A *Eucalyptus* Study Tour of South-western Australia

by T.E.H. Aplin, R.J. Edmiston, I. Abbott

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CONTENTS

SUMMARY

Detailed information about the location of 105 species of eucalypts in South-western Australia is given for an 8 day self-guided tour of South-western Australia. An additional 35 species could be studied if the tour were extended for an extra six days. Each day's traverse is accompanied by brief notes on environment and European settlement.

INTRODUCTION

The plant communities of South-western Australia are typically dominated by species of *Eucalyptus*. These communities vary in structure from high open forest to woodland and shrubland, according to rainfall and soil. Many eucalypt species occur within short distances of each other. Some are renowned for their unique morphological, silvicultural or horticultural value.

This self-guiding tour is intended for visiting botanists or foresters interested in studying eucalypt trees in temperate South-western Australia.

We have organized the tour into 8 days, with a further 6 days optional (Fig. 1). Detailed road directions are given, enabling the visitor to locate each species. Because this booklet is intended for visitors, we provide for each day's traverse a precis of vegetation, geology, soils and climate together with short notes on the history of European settlement, land use and social patterns.

We have avoided duplicating information already available on eucalypts. For illustrations of the buds and fruits of most species, and for descriptions and notes on each species, see Chippendale (1968), Chippendale (1973) and Gardner (1979). A key to identification of species is provided by Grieve (1980).

FIGURE 1: Route of the 8 day study tour and of the optional 6 day tour.

a. Physical environment

The study tour traverses four of the six landform-soil regions of South-western Australia (McArthur and Bettenay, 1979): Swan, Avon, Kalgoorlie and Stirling Regions (Fig. 2).

The Swan Region is a coastal plain, underlain by Quarternary, Tertiary and Palaeozoic sediments. Soils are predominantly shallow podsolized calcareous and siliceous sands, with red or yellow earths of piedmont and riverine alluvium. The water supply is ground water and artesian water. The mean annual rainfall is 800-1000 mm (Fig. 3).

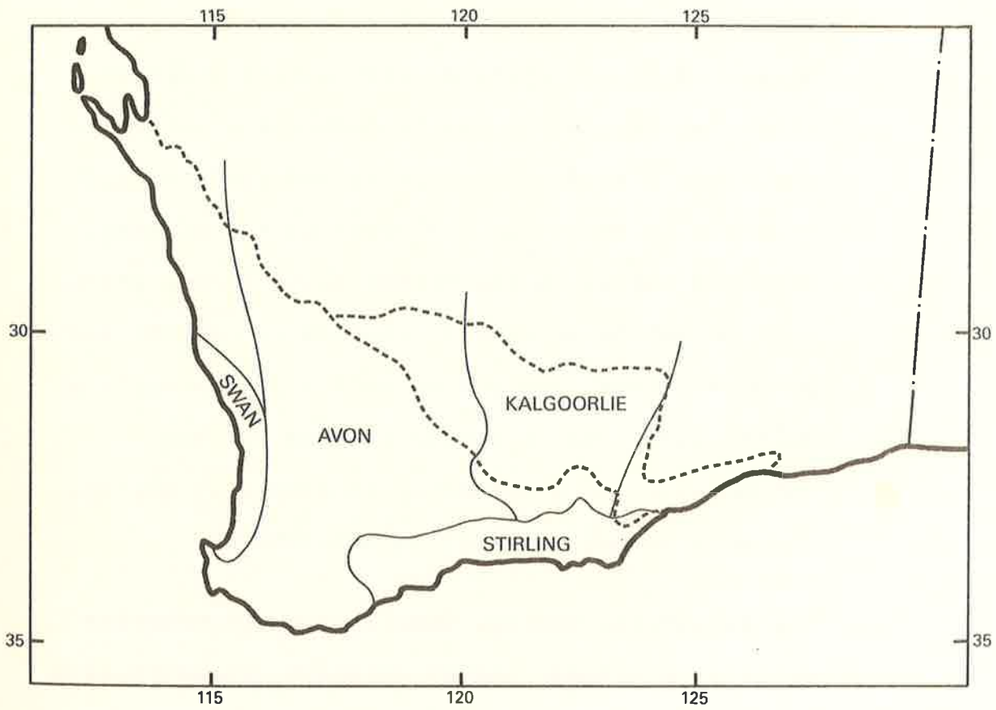

FIGURE 2: Landform - soil regions of South-western Australia.

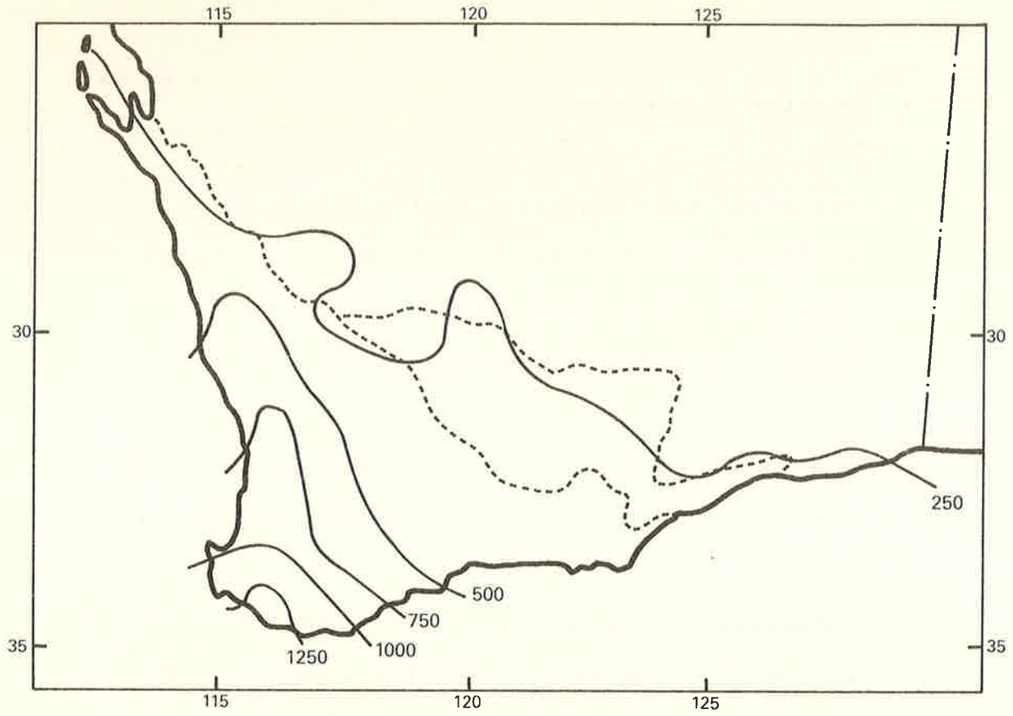

FIGURE 3: Isohyets (mean annual rainfall, mm) for South-western Australia.

The Avon Region consists of a lateritized plateau, dissected at the fringes, with saline drainage lines inland. Rocks are Precambrian granite and gneisses, with dolerite dykes; and soils consist of gravelly sands and duricrust on the plateau, with red earths on the fringe dissections, yellow sand on inland residuals, shallow red duplex soils on dissections, and red or yellow duplex soils on valley fill. Water supply is from surface catchments; the groundwater is generally saline. The mean annual rainfall is 300-1200 mm.

The Kalgoorlie Region, underlain by Precambrian granite, gneisses, and greenstones, consists of a partly dissected plateau with saline drainage lines. Yellow sands are found on the laterite

residuals, red earths in the broad valleys, and calcareous aeolian loams around major lake chains. Water supply is from surface catchments; the groundwater is saline. The mean annual rainfall is 200-300 mm.

The Stirling Region consists of a lateritized plateau, dissected at the fringes, with emergent quartzite ranges. The underlying rocks are Tertiary sediments and Proterozoic gneisses, schists and quartzites. The ranges carry shallow sandy soils, while the general area carries yellow gravelly duplex soils with yellow duplex soils in dissections. Water supply is from surface catchments; the groundwater is saline, but some rivers are fresh. The mean annual rainfall is 400-800 mm.

b. Vegetation

The vegetation formations of South-western Australia (Fig. 4) correlate broadly with landform-soils and rainfall (Figs. 2, 3). The relatively wet south-western corner is occupied by eucalypt forests. In the drier parts of the south-west, this forest is replaced by woodlands, shrublands and heath. These communities form a mosaic over an extensive area. The structural classification in the text follows a modification of that devised by Specht (Aplin, 1983). Detailed treatment of the vegetation types encountered each day is given in the text.

c. Phytogeography

A map showing the phytogeographic provinces and districts (Fig. 5), or natural ecological regions, of the area has been prepared by Beard (1980). The study tour is restricted to the South-western botanical province and the South-western Interzone. Details for each of the districts are given in the text.

d. Flora

The indigenous flora of Western Australia includes about 7000 species of vascular plants (Green, 1981), of which approximately 3700 occur in the South-western botanical province. The species richness of this region, in comparison with areas of similar size in other parts of the world, is relatively high, with the families of Myrtaceae, Proteaceae, Leguminosae, Stylidiaceae, Goodeniaceae and Epacridaceae each containing a disproportionately high number of species.

Sites of greatest richness in shrubland and heath communities are shallow sandy soils and laterite, in contrast to the relatively low species' richness of deep sandy soils. Sites of extreme habitat diversity, such as are found in the

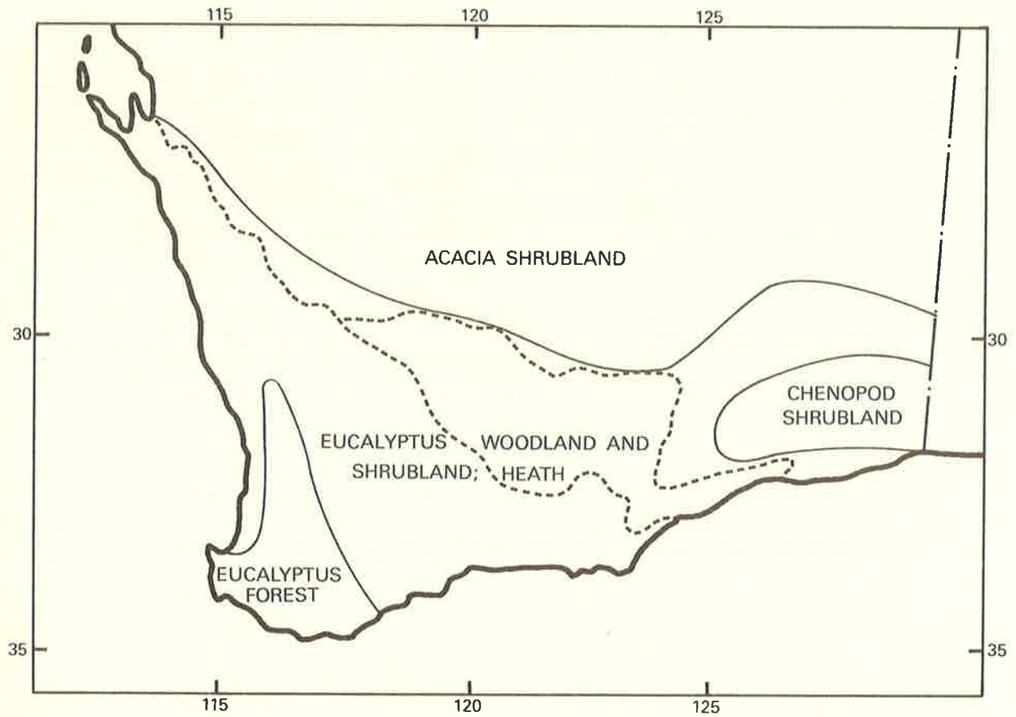

FIGURE 4: Vegetation formations of South-western Australia.

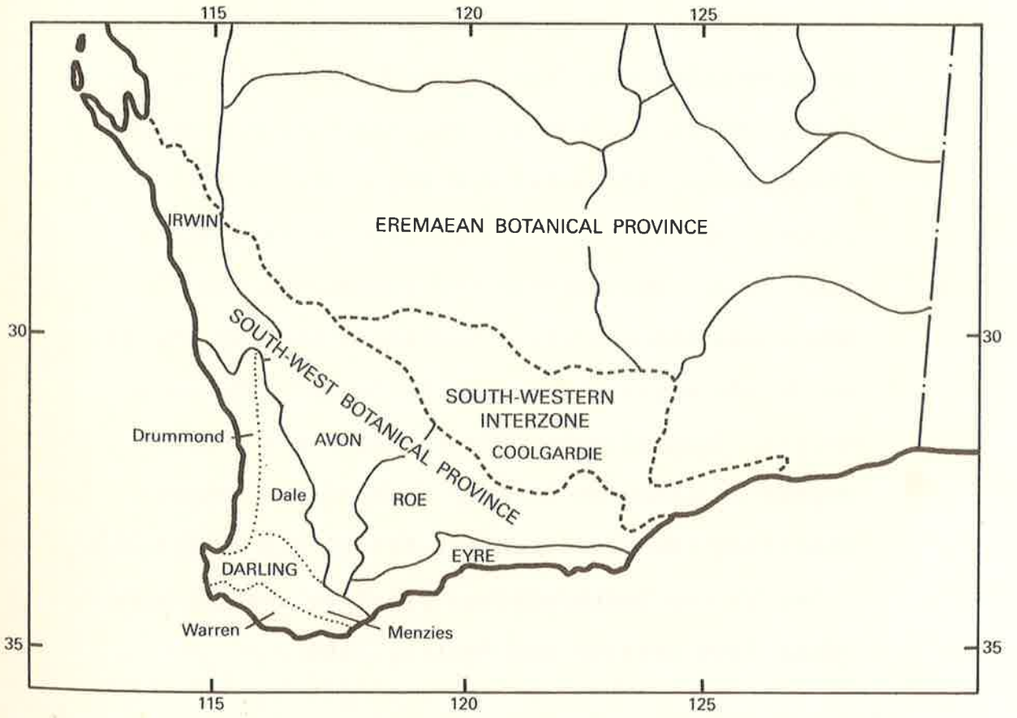

FIGURE 5: Phytogeographical regions of South-western Australia.

Stirling Range-Fitzgerald River area, are the chief centres of richness. As postulated by Marchant (1973), these centres represent either refugial areas which underwent a great deal of diversification following climatic change, or are areas near refugia which provide a variety of ecological niches for a colonizing, evolutionary dynamic flora. The two cusps of the province, represented by the Irwin and Eyre botanical districts, are the floristically richest areas. For example, Fitzgerald River National Park has over one-third of the species total of the South-west, despite its proportionately smaller area.

Some 2500 plant species are endemic to the South-western province, about 68 per cent of the flora (Marchant, 1973). The families Proteaceae, Leguminosae, Myrtaceae and Epacridaceae have a large proportion of endemic species in Western Australia. Many genera are endemic in the South-western province, including most of the 47 monotypic genera found in the State. The genus *Acacia* (Leguminosae: Mimosoideae) has a high degree of endemism (72% of species) in Western Australia (Maslin & Pedley, 1982), and even higher (78%) in the South-western province and Interzone (Data from Hnatiuk and Maslin, 1980).

The larger number of species and high percentage of endemism in the flora of the South-western province has been attributed to the existence of barriers to migration, and to tectonic stability, low relief, and slow, extremely local patterns of erosion that have occurred since the Early Tertiary, allowing accumulated persistence of many slowly-evolving relict species (Hopper, 1979). In addition, numerous closely-related species appear to have arisen owing to climatic fluctuations and active landscape erosion in the Quaternary.

The Miocene period has been regarded as important in Australian phytogeography because it marked the end of a long period of peneplanation, the beginning of earth movements in the south-east of the continent, and the partial isolation of the south-western portion from the rest of southern Australia. The limestones of the Nullarbor Plain, laid down in the Miocene and Pliocene, became an edaphic barrier between east and west, although not a completely effective one; and the development of a lateritic mantle over the western shield, in the Eocene and Miocene, gave rise to a significant number of laterite-tolerant species. Later weathering of the laterites would have broken up the continuous flora and caused disjunction of species.

The existence of pockets of elements of the south-western flora on the coastline along the Great Australian Bight, and on granite monadnocks in the Eastern Goldfields, indicates a wider distribution in the past of south-western species (Marchant, 1973). The area to the north of the Nullarbor, which contains a surprising number of genera and species normally considered as south-western, could have provided, under pluvial conditions, an effective corridor between south-western and south-eastern Australia.

e. *Eucalyptus*

The genus *Eucalyptus* L'Herit (Myrtaceae), containing over 500 species, has long been regarded as a taxonomically difficult group. A scheme of classification devised by Pryor and Johnson (1971) and Johnson (1976) now recognizes 9 genera (Johnson and Briggs, 1983), of which Genus *C (Corymbia), Eudesmia, Eucalyptus (Monocalyptus)* and *Symphyomyrtus* are represented in the South-western province and Interzone.

Burbidge (1952, 1960) proposed that the development of the distinctive mallee habit (multiple stems emerging from an underground lignotuber) and speciation of *Eucalyptus* occurred

during the Holocene, as a consequence of the "Great Arid". Subsequent research has supported the hypothesis that arid conditions have had a profound effect on the evolution of the flora, but, as noted by Hopper (1979), the evidence points to several arid phases of varying severity which occurred throughout the Quaternary and late Tertiary.

The isoflor map for *Eucalyptus* (Fig. 6), based on the data of Chippendale and Wolf (1981), shows that the highest numbers of species are found in the region from Albany to Norseman. The relatively wet south-western corner has the fewest number of species, and numbers of species per grid in the Eremaean botanical province are also very low.

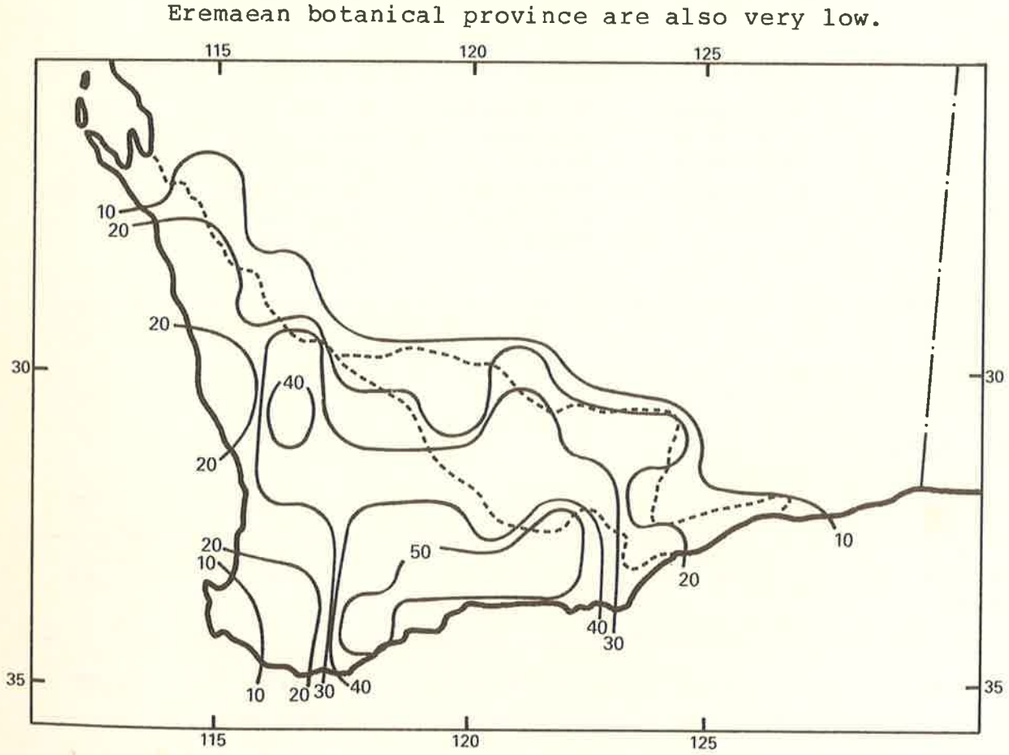

FIGURE 6: Isoflor map, showing number of *Eucalyptus* species present throughout the South-western province and Interzone.

There are 232 *Eucalyptus* species native to Western Australia, of which 163 or 70% are found in the South-western botanic province and Interzone (Appendix). Of these, 124 species or 76% of the total number of species in the province are endemic in the South-western botanical province and Interzone, 21 species (13%) extend their distribution ranges into the Eremaean botanical province, while an additional 18 species (11%) have their distribution ranges extending outside Western Australia (Table 1).

TABLE 1

Geographical range of species that occur in the South-western province and Interzone.

Subgenus	No. of species restricted to South-western province and Interzone	No. of species in adjacent Eremaean, South-western province and Interzone	No. of South-western province Interzone species extending their range outside Western Australia	Total for each subgenus
Corymbia	3	-	-	3
Eudesmia	7	-	-	7
Monocalyptus	24	-	-	24
Symphyomyrtus	96	21	18	129
Total for all subgenera	124	21	18	163
% of Total	76	13	11	100

The Study Tour

Specific stops have been arranged throughout the 8 day tour for a close inspection of 105 species of *Eucalyptus* present in the southern parts of the South-western botanical province and in the Interzone. An additonal 35 species can be inspected if the tour is extended for an extra 6 days, but for one of these days it is essential to have the use of a four-wheel drive vehicle.

The Main Tour

Day 1: Perth to Merredin.

From Perth, the capital of Western Australia, the route traverses the Darling Range and the agricultural towns of York, Quairading and Kellerberrin to reach Merredin, centre of the eastern agricultural district.

The Swan River, site of Perth city, was visited by the Dutchman de Vlaming in 1697, and by the French expedition under Baudin in 1801, but European settlement in Perth only began in 1829 with James Stirling. Fremantle, the port, and Guildford, on the banks of the Swan, were also settled then. The following year Ensign Dale crossed the Darling Range to discover the fertile, lightly timbered and well-grassed pastures of the Avon Valley, and by 1834 occupants of the government grants of land had established themselves in York. Further to the east, tracts of land were taken up as pastoral leases in the 1860's, including those in the present-day Quairading and Kellerberrin districts.

Western Australia remained a stagnant colony until the gold discoveries of the 1880's, and the introduction of superphosphate in the 1890's. The colonial government encouraged farming to ease unemployment caused through the misfortunes of unlucky miners, and

most of the area east of York was opened up between 1890 and 1910 for cereal growing.
An experimental farm, now the Merredin Agricultural Research Station, near Beverley, was established in 1924. The township of York was established in 1835, and those to the east were established in the period 1899-1918 following the completion of rail and road links.

The Darling Range soils are inherently infertile, with a massive laterite capping 3-5 m thick, and the vegetation that they supported was not cleared except for local settlement and for orchards in the valleys. In contrast, most of the woodland on the eastern border of the Range, which occurred on better class soils, has been cleared and used for livestock production.

Three classes of agricultural land were recognized in the south-west (Burvill, 1979). First class land with *Eucalyptus* woodland cover had red earths or calcarous loam soils of relatively heavy texture. Second class soils, usually grey-brown sands and loamy sands, with sandy to mottled clay subsoil, carried eucalypt shrubland vegetation. These are more dependent on superphosphate, but show an advantage over heavier soils in light rainfall seasons. Third class soils are on the so-called sandplains, with sand or gravelly sand overlying clay or lateritic residuals, these were not cultivated until the importance of trace elements, particularly Cu and Zn, was appreciated.

A glance at a road map shows that the wheatbelt is densely settled. This is because, when the region was being developed, no farm was supposed to be more than 20 km from a railway siding, as all cartage in those days was by horse and cart. The size of farms has increased over the years for economic reasons and the modal size, at present, of 1500 ha is quite large by other Australian standards. In the western portion of the wheatbelt, mixed sheep/wheat farming is practised, with emphasis on one or the other depending upon whether the price of wool or wheat is booming. Towards the east, in the lower rainfall area, holdings become larger, and emphasis is on cropping wheat. These farms have to be highly mechanized and capitalized to be economic.

Some 80% of the wheatbelt native vegetation has now been cleared for agriculture. Its removal has altered the area's hydrology, because pastures and crops use less of the rainfall than native vegetation, so that more water enters the subsoil, moves downslope into valley bottoms, and brings saline water to the surface. These salt-affected lands are more prevalent in the eastern half of the wheatbelt.

Most of the country traversed rests on the Pre-Cambrian basement known as the Yilgarn Block, an ancient landmass made up of granites and gneisses 2400 million years old. Most of this basement is covered with a highly weathered overburden of laterite, drift

sand, soil and evaporite deposits. The landscape is one of low relief, with broad flat-floored valleys up to 15 km wide. The most prominent topographical features are laterite breakaways or small cliffs, salt lakes or salinas, and outcrops of country rocks as ridges and inselbergs which are erosional remnants of the Yilgarn block. The gentle undulating topography incorporates well-defined drainage lines from ancient river systems of an earlier, wetter climate. Water seldom flows in them at present. Chains of salt lakes indicate the direction of ancient watercourses.

The soil pattern in the wheatbelt is complex, but it is related to topography. Valleys have brown, red-brown, or grey sandy loams and clay loams with sandy clay subsoils. Lime nodules are often present in the profile, associated with alkaline soils. Higher parts of the landscape have acid sands and ironstone on the surface. Laterite formations were produced in an earlier wetter climate. They occur throughout the wheatbelt irrespective of present rainfall.

Mean annual rainfall declines with distance from the coast: e.g. Perth (883 mm), Kalamunda (1069 mm - orographic effect), York (454 mm) and Merredin (327 mm).

The route takes us through the Darling and Avon botanic districts. The Dale subdistrict (named after Ensign Dale), of the Darling botanical district (named after

the Darling Range), occupies the laterite capped plateau dissected by young streams to form steep-sided valleys. An open forest formation of *E. marginata-E. calophylla* characterizes the lateritic erosional and deep depositional surfaces, with an *E. wandoo* alliance restricted to the heavier pediment soils. The *E. wandoo* understorey layer has a more open character. This woodland vegetation, which is most highly developed on the eastern fringes, is widely distributed in the Avon botanical district.

The Avon botanical district (named after the Avon River), which covers most of the so-called wheatbelt, is now largely cleared of native vegetation. On its western edge, where the terrain is hilly and the soils are hard, acidic, and yellow mottled (representing the pediments of early erosional cycles), the woodland formation consists of *E. wandoo*, associated with *E. accedens* and *E.astringens* on lateritic breakaways. In the southern portion *E. gardneri* and *E. falcata* are more commonly seen on the breakaways, while *E.occidentalis* woodland alliance replaces the *E. wandoo* woodland.

The *E. wandoo* woodland has a very open low shrub layer, in which poisonous plants of the genera *Gastrolobium* and *Oxylobium* are commonly seen. On granite outcrops, a vegetation complex reflects the succession of colonization by algae and lichens, to

shrublands with *Leptospermum*, and eventually to climax communitys of *Allocasuarina huegeliana* woodland, which occur on sandy or gritty soils over one metre in depth.

On the hard neutral red soils of the river valley systems, which represent further erosional cycles, the woodland formation is represented by *E.loxophleba*, with *Acacia acuminata* as its main associate. *Acacia acuminata* tends to merge with *E. wandoo*, particularly as the soils become sandy or gritty. In the southern portion *E. occidentalis* replaces *E. loxophleba*. *Eucalyptus occidentalis* woodlands also occur on the clay soils of swamps or seasonal shallow lakes.

Extensive areas of *E. salmonophloia* woodland are found in the hard alkaline red soils on valley plains and terraces further to the east. *Maireana* and *Atriplex* dominate the open mixed low shrub understorey on more saline soils. Other trees associated with this alliance are *E. salubris* and *E. longicornis*. *Casuarina obesa* and *Melaleuca* low woodland fringe salt lakes, remnants of once extensive river systems, along with low shrubland formations of *Halosarcia*. *Eucalyptus sargentii* and *E. kondininensis* grow on saline soils.

Forming a mosaic with the woodland formations are low woodland and high shrubland formations developed on the plateau, on sandy yellow earths containing ironstone gravel overlying mottled or pallid-zoned clays.

Shrubland formations with *E. eremophila*, *E. oldfieldii*, *E. drummondii* and other mallee eucalypts are present, while *E. macrocarpa* occurs on deep sand. *Banksia prionotes* woodland and *Acacia-Allocasuarina-Melaleuca* and *Grevillea* shrublands are found on deep yellow sand. *Dryandra* and mixed Myrtaceae, Proteaceae, Leguminosae and Epacridaceae heath occur on laterite or shallow sand over laterite.

Stop 1. Proceed for 75.2 km from Perth along the Perth to York road to reach the turn-off to Mt. Observation. Detour for about 2 km to reach Mt Observation look-out: woodland with *E. wandoo** and *E. accedens** on breakaway country, with *E. drummondii** near outcropping granite. Note also *Allocasuarina huegeliana*, *Macrozamia riedlei*, *Dryandra sessilis*, *Diplolaena drummondii*, and several species of *Drosera*. Open forests with *E.marginata* and *E.calophylla* occur on the Darling Plateau.

Stop 2. 30 km east of previous stop, Mt. Brown look-out at York: open woodland with *E.loxophleba**. Note also *Acacia acuminata* and *Pittosporum phylliraeoides*. Most of the vegetation has been cleared for agriculture and there are numerous naturalized alien species present.

*Indicates when a species, subspecies or variety is first seen at a site.

Stop 3. 51.1 km east of previous stop on road to Quairading, Jacob's Well turn-off: woodland with *E. astringens**, *E. salmonophloia** and *E. wandoo*. Note *Grevillea insignis* on breakaway, and paucity of understorey vegetation.

Stop 4. On reaching Quairading, proceed along the Quairading-to-Corrigin road for 11.7 km: *E. albida** is present.

Stop 5. A further 33 km along the same road: salt flat with *E. kondininensis**. Note *Halosarcia* communities.

Stop 6. Return to Quairading and proceed 1 km east, along Bruce Rock road: *E. macrocarpa** shrubland on deep sands. Note the diversity of plant species on sandplain.

Stop 7. A further 8 km east: *E. sargentii**, a salt-tolerant species, is seen in the valley, with *Halosarcia* communities. Note also *Kunzea pulchella*, *Grevillea paniculata*, *Santalum acuminatum*, *Leptospermum erubescens*, *Gastrolobium spinosum* and species of *Acacia*.

Stop 8. A further 10 km east, take the road from Yoting to Quairading, and 18 km north of Yoting, turn right to go to the eastern part of Mt. Caroline: *E. caesia* ssp. *caesia** on granite monadnock. This is a rare species that is now widely grown in gardens.

Stop 9. Proceed from Mt. Caroline to Kellerberrin, then proceed north for 14 km along Trayning Road: *E. oldfieldii** and *E. wandoo* in woodland. Note also *Phebalium filifolium*, *Guichenotia macrantha*, *Baeckea grandiflora* and several species of *Grevillea*.

Stop 10. Proceed northwards to Trayning, then turn east and proceed for 17 km: *E. stowardii** is found on a calcareous hill. Continue to Merredin.

Day 2: Merredin to Kalgoorlie

The route traverses part of the Avon and Coolgardie botanical districts and passes through the towns of Southern Cross and Coolgardie to end at Kalgoorlie, centre of the Eastern Goldfields. The first portion passes through marginal farming country. Near Southern Cross agriculture gives way to pastoral use, with little or no clearing of native vegetation.

The first payable gold in the Southern Cross district was discovered in 1887. Within four years there were over 400 men working in mines around the town. This find, however, was over-shadowed by that in the area known as Fly Flat, 1892, when Coolgardie declined dramatically, while Kalgoorlie expanded. In 1976, Coolgardie had a population of about 650. The only signs of those earlier prosperous times at Coolgardie are the fine, solid public buildings.

It was the discovery of gold coupled with serious droughts and a bank crash in eastern Australia that caused the huge influx of people into Western Australia, for example: 1881 (29 700), 1889 (44 000), 1896 (138 000), 1904 (239 000), 1911 (282 000). As a result of this influx, the colony could not cope, much food had to be imported, and this was one reason why the government was so keen to encourage agriculture.

The Kalgoorlie district was first explored by Lefroy in 1863, but it was not until gold was discovered that closer settlement came about. Kalgoorlie was settled in 1893. At first alluvial gold was sought by gold washing, but this method later gave way to underground mining, requiring large capital.

More gold has been mined from the Golden Mile of Kalgoorlie than from any other area in Western Australia; in fact, the field is second only to the Porcupine field in Canada. The lode is 4 km long, 1.2 km wide and 1.5 km deep.

In Kalgoorlie we see well-preserved turn-of-the-century architecture coupled with shabby shanty-town suburbs typical of mining settlements. The wide streets are a legacy of the days when camel teams had to be turned around in the main streets. The present population of Kalgoorlie-Boulder is about 20 000. The new rail link to Perth, upgraded to standard gauge, was fully operational in 1968.

Most of the woodlands around Kalgoorlie have been cut over for fuel, mainly to operate boilers at mines and water-pumping stations, and for mine props. Even as late as 1942, 1 700 tons of wood were used daily in Kalgoorlie to generate energy. The woodlands we see today are natural regeneration from coppice and seed.

The vegetation of the Coolgardie botanical district consists predominantly of eucalypt woodlands, becoming open, and with an *Atriplex-Maireana* understorey on the more calcareous soils. However, much of the area between Southern Cross and Coolgardie consists of sandplains covered with high shrubland and heath vegetation.

The annual rainfall ranges from 200-300 mm. The geology, similar to that of the Avon botanical district, includes Proterozoic granite and gneiss of the Fraser Range Block. The topography is gently undulating with occasional ranges of low hills. To the west are sandplains and some large playa lakes.

Stop 1. 34 km east of Merredin along Great Eastern Highway, at Walgoolan, turn northwards and proceed for 41 km to Warralakin. Turn east and continue for 10 km, then northwards a further 10 km. On the eastern side of the road is Chutawalakin Hill, on private property. Here *E. caesia* spp. *magna** and *E. crucis* spp. *lanceolata** may be seen. On Chiddarcooping Hill on the western side of the road, growing with the other two taxa, is *E. orbifolia**.

Stop 2. Return to Warralakin, then proceed south towards Walgoolan for 30 km. Turn east, heading towards Westonia, for 6 km: *E. ewartiana** is present.

Stop 3. Continue to Westonia, then proceed north-east for 3 km, east for a further 2 km then north, and north-west, for 5 km to reach Sandford Rocks: *E. crucis* spp. *crucis** can be seen here.

Stop 4. Return to Westonia, then proceed southwards to rejoin Great Eastern Highway. In scrubland near this point is *E. platycorys**.

Stop 5. Proceed eastwards for 3 km: woodland community with *E. sheathiana**, *E. celastroides**, *E. redunca**, *E. erythronema** and *E. salmonophloia*, *Eremophila oppositifolia* and *E. drummondii*. Note also *Callitris morrisonii*, *Melaleuca pauperiflora*, *Eremophila oppositifolia* and *E. drummondii*.

Stop 6. 31.1 km east of last stop is the Nulla Nulla turn-off: high shrubland with *E. eremophila**, *E. uncinata**, *E. sheathiana* and *E. burracoppinensis**. Note also diversity of species in low shrub layer.

Stop 7. Pumping Station, 27.1 km east of last stop: woodland on alkaline soils with *E. longicornis**, *E. melanoxylon** and *E. gracilis**.

Stop 8. Outskirts of Southern Cross, 4.2 km east of last stop: *E. corrugata** on greenstone series. We are entering the Coolgardie botanical district.

Stop 9. 25.4 km east of last stop: *E. foecunda** and *E. leptopoda** high shrubland on sand over clay.

Stop 10. 84.3 east of last stop: woodland with *E. oleosa* var. *oleosa**, *E. griffithsii**, *E. clelandii**, *E. transcontinentalis** and *E. salubris**. Note *Acacia aneura*.

Stop 11. 17.3 km east of last stop: woodland with *E. torquata**, *E. campaspe**, *E. celastroides*, *E. salmonophloia*, *E. transcontinentalis*, *E. clelandii* and *E. lesouefii**. Note *Allocasuarina cristata* and various species of *Dodonaea* and *Eremophila*. Continue to Kalgoorlie.

Day 3. Kalgoorlie to Norseman

The route passes through the nickel mining town of Kambalda, on Lake Lefroy, to the gold mining town of Norseman. Livestock production between Kalgoorlie and Norseman is carried out on pastoral leases.

Gold mining commenced at Norseman in 1897 and is still continuing. Although first discovered in the Eastern Goldfields region in 1897, nickel was not mined until 1966 when the high grade nickel ore body at Kambalda was found. In 1968 large-scale production of common salt was started at Lake Lefroy.

The area traversed was opened up, soon after the discovery of gold, to connect the Eastern Goldfields with the port of Esperance. Much of this trade, however, was lost with the opening of the Perth to Kalgoorlie rail link. The Kalgoorlie to Esperance railway was not completed until 1925.

The soils are typical of those on granite, gneiss and greenstone. Mean annual rainfall ranges from approximately 250 mm at Kalgoorlie to 300 mm at Norseman. The bioclimate is semidesert, mediterranean, with the rainfall received in winter.

The Coolgardie botanical district, traversed in part between Southern Cross and Kalgoorlie, extends from Kalgoorlie to Norseman and on to the southern shore of

Lake Gilmore, which lies between the railway sidings of Daniell and Kumarl. The landscape consists of ranges of low hills formed by the outcrops of greenstone. These are separated by extensive almost flat surfaces built up of alluvial and colluvial in-fill, with a general altitude of some 400 m above sea level. At the lowest points in the landscape there are numerous, often large, playa lakes, which may fill with water after rain, but are normally dry, and floored with dried mud or salt crystals.

The ridges carry a characteristic woodland of *E. torquata-E. lesouefii*, with *E. campaspe*, *E. clelandii*, *Allocasuarina cristata* and *Grevillea nematophylla*. The shrub layer consists largely of *Eremophila* spp., notably *E. scoparia*, *E. glabra* and *E. oldfieldii*, *Dodonaea*, *Cassia* and *Acacia*, interspersed with *Atriplex nummularia*. The woodlands of the middle slopes are taller and are made up of *E. lesouefii*, with *E. transcontinentalis*, *E. salmonophloia*, *E. oleosa* and *E. campaspe*, and, more rarely, *E. clelandii*, *E. flocktoniae* and *E. gracilis*. On lateritic breakaways is *E. stricklandii*. The shrub layer consists of the broombush type, on rising ground, with several species of *Eremophila*, *Acacia graffiana* and various other plant species. On lower ground the shrub layer consists mainly of *Atriplex vesicaria*, *Maireana sedifolia* and *Cratystylis conocephala*. The woodlands of the lower slopes and

flats consist typically of *E. salmonophloia*, with *E. salubris*, *E. lesouefii* and *E. longicornis*. *Melaleuca pauperiflora* becomes dominant in the understorey on periodically wet soils. *Pittosporum*, *Santalum*, *Myoporum*, *Brachychiton* and *Callitris*, which assume the form of small trees, are also seen.

Stop 1. Proceed southwards from Kalgoorlie to the lookout at Kambalda. From here there is a panoramic view of Lake Lefroy, the Kambalda nickel mine and the woodland vegetation of the valley floor. In contrast to Kalgoorlie and Coolgardie, most of the trees and shrubs in the townships of East and West Kambalda have been retained. Note small trees of *Santalum spicatum* and *Brachychiton gregorii*.

Stop 2. Proceed to the township of Widgiemooltha. 36.5 km south of Widgiemooltha and 3 km south of Higginsville, an old mining centre still producing some gold, you will see: woodland with *E. stricklandii**, *E. salmonophloia* and *E. celastroides*.

Stop 3. 30 km from previous stop, near turn-off to Hyden: woodland with *E. dundasii**, *E. lesouefii* and *E. flocktoniae**.

Stop 4. 15 km from the last stop, turn right onto a track. Proceed for 5-6 km: open woodland with *E. brockwayi**, *E. oleosa*, *E. gracilis* and an undescribed eucalypt with the manuscript name *E. "pterocarpa"**, a species similar to *E. lesouefii*, but with a completely smooth bark and only three buds to the umbel.

Stop 5. Return to the highway, and proceed southwards for 8 km from the *E. "pterocarpa"* turn-off. There is a large granite outcrop on the right-hand side, greenstone outcropping on the left-hand side, and Lake Cowan ahead: low woodland with *E. websterana**, *E. concinna**, *E. oleosa*, *E. dundasii*, *E. torquata*, *E. lesouefii* and *E. brockwayi*. Note also various species of *Eremophila*. Continue to Norseman.

Day 4: Norseman to Esperance

The route from Norseman traverses the southern part of the Coolgardie botanical district and then through part of the Roe and Eyre botanical districts of the South-western botanical province to the port of Esperance, centre of a thriving agricultural region. The agricultural region commences at the siding of Kumarl, and from here to Scaddan the duplex soils are used mainly for cereal grain production. South of

Scaddan the application of superphosphate and trace elements on the lighter, sandier soils has led to pasture establishment and livestock production.

The Roe botanical district (named after John Septimus Roe, Surveyor-General and explorer of that area), has a gently undulating landscape of low relief, mantled by duplex soils of sand overlying clay. The underlying Archaean and Proterozoic granites are overlain by early Tertiary sediments.

The climate is dry warm mediterranean with a mean annual rainfall between 200-500mm, and a 7-8 month summer drought period.

The Eyre botanical district (named after John Eyre, explorer, who traversed the region in 1841) lies at the edge of the Archaean Shield where it abuts onto the Proterozoic metamorphics of the Albany-Esperance block. The latter consists largely of sediments of middle and late Eocene age, at one time mantled by a lateritic crust, which is represented in the present landscape by narrow ironstone gravel ridges and erosional scarps along the northern edge. The Stirling, Mount Barren and Russell Ranges, which rise abruptly out of an otherwise predominantly undulating landscape, are composed of hard Proterozoic metasedimentary rocks. The soils are predominantly sandy, overlying clay or ironstone gravels.

The Dutch, under Francois Thyssen in 1627, first discovered the south coast of Western Australia and charted it as far east as Cape Arid. The coastline was named Nuytsland, after Pieter Nuyts, a Dutch East India Company official on board the vessel. A French expedition under D'Entrecasteaux put in at Esperance Bay in 1792 and proceeded to visit and chart the coast and off-shore islands. Names such as Esperance, Archipelago of the Recherche, Cape Le Grand and Duke of Orleans Bay were given by the French.

Esperance is of historical importance, botanically, because it was here on one of the off-shore islands that La Billardiere, one of the naturalists in the expedition, collected the first Western Australian eucalypt, *E. cornuta*, which he subsequently described and named in 1799. The botanist Robert Brown and the scientific illustrator Ferdinand Bauer accompanied the Mathew Flinders expedition which visited the area in 1802.

The area between Cape Arid and King George Sound was first traversed on foot by two lads, James Newell and James Manning, who were marooned near Cape Arid in 1835 and had to make their way on foot to King George Sound. In 1841, E.J. Eyre made his continental crossing following the coast from South Australia. The Surveyor-General, J.S. Roe on his 1848-49 expedition travelled as far as the Russell Range, via Mt Ridley and Mt Ney, returning via the coastal plain.

The first settlers in the Esperance district, the Dempster brothers, arrived in 1863. The town and port of Esperance was gazetted in 1893. With the opening of the rail link at Coolgardie it became the port for exporting wheat from the Salmon Gums-Grass Patch area, and a holiday resort for people of the Eastern Goldfields. Research at the Esperance Downs Research Station at Gibson, established in 1949, paved the way for agricultural development in the region, and since the late 1950's and early 1960's successful land development has been carried out. The population of Esperance in 1976 was in excess of 5 000.

The climate of the area is warm mediterranean, with a mean annual rainfall between 500-700 mm, and with 5-6 dry months a year.

The Roe botanical district contains a number of plant communities found in adjacent districts. On residual sandplains there are areas of mixed high shrubland and heath. These merge into *E. eremophila-E. oleosa* and *E. redunca-E. uncinata* tall shrublands, in which there are a number of other eucalypt species. *E. salmonophloia* and *E. occidentalis* woodlands are seen in the valleys, the former to the north, the latter to the south.

The salt lakes carry *Halosarcia* low shrubland communities. These are fringed by *Melaleuca* low woodland or shrubland communities, with the dominant species being *M. lateriflora* and *M. uncinata*.

The vegetation of the Eyre botanical district is made up of high shrubland formations with shrub or mallee eucalypts dominating. *Eucalyptus tetragona, E. redunca-E. uncinata, E. gardneri-E. nutans* (on undulating slopes) and *E. eremophila-E. oleosa* communities form a mosaic over the area. Patches of mixed heath of Proteaceae, Myrtaceae and Leguminosae are present, with heath vegetation merging into and forming the understorey of the high shrubland communities. Low forests of *E. gardneri-E. falcata* occur locally on scarp slopes, with *E. platypus* on heavy clays. On the sandy soils *Banksia speciosa-Lambertia inermis* and *Nuytsia floribunda* become dominant. *Eucalyptus cooperana* high shrubland occurs on soils overlying limestone. The ranges carry closed heath and scrub formations of mixed Myrtaceae, Proteaceae, Leguminosae and Epacridaceae communities, and are noted for their species diversity and the many endemic, or near endemic, species. Woodlands of *E. marginata-E. calophylla* and *E. wandoo* occur on the lower slopes and valleys of the Stirling Range to the extreme west.

Woodland formations of *E. occidentalis, E. loxophleba* and *E. salmonophloia* occur along drainage lines and loamy slopes and flats. The former species favours higher rainfall and winter wet sites and is often seen on or around clay pans. Salt lakes are covered by or fringed by low shrubland formations of *Halosarcia* and *Atriplex*. A scrub formation of *Melaleuca* may also be present.

The littoral fringe of the coastal plain is made up of a chain of granite bosses with drift sand between them. Scrub communities of species of *Acacia*, with *E. angulosa* and *Agonis flexuosa* are present within the sand dune and granite lithic complexes. *Banksia baxteri* and *B. attenuata*, as well as *Lambertia inermis*, are dominant on the drift sand, inland. Coastal swamps carry a *Melaleuca* alliance.

Stop 1. Proceed 20 km south of Norseman: woodland with *E. foecunda, E. cylindrocarpa** and *E.gracilis*. 10.7 km further on is an area that was cleared for a dam catchment in 1968. Note the regeneration of *Eucalyptus* and *Eremophila*.

Stop 2. 13 km from previous stop: woodland with *E. calycogona**, *E. annulata**, *E. salmonophloia, E. dundasii* and *E. salubris*.

Stop 3. 7 km past previous stop, near railway crossing: woodland with *E. pileata**. 25 km further south, or 3 km south of Beete Siding, an intermediate form between *E. conglobata* and *E. fraseri* can also be seen. We now leave Coolgardie botanical district and enter Roe botanical district.

Stop 4. 4 km further south: *E. ovularis** present.

Stop 5. 19 km further south or 13 km south of Kumarl: mixed eucalypt high shrubland with *E. dielsii**, *E. diptera**, *E. annulata*, *E. flocktoniae*, *E. eremophila*, *E. oleosa*, *E. sheathiana* and *E. calycogona*. Note *Halgania* and *Boronia*.

Stop 6. 7 km south of previous stop is a gravel pit on the right hand side of the road: high shrubland with *E. grossa** and *E. cylindriflora**.

Stop 7. 9 km south of previous stop or 6 km south of Salmon Gums: mixed woodland with *E. conglobata**, *E. leptocalyx**, *E. eremophila*, *E. flocktoniae*, *E. salmonophloia*.

Stop 8. 40 km past previous stop or 19 km south of Grass Patch: high shrubland with *E. forrestiana* ssp. *dolichorhyncha**, *E. redunca**, *E. leptocalyx*, *E. conglobata*, *E. occidentalis**, *E. merrickiae**, *E. goniantha**, *E. spathulata* ssp. *grandiflora**, *E. anceps** and *E. rigidula**. Note also *Banksia media* and *Hakea laurina*. Another 2 km on, *E. forrestiana* ssp. *forrestiana** occurs in high shrubland.

Stop 9. A further 1 km, on the edge of a salt lake: the salt-tolerant *E. halophila**. We enter Eyre botanical district.

Stop 10. 32 km from previous stop or about 27 km south of Scaddan: high shrubland with *E. micranthera**. Note also *E. tetraptera* along roadside. Continue to Esperance.

Day 5: Esperance to Ravensthorpe

The route traverses the Eyre botanical district and ends at Ravensthorpe, once a gold mining settlement but now a local centre for agriculture.

The first settler to come in to the Ravensthorpe district was W. Dunn, who settled at Cocanarup in 1871. Gold was discovered in the area in 1891, and the gold mining town Ravensthorpe and its port Hopetoun were declared as townships in 1901. The rail link between these two towns was laid down in 1908-1909 but was closed in 1936.

The geology, soils, climate and vegetation of the Eyre botanical district have already been described (Day 4).

A distinct vegetation system is associated with the greenstone rock outcrops around the town of Ravensthorpe. There the topography is hilly, the soil depth varying with topography, and the vegetation consists of scrub, high shrubland and woodland. *Eucalyptus* species include *E. megacornuta*, *E. lehmannii*, *E. preissiana*, *E. nutans*, *E. gardneri*, *E. salmonophloia*, *E. longicornis* and *E. myriadena*. *Eucalyptus rugosa* has been recorded at Cocanarup.

Stop 1. Esperance lookout: coastal scrub with *E. platypus* var. *heterophylla** and *E. angulosa**.

Stop 2. Proceed for 75 km from the Ravensthorpe turn-off at Esperance to the first hill past Young River: high shrubland with *E. tetragona**, *E. doratoxylon**, *E. redunca*, *E. incrassata**, *E. leptocalyx* and *E. uncinata*. Note also *Brachysema*, *Dryandra*, *Synaphea*, *Calytrix*, *Eremaea* and *Lysinema*.

Stop 3. 52 km past the previous stop, soon after crossing the Oldfield River, fork left into the Jerdacuttup North Road and proceed for another 23 km: high shrubland with *E. stoatei**, *E. goniantha* ssp. *goniatha* and *E. merrickiae*.

Stop 4. 11 km past this stop, on the steep banks of the Jerdacuttup River: low forest of *E. platypus* var. *platypus**.

Stop 5. Another 10 km on is the Ravensthorpe-Hopetoun road. Turn right here to head north: *E. spathulata* ssp. *spathulata** can be seen.

Stop 6. Proceed for 8-9 km northwards along the Ravensthorpe-Hopetoun road: stop for *E. tetraptera**. Go on a further 1 km, then right for a short detour: high shrubland with *E. nutans** and *E. gardneri**.

Stop 7. Return to main road and proceed to foot of Mt Desmond: open heath with emergent *E. desmondensis**, a species restricted to this small area. Also restricted to Mt. Desmond is *E. bennettiae**, which is found on the north-west slope, in association with *E. lehmannii** in high shrubland. On the top of Mt. Desmond: *E. preissina** with *E. tetragona* in high shrubland.

Day 6: Ravensthorpe to Albany

The route from Ravensthorpe, through the Eyre botanical district and the Menzies subdistrict of the Darling botanical district, ends at the port of Albany. The Menzies subdistrict was named after Archibald Menzies who collected botanical material at King George Sound in 1791, and also provided the first detailed descriptions of fired countryside in the south-west. We will eventually see fired countryside on this section of the tour.

Jerramungup was gazetted a townsite in 1957 when development of the surrounding light lands took place. Settlement in the district, however, began in 1849 when J. Hassell took up the pastoral lease "Jarramongup Spring" on the Gairdner River. The word Jarramongup is a corruption of the Aboriginal "Jarramoich" which means moitch on high ground - moitch being the name of *E. occidentalis*.

King George Sound, where the port of Albany is situated, was named by George Vancouver in 1791. Menzies was the naturalist on this expedition. King George Sound was also visited by Jacques La Billardiere (1792) and Robert Brown (1801).

In 1826, to thwart any French moves for possession, Major Lockyer was sent from Sydney to establish a settlement at King George Sound. This settlement, then part of New South Wales and known as Frederickstown, was renamed Albany in 1831 when the settlement was annexed to that on the Swan River. The pastoral occupation of the district covering a radius of 160 km from King George Sound occurred gradually between 1830 to 1850. George Cheyne went to Albany in 1831 and soon applied for a land grant. He also took up land east of Albany. The population of Albany in 1976 was close to 14 000.

Albany, a thriving tourist resort, provides the services and cultural needs of the surrounding agricultural area. The climate of Albany makes it a popular tourist resort, with a summer average temperature of a mild 22.4°C. It has only a few days a year over 32°C and a winter average of 18°C. Frosts are almost unknown and the mean annual rainfall of 942 mm is spaced over the year. The woodland vegetation around Albany wrongly indicated to early settlers that the district was blessed with a fertile

soil and early attempts to farm the area met with failure. The district has only become productive with the use of fertilizers and trace elements.

The basement rocks of the area consist of metamorphic rocks and granites of Proterozoic age. The latter appear in the massive granite outcrops that dominate the landscape, such as the Porongurup Range. The are overlain in places by Tertiary marine and continental sediments.

The Albany district consists essentially of a plain ascending gradually from the coast and levelling off further inland. Beyond this point the plain undulates gently, with little significant change in level. Above the plain rise numerous granitic bosses, and further still the commanding peaks of the Stirling Range which are composed of Proterozoic quartzites and phyllites. Below the plain are the entrenched valleys of the numerous, short rivers draining to the south coast. Sand dunes have been built up on the coastal margin of the plain and have impounded numerous swamps and sea inlets on their landward side. Along the coast the granitic outcrops are relatively small and numerous and have been exposed by dissection of the country. Further inland they become higher and more massive. The variability in topography, and soil types, provides a diversity of habitats which support a rich assemblage of plant species.

The geology, soils, rainfall and vegetation of the Eyre botanical district have already been described (Day 4).

The Menzies subdistrict is similar to the Dale subdistrict, which has also been dealth with (Day 1). The Menzies subdistrict marks the transition from the Warren subdistrict, with its high rainfall, to the Dale subdistrict where the annual rainfall for the most part scarcely exceeds 600 mm. The vegetation is predominantly *E. marginata-E. calophylla* open forest, merging eastwards into *E. wandoo* and *E. cornuta* woodlands. The understorey species differ from those in the Dale subdistrict and approach those seen in the Warren subdistrict. Around Albany itself the soils are excessively poor, leached and badly drained. *Allocasuarina fraseriana* and *E. staeri* are present, the latter where deep white sand overlies laterite. Stunted *E. marginata* can also be seen here.

Stop 1. Proceed for 2.5-3 km past Gairdner River, or 108 km from Ravensthorpe: *E. xanthonema** in high shrubland.

Stop 2. Proceed past Jerramungup for about 60 km along the road to Albany. At Boxwood Hills cross-road turn left into the Bremer Bay Road and proceed for 16-17 km, then turn right and proceed for 4.5 km towards Beaufort Inlet: dense low

forest and high shrubland with *E. lehmanii*, *E. conferruminata**, *E. erythranda**, *E. falcata*, *E. angulosa*, *E. tetraptera*, *E. redunca*, *E. newbeyi**, *E. occidentalis*, *E. cornuta*, *E. platypus* var. *heterophylla*, *E. gardneri*, *E. tetragona* and *E. uncinata*.

Stop 3. Return to Boxwood Hills cross-road and head towards Albany. Proceed for about 5 km to reach Marra Bridge over the Pallinup River: *E. macranda** occurs at this site.

Stop 4. Return to Boxwood Hills cross-road and proceed in a north-westerly direction for 7-8 km to reach Corackerup Creek: woodland with *E. rudis**, *E. occidentalis* and *Casuarina obesa* along the water course. Woodland with *E. wandoo* comes in 1 km past this stop.

Stop 5. 5 km past previous stop turn left and proceed for 10 km: high shrubland with *E. decipiens**. 5 km after crossing Pallinup River: low forest of *E. platypus* var. *platypus* growing on spongolite.

Stop 6. 36 km further on, turn left and proceed southwards for 5.5 km along the Manypeaks road: high shrubland with *E. pachyloma**, *E. buprestrium** and *E. marginata**.

Stop 7. 20 km further on, we enter the Menzies subdistrict of the Darling botanical district: larger trees of *E. marginata**, *E. calophylla*, *Agonis flexuosa* and *A. parviceps*.

Stop 8. On reaching the Albany-Esperance Highway turn left and proceed for 6-7 km. Turn right and continue to Cheyne Beach. On track to Mermaid Point 0.5-1 km from Cheyne Beach: *E. acies** and *E. cornuta**. Return to Albany-Esperance Highway, turn left and proceed to Albany. You are in the Warren subdistrict of the Darling botanical district.

Day 7: Albany to Margaret River

The route passes through the hamlets of Denmark, Walpole and Pemberton, finishing at Margaret River.

Dr T.B. Wilson first explored the area around Denmark in 1829. Development began in 1895 with the erection of a timber mill at Denmark by the Millar Brothers. The timber industry began in the early days of settlement, but it was not until 1874 that exports began to exceed local usage. Exploitation of timber up to 1910 was confined mainly to the immediate hinterland of Perth, Albany and Bunbury. Nineteen eleven saw the opening of state-owned mills at Manjimup and Pemberton.

The first explorer to visit the area between Busselton and August was Lt W. Preston in 1831. Also in that year Dewar and Smith, and Stirling and Roe got as far as Augusta. In 1842 botanical collections in the area were made by Drummond who was accompanied by John Gilbert, the zoological collector. At Busselton he stayed with the botanical enthusiast Georgiana Molloy. Early settlements included Busselton (1837) and Augusta (1830). Margaret River was gazetted a townsite in 1913.

In the 1920's, a grandiose scheme by the Premier, James Mitchell, to resettle World War I veterans and British migrants was instigated. Ringbarked trees are often referred to as "Mitchell's monuments". The scheme failed, mainly through ignorance of conditions, and by the early 1930's hundreds of farms were abandoned. Mechanization and improved agricultural techniques have reversed the situation. The region today supports fruit growing, livestock production and intensive agriculture, apart from the timber industry, which produces sawn timber and wood chip for export.

Our route traverses part of the Warren subdistrict (named after the Warren River) of the Darling botanical districts, which occupies the extreme south-western corner of Western Australia, and part of the Menzies subdistrict. The Warren subdistrict, which overlies Precambrian granites and gneisses is a zone characterized by deeply incised valleys of

south-flowing streams and by remnants of laterite on the interfluves. Nearer the coast are leached sands and extensive swamps. The mean annual rainfall is in excess of 1 200 mm.

The main vegetation types are high open forest on granite soils, represented by *E. diversicolor*; open forest on lateritic soils, represented by *E. marginata-E. calophylla*; low forest and scrub of *Agonis flexuosa* on extensive coastal dunes; also on sand are low forests of *E. marginata*, *Banksia* and *Melaleuca*, heath and sedgelands, the latter in waterlogged areas. Seasonally flooded areas may also carry *Melaleuca preissiana* low forest. Found in *E. diversicolor* forest are: *E. jacksonii* and *E. guilfoylei* with *Banksia grandis*, *B. littoralis*, *Allocasuarina decussata*, *Agonis flexuosa* and *A. juniperina* as understorey trees and a dense high shrub layer of *Trymalium spathulatum*, *Chorilaena quercifolia*, *Hovea elliptica*, *Acacia pentadenia*, *Albizia lophantha* and *Pteridium aquilinum*. More typical of *E. marginata-E. calophylla* forest are: *E. patens*, *E. megacarpa* and *E. rudis* with *Banksia grandis*, *B. littoralis*, *Allocasuarina fraseriana*, *Persoonia longifolia*, *P. elliptica*, *Nuytsia floribunda* and *Xylomelum occidentale* as understorey trees and a low shrub, heathlike ground layer.

To the west of the Donnelly River, the lateritic capped and locally dissected, undulating landscape overlies Mesozoic sediments. The *E. marginata-E. calophylla* low woodland or open forest consists of stunted trees, due to poor drainage. *Kingia australis* is prominent on clay loam soils. This area lies in the Menzies subdistrict.

On crossing the Blackwood River at Alexandra Bridge, we enter the Warren subdistrict. Along the coastal strip from Cape Naturaliste to Cape Leeuwin is a belt of calcarenite with *E. calcicola* present, and unconsolidated sand with *Pimelea ferruginea* as the prominent species. Further from the coast, *Agonis flexuosa* and/or species of *Banksia* dominate, followed by *E. marginata* on leached sands, while on deeply weathered red soil and on alluvial soils *E. diversicolor* can be seen.

Stop 1. Proceed along the South Coast Highway, through Denmark, to reach the Bow Bridge. Then continue for 8 km before turning left into Nut Road. Follow the road for 4 km then turn left into Ficifolia Road. Along the next 3 km is Ficifolia Block: heath with emergent *E. ficifolia**.

Stop 2. Turn left into Conspicuous Beach Road to return to the South Coast Highway. Proceed for 1 km to reach the road leading right to the Valley of

the Giants: high open forest with *E. guilfoylei**, *E. jacksonii** and *E. diversicolor**. Note also *Allocasuarina decussata*, *Acacia pentadenia*, *Chorilaena quercifolia*, *Trymalium spathulatum*, *Crowea angustifolium* and *Chorizema ilicifolium*.

Stop 3. Return to South Coast Highway and continue on to Nornalup, then proceed for a further 4 km west: *E. brevistylis** in high open forest.

Stop 4. Continue on to Walpole and proceed for 34 km from Walpole along the South-western Highway: open forest with *E. marginata* and *E. calophylla*, as well as *Podocarpus drouyniana*.

Stop 5. 30.5 km from previous stop, turn right into Bevan Road and proceed for 4.8 km: swamp vegetation, with *Cephalotus follicularis*, the pitcher plant.

Stop 6. Return to Highway, then proceed for a further 10 km. Turn left and proceed through Northcliffe, towards Pemberton. Just before Pemberton turn left into Vasse Highway and proceed along Vasse Highway for 40 km. Turn left and proceed for 28 km to reach Brockman Highway. Head west along Brockman Highway for 41 km. Turn left into Bussell Highway, proceed for 1 km then turn right and continue on for 2 km to reach Caves Road.

Turn right into Caves Road and proceed for 8 km. Turn left into a track leading to Boranup Hill. Proceed 3.4 km along the track: *E. calcicola** occurs on limestone. Return to Caves Road and continue northwards to the township of Margaret River.

Day 8: Margaret River to Perth

The route traverses part of the Darling botanical district, notably the Drummond and Dale subdistricts. Population centres includes Bunbury, Busselton, and Mandurah along the coast and Harvey and Pinjarra inland.

The Dutch navigator Volkersen sailed along the west coast to near Bunbury in 1658, and his charts gave special attention to off-shore reefs and landscape profiles. Baudin, in 1801, entered Geographe Bay where natural history samples were collected and Aborigines were observed and studied.

Pastoral expansion from Perth southwards saw the establishment of settlements at Bunbury (1841) and Pinjarra (1830). Timber production followed, and in the 1840's licenses were required for the cutting of timber in certain areas.

The route traverses two physiographic regions, the coastal plain and the plateau. The coastal plain is a long, narrow lowland, made up of limestone ridges, sand dunes, sand plain, lakes, estuaries and rivers. Only at the edge of the plateau and along river courses are alluvial soils found. Because of their infertile soils, large areas of the coastal lowlands still remain undeveloped and in their natural state. The plateau has a distinct edge only along the Darling Scarp. In the south, the Whicher Range gradually descends to the plain.

Cities, towns, roads, railways, reservoirs, mines and other man-made structures have been added to the natural environment. The State capital, Perth, presents the most drastically transformed landscape, and is the centre that dominates the economic life of the region. South of Perth, most of the coastal plain has been cleared, especially as new farming techniques, irrigation systems and drains have allowed pastures to be established. Along the edge of the Darling Scarp, where alluvial soils are found, farms and towns have been established and connected by road and rail.

State forests bear the imprint of past and present development through clearings carved out in many places. Timber mill sites, many of them since reclaimed by the forests, were among the first interruptions to the landscape. Other clearing of

land has often followed the river valleys and roads. Less extensive, but more dramatic, have been the impact of bauxite, coal and tin mining. The plateau margin and coastal plain also bear the imprint of industrial development.

The geology, soils and vegetation of the Dale subdistrict have already been dealt with (Day 1). The annual rainfall ranges from 850 mm in the north to 1 000 mm in the south.

In the Drummond subdistrict (named after James Drummond, botanical collector in the early days of the Swan River Colony) the narrow strip of Recent or Pleistocene sand dunes carries scrub or low forests of *Agonis flexuosa* at the southern edge, with *Acacia* species and sand dune complex over most of its length. Inland and parallel to the coastal dune system is a narrow belt of coastal limestone hills, the natural habitat of *E. gomphocephala* woodland. This woodland has an understorey tree layer of *Banksia grandis* and *Agonis flexuosa*, with a sparse shrub layer. The greater part of the plain is mantled with aeolian sand. The northern sector carries a low forest formation of *Banksia menziesii-B.attenuata-Allocasuarina fraseriana-E. todtiana*, with a heath understorey, and smaller areas of *B. prionotes*. The southern part is dominated by a *E. marginata-E. calophylla* open forest or woodland, with a heath understorey, and smaller

areas of *Banksia* low forest. Poorly drained swampy areas carry *Casuarina obesa* low forest while *Actinostrobus pyramidalis* is of local significance. Swamp and fen communities include a number of sedge species. Watercourses in the district are fringed by *E. rudis* and *Melaleuca* spp.

Stop 1. From Margaret River proceed to Busselton, then along the Vasse Highway, which links Busselton to Nannup, for 17 km to reach the Whicher Range: open forest with *E.marginata*, *E. calophylla* and *E. haematoxylon**. Note also *Dasypogon hookeri*, *Xylomelum occidentale*, *Persoonia elliptica*, *Nuytsia floribunda*, *Xanthorrhoea preissii*, *Calothamnus sanguineus*, *Conostephium pendulum*, *Adenanthos barbigera*, *Hypocalymma robustum*, *Mesomelaena tetragona* and *Anarthria prolifera*.

Stop 2. Return to the Busselton-Bunbury road via Tutunup to reach the Ludlow State Forest: woodland with *E. gomphocephala** and *Agonis flexuosa*.

Stop 3. Proceed to Capel, and 10 km north, turn right to go to Boyanup. Six km from Boyanup, on the road to Dardanup: *E. mundijongensis** is present.

Stop 4. Proceed through Dardanup to return to the South-western Highway near Burekup and continue on to Harvey. Two-and-a-half km north of Harvey turn

right into Honeymoon Road. Eight or nine km along Honeymoon Road: *E. marginata-E. calophylla* open forest with *E. megacarpa** and *E. patens**.

Stop 5. Return to South-western Highway and continue northwards to Coolup. From Coolup follow the road leading eastwards and then northwards to join the Pinjarra to Dwellingup road. Proceed for 6 km eastwards along the Pinjarra to Dwellingup road, turn left into Scarp Road and continue along that road for 5 km: open forest with *E. laeliae**, *E. marginata* and *E. calophylla*.

Stop 6. Continue along Scarp Road until Del Park Road is reached, turn left and proceed along Del Park Road for 11.5 km. On the edge of the Darling Scarp: *E. lane-poolei** is present. Proceed to Perth.

Optional Trips

A. Kalgoorlie to the Trans-Australian Railway and return.

The route lies entirely in the Coolgardie botanical district, and passes through several pastoral leases in which wool production is the main industry. Ernest Giles explored the northern edge of the Nullarbor Plain during his crossing of the continent in 1875. The first sheep stations on the fringe of the Nullarbor were established in the 1880's, with the wool carted for shipment to Israelite Bay on the western edge of the Bight. Mason and Yonge in 1896 surveyed the Nullarbor when they went there to report on the spread of rabbits into Western Australia, and J. Muir in 1901 surveyed the route of the proposed transcontinental railway. The east-west rail link was completed in 1917. The construction of the road from Norseman to eastern Australia was completed in 1942. Before then the only link was along ungraded bush tracks linking pastoral stations. The road was sealed up to the South Australian border in 1965-69. The mean annual rainfall ranges from 252 mm at Kalgoorlie to less than 200 mm at Karonie which lies 110 km to the east.

The vegetation consists of *Acacia-Allocasuarina* scrub on ironstone, *Allocasuarina cristata* open woodland on ridges, mixed eucalypt woodland on the middle slopes,

and woodland with *E. salmonophloia, E. salubris, E. lesouefii* and *E. longicornis* on the lower slopes and flats. The main lower stratum vegetation in woodlands comprise mainly *Atriplex vesicaria, Maireana sedifolia* and *Cratystylis conocephala*. On less alkaline soils species of *Eremophila* and other shrub genera predominate.

Stop 1. Drive due east through Hampton Hill Station, and the abandoned township of Bulong. Note woodland, with *E. salmonophloia* and the *Atriplex-Maireana* understorey.

Stop 2. From Bulong, proceed in a south-easterly direction to meet the Trans-Australian Railway line. Follow the track than runs parallel to, and on the south side of, the line until Karonie. Proceed eastwards for a further 58 km: *E. woodwardii** is present on deep sandy loam or sand.

Stop 3. Return to Karonie, then head north for 4-5 km: *E. kruseana** and *E. brachyphylla**, restricted to granitic soils or rocky outcrops. Also present is *E. lucasii**. Return to Kalgoorlie.

B. Norseman to Balladonia and return

The route, from Norseman to Balladonia and return, is wholly within the South-western interzone or

Coolgardie botanical district. It follows the highway linking the south-west to eastern Australia.

The mean annual rainfall ranges from about 300 mm at Norseman to about 200 mm at Balladonia.

The hills near Norseman, and the Fraser Range to the east, consist of granulitic gneiss of Proterozoic age. Between then the country is somewhat flat and featureless, with a few rocky knolls or ridges, and occasional chains of salt lakes. The soils are sandy loams with silcrete fragments and silcrete gravels derived from the breakdown of a siliceous duricrust. The underlying geology is Archaean granite and metamorphic rocks. East of Fraser Range is an undulating landscape with a sequence of low ridges and depressions, with occasional granite outcrops to break the sequence. The soils are strongly calcareous. This undulating landscape gives way to a flat plain, with little microrelief. A few granite outcrops break through the limestone mantle which is overlain by a pink earth, very powdery when dry. The geology of the area east of the Fraser Range consists of Eocene-Miocene sediments, mainly limestone.

The vegetation of the Ranges consists of scattered trees of *Allocasuarina huegeliana* and *Pittosporum phylliraeoides* on the rockiest of hills. The sandier slopes carry an open shrubland with *E. griffithsii* and

a spinifex understorey layer with *Triodia scariosa*. *Eucalyptus dundasii* and *E. lesouefii* give way to *E. oleosa*, *E. transcontinentalis* and *E. flocktoniae* on red loam with areas of *E. salmonophloia* and *E. salubris* on floury calcareous soils.

Between the hills near Norseman and the Fraser Range the vegetation consists mainly of *Eucalyptus* woodland, with many of the species seen previously. East of the Fraser Range, woodlands again predominate, with *E. oleosa* being the most common and consistent species.

Stop 1. Leave Norseman, along Eyre Highway, and proceed east for 7 km to Jimberlana Hill: shrubland with *E. eremicola** and the undescribed *E. "platydisca"**, which has close affinities with *E. diversifolia*, a species not present in the study area. In woodland are *E. dundasii* and *E. concinna*. The shrub layer has a diversity of species.

Stop 2. A further 100 km east: *E. effusa**.

Stop 3. Two km further on: *E. fraseri**.

Stop 4. Twenty-seven km further east: *E. comitae-vallis**.

Stop 5. Fourteen km further along the highway: *E. cyclostoma**.

Stop 6. Thirty-five km further along the Eyre Highway: *E. balladoniensis**. This stop is about 30 km from the eastern limit of the South-western interzone. Beyond that is the Eucla botanical district of the Eremaean Province. Return to Norseman.

C. Esperance to Cape Le Grand and return.

The route, which lies within the Eyre botanical district, goes from Esperance to the Cape Arid and Cape Le Grand National Parks, and back.

The geology, soils, climate and vegetation of the Eyre botanical district have already been dealt with (Day 4).

Cape Le Grand National Park, of nearly 16 000 ha, is largely composed of Archaean granite and gneiss. It was set aside as a National Park mainly for its scenic beauty.

Cape Arid National Park, which occupies over 250 000 ha, is an area of botanical significance, as it is the type locality of many of Robert Brown's species which he collected there in 1801. The Park is rich in plant species which occur mainly in high shrubland vegetation and include several endemic to the Park.

Stop 1. From Esperance proceed for 64 km along Fisheries Road, leading eastwards to Israelite Bay. *Eucalyptus cooperana** is present on sand over limestone in high shrubland.

Stop 2. A further 9 km along Fisheries Road: *E. discreta** occurs on sand in high shrubland. This species is similar to *E. uncinata*, but with short pedicellate fruit.

Stop 3. Proceed for another 37 km, and just past Boyatup Hill is the turn-off to the track leading in a north-easterly direction to Mount Ragged. Proceed along this track for 30 km: *E. rugosa**, *E. cooperana* and *E. discreta*.

Stop 4. Return along Fisheries Road. Sixty-eight km west of the Mount Ragged turn-off, turn south and proceed for 12 km, then westwards for 8 km before heading south again to reach Cape Le Grand National Park: on or near the base of Mount Le Grand in shrubland or scrub are *E. aquilina**, *E. ligulata** and *E. insularis**. On the north side of the saddle, west of Mount Le Grand, in scrub, is *E. conferruminata*, a species similar to *E. lehmannii*, but with larger buds and fruit. Between Mount Le Grand and Frenchman's Peak is *E. goniantha* ssp. *globosa**. Return to Esperance.

D. Ravensthorpe to Johnston Lakes and return.

The route takes us through part of the Eyre and Roe botanical districts. It passes through farming country for much of the way. The farms on the heavier soils were first developed from about 1927 as part of the 3500 Farms Scheme. Dr L.J. Teakle, who was part of a team that assessed the land for salinity, warned that salt problems could arise.

Nonetheless, the scheme went ahead, but with the advent of the Depression in 1930 it was abandoned, and it was many years later that more extensive farming took place. With the development of farming the railway links to Newdegate and Hyden were completed in 1930. In 1951, the Newdegate Research Station was established and trials were conducted on "light lands". The results of these trails led to further agricultural development, and the alienation by the Crown of large areas of light land. There is still considerable pressure being brough to bear on the Government to further develop Crown Lands to the north and east of the present farming areas. This resulted in the setting up of trial plots in 1967 at Forrestania and south of the Johnston Lakes.

J.S. Roe first explored the area in 1849, while H.M. Lefroy travelled through the northern portion in 1863. The Johnston Lakes were named in 1901 by Frank Hann.

The rainfall diminishes from south to north and from west to east. Ravensthorpe has a mean annual rainfall of about 420 mm, Hyden about 340 mm, while Forrestania has less than 300 mm. The period in which average rainfall exceeds effective rainfall is 6 months for Ravensthorpe, about 4-and-a-half months for Hyden and about 3-and-a-half months for Forrestania. The difference between mean maximum and mean minimum temperatures is greater inland than near the coast.

The distinctive vegetation associated with the greenstone rocks around Ravensthorpe gives way, northwards, to high shrubland, high open shrubland and heath on sandplains, high shrubland on slopes which cover the bulk of the area, high shrubland and woodland on upper valley soils, woodland on lower valley soils, and woodland and halophytic communities of *Halosarcia* and *Atriplex* on saline and alkaline soils.

Around Forrestania is another greenstone belt with woodland, mainly comprising *E. salmonophloia* and *E. longicornis*, and to the east is a basin of interior drainage with woodland and high shrubland. Heath occurs on deep sands and shrubland on shallow soils over lateritic hardpan on high ground. Between Lake Hope and Johnston Lakes is yet another greenstone belt with *Allocasuarina* scrub on rocky knolls and woodland with *E. dundasii* and *E. longicornis* on the footslopes.

Also present is *E. corrugata*. The last vegetation type forms part of the South-western interzone or Coolgardie botanical district.

Stop 1. Proceed for 41 km northwards from Ravensthorpe on the road to Lake King: the very narrow-leaved species *E. formanii** is present.

Stop 2. A further 26 km on is a cross-road with one road leading west from Lake King towards Newdegate. Proceed for 12 km westwards along this road: *E. angustissima** can be seen growing in sand just west of the salt lake.

Stop 3. A further 13-14 km west: *E. loxophleba* ssp. *gratiae** is present.

Stop 4. Return to the Lake King cross-road and head north-west for some 64 km to reach Holt Rock. Head northwards for a further 2 km and take the north-west fork. Proceed for 35 km skirting the eastern edge of Lake Hurlstone, past Modesty Rock, Marble Rocks and Emu Rock, to arrive at a cross-road known as The Basin. Turn right here into the Hyden-Norseman road and proceed eastwards for 22 km. At this point there is a track that heads south. Follow the track for 3.7 km, then turn east and continue for 400 m: *E. steedmanii**, which was recently rediscovered after 40 years, occurs here.

Stop 5. Return to the Hyden-Norseman road and continue eastwards for 36 km: *E. brachycorys**.

Stop 6. A further 5 km: *E. deflexa**.

Stop 7. A further 38 km: *E. georgei**.

E. Ravensthorpe, through the Fitzgerald River National Park, to Jerramungup.

The route, which lies within the Eyre botanical district, goes from the old port of Hopetoun and from there through the Fitzgerald River National Park to Jerramungup. This leg of the route should only be attempted with a four-wheel-drive vehicle.

The botanical collector W. Baxter visited the general area occupied by the Fitzgerald River National Park in 1829, while other early botanical collections were made by James Drummond (1847 and 1948), J.S. Roe (1848) and George Maxwell (1863). Sir William Hooker, when he received Drummond's 1848 collection, announced that he had "rarely seen so great a number of fine and remarkable species arrive at any time from one country".

The vegetation around Ravensthorpe gives way southwards to tall open shrubland in which *E. tetragona* is the characteristic species on the sandy gravelly plains. Replacing it on deep sands are *Banksia speciosa* and *Lambertia inermis*. On the coastal dunes *E. angulosa* and *E. platypus* var. *heterophylla* make up a low closed woodland community. The Mount Barren ranges made up of Proterozoic metamorphosed rocks stand out above the plain. They carry scrub or high shrubland with a dense heath understorey.

The Fitzgerald River National Park which occupies about 245 000 ha contains over 1300 plant species of which some 300 species are endemic in the Eyre botanical district. At least 35 species are endemic in the Park, a large proportion of them restricted to the Mount Barren ranges. Aplin and Newbey (unpublished data) recorded 47 species of *Eucalyptus*, as listed in the Appendix. Of these, 20 are endemic in the Eyre botanical district, and 3 species are endemic in the Park: *E. burdettiana*, *E. coronata* and *E. sepulcralis*. They are restricted to the Proterozoic metamorphic rocks of the Mount Barren ranges. The elevated plains to the north of the Mount Barren ranges have soils derived from sedimentary rocks, particularly spongolite. The vegetation ranges from high shrubland to heath. Mount Drummond, in the northern portion of the Park, is an outlier of the Mount Barren series.

Stop 1. Proceed southwards to Hopetoun, then take road into Fitzgerald River National Park, past the southern edge of Culham Inlet. Note *E. platypus* var. *heterophylla* in the lee of coastal dunes. Arrive at East Mount Barren: scrub and heath with *E. preissiana*, *E. coronata**, *E. tetraptera*, *E. burdettiana**, *E. tetragona* and *E. doratoxylon*. Note also *Banksia sceptrum*, *B. coccinea*, *B. baxteri*, *B. bauerii* and *B. speciosa*, *Hakea victoriae*, *Pimelea physodes*, *Regelia velutina* and many other shrub species.

Stop 2. Approximately 11 km past East Mount Barren along the track in the Park: note the small slender trunk and the weeping habit of *E. sepulcralis**.

Stop 3. On reaching the route of the old telegraph line turn left and proceed in a south-westerly direction for 8 km. To the left is the Whoogarup Range, at the foot of which are *E. chrysantha** and *E. sepulcralis*, with other species of eucalypts in high shrubland.

Stop 4. A further 18 km is Woolbernup Hill, with Thumb Peak and Middle Mount Barren behind, to the south. On all three of these massifs in scrub and high scrubland are many shrub species of eucalypts: observe *E. acies*, which also occurs at Cheyne Beach.

Stop 5. Return along track for 4 km, then turn left into a track that heads north. Note the rich assemblages of shrub eucalypts and other shrub species along the route. The track goes past Mount Drummond to the old Ongerup Road which when followed westwards eventually leads to the main Ravensthorpe to Jerramungup Road. Continue to Jerramungup.

F. Albany to Stirling and Porongurup Ranges and return.

The route, which passes through part of the Menzies subdistrict and Eyre botanical district, goes from Albany to the Stirling Range and Porongurup Range National Parks before returning to Albany.

The vegetation of the Eyre botanical district and Menzies subdistrict has been dealt with previously (Days 4 and 6).

The Stirling Range National Park, covering 115 000 ha, is mountainous with the highest peak, Bluff Knoll, rising to 1076 m above sea level. These mountains support a mixed closed scrub or heath vegetation and the lower slopes and valleys are covered with eucalypt woodland, notably *E. marginata*, *E. calophylla* and *E. wandoo*. There are over 750 plant species recorded of

which 50 are endemic in the park. Hussey (1981) recorded 25 species of *Eucalyptus*, as listed in the Appendix, of which six are endemic in the Eyre botanical district and two in the Park, *E. talyuberlup* and *E. macrocera*.

The Porongurup National Park has an area of 2 239 ha, with the granite peaks rising to 700 m above sea level. In places the rocks are exposed as large boulders, but where soils are deep there is a high open forest. On the southern slopes and in the wetter gullies on the northern face this is dominated by *E. diversicolor*. Elsewhere *E. calophylla* and *E. marginata* are dominant, while around the granite outcrops they are replaced by *E. megacarpa* and *E. cornuta*.

Stop 1. Seven km from Albany, along the Albany-Borden Road: woodland with *E. staeri**, *E. marginata* and *Allocasuariana fraseriana*.

Stop 2. Proceed for a further 72 km along the Albany-Borden Road to Stirling Range National Park. Note high shrubland with *E. decurva** and diversity of flora on sandy gravelly soils.

Stop 3. Drive up to Bluff Knoll car park. Observe the scrub and heath, and panoramic view of Stirling Range.

Stop 4. Proceed along Stirling Range Drive for 19 km from the Albany-Borden Road: shrubland with *E. kalganensis**, *E. decurva*, *E. buprestium*, *E. calophylla*, *E. marginata* and *E. preissiana*.

Stop 5. Twenty-five km from previous stop along the Stirling Range Drive: woodland with *E. wandoo*, *E. macrocera**, *E. occidentalis*, *E. calophylla* and *E. marginata*. Note also occurrence of *E. talyuberlup** in shrubland.

Stop 6. 3.5 km from previous stop there is shrubland and heath with diversity of species. Note occurrences of *E. talyuberlup*, *E. preissiana*, *E. falcata* and *E. occidentalis*.

Stop 7. From the Stirling Range National Park proceed to the Porongurup Range, and observe open forest with *E. diversicolor*. Note tall understorey shrub layer with *Trymalium spathulatum*, *Albizia lophantha* and *Acacia urophylla* and the granite-derived red loam.

Stop 8. At the granite rock, 2.5 km along scenic drive in Porongurup Range National Park, note *E. cornuta* and various orchids, mosses and low herbs on shallow granitic soil. Return to Albany.

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APPENDIX

The 136 species of *Eucalyptus* present in the South-western province and Interzone are listed a alphabetically below.

+ C Corymbia
E Eudesmia
M Monocalyptus
S Symphyomyrtus

South-western Province and Interzone
* Ir Irwin District
Av Avon District
Da Darling District
Ro Roe District
Ey Eyre District
Co Coolgardie District

E Eremaean Province
O Outside Western Australia
St Stirling Range National Park
F Fitzgerald River National Park

Sub-genus+	Botanical Name	Common Name	Distribution*
S	*E. accedens* W.V. Fitzg.	Powder Bark wandoo	Ir Av Da
M	*E. acies* Brooker	Woolburnup mallee	Ey
S	*E. albida* Maiden & Blakely	White-leaved mallee	Av Ro Ey F
S	*E. anceps* (Maiden) Blakely	Kangaroo Island mallee	Av Ro Ey F O St F
S	*E. angulosa* Schau.	Ridge-fruited mallee	Da Ey E O St F
S	*E. angustissima* F. Muell.	Narrow-leaved mallee	Da Ey E O
S	*E. annulata* Benth.	Open-fruited mallee	Ro Ey Co St F
M	*E. aquilina* Brooker	Mt Le Grand mallee	Ey
S	*E. astringens* (Maiden) Maiden	Brown mallett	Av Ro Ey F
S	*E. balladoniensis* Brooker	Balladonia mallee	Co
S	*E. bennettiae* D. J. Carr & S.G.M. Carr		Ey
S	*E. brachycorys* Blakely	Cowcowing mallee	Av Ro
S	*E. brachyphylla* C.A. Gardn.		Co
M	*E. brevistylis* Brooker	Rate's tingle	Da
S	*E. brockwayi* C.A. Gardn.	Dundas mahogany	Co
M	*E. buprestium* F. Muell.	Apple mallee	Ey St F
S	*E. burdettiana* Blakely & Steedman	Burdett gum	Ey F
S	*E. burracoppinensis* Maiden & Blakely	Burracoppin mallee	Av Co
S	*E. caesia* Benth.	Gungurru	Av Co

Sub-genus+	Botanical Name	Common Name	Distribution
M	*E. calcicola* Brooker	Hamelin Bay mallee	Da
C	*E. calophylla* R. Br.	Marri	Av Da Ey St
S	*E. calycogona* Turcz.	Gooseberry mallee	Av Ro Ey Co F E O
S	*E. campaspe* S. Moore	Silver-topped gimlet	Co E
S	*E. celastroides* Turcz.	Mirret	Ir Av Ro Ey Co F
S	*E. cerasiformis* Brooker & Blaxell		Ro
M	*E. chrysantha* Blakely & Steedman	(hybrid *preissiana* x *sepulcralis*)	Ey
S	*E. clelandii* (Maiden) Maiden	Cleland's blackbutt	Ro Co E
S	*E. comitae-vallis* Maiden	Comet Vale mallee	Co E
S	*E. concinna* Maiden & Blakely	Victoria Desert mallee	Ro Co E O
S	*E. conferruminata* D.J. Carr & S.G.M. Carr		Ey F
S	*E. conglobata* (R.Br. ex Benth.) Maiden	Port Lincoln mallee	Av Ro Ey F O
S	*E. cooperana* F. Muell.	Many-flowered mallee	Ey
S	*E. cornuta* Labill.	Yate	Da Ey St F
M	*E. coronata* C.A. Gardn.	Crowned mallee	Ey F
S	*E. corrugata* Luehm.	Rough-fruited mallee	Co
S	*E. crucis* Maiden	Silver mallee	Av Co E
S	*E. cyclostoma* Brooker		Co E
S	*E. cylindriflora* Maiden & Blakely	White mallee	Ro Ey
S	*E. cylindrocarpa* Blakely	Woodline mallee	Ro Co
S	*E. decipiens* Endl.	Redheart	Av Da Ro Ey St F
S	*E. decurva* F. Muell.	Slender mallee	Av Ey St E
S	*E. deflexa* Brooker		Ro Ey
S	*E. desmondensis* Maiden & Blakely	Desmond mallee	Ey
S	*E. dielsii* C.A. Gardn.	Cap-fruited mallee	Ro Ey
S	*E. diptera* C. Andrews	Two-winged gimlet	Ro
S	*E. discreta* Brooker		Ey
M	*E. diversicolor* F. Muell.	Karri	Da
S	*E. doratoxylon* F. Muell.	Spearwood mallee	Ey St

Sub-genus+	Botanical Name	Common Name	Distribution
S	*E. drummondii* Benth.	Drummond's gum	Ir Da Av
S	*E. dundasii* Maiden	Dundas blackbutt	Co
S	*E. effusa* Brooker	Rough-barked gimlet	Co
S	*E. eremicola* Boomsma		Co E O
S	*E. eremophila* (Diels) Maiden	Tall sand mallee	Av Ro Ey Co F E
S	*E. erythrandra* Blakely & Steedman	(hybrid *angulosa* x *tetraptera*)	Ey
S	*E. erythronema* Turcz.	Red-flowered mallee	Av
S	*E. ewartiana* Maiden	Ewart's mallee	Av Co E O
S	*E. falcata* Turcz.	Silver mallet	Ir Av Ro Ey St
C	*E. ficifólia* F. Muell.	Red-flowering gum	Da
S	*E. flocktoniae* (Maiden) Maiden	Merrit	Av Da Ro Ey Co F
S	*E. foecunda* Schau.	Narrow-leaved red mallee	Ir Av Da Ro Ey Co F E O
S	*E. formanii* C.A. Gardn.		Ro Co
S	*E. forrestiana* Diels	Fuschia gum	Ro Ey
S	*E. fraseri* (Brooker) Brooker	Balladonia gum	Co
S	*E. gardneri* Maiden	Blue mallet	Da Ro Ey F
S	*E. georgei* Brooker & Blaxell	Hyden blue gum	Ro Co
S	*E. gomphocephala* DC.	Tuart	Da
S	*E. goniantha* Turcz.	Jerdacuttup mallee	Ro Ey
S	*E. gracilis* F. Muell.	Snap-and-rattle	Ay Ro Ey Co F E O
S	*E. griffithsii* Maiden	Griffith's grey gum	Co
S	*E. grossa* F. Muell. ex Benth.	Coarse-leaved mallee	Ro
S	*E. guilfoylei* Maiden	Yellow tingle	Da
C	*E. haematoxylon* Maiden	Mountain marri	Da
S	*E. halophila* D.J. Carr & S.G.M. Carr		Ro
S	*E. incrassata* Labill.	Lerp mallee	Av Da Ro Ey Co St F E O
M	*E. insularis* Brooker		Ey
M	*E. jacksonii* Maiden	Red tingle	Da
M	*E. kalganensis* Maiden	(hybrid *marginata* x *preissiana*)	Ey
S	*E. kondininensis* Maiden & Blakely	Kondinin blackbutt	Av

Sub-genus+	Botanical Name	Common Name	Distribution
S	*E. kruseana* F. Muell.	Book-leaf mallee	Co
S	*E. laeliae* Podger & Chippendale	Darling Range ghost gum	Da
S	*E. lane-poolei* Maiden	Salmon bark wandoo	Ir Da
S	*E. lehmannii* (Schau.)Benth.	Bushy yate	Ey F
S	*E. leptocalyx* Blakely	Hopetoun mallee	Ro Ey
S	*E. leptopoda* Benth.	Tammin mallee	Ir Av Co F E
S	*E. lesouefii* Maiden	Goldfields blackbutt	Co F
M	*E. ligulata* Brooker	Lucky Bay mallee	Ey
S	*E. longicornis* (F.Muell.) F. Muell. ex Maiden	Red Morrel	Av Ro Co E
S	*E. loxophleba* Benth	York gum	Ir Av Da Ro Ey Co F
S	*E. lucasii* Blakely	Barlee Box	Ir Co E
S	*E. macrandra* F. Muell. ex Benth.	Long-flowered marlock	Ey St F
S	*E. macrocera* Turcz.		Ey St
S	*E. macrocarpa* Hook	Mottlecah	Ir Av
M	*E. marginata* Donn. ex Sm.	Jarrah	Ir Av Da Ey St
M	*E. megacarpa* F. Muell.	Bullich	Da Ey St
S	*E. megacornuta* C.A. Gardn.	Warted yate	Ey F
S	*E. melanoxylon* Maiden	Black morrel	Ro Co E
S	*E. merrickiae* Maiden & Blakely	Goblet mallee	Ro Ey Co
S	*E. micranthera* F. Muell. Benth.	Alexander River mallee	Ey F
S	*E. mundijongensis* Maiden	(hybrid *gomphocephala* x *wandoo*)	Da
S	*E. myriadena* Brooker		Av Ro Ey Co
S	*E. newbeyi* D.J. Carr & S.G.M. Carr		Ey F
S	*E. nutans* F. Muell	Red-flowered moort	Ey F
S	*E. occidentalis* Endl.	Flat-topped yate	Av Da Ey St F
S	*E. oldfieldii* F. Muell.	Oldfield's mallee	Ir Av Co E
S	*E. oleosa* F. Muell. ex Miq.	Giant mallee, Ninghan mallee	Ir Av Ro Ey Co F E O
S	*E. orbifolia* F. Muell.	Round-leaved mallee	Co E O
S	*E. ovularis* Maiden & Blakely	Small-fruited mallee	Ro Co
M	*E. pachyloma* Benth.	Kalgan Plains mallee	Av Ey St F
M	*E.patens* Benth.	Yarri	Da

Sub-genus+	Botanical Name	Common Name	Distribution
S	*E. pileata* Blakely	Capped mallee	Av Ro Ey Co F E O
S	*E. platycorys* Maiden & Blakely	Boorabbin mallee	Ro Co
M	*E. "platydisca"*	(undescribed)	Ro Co
S	*E. platypus* Hook.	Moort	Ro Ey St F
M	*E. preissiana* Schau.	Bell-fruited mallee	Ey St F
S	*E. "pterocarpa"*	(undescribed)	Co
S	*E. redunca* Schau.	Black marlock	Ir Av Ro Ey Co St F
S	*E. rigidula* Maiden	Stiff-leaved mallee	Ir Av Ro Co E
S	*E. rudis* Endl.	Flooded gum	Ir Av Da St F
S	*E. rugosa* R.Br. ex Blakely	Kingscote mallee	Ey Co E O
S	*E. salmonophloia* F. Muell.	Salmon gum	Ir Av Ro Co
S	*E. salubris* F. Muell.	Gimlet	Ir Av Ro Co
S	*E. sargentii* Maiden	Salt river gum	Av
M	*E. sepulcralis* F. Muell.	Weeping gum	Ey F
S	*E. sheathiana* Maiden	Ribbon-barked mallee	Av Ro Co
S	*E. spathulata* Hook.	Swamp mallet	Av Ro Ey F
M	*E. staeri* (Maiden) Kessell & C.A. Gardn.	Albany blackbutt	Da
S	*E. steedmanii* C.A. Gardn.	Steedman's gum	Ro
S	*E. stoatei* C.A. Gardn.	Scarlet pear gum	Ey
S	*E. stowardii* Maiden	Fluted horn mallee	Av
S	*E. stricklandii* Maiden	Yellow-flowered blackbutt	Co
S	*E. talyuberlup* D.J. Carr & S.G.M. Carr		Ey St
E	*E. tetragona* (R.Br.) F. Muell.	Tallerack	Ir Ro Ey St F
S	*E. tetraptera* Turcz.	Four-winged mallee	Ey F
S	*E. torquata* Luehm.	Coral gum	Co
S	*E. transcontinentalis*	Redwood	Av Ro Ey Co F E
S	*E. uncinata* Turcz.	Hook-leaved mallee	Da Ro Ey St F
S	*E. wandoo* Blakely	Wandoo	Ir Av Da Ey St
S	*E. websterana* Maiden	Webster's mallee	Co E O
S	*E. woodwardii* Maiden	Lemon-flowered gum	Co
S	*E. xanthonema* Turcz.	Yellow-flowered mallee	Ey F

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