-units have been recognised, within which the composition and structure are less varied, and these approximate the association of Beadle and Costin (1952). Structure has been described in terms of Specht (1970) with modifications according to height classes as shown in Table 8.

Botanical names have been taken from Willis (1970 and 1972), with amendments from Todd (1979). Common names are listed in Appendix V.

Estimates of the most common structural forms of the communities have been made, although their accuracy may sometimes be limited by changes, which may occur rapidly in response to forest management activities or natural events such as bushfires and storms, or gradually as the community matures and senesces.

While the composition of dominant species is subject to less variation over time, selective removal or retention of species may give a false indication of the previous abundance and distribution. In the north this effect has probably been minimal because most regeneration occurs as coppice from the base of the mature tree stumps rather than from seedfall.

Communities intergrade in both structure and composition, so clear-cut boundaries between vegetation units may not be apparent in the field.

### *The communities*

A varied structure (and composition) of the native vegetation (shown in Table 9) reflects the diversity of climate, topography, geology and soils within the catchment. Perhaps the greatest cause of variation is rainfall, with a two- or threefold increase in average annual rainfall from north to south.

Open forests and woodlands are the most common structure forms. Taller open forests are common in the more humid south, while lower open forests and woodlands predominate in the drier north. Small areas of mallee occupy impoverished sites to the north of Bendigo, and open woodlands occur on the extensive northern alluvial plains of the Campaspe River.

### *Eucalyptus obliqua – E. viminalis* open forest

Stands of *E. obliqua – E. viminalis* are confined to areas of higher rainfall in the south, usually as an open forest II or III, often with a shrubby or ferny understorey.

The community is found on moist, but well-drained sites and is common on the more elevated steep granitic parts of Mount Alexander and the Cobaw Range. The understorey in these areas is dominated by *Pteridium esculentum* and native grasses. Other stands occur in moist upper drainage depressions on the northern slopes of Mount Macedon. These have a mesophytic understorey, with species such as *Olearia argophylla*, *Pomaderris aspera*, *Hedycarya angustifolia* and various ferns. *E. delegatensis*, a common species on the southern slopes of Mount Macedon, occur occasionally in the moist upper parts of a few drainage depressions.

*E. viminalis* and *E. obliqua* occur with *E. radiata* and *E. pauciflora* near Trentham on well-drained basaltic soils, and are now confined to road reserves and shelter belts. The original forest may originally have been layered, with *Acacia melanoxylon* and *A. dealbata* forming a lower tree stratum and various ferns, shrubs and grasses providing a ground cover. *Rubus fruticosus* sp. agg. is a frequent invader of the fertile, moister sites.

**Table 8 – Structural forms of vegetation in Australia**

Form and height class of tallest stratum	Projective foliage cover of tallest stratum			
	Dense (70-100%)	Mid dense (30-70%)	Sparse (10-30%)	Very sparse (<10%)
Trees (over 40 m)		Open forest IV		
Trees (27-40 m)	Closed forest III	Open forest III	Woodland III	Open woodland III
Trees (15-27 m)	Closed forest II	Open forest II	Woodland II	Open woodland II
Trees (8-15 m)	Closed forest I	Open forest I	Woodland I	Open woodland I
Scrub (2-8 m)	Closed scrub	Open scrub	Tall shrubland	Tall open shrubland
Scrubs (under 2 m)	Closed heath	Open heath	Low shrubland	Low open shrubland
Hummock grasses (0-2 m)			Hummock grassland	Open hummock grassland
Herbs	Closed herbland*	Herbland*	Open herbland*	
	Closed tussock grassland	Tussock grassland	Open tussock grassland	
	Closed grassland	Grassland	Open grassland	
	Closed herbfield	Herbfield	Open herbfield	
	Closed sedgeland	Sedgeland	Open sedgeland	
	Closed fernland	Fernland	Open fernland	
	Closed mossland	Mossland	Mossland	

\* Appropriate names for the community will depend on the nature of the dominant herb

Source: Modified from Specht (1970)

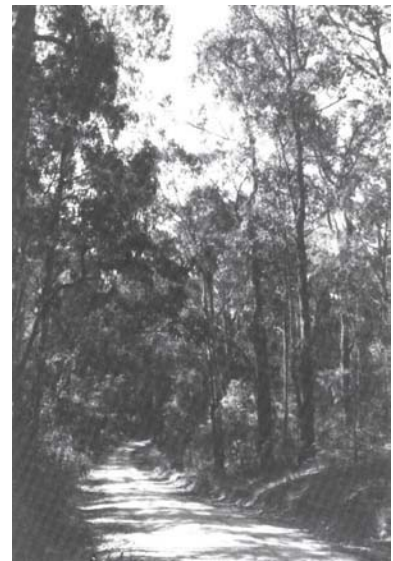
**Table 9 – Summary of vegetation units**

Unit	Sub-Unit	Structure	Frequently Associated Species	Main Occurrences within the Catchment
<i>E. obliqua</i> <i>E. viminalis</i>	-	Open forest II/III	<i>E. pauciflora</i> <i>E. radiata</i> (basaltic plains)	Mt Alexander, Cobaw State Forest, Mt Macedon, basaltic plains near Trentham
<i>E. obliqua</i> <i>E. radiata</i>	-	Open forest II/III	<i>E. rubida</i> (poorer-drained sites)	Mt Macedon, gentle hills on sedimentary rocks in the south
<i>E. viminalis</i>	-	Open forest II Woodland II Open woodland II Open forest II	<i>E. ovata</i> , <i>E. pauciflora</i> (basaltic plains near Kyneton)	Widespread in the south Mt Alexander
<i>E. ovata</i>	-	Open forest II	-	Poorer drained sites throughout the south
<i>E. rubida-E. dives</i> <i>E. radiata</i>	-	Woodland II/Open forest II	-	Gentle granitic terrain near Elphinstone and east of Kyneton; gentle hills on sedimentary rocks south and west of Kyneton
<i>E. microcarpa-E. melliodora-E. leucoxyton</i>	<i>E. microcarpa</i>	Open woodland II/Woodland II	<i>E. leucoxyton</i> <i>E. melliodora</i> <i>Casuarina luehmannii</i>	Alluvial plains in the north
	<i>E. microcarpa</i>	Woodland forest II	II/Open <i>E. albens</i> <i>Casuarina luehmannii</i> <i>E. melliodora</i> <i>E. leucoxyton</i> (sedimentary terrain only)	Gentle terrain on sedimentary rocks to the north of Lake Eppalock; gentle terrain on tillites to the north and south of Lake Eppalock
	<i>E. microcarpa-E. leucoxyton</i>	Woodland I to forest II	Open <i>E. albens</i>	Gentle terrain on sedimentary rocks to the east and south-east of Bendigo
	<i>E. microcarpa-E. melliodora</i>	Woodland I to forest II	Open -	Lower slopes and drainage depressions on Ordovician sediments and on alluvial terraces in the centre and north.
	<i>E. microcarpa</i> <i>E. albens</i>	Woodland forest II	II/Open <i>E. melliodora</i>	Basaltic plains north of Redesdale; the Mount Camel Range on the north-east boundary of the catchment.
<i>E. sideroxyton</i>	-	Open forest II	<i>E. microcarpa</i> <i>E. melliodora</i> <i>E. leucoxyton</i>	Gentle hills on sedimentary rocks north-east of Bendigo (the Wellsford Forest); also south-west of Toolleen and south of Heathcote
<i>E. macrorhyncha-E. polyanthemos</i>	<i>E. macrorhyncha-E. polyanthemos-E. microcarpa-E. goniocalyx</i>	Woodland I/Open forest I	-	Steep hills on sedimentary rocks west of Taradale and near Heathcote
	<i>E. macrorhyncha-E. polyanthemos-E. microcarpa-E. goniocalyx</i>	Woodland I/II to forest I/II	Open -	Steep hills on sedimentary rocks throughout the central areas
<i>E. camaldulensis</i>	-	Woodland forest II	II/Open <i>E. melliodora</i>	Along the major streams in the north; also on granitic slopes near Sutton Grange and on basalt near Redesdale
<i>E. pauciflora</i>	-	Woodland I	-	Camel's hump near Mt Macedon
<i>E. viridis-E. behriana</i>	<i>E. viridis</i> <i>E. polybractea</i>	Open scrub	-	Well-drained crests on weathered sedimentary rocks north of Bendigo
	<i>E. viridis</i> <i>E. behriana</i>	Open scrub/Open forest I	-	Upper drainage depressions on weathered sedimentary rocks north of Bendigo

Unit	Sub-Unit	Structure	Frequently Associated Species	Main Occurrences within the Catchment
<p><i>Ungrouped mixed-species open forests containing any of the following:</i></p> <ul style="list-style-type: none"> <li><i>E. gonioclayx</i></li> <li><i>E. macrorhyncha</i></li> <li><i>E. viminalis</i></li> <li><i>E. rubida</i></li> <li><i>E. melliodora</i></li> <li><i>E. obliqua</i></li> <li><i>E. microcarpa</i></li> <li><i>E. polyanthemos</i></li> <li><i>E. camaldulensis</i></li> <li><i>E. dives</i></li> <li><i>E. radiata</i></li> </ul> <p><i>Casuarina stricta</i></p>				Minor occurrences on Ordovician sediments or granitic rocks in central areas



*A ferny open forest of E. obliqua and E. viminalis grows on the boulder-strewn slopes of the Cobaw ridge.*



*Forests of E. obliqua and E. radiata – common on sedimentary rocks in the south – are valuable as a source of millable timber*

***E. obliqua* – *E. radiata*** open forest

Open forest of these two eucalypts occupies the northern slopes of Mount Macedon and the gentle hills on Ordovician sediments in the south of the catchment. It is restricted to areas of higher rainfall and free soil drainage, typically on shallow uniform or gradational soils. In Ordovician areas with lower rainfall the soils of the lower slopes tend to be less permeable. Here *E. obliqua* becomes less common and *E. radiata* predominates, often with *E. rubida* in the less well-drained areas.

The structural form is an open forest II or III, the lower form usually occurring on the drier and more exposed north-facing slopes. The forests generally have a sparse understorey of shrubs and grasses with a continuous ground litter layer of leaves and twigs.

***E. viminalis*** woodland to open forest

Open forest of *E. viminalis* is widespread throughout the southern half of the catchment in areas with rainfall greater than 650 mm a year. It usually occurs as open forest II or woodland II with grassy or ferny understories.

*E. viminalis* is the dominant tree species on the steep, well-drained slopes of the cones and scarps on basalt, and is widespread on the basaltic plains from Kyneton to Woodend in association with *E. ovata* and *E. pauciflora*. Within these plains *E. pauciflora* prefers the better-drained slopes, whereas *E. ovata* is usually restricted to slowly drained lower slopes and depressions.

Woodland or open woodland of *E. viminalis* predominates on the lower slopes of Mount Alexander, but is replaced by the *E. obliqua* – *E. viminalis* vegetation unit on the upper slopes and crests.

***E. ovata*** open forest

Stands of *E. ovata*, mainly in the form of shrubby open forest II, are widespread on poorly drained sites such as drainage depressions, alluvial terraces and flatter parts of plains throughout the south of the catchment. The community is commonly found on the basaltic terrain between Kyneton and Woodend, but also on sedimentary terrain and on the granodiorite of the Cobaw Batholith. It frequently occurs in similar environments to those supporting *E. viminalis* open forest, although the latter tends to occupy the better-drained slopes. *E. camaldulensis* woodlands or open forests replace the *E. ovata* forests in the warmer and drier northern areas where waterlogging is less regular.



***E. viminalis*, a common species throughout the southern half of the catchment, occurs in a woodland formation on the dry rocky slopes of Mount Alexander.**



***E. ovata*, as indicated by its common name Swamp Gum, inhabits poorly drained lower slopes, plains and drainage depressions in the south.**

***E. rubida* – *E. radiata* – *E. dives*** woodland/open forests

This community occurs as woodland II to open forest II on gentle granitic slopes and crests near Elphinstone and to the east of Kyneton, and on gentle slopes with sedimentary rocks to the west and south of Kyneton. It merges with the *E. obliqua* – *E. radiata* forests in higher-rainfall areas, and could be considered as the lower-rainfall limit of the *E. obliqua* – *E. radiata* unit. On granitic rocks occurrences appear to be confined to gently undulating areas that have been protected from stream dissection. The soils and parent material are strongly weathered, indicating that the landscapes are old, perhaps relics of the Tertiary period. The vegetation unit does not occur on adjacent more dissected granitic slopes.

Understories have been greatly disturbed. In lands on granitic rocks the surface cover is grassy, and sparse because of the droughty nature of the coarsely textured soils. A more shrubby understorey grows in lands on sedimentary rocks.



### ***E. microcarpa* – *E. melliodora* – *E. leucoxyton* – *E. albens***

Open woodlands, woodlands and open forests of these species occur throughout the north of the catchment on a variety of soil parent materials, including sedimentary rocks, glacial tillite, basalt and alluvium. *E. microcarpa* is ubiquitous, and is the sole tree species in many areas. *E. melliodora*, *E. leucoxyton* and *E. albens* commonly occur with *E. microcarpa*, although seldom more than one of them at the one site. Most of the woodlands and forests have been cleared for agriculture or selectively logged, so it is difficult to determine the original structure with any accuracy.

Five sub-units have been recognised on the basis of species predominance and structural form.

*E. microcarpa* open woodland II to woodland II occurs on the extensive alluvial plains in the north, occupying all woodland of *E. camaldulensis*. Associated species include *E. melliodora*, *E. leucoxyton* and *Casuarina Luehmannii*. The understorey is usually open and grassy with sparse small shrubs.

*E. microcarpa* woodland II to open forest II is found on gently undulating to rolling terrain on Ordovician sediments to the north of Lake Eppalock, and on Permian tillites to the north and south of Lake Eppalock. Other species may occur in association. Among these, *E. leucoxyton* is restricted to areas on sedimentary rocks, while *E. melliodora* is widespread on moister but well-drained lower slopes and alluvial flats; *Casuarina luehmannii* occurs sporadically in areas on sedimentary rocks and, along with *E. albens*, is found occasionally on the soils developed from tillites.

*E. microcarpa* – *E. leucoxyton* woodland I to open forest II, with *E. albens* frequently associated, is particularly extensive on gently undulating to rolling terrain on Ordovician sediments to the east and south-east of Bendigo as a sparse shrubby open forest II, woodland II or occasionally woodland I. Similar stands occupy gentle lower slopes on sedimentary rocks to the north of Bendigo, occasionally with *E. sideroxyton* and *E. polyanthemos*, but whipstick mallee grows here on the lateritised upper slopes and crests. In the Wellsford Forest to the north-east of Bendigo *E. microcarpa* and *E. leucoxyton* occupy the lower slopes and drainage depressions, but are replaced by *E. sideroxyton*, *E. polyanthemos* and *E. macrorhyncha* on the upper slopes and crests. The community also occurs on the lower slopes of Tertiary gravel deposits east of Bendigo where the underlying Ordovician rocks are near to the surface. Understorey species commonly include *Cassinia arcuata*, *Acacia genistifolia*, *A. pycnantha*, *Grevillea alpina*, *G. dryophylla* and bush-peas such as *Pultenaea largiflorens*.

*E. microcarpa* – *E. melliodora* woodland II to open forest II occupies moister sites, commonly on the lower slopes and drainage depressions on Ordovician sediments and on alluvial terraces throughout the central and north-central areas.

*E. microcarpa* – *E. albens* woodland II to open forest II occurs on soils developed from basalt in the north. The community is common on the narrow basaltic plain that stretches from Redesdale north towards Barnadown and on the north-south trending Cambrian basaltic ridge of the Mount Camel Range. *E. melliodora* is also present on some of the better-drained scarps or slopes. These basaltic areas have been almost totally cleared to gain valuable grazing and cropping land, and only isolated native trees remain. The original understorey has been so disturbed that its original structure and composition are unknown.

### ***E. sideroxyton* open forest II**

*E. sideroxyton* is the dominant eucalypt to the north-east of Bendigo in the Wellsford Forest and in small areas south-west of Toolleen, and south of Heathcote. It generally occupies gentle mid to upper slopes on Ordovician sedimentary rocks with soils that are usually red, ferruginised, gravelly and relatively infertile. *E. sideroxyton* often occurs in pure stands, but may be inter-mixed with species such as *E. microcarpa*, *E. melliodora* and *E. leucoxyton* on lower slopes.

The understorey is shrubby and typically sparse. Common species include *Acacia acinacea*, *A. genistifolia*, *A. pycnantha*, *Grevillea alpina* and *G. dryophylla*, with *Melaleuca decussata* in wetter areas. *E. sideroxyton* regenerating in forest openings is frequently smothered by the parasitic dodder-laurel. *Cassytha melantha*. Orchids are common and often provide colourful displays during spring.



*Mature specimens of E. microcarpa are still common along road reserves in the northern half of the catchment.*



*The characteristic black and deeply furrowed bark of E. sideroxylon highlights this common tree of the central sedimentary areas.*



*Steep, stony sedimentary ridges throughout the central catchment area support a low woodland or open forest of E. macrorhyncha, E. polyanthemos and E. goniocalyx with a sparse heathy understorey.*

***E. macrorhyncha – E. polyanthemos – E. goniocalyx – E. microcarpa***

Woodlands and open forests of these species are widespread on the crests and upper slopes of hills and ridges on Ordovician sediments, and less commonly on granitic rocks in the central and northern areas. They usually occur on sites with shallow stony soils of low fertility and low water-storage capacities. Structure ranges from woodland I on the poorest sites through to open forest II on the better ones.

*E. macrorhyncha – E. polyanthemos – E. goniocalyx* woodland I to open forest I usually occupies the crests and upper slopes on Palaeozoic sedimentary rocks west of Taradale and near Heathcote along the McIvor Range. The community also occurs on the crests of Tertiary gravel deposits east of Bendigo. The trees are stunted, often multi-stemmed and of poor form, probably caused by previous management techniques that have resulted in the overstocking of trees on drought-prone sites. Site droughtiness is related to the presence of rocky soils in the sedimentary areas and cemented hardpans on the gravels.

The typically low and shrubby understorey commonly includes *Brachyloma daphnoides* on rocky slopes. *Grevillea alpina*, *Acacia pycnantha* and *Cassinia arcuata*. A tussock grass understorey of *Poa* spp. is common in some areas on sedimentary rocks. *E. cephalocarpa*, is uncommon north of the Divide, but is found as isolated trees in the Fryers State Forest to the west of Taradale. Areas on Tertiary gravels are also rich in orchid species and a prolific display of orchid flowers often occurs in spring.

Woodland I and II to open forest I and II of *E. macrorhyncha*, *E. polyanthemos*, *E. microcarpa* and *E. goniocalyx* predominates on the steeper rocky slopes and sharper crests on Ordovician sediments and metamorphosed aureole ridges in the central parts of the catchment. This community has a more limited occurrence on granitic rocks, but is locally common on gentle crests near Sutton Grange, on a small rocky outcrop near Toolleen, and to a lesser extent on slopes south-west of Tooborac. *E. albens* occurs sporadically while *E. melliodora* is found occasionally on moist well-drained sites.

The understorey is commonly grassy, or dominated by low shrubs such as *Acacia pycnantha*, *A. acinacea*, *A. genistifolia*, *Cassinia arcuata*, *Grevillea alpina* and *G. dryophylla*. The parasitic small tree *Exocarpos cupressiformis* occurs sporadically, either singly or in small clumps.

#### *E. camaldulensis* woodland and open forest

River red gum is common in the northern and north-eastern parts of the catchment where it forms a large spreading crown, impressively lining the major streams and creeks. It is also the dominant species on the slopes and in drainage depressions near Sutton Grange where the soils on granitic rock tend to overlie siliceous hardpans. It is also the dominant tree on the basaltic plain to the south and east of Redesdale.

*E. camaldulensis* appears to require limited periods of waterlogging and warm summers for its survival within the catchment. In the southern drainage depressions where waterlogging is more continuous, and summer temperatures lower, it is replaced by *E. ovata*. It was not observed on well-drained shallow stony soils and deep sandy soils.

*E. camaldulensis* occurs as a woodland II or open forest II, in pure stands or with *E. melliodora*. The original understorey was most likely dominated by grasses such as *Themeda australis*, *Stipa* spp., *Danthonia* spp. and *Poa* spp. The better-drained scarps on basalt support shrubs such as *Acacia implexa* and *Hymenanthera dentata*.



*E. camaldulensis* lines the major streams and depressions in the northern area – in this instance, the Campaspe River north of Goornong

#### *E. pauciflora* woodland

An isolated woodland I of *E. pauciflora* is found in the south on the rocky upper slopes and crests of Camel's Hump at an elevation of about 1,000 m. The understorey is sparse, due to abundant rock outcrop, and grassy *E. pauciflora* also grown on the peak of nearby Mount Macedon just outside the catchment. The nearest extensive subalpine communities are a considerable distance away in the Eastern Highlands.

In the lower country, isolated specimens of *E. pauciflora* occur throughout the basaltic plains between Kyneton and Trentham on well-drained scarps and crests, and on the slopes of Mount Jim composed of trachyte. The sporadic occurrences throughout the lowlands suggests a more widespread distribution over previous millennia. The remaining trees have survived in favourable sites such as the well-drained slopes with soils of good fertility.

#### *E. viridis* – *E. behriana* – *E. polybractea*

Open scrub and open forest of this whipstick mallee grow only on the remnants of a deeply weathered lateritised land surface north of Bendigo in an area locally known as the 'Whipstick'. The low eucalypts are characteristically multi-stemmed, and confined to shallow soils of low fertility and low water-holding capacity. Where soil depth has been increased by alluvial deposition, and by fracturing or dissection of hardpans, eucalyptus with tree form occur, such as *E. sideroxylon*, *E. leucoxyton*, *E. polyanthemos* and *E. microcarpa*.

The understorey is frequently sparse, and often includes shrubs such as *Acacia williamsonii* (endemic to the whipstick area), *A. acinacea*, *Cassinia arcuata*, *Eriostemon verrucosus*, *Melaleuca uncinata* and *M. decussata* as well as various orchids. Floristically, it is very similar to the understorey in adjacent stands of *E. sideroxylon*, and *E. microcarpa* – *E. leucoxyton* – *E. melliodora* – *E. albens*.

Two sub-units can be recognised on the basis of species composition and landscape position.



*E. viridis* – *E. polybractea* open scrub occurs on drier crests and slopes with shallow stony soils. It is valued for eucalyptus oil production, and since the 1920s many areas have been cut on a 2-year rotation. Oil production is enhanced by the ability of the trees of coppice readily from a woody underground stump – the mallee root – and by the high oil content of the leaves.



*Isolated communities of E. pauciflora occur on Camel's Hump and nearby Mount Macedon.*



*The mallee eucalyptus of the 'whipstick' area have been cut over for eucalyptus oil production on a regular basis since the 1920s.*

Within the whipstick area, stands of *E. viridis* – *E. behriana* open scrub/open forest I occur on the deeper and moister soils, commonly in the upper drainage depressions. The increased supply of moisture frequently allows an open forest I to develop. *E. froggattii*, a rare species endemic to the whipstick and a few other isolated areas, grown on the deeper, more fertile soils that are preferred for agricultural development, and hence special care is needed for its survival.

#### **Ungrouped mixed-species open forests**

Some vegetation patterns in the central parts of the catchment are difficult to classify. These mixed forests represent the mingling of drier northern and moister southern communities. The most common form is open forest II.

Species that cohabit the lower slopes on Ordovician sediments in areas such as Fryers and Metcalfe State Forests include *E. macrorhyncha*, *E. viminalis*, *E. melliodora*, *E. goniocalyx*, *E. obliqua*, *E. microcarpa*, *E. rubida*, *E. radiata* and *E. polyanthemos*.

Further north on granitic terrain between Metcalfe and Sutton Grange a number of vegetation units frequently intermingle on the crests and steeper slopes, commonly including *E. goniocalyx*, *E. microcarpa*, *E. melliodora*, *E. camaldulensis*, *E. dives*, *E. macrorhyncha*, *E. rubida*, *E. polyanthemos* and *Casuarina stricta*.