

**A
FLORA
AND
VEGETATION SURVEY
OF DONGOLOCKING NATURE
RESERVES
19889 AND 19890**

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1.0 INTRODUCTION

This report documents the flora and vegetation of reserves 19089 and 19090, two of the Dongolocking Group of Nature Reserves.

1.1 LOCATION

Reserves 19089 and 19090 are situated approximately 185 km south-east of Perth, in the Avon District of the South-West Botanical Province, as defined by Beard (1980). They join diagonally at one corner, but are separated by a gravel road. The closest towns are Dumbleyung, 26 km to the south south-east and Lake Grace some 50km to the east.

1.2 VESTING HISTORY

The reserves were established in 1929 for timber (Mallet) protection, the Mallet bark then being used for tanning. In 1959 a small excision was made from reserve 19089, presumably to accommodate the gravel road passing along its eastern boundary. The reserves remained unvested until 1972 when their purposes were changed to the 'Conservation of Flora and Fauna' and they were vested in the Western Australian Wildlife Authority.

1.3 REGIONAL AGRICULTURAL CLEARING

Much of the area surrounding Dumbleyung was taken up as pastoral leases by 1870, however it was not until the railway line reached Dumbleyung in 1907 that freehold agricultural land began to be taken up and cleared. Gentilli (1961) found that by 1961, clearing in Dumbleyung Shire had reached 61%, with 23% remaining as Crown Land. Since then alienation of Crown Land has continued in the region with for example, uncleared land within a 20km radius of the nearby Dongolocking reserves declining by a further 50% between 1961 and 1972 (Chapman 1978). This regional clearing has led to the reserves being almost completely surrounded by cleared farmland. Remnant bushland occurs in three small patches in adjacent paddocks but is not fenced and is therefore, probably grazed.

1.4 GRAZING AND FIRE HISTORY

Some of the woodland and forest areas of the reserves may have been used as grazing land in the last century but much of the vegetation is relatively impenetrable heath, or only supports a very sparse understorey. No other uses of the area appear to have been made.

No details of the fire history of the reserves are known but it appears that there has not been a fire in any part of the reserves for at least 20 years. Only one small area of woodland included regenerating trees (8-10 metres tall) and this area may have experienced a localised fire. Firebreaks are located on the boundaries of both reserves and in addition one runs north-south through Reserve 19089.

1.5 CLIMATE

The area in which the reserves lie has a Mediterranean climate, with hot, dry summers and cool, wet winters. Dumbleyung, the nearest town to the reserves, has an annual average rainfall of 401 mm, with 65% of this falling in the months from May to September (Bureau of Meteorology, 1986). An average of 91 raindays per year are recorded at Dumbleyung with at least 2 raindays occurring in each month. It is likely that Reserves 19089 and 19090 receive slightly less rainfall than Dumbleyung as they are north and east of the town. Rainfall data is incomplete for 1985 but in 1984 rainfall was well below average with only 308 mm being received. Lake Grace township, the nearest official temperature recording station, has mean maximum temperatures rising to 31.9°C in January with mean maxima in July being 15.8°C. Very cold winter minimum temperatures may be experienced with occasional light frosts occurring, especially in low lying areas.

1.6 PHYSIOGRAPHY AND GEOLOGY

The reserves lie on a gently undulating area of the Darling Plateau, which is the surface expression of the Yilgarn Block, an ancient (Archaen) rigid shield of granite and gneiss with some altered volcanics and sediments (Williams 1975). They contain remnants of the original lateritised peneplain of the shield, eroded to form breakaways. These breakaways have steep gradients with drops of up to 10 metres, however the remainder of the reserves have gentle topography. The maximum height is 380 metres above sea level and the minimum height of 310 metres occurs on the southern and eastern edges of Reserve 19090. Figure 1 shows the contours of the area.

1.7 SOILS

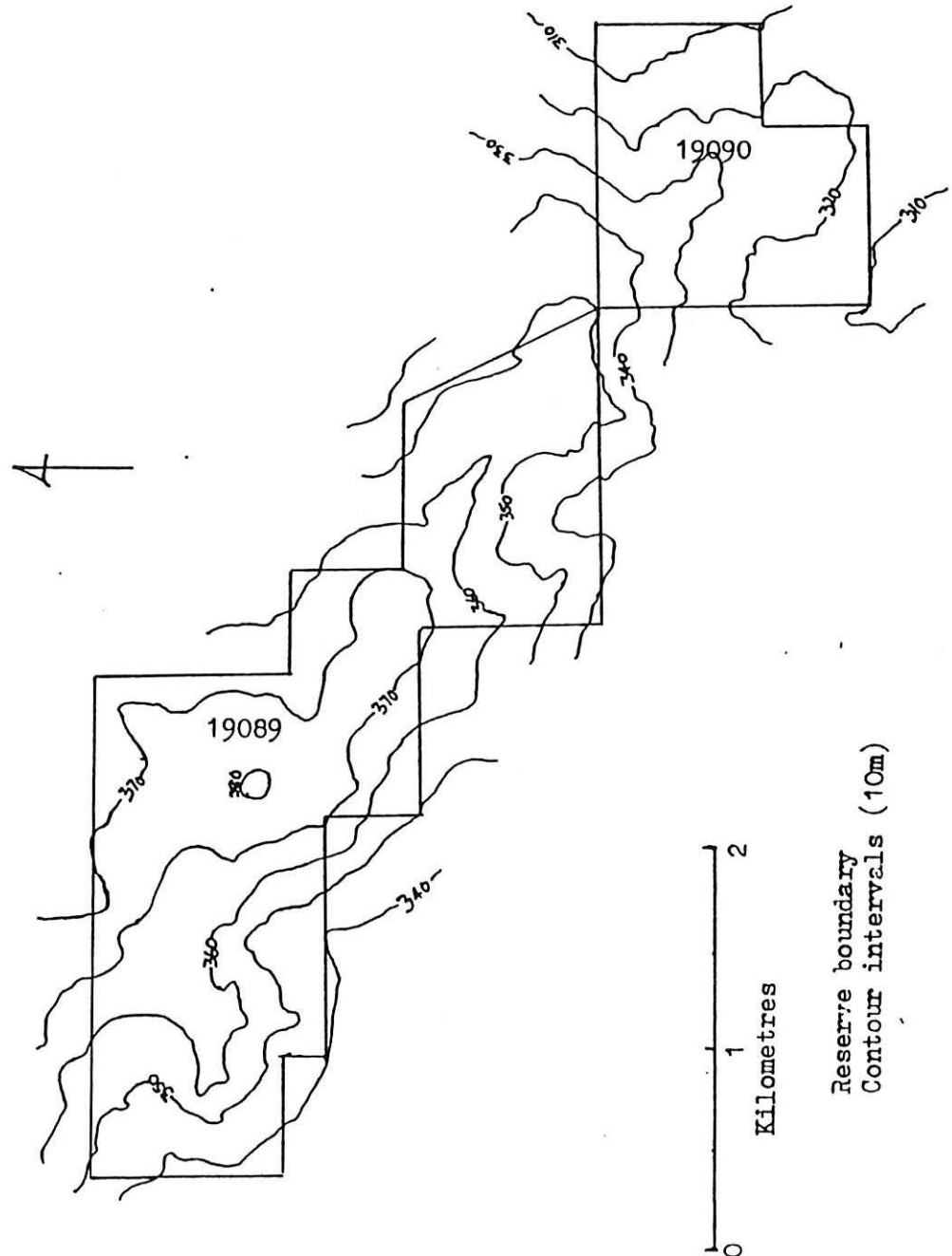
Approximately fifty percent of the surface of the reserves has lateritic soils formed from the exposure of a laterised layer of an older soil profile. In three small areas this is overlain by grey-white, sandy soils on which there are areas of sand-plain vegetation. Underneath the laterite, "pallid-zone" clays have developed. These are exposed on the breakaway slopes and in broader areas are the parent materials of common soil types. The remainder of the soils are hard-setting loams with clayey sub-soils.

1.8 GRAVEL PITS AND RUBBISH DUMPS

Two gravel pits and two rubbish dumps were observed in the reserves. The gravel pits have been extensively used in the past and the largest appears to have been used within the last few years. A rubbish tip in a trench on a north-east corner of Reserve 19089 was still in use during the survey.

FIGURE 1 - TOPOGRAPHY

(From Lands and Surveys Moulyinning Sheet 2431-1)



2.0 METHODS

The vegetation mapping was based on the field interpretation of black and white aerial photographs of a scale of 1:15,000. After a preliminary inspection of the reserves extensive foot and vehicle traverses (the latter only on existing tracks) were made through the reserves to correlate areas of different photo-texture and colour with different vegetation units. The boundaries of the units were marked directly onto the aerial photographs in the field to ensure the maximum possible accuracy in compiling the map. In the course of the traverses, data was collected on the floristic composition, cover and structure of the vegetation as well as observations on the soil, aspect and slope at some 77 sites. Using the data collected at the vegetation recording sites, the units observed in the field were classified using the system of Specht (1970) as modified by Aplin (1979). A further modification was made in the application of the Specht system, to give recognition to the distinctive mallee form. A grouping using this (i.e. mallee) name was made at the formation level (see Table 2). Site descriptions using the system of Muir (1977) were prepared to enable interpretation of the map units and appreciation of the variation of the vegetation of the study area.

The forest and woodland stands were not divided (they were referred to as Forest / Woodland) as otherwise very similar stands (or parts of stands), would have been separated because of a difference of only a few percent in the estimated cover - which would not be accurate to this very fine level any way,

The flora survey was carried out in conjunction with the vegetation survey with most specimens being collected at the vegetation recording sites. Some common species were not collected in the field as their identity was known. Those collected were pressed, dried and identified by keying out and comparison to named specimens at the Western Australian Herbarium.

The survey was carried out in one five day visit from the 14th to 18th of April 1986.

3.0 LIMITATIONS

Some relatively small areas of the reserves could not be visited due to the lack of time, the vegetation map for these parts of the reserves was based on extrapolation from areas of similar texture and colour on the aerial photographs.

The flora list for the reserves is relatively incomplete because of :-

- (1) the relatively limited time available for collection of flora apart from at vegetation recording sites,
- (2) the timing of the survey which was carried out in mid-April, i.e. at the end of Summer when little is in flower and cryptophytes and therophytes are virtually not available to be collected.

4.0 FLORA SURVEY

4.1 FLORA RECORDED

Two hundred and five native plant species from eighty-one genera in thirty-seven different families were recorded from the reserves during the flora survey. They are listed in Appendix 2, and include several species which could not be identified as only sterile material was available. One gazetted rare species and two geographically restricted species were recorded as well as other species of interest. No introduced species were recorded.

The flora list is dominated by two of the major families of the South-West Botanical Province; Myrtaceae and Proteaceae. The Myrtaceae were represented by 57 species in 10 genera, including 18 *Eucalyptus* species which provided the dominants of the variety of forest, woodland and mallee associations. The Proteaceae were represented by 51 species in 11 genera the most important being *Hakea* (15 species), *Dryandra* (12 species) and *Petrophile* (6 species). Many of the genera of Myrtaceae, including *Melaleuca* (15 species) and *Verticordia* (7 species) were predominantly found in the species-rich heathlands although *Melaleuca* species also formed understorey layers in some of the forest and woodland areas.

There is a large gap between the number of species recorded for the Proteaceae and Myrtaceae and the number for the Papilionaceae (8 species) and Epacridaceae (6 species) which are also usually prominent in the vegetation of the South-West Botanical Province. This is partially due to the timing of the field work and the bias in the sampling towards species important in the structure of the vegetation. As many Papilionaceae and Epacridaceae are inconspicuous when not in flower they would have been easily overlooked if they were not present at recording sites. In addition, many are small shrubs so that their contribution to the structure of the vegetation is lower. Mimosaceae (the wattles), another important family in the flora of the South-West Botanical Province, was represented by thirteen species.

All the families discussed above are dicotyledon families, and this major plant group forms the bulk not only of the vegetation of the reserves, but also of the flora recorded. Only three monocotyledon families, Cyperaceae (9 species), Liliaceae (7 species) and Restionaceae (4 species) are represented by more than two species.

TABLE 1 - Number of Species Recorded for the Different Plant Families Found in the Study Area.

FAMILY	NO. OF SPECIES
Myrtaceae	57 (Eucalyptus 18, Melaleuca 15, Verticordia 7)
Proteaceae	51 (Hakea 15, Dryandra 12, Petrophile 6)
Mimosaceae	13
Cyperaceae	9
Papilionaceae	8
Liliaceae	7
Epacridaceae	6
Casuarinaceae	5
Asteraceae	5
Restionaceae	4
Santalaceae	3
Rutaceae	3
Rhamnaceae	3
Sapindaceae	3
Chloanthaceae	3
Lamiaceae	3
(The remaining 20 families have one or two species each)	

4.2 DIVERSITY OF THE FLORA

A crude measure of the diversity of the flora of the reserves forming the study area can be obtained by calculating the ratio of the number of species present to the area in square kilometres. This gives a figure of 33.3 species per square kilometre for the reserves which have a total area of 615 ha (6.15 square km).

This figure compares very favourably with other reserves in the wheatbelt. For example Muir

(1980) gives a figure of 28 species per km^2 for Dongolocking Nature Reserve (including Reserves 19096, 19083, 19082 and 10473) and states that this was the highest figure recorded for any of the reserves examined by him. In another paper, Muir (1977) suggests that higher values of the ratio of species per km^2 may occur on the western (high rainfall) edge of the wheatbelt (e.g. Tutanning Reserve with 22 species/ km^2) with declining numbers as one moves east. This seems not to be the case when data from the two groups of Dongolocking reserves and the Corrigin Water Reserve (Napier and Coates, 1986) are taken into account.

Given the sensitivity of the total species to area ratio to :-

- (1) overall size, where large reserves would be expected to have a lower value than small reserves;
- (2) vegetation diversity and type, where reserves with uniform vegetation would be expected to have lower values than those with a variety of associations, and the presence of species-rich formations such as heaths found on laterite would produce high values;

then it is suggested that the index is too crude to resolve the question of whether or not there is an overall gradient of species diversity from west to east in the wheatbelt. Given the known variation in species richness between the different formations found in the wheatbelt (Muir 1977, 1980) it would be more useful to investigate this question for different formations using a more sophisticated technique. However, the ratio may still be useful as a crude index of the value of particular reserves for the conservation of plant species.

4.3 SPECIES OF INTEREST

4.3.1 Gazetted Rare Species

One gazetted rare species was collected in the study area. This was *Pomaderris bilocularis*, which has only previously been recorded from the Tutanning Nature Reserve (Rye and Hopper, 1981) and more recently at Corrigin Water Reserve (Napier and Coates, 1986). The species was only seen at Site 28, in a mallee/heath. It was not common at this location.

It is possible that other gazetted rare (or geographically restricted) species occur on the reserves. A number of gazetted rare species of Orchidaceae for example occur within 50 km of the reserves and might be found on the reserves if searches were made during their flowering seasons.

4.3.2 Geographically Restricted Species

Two species listed as geographically restricted by Millar (1982) were found. *Dryandra cynaroides* had previously been recorded at Corrigin and between Brookton and Woodanilling. This plant was collected in two laterite heath locations and because of its similarity to the more common species *Dryandra vestita* may have been overlooked at other sites. Good numbers of the species were seen.

Another species recorded which is not widely distributed is *Melaleuca conferta* which has a range of 140 km between Kulin and Newdegate, a little to the east of the reserves surveyed. Only one collection was made and no record of the number of plants in the area is available.

4.3.3 Poorly Known Species

An undescribed *Baeckea* species [AN751] was collected in shrubland at site 30 and noted to comprise 1% of the heath layer at that location. Only two previous collections have been made, both in the wheatbelt (M. Trudgen, pers. comm.).

Lasiopetalum microcardium, which is only represented by five collections at the W.A. Herbarium, was also recorded.

4.3.4 Range Extensions

The known ranges of three species were extended by collections made during the survey. These are *Acacia brachyclada*, whose range has been extended to the south-west of previous collections (B. Maslin, pers. comm.) and *Hakea laurina* which previously had not been collected north of the Stirling Range and whose main area of distribution is between Jerramungup and Esperance. The third species whose range was extended is the *Baeckea* sp. [AN751] commented on above, which had only been collected further north.

4.3.5 Introduced Species

No introduced species were collected during the survey. This was due to a combination of two factors; the timing of the survey during late summer when annual species were not available and the extremely good condition of the reserves (see below) which would have restricted the invasion of weeds.

5.0 VEGETATION SURVEY

5.1 INTRODUCTION

Many of the common wheatbelt formations were found on the reserves. Five major formation groups were recorded, these being Forests, Woodlands, Mallee (Low Woodlands and Low Forests of Specht, 1970), Shrubland and Heath. Within these groups sixteen formations defined using the height and canopy cover levels of Aplin (1979) were observed. Within these sixteen formations, thirty seven plant associations were delineated from a total of 77 site recordings. The major formation groups and their associations are listed below in Table 2. The associations are often quite broadly defined (see limitations, above) and different stands may be included in different height and/or canopy cover formations of Specht (1970). Table 3 lists the formations recorded on the reserves and the sites which represent them. Detailed descriptions of each association and each site are given below.

Mallee and heath formations were very well represented on the reserves both in terms of diversity (13 mallee and 12 heath associations) and area covered. Extensive areas of woodland/forest (ten associations, including five mallee associations) were also mapped, but many mallee populations were too small to map. The least well represented formation was that of shrubland, with only two associations being recorded and the area covered by them being very small.

Some areas of the reserves were difficult to place in major formations due to mixtures of structural elements and plant species. These occurred as interzones between heath and shrublands, and especially between heath and mallee areas. Non-mappable mosaics occurred on both reserves. Maps 1 and 2 show the distribution of the different associations on the reserves and indicate the vegetation recording site locations.

5.2 SYNOPSIS OF THE VEGETATION

5.2.1 Forest / Woodland

These associations occurred generally on the hard-setting sandy loams in the lower lying areas of the reserves. The three major upper stratum species were *Eucalyptus longicornis*, *E. wandoo* and *E. salmonophloia*. Understorey layers were characteristically sparse and included low scattered sedges, annual grasses and members of the Asteraceae. In some associations thickets or patches of various *Melaleuca* species occurred as a distinct layer but these areas were generally unmappable due to their small size. Additionally, areas of mixed mallee species also occur below tree canopies, usually on formation boundaries.

TABLE 2 - LIST OF VEGETATION ASSOCIATIONS

FOREST/WOODLAND

- F/W1. *Eucalyptus longicornis*, *E. wandoo* Woodland to Open Forest
- W 2. *Eucalyptus salmonophloia* Open Woodland to Woodland
- W 3. *Eucalyptus wandoo* Low Open Woodland
- F/W4. *Eucalyptus longicornis* Open Woodland to Open Forest
- W 5. *Eucalyptus longicornis*, *E. wandoo*, *E. salmonophloia* Woodland
- F 6. *Eucalyptus astringens* Low Open Forest
- F 7. *Eucalyptus falcata* Low Open Forest
- F 8. *Eucalyptus falcata*, *E. gardneri* Low Open Forest
- F 9. *Eucalyptus falcata*, *E. gardneri*, *E. astringens* Low Open Forest
- F 10. *Eucalyptus gardneri* Low Open Forest

MALLEE (LOW WOODLANDS, LOW OPEN FORESTS AND LOW CLOSED FORESTS)

- M 1. *Eucalyptus falcata*, *E. incrassata*, *E. albens* Low Woodland
- M 2. *Eucalyptus leptophylla* Low Woodland
- M 3. *Eucalyptus phenophylla*, *E. leptophylla*, *E. conglobata* (or any 2)
Low Open Forest
- M 4. *Eucalyptus conglobata* Low Open Forest
- M 5. *Eucalyptus phenophylla* Low Woodland
- M 6. *Eucalyptus flocktoniae*, *E. conglobata* Low Open Forest
- M 7. *Eucalyptus albens* Low Woodland
- M 8. *Eucalyptus conglobata*, *E. eremophila* Low Closed Forest
- M 9. *Eucalyptus incrassata* Low Woodland
- M 10. *Eucalyptus phenophylla*, *E. aff. occidentalis* Low Closed Forest
- M 11. *Eucalyptus flocktoniae*, *E. incrassata* Low Open Forest
- M 12. *Eucalyptus incrassata*, *E. leptophylla* Low Open Forest

SHRUBLAND

- S 1. *Leptospermum erubescens* Shrubland to Open to Closed Scrub
- S 2. *Lambertia inermis* High Shrubland to Open Scrub

HEATH

- H 1. Mixed (*Hakea* spp., *Dryandra* spp., *Banksia baueri*) Low Open Heath to Open
Shrubland to Shrubland
- H 2. *Hakea subsulcata* Open Heath
- H 3. *Beaufortia interstans*, *Dryandra* spp. Low Shrubland to Low Open Heath
- H 4. *Beaufortia incana*, *Hakea crassifolia* Low Open Heath to Shrubland
- H 5. *Melaleuca pungens* Low Open Heath
- H 6. *Melaleuca pungens*, *Beaufortia incana* Low Closed Heath

- H 7. *Dryandra* spp., *Hakea* spp. Low Open Heath
- H 8. *Allocasuarina microstachya* Low Open Shrubland
- H 9. *Beaufortia interstans* Low Open Heath
- H 10. Mixed Low Shrubland
- H 11. *Petrophile ericifolia* Open Heath
- H 12. *Eremaea pauciflora*, *Calytrix fraseri* Low Open Heath
- H 13. *Petrophile squamata* Low Open Heath
-

The distinct mallet associations, the upper strata of which were often monospecific, are also included in this group. *Eucalyptus astringens* (brown mallet), *E. gardneri* (blue mallet) and *E. falcata* (silver mallet) form dense stands on laterite breakaways throughout the southern wheatbelt and occur in this way on Reserves 19090 and 19089. Some very large and mature plants of *Eucalyptus astringens* (to 20 m) were noted at the western end of Reserve 19089 and a number of very dense young stands of both *E. astringens* and *E. gardneri* were also seen (Photo. one).

5.2.2 Mallee

Extensive mallee areas occur on both reserves. The mallee associations are all under 10 m in height and generally fall into the Low Open Forest formation of Specht. Pure mallee associations occur predominantly on the pallid zone clays below laterite breakaways and have very sparse, or totally non-existent understories. The most common mallee appeared to be *Eucalyptus conglobata* forming dense, often monospecific stands directly downslope from mallet populations. A second common species was *Eucalyptus phenophylla* (manuscript name, Brooker and Hopper), often occurred with *E. conglobata*. *E. incrassata* (Lerp mallee), was frequently collected but usually only occurs in thin bands at the edge of heaths or scattered throughout shrublands and heaths. *Eucalyptus* aff. *occidentalis* was collected only once.



Photograph One :

Showing a dense mallet stand of
Eucalyptus astringens (brown
 mallet) and *E. gardneri* (blue mallet)

5.2.3 Shrubland

The relatively small areas of shrubland which were recorded occurred as bands or patches of *Leptospermum erubescens* or as larger areas of shrubs over heath where *Lambertia inermis* was the dominant or highest stratum. The latter species varied in height up to 4 m and occurred mostly on the northern, sandplain area of Reserve 19089.

TABLE 3 - VEGETATION FORMATIONS ON THE RESERVES WITH REPRESENTATIVE SITES

(after Specht, as modified by Aplin, with further modification to separate mallees)

	Description (projective foliage cover of tallest stratum)	Site Nos.
Trees over 10 m	Open Forest (30-70%)	8, 13
	Woodland (10-30%)	9, 25, 43, 47, 69
	Open Woodland (<10%)	14, 41, 62
Trees under 10 m (Mallees)	Low Closed Forest (70-100%) [dense mallee]	51, 61
	Low Open Forest (30-70%) [mallee]	12, 15, 16, 18, 19, 22, 24, 27, 30, 31, 37, 40, 42, 44, 45, 50, 64, 68, 77, 29
	Low Woodland (10-30%) [mallee over heath]	4, 6, 26, 33, 36, 46, 54, 66, 70
	Low Open Woodland (<10%)	7, 23, 38, 55, 75
Shrubs over 2 m	Open Scrub (70-30%)	10
	High Shrubland (10-30%)	57
	High Open Shrubland (<10%)	35, 76
Shrubs 1 - 2 m	Closed Heath (70-100%)	48, 59
	Open Heath (30-70%)	2, 5, 11, 34, 39, 67, 71
	Shrubland (10-30%)	3, 28
Shrubs under 1 m	Low Closed Heath (70-100%)	63, 74
	Low Open Heath (30-70%)	1, 17, 20, 21, 32, 52, 53, 56, 58, 65, 72, 73
	Low Shrubland (10-30%)	49, 60

5.2.4 Heath

Many of the heath areas throughout the reserves are very mixed and dominant species were not always obvious. As is common on lateritic areas in the south-west, species of the families Proteaceae and Myrtaceae dominate with those of the Proteaceae being most common in this case. Mixed *Dryandra* - *Hakea* heath areas were widely distributed with common species in the Myrtaceae being *Meisaleuca pungens* and *Beaufortia interstans*. Three heath groups were defined by soil type, these are sand, laterite and poorly drained loam. Laterite heaths were the most widespread with only two areas of sand heath and three small areas of low heath in poorly drained loamy areas.

The most abundant species in the sand heath areas were from the genera *Verticordia*, *Baeckea* and *Calytrix* and members of the family Restionaceae and those in the heaths on laterite were from the Proteaceae. Whereas those in the low heaths generally included *Allocasuarina microstachys*, *Lepidosperma* and *Schoenus* species.

5.3 VEGETATION OF THE STUDY AREA

5.3.1 Woodland / Forest Associations

F/W1. *Eucalyptus longicornis* (Morrell), *E. wandoo* (Wandoo)

WOODLAND to OPEN FOREST

This very broadly defined vegetation type occurs on a range of soils, including grey and grey-brown sandy loams, and pink-beige sandy loams with lateritic pebbles in small areas in the south-western areas of Reserve 19089. It varies in the height and density of the two dominant overstorey species. *Eucalyptus longicornis* varies from 12-25 m and between 5 and 40% cover while *E. wandoo* ranges from 10-18 m and 7-10% cover. The understorey is generally sparse and low and includes sedges and low shrubs such as *Dodonaea humifusa*, *D.*

attenuata and *Grevillea patentiloba* with occasional patches of *Allocasuarina campestris* and shrubs of *Gastrolobium crassifolium*, the herb *Borya nitida* and the small sedges *Schoenus brevisetis* and *Loxocarya flexuosa*.

SITE 8

Muir Description - Low Forest A on grey sandy loam.

S1 - Young *Eucalyptus longicornis* trees to 12 m and up to 40% cover with occasional *E. wandoo* and *Acacia acuminata* to 10 m.

S2 - A very scattered understorey of *Loxocarya flexuosa* (0.1 m) and *Dodonaea attenuata* to 0.8m.

SITE 43

Muir Description - Woodland on pink/beige sandy-clay loam with 20-30% cover of laterite pebbles.

S1 - *E. longicornis* to 25 m and 5% cover with *E. wandoo* to 18 m and 10% cover.

S2 - Very scattered plants of *Hakea dissocarpa* to 1.5 m, < 2% cover.

S3 - Occasional plants of *Grevillea patentiloba* (30 cm), *Dodonaea humifusa* and *Lepidospermum* sp.

Comment - Occasional patches of *Allocasuarina campestris* (2 m and 50% cover) occur.

SITE 47

Muir Description - Low Forest A over Very Open Low Sedges on grey/brown sandy loam.

S1 - *E. wandoo* to 14 m and 7% cover. *E. longicornis* regeneration 8-10 m and < 30% cover.

S2 - Occasional plants of *Gastrolobium crassifolium* (1 m) and *Schoenus brevisetis* with *Borya nitida* < 5% and *Loxocarya flexuosa* < 10%.

W2. *Eucalyptus salmonophloia* (Salmon Gum) OPEN WOODLAND - WOODLAND

This vegetation unit occurs in conjunction with breakaways and often below or near mallet stands, on gravelly pink-brown to brown loams. The Salmon Gum (18 m) varies in cover from 5-20% and occurs over a dense mallee layer of *Eucalyptus conglobata* (6-8 m), which gives this unit its characteristic appearance. The understorey is very sparse with occasional shrubs of *Grevillea patentiloba* and the low matt shrub *Acacia erinacea*.

SITE 62

Muir Description - Woodland over Tree Mallee on gravelly brown/pink loam.

S1 - *Eucalyptus salmonophloia* to 18m and 5-10% cover.

S2 - *E. conglobata* 6-8 m and 50-60% cover.

Very occasional plants of *Grevillea patentiloba* and *Acacia erinacea*.

SITE 69

Muir Description - Woodland over Tree Mallee on brown loam with 100% laterite pebble surface.

As for Site 62 with *E. salmonophloia* up to 20% cover.

W3. *Eucalyptus wandoo* (Wandoo) LOW OPEN WOODLAND

This vegetation type occurs on a range of topographic situations and a variety of soils from grey-brown sandy loams through grey-brown loams to grey sandy loam with lateritic pebbles over clay. It appears to occur between larger areas of other formations. It is often in low lying areas prone to waterlogging. The Wandoo changes from an open layer (8-10 m) with emergent *Eucalyptus longicornis* through *E. wandoo* (15-18 m) over an open secondary tree layer of Jam (*Acacia scuminsla*) to a mid-dense Wandoo (8-10m) with no second tree layer. The wandoo is generally stunted and poor.

The understories ranged from low, open shrublands of *Cryptandra leucophracta* with the sedge *Lepidosperma brunonianum* and herbs of *Agrostocrinum scabra* and annual Asteraceae to low open shrubs layers dominated by *Calytrix ? oldfieldii* to mid-dense shrub layers including *Leptospermum erubescens*, *Phlebalium tuberculatum*, *Dryandra armata*, *Isopogon buxifolius*, *Petrophile squamata*, *Gastrolobium crassifolium* and *Calytrix lechenaultia*.

SITE 7

Muir Description - Open Low Woodland A over Very Open Low Sedges and Very Open Herbs on grey/brown loam

S1 - *E. wandoo* 8-10 m with 5-7% cover and *E. longocornis* 12 m and 2%.

S2 - Occasional *Acacia acuminata* and mallees to 5 m.

S3 - *Lepidosperma brunonianum* < 60 cm and 5% cover with *Cryptandra leucophracta* (10 cm), *Agrostocrinum scabra* and annual Asteraceae to 5%.

Comment - Many dead trees of Wandoo and Jam apparently due to waterlogging.

SITE 9

Muir Description - Woodland over Open Low Woodland A over Open Dwarf Scrub C.

S1 - *E. wandoo* 15-18 m and 15% cover.

S2 - *Acacia acuminata* to 8 m and 2% cover.

S3 - *Calytrix ? oldfieldii* to 40 cm and < 10% cover in patches.

Comments - Occasional plants of *Hakea lissocarpa* and *Leptospermum erubescens* to 2 m. This area appears to be an interzone between heath and woodland but is patchy and poorly drained.

SITE 23

As for Site 7 with the addition of senescent patches of *Melaleuca uncinata* to 2 m. The area is

prone to waterlogging. Clay/loam soil.

SITE 38

Muir Description - Open Low Woodland A over Low Heath C on grey sandy loam with 30% laterite over clay.

S1 - Young *E. wandoo* to 6m with occasional mallee sp.

S2 - *Isopogon buxifolius* (2%), *Dryandra armata* (10%), *Leptospermum erubescens* (30%) and *Phebalium tuberculatum* (20%) with other heath species.

Comments - Transition zone between woodland and heath.

SITE 75

Muir Description - Low Woodland A over Low Heath C on pale grey-brown loamy sand.

S1 - *E. wandoo* to 8-10 m and 10-20% cover.

Remainder is similar to Site 38 with the addition of *Petrophile squamata* 1 m (3%), *Gastrolobium crassifolium* and *Calytix leschenaultii*, 2%.

Comments - A small interzonal area between woodland and heath areas.

F/W4. *Eucalyptus longicornis* (Morrell) OPEN FOREST - OPEN WOODLAND

This vegetation type occurs on grey-brown sandy loam with either a fine, quartz gravel surface or with scattered lateritic surface pebbles. It is really a complex of associations distinguished only by its overstorey of *E. longicornis*. Its lower stories can consist of mallees, occasional thickets of *Melaleuca* spp. or scattered low shrubs. The *E. longicornis* varies in height from 12-20 m and in cover from 5-31%. Where the percentage cover of *E. longicornis* is high the understorey consists of scattered low shrubs (e.g. Site 13) such as *Allocasuarina erinacea*, *A. brachyclada* and *Templetonia sulcata*. Where the percentage cover of *E. longicornis* is low, denser mallee and *Melaleuca* understories occur. The three sites recorded illustrate some of this variation. Site 13 has a mid-dense, upperstorey of *Eucalyptus longicornis*.



Photograph Two : *Eucalyptus longicornis* (Morrell) Open Woodland. [Site 13]

(15 m) over a sparse understorey including the shrubs *Acacia brachycarpa*, *Templetonia sulcata*, *Phlebotium filifolium* and the low mat shrub *Acacia erinacea*. Site 14 has an open, upperstorey of *Eucalyptus longicornis* (12 m), a second tree layer of the mallees *Eucalyptus conglomerata*, *E. flocktoniae* and *E. leptophylla* over a patchy understorey of *Melaleuca sedata* and *M. cardiophylla* (1.5 m) forming dense isolated patches, over scattered low shrubs. Site 41 has a tall, open canopy of *Eucalyptus longicornis* (20 m) over a moderately dense, lower tree layer of the mallees *Eucalyptus conglomerata* and *E. leptophylla* (5-6 m). The understorey is open with very occasional patches of *Melaleuca sedata*.

SITE 13

Muir Description - Low Forest A over Thicket/Heath A on grey brown sandy loam with fine quartz gravel surface.

S1 - *E. longicornis* to 15 m and 31% cover.

S2 - *Melaleuca* sp. (AN660) to 2.5 m and up to 40% cover.

S3 - Very scattered shrubs to 0.5 m including *Acacia brachyclada*, *Templetonia sulcata*, *Phebalium filifolium*, *Acacia erinacea*.

SITE 14

Muir Description - Open Low Woodland A over Tree Mallee over Dense Heath B on grey brown sandy loam with scattered laterite pebbles.

S1 - *E. longicornis* to 12 m and 5% cover.

S2 - *E. conglobata*, *E. flocktoniae* and *E. leptophylla* 6-8 m and 50% cover.

S3 - *Melaleuca adnata*, *M. cardiophylla* to 1.5 m and up to 80% cover in patches with scattered low shrubs.

Comments - This site is representative of areas of *E. longicornis* open woodland with dense patches of mallee and *Melaleuca* understorey. Scattered thickets of *Melaleuca* occur throughout the association. Occasional *E. salmonophloia* also occur.

SITE 41

Muir Description - Open Woodland over Tree Mallee.

S1 - *E. longicornis* to 20 m and 5% cover.

S2 - *E. conglobata* - *E. phenophylla* to 5-6 m and 40% cover.

Comment - Dense bark and twig litter is found in this area.

**W5. *Eucalyptus longicornis* (Morrel), *E. salmonophloia* (Salmon Gum),
E. wandoo (Wandoo) WOODLAND**

This vegetation type occurs on pale grey sandy loams. This association contains a mixture of the three tallest eucalypt trees in the reserves. While the percentage of each varies considerably their total percentage cover is generally 30%. *Eucalyptus longicornis* and *E. wandoo* are slightly more abundant than the Salmon Gum. Beneath the trees there is an open understorey with shrubs of *Dodonaea attenuata*, low shrubs of *Acacia erinacea*, sedges of *Loxocarya* sp. and herbs of *Lomandra effusa*, *Podolepis capillaris*, *Disanella revoluta*, Rhamnaceae sp. [AN685] and Chenopodiaceae sp. [AN709]. Occasional mid-dense stands of *Leptospermum erubescens* occur in patches under the Wandoo. The very scattered low shrub understorey (< 1%) includes *Dodonaea attenuata*, *Acacia erinacea* and sedges and grasses.

Two major areas of this association are found, one in each reserve.



Photograph Three: *Eucalyptus longicornis* (Morrel), *E. salmonophloia* (Salmon Gum),
E. wandoo (Wandoo) Woodland. [Site 25]

SITE 25

Muir Description - Woodland/Low Woodland A on pale grey sandy loam.

S1 - *E. longicornis* to 18 m, *E. wandoo* 12-14 m and *E. salmonophloia* 18 m < 30% cover.

S2 - Very scattered shrubs (< 1%) of *Dodonaea attenuata*, *Acacia erinacea* with grasses, sedges (*Loxocarya* sp., *Lomandra effusa*) and annual Asteraceae.

F6. *Eucalyptus astingens* (Brown Mallet) LOW OPEN FOREST - OPEN FOREST

In the study area this association occurs only on the edges of laterite breakaways. The dominant generally grows in monospecific stands which vary from 50-80% cover and from 6-15 m tall. Occasional trees to 20 m may be found although stands are mostly single-aged. The understorey is usually negligible with occasional shrubs of *Melaleuca* sp. [AN 701] to 1.5 m over scattered low shrubs of *Acacia glaucoptera* and *Dodonaea humifusa*.

SITE 24

Muir Description - Low Forest A over Open Low Scrub A on red/brown gravelly clay loam.

S1 - *E. astingens* to 8 m and 60% cover.

S2 - *Melaleuca* (701) to 1.8 m and < 10%.

S3 - *Acacia glaucoptera* < 1%, *Dodonaea humifusa* < 1%.

Comment - This association is found only on laterite breakaways throughout the reserves. It has a characteristically sparse understorey.

SITE 18

Muir Description - Low Forest A.

As site 24 but *E. astingens* to 12 m and only occasional *Melaleuca uncinata* to 1 m.

SITE 30

As for Site 24.

SITE 40

Muir Description - Low Forest A.

E. astringens to 15 m and 50% cover, mature trees, no understorey.

SITE 42

Muir Description - Low Forest A.

Young stand of *E. astringens* 6-7 m and 60-80% cover. No understorey.

F7. *Eucalyptus falcata* (Silver Mallet) LOW OPEN FOREST

The only occurrence of this vegetation type within the study area occurs at the base of a lateritic breakaway (near the southern section of Reserve 19089), on brown loam with lateritic surface pebbles. However at other locations within the reserves the silver mallet occurs mixed with other mallots (*E. gardneri*, *E. astringens*). The dominant forms a dense canopy (4-6 m high and 70% cover) over a very sparse lower shrub layer of *Dodonaea humifusa* and *Gastrolobium crassifolium*. The stand appeared to be fairly young.

SITE 19

Muir Description - Low Forest A/B on brown loam with 30% laterite.

S1 - *E. falcata* 4-6 m and < 70% cover.

S2 - *Dodonaea humifusa*, *Gastrolobium crassifolium* < 1m and < 1% cover.

Comments - A very young, dense stand with *E. astringens* on slopes of a laterite breakaway.

F8. *Eucalyptus falcata* (Silver Mallet), *E. gardneri* LOW OPEN FOREST

There are four areas of this unit within Reserve 19089, in the lower centre of the eastern block, just south of the junction of the middle and western blocks, the middle northern section of the western block and along the border between the western and central blocks. Like the monospecific stands described above this mixed association of silver and blue mallet occurs on breakaways. The mallets form a mid-dense canopy (of which *E. falcata* provided a cover of 20% and *E. gardneri* 30% with both being 10 m high) over scattered shrubs of *Dodonaea humifusa*, *Melaleuca uncinata*, *Callitris roei* and sedges of *Lepidosperma* sp. They occur on light brown sandy loam with 5% lateritic surface pebbles.

SITE 29

Muir Description - Low Forest A on light brown sandy loam with 5% laterite.

S1 - *E. falcata* to 10 m and 20% and *E. gardneri* to 10 m and 30% cover.

S2 - Scattered shrubs of *Dodonaea humifusa*, *Melaleuca uncinata* and occasional *Callitris roei*.

Comments - degraded breakaway.

SITE 46

As for Site 29.

F9. *Eucalyptus falcata* (Silver Mallet), *E. gardneri*, *E. astringens* (Brown Mallet) LOW OPEN FOREST

This mixed mallet open forest occurs on a lateritic breakaway, on orange-brown lateritic loam. The mallets (8-10 m) form a mid-dense canopy. There is usually almost no understorey. Occasionally *Eucalyptus longicornis* and *E. wandoo* occur in the upper storey, with an open understorey of *Santalum acuminatum* and *Melaleuca uncinata* (Site 50).

As well as the areas of this unit shown on the map there are areas within the study area which were too small to map.

SITE 18

Muir Description - Low Forest A.

S1 - Three mallet species 8 - 10 m and 30-60% cover in total.

Negligible understorey.

F10. *Eucalyptus gardneri* OPEN FOREST

Although no site was recorded in this type, it was noted in Reserve 19089 where it forms dense bands, usually on the lower edge of breakaway slopes. As with other mallet stands the cover was generally < 60% with trees of 8-12 m.

5.2.2 Mallee Associations

M1. *Eucalyptus falcata* (Silver Mallet), *E. albens* (White Leaved Mallee), *E. incrassata* (Lerp Mallee) LOW WOODLAND

This mid-dense, mixed mallee association occurs on brown-pink clay loam. The Eucalypts vary in height from 3-6 m, forming a moderately dense tree layer over a mixture of heath and sedge species (*Dryandra armata*, *D. vestita* and sedges of *Lepidosperma drummondii*) which reflected the surrounding heath association.

The only mappable stand of this unit occurs in the central northern section of Reserve 19090 with other, smaller, areas occur scattered in the various heath associations. It had *E. gardneri* in a mallee form and was the only area in which that was noted. The mallees were low.

SITE 4

Muir Description - Shrub Mallee over Open Dwarf Scrub on brown/pink clay loam.

S1 - *E. falcata* to 3 m, *E. incrassata* 4-5 m and *E. sibirica* 5-6 m with ~50% cover total.

S2 - *Dryandra armata*, *D. vestita* and *Lepidosperma drummondii* to 90 cm.

Comments - A small, isolated patch in a heath area but representative of other similar, but unmappable, areas in heath.



Photograph Four : *Eucalyptus falcata* (Silver Mallet), *E. sibirica* (White Leaved Mallee), *E. incrassata* (Lerp Mallee) Low Woodland. [Site 4]

M2. *Eucalyptus leptophylla* LOW WOODLAND

The only occurrence of this unit within the study area occurs in the north-eastern section of Reserve 19089 on what appeared to be a poorly drained site with a yellow-brown clay loam soil. The mallee, *Eucalyptus leptophylla* (3-5 m, cover 10-15%) forms an open to

mid-dense cover over a mid-dense understorey composed of the shrubs *Beaufortia interstans*, *Maisiueca serista*, *Gastrolobium spinosum* and sedges of *Schoenus* sp., *Lepidosperma drummondii* and *Lyginia barbata*. The shrubs having a total of some 70% cover and the sedges 20% cover.

SITE 6

Muir Description - Open Shrub Mallee over Open Dwarf Scrub D and Open low Sedges on yellow/brown sandy clay loam.

S1 - *E leptophylla* 3-5 m and 10-15% cover.

S2 - *Beaufortia interstans*, 2%, *Maisiueca serista*, 3% and *Gastrolobium spinosum*.

S3 - *Schoenus* sp. 5% , *Lepidosperma drummondii* to 50 cm and 10% cover and *Lyginia barbata* 10%.

Comment - A small, poorly drained area, possibly a transition zone.



Photograph Five : *Eucalyptus leptophylla* Low Woodland. [Site 6]

M3. *Eucalyptus phenophylla*, *E. leptophylla*, *E. conglobata* (or any combination) LOW OPEN FOREST

This vegetation unit covers sites with the above three mallees present, as well as sites with a combination of any two, and is common throughout the reserve. The percentage covers of the three species varies considerably, with total cover ranging from 40-70% and heights from 4-7 m.

Variation within the unit includes (e.g. at sites 12 and 64) a dense mixed mallee association of *Eucalyptus phenophylla*, *E. leptophylla* and *E. conglobata* all to 5 m tall over an open layer of Jam (*Acacia scuminata*). The understorey of this variant has an open shrub layer of *Phacelium tuberculatum*, *Gastrolobium crassifolium* and *Melaleuca uncinata* with occasional shrubs of *Daviesia hakeoides*. *Melaleuca uncinata* can also occur in isolated stands. The lower understorey layer is dominated by *Loxocarya* sp., *Lepidosperma brunonianum* and *Gahnia sacistrophylla* forming an open sedge-land. Within this unit there are occasional thickets of *Melaleuca cardiophylla* to 1.8 m, which are too small to map accurately as individual vegetation units.

Two sites which have only *Eucalyptus phenophylla* and *E. conglobata* in the upper storey have similarities in height (5-7 m) and percentage foliage cover (50-70%) of the tree layer but vary greatly in their understoreies. Site 31, the soil at which is grey-brown clay loam, virtually lacks an understorey. Site 77, on brown-pink clay loam with 5% quartz pebbles, has a mid-dense, tall (2 m) shrub layer of *Melaleuca* sp. [AN683] with occasional shrubs of *Dodonaea attenuata* and *D. humifusa*.

There was further variation at sites 16 and 22, which have combinations of *Eucalyptus leptophylla* and *E. phenophylla* and were the lowest (4-5m) and the least dense recorded in this association, with *E. phenophylla* usually being the smaller. The layered understorey has

a dense upper shrub layer dominated by *Leptospermum erubescens* with occasional shrubs of *Melaleuca* sp. [AN690] and *Melaleuca uncinata* over an open low shrub layer including *Leucopogon* sp. [AN693], *Dryandra cirsioides* and *Melaleuca subtrigona* over an open sedgeland of *Lepidosperma brunonianum*, *Loxocarya* sp. and *Gahnia ancistrophylla*. *Beaufortia schauerei* and *Melaleuca* sp. [AN698] can also occur in isolated patches.

SITE 12

Muir Description - Tree Mallee over Open Dwarf Scrub D over Open Low Sedges.

S1 - *E. phenophylla*, *E. aff. leptophylla* and *E. conglobata* to 5m and 60% cover with *Acacia acuminata* (4 m) and 5% cover.

S2 - *Phebalium tuberosum*, *Gastrolobium crassifolium*.

S3 - *Borya nitida*, *Loxocarya flexuosa* to 10 cm and 5% cover.

SITE 16

Muir Description - Tree/Shrub Mallee over Heath A/Low Scrub A over Open Low Sedges on yellow/grey sandy loam.

S1 - *E. aff. leptophylla* 4-5 m and *E. phenophylla* to 4 m and 40-50% total cover.

S2 - *Leptospermum erubescens* < 2 m, 10-50% with *Melaleuca uncinata* 2 m and *Melaleuca* (690), 2.3 m and < 1%.

S3 - *Loxocarya* sp. 20 cm and 8% cover with *Lepidosperma brunonianum* < 2% and *Gahnia ancistrophylla* < 3%.

SITE 22

As for Site 16.

SITE 31

Muir Description - Tree Mallee on grey/brown clay loam.

S1 - *E. conglobata* and *E. phenophyllis* 5-6 m and 70% cover.

SITE 64

As for Site 12 with sedge layer of *Lepidosperma*. This site is in a fringing band of mallee between heath and vegetation on a degraded breakaway.

SITE 77

Muir Description - Tree Mallee over Heath A on brown/pink clay loam with 5 % quartz pebbles.

S1 - *E. phenophyllis* 6-7 m and *E. conglobata* 50-70%.

S2 - *Melaleuca* sp. (AN683) to 2 m and 50% cover.

Occasional shrubs of *Dodonaea humifusa* and *D. attenuata*.

Comments - *Melaleuca* understorey is patchy in this mallee type.

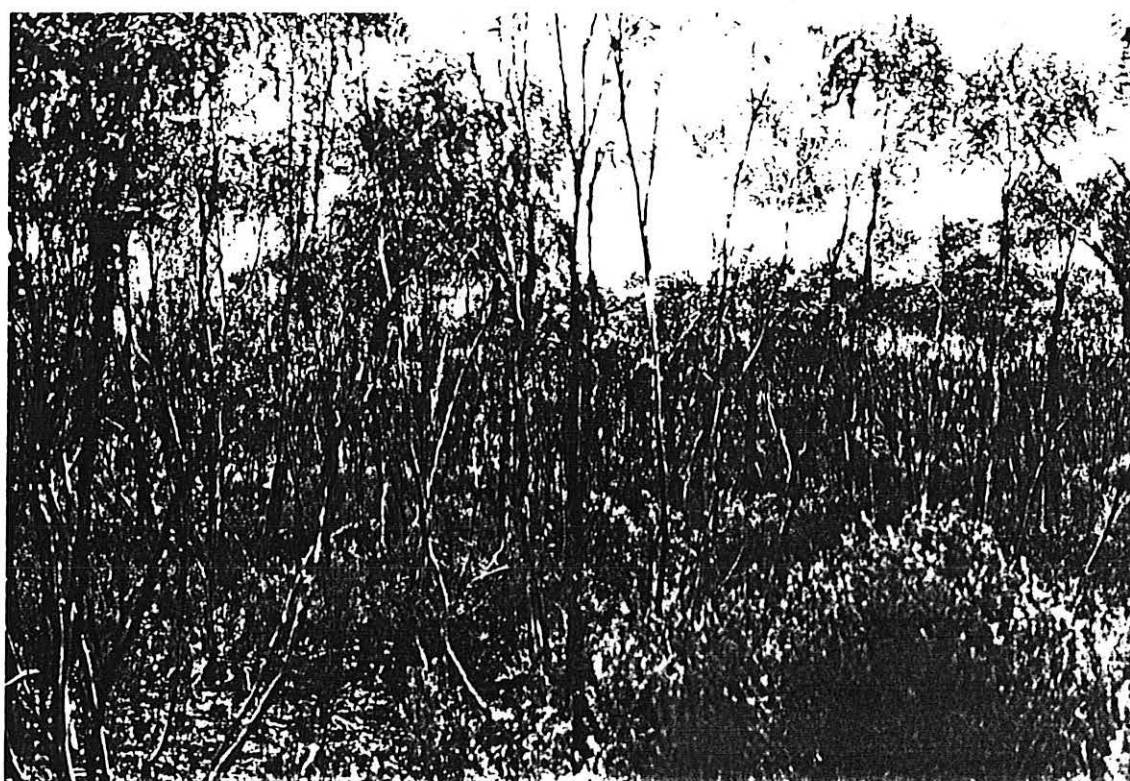


Photograph Six : *Eucalyptus phenophyllis*, *E. leptophyllis*, *E. conglobata* (or any combination) Low Open Forest. [Site 22, Background]

M4. *Eucalyptus conglomerata* (Port Lincoln Mallee) LOW OPEN FOREST

This association was found throughout the study area on light grey-brown loamy clay (derived from the pallid zone clays) with scattered lateritic surface pebbles. It usually occurs downslope from mallee populations on breakaway slopes and can form quite large belts.

The upper canopy has a mid-dense to dense cover of mallees of *Eucalyptus conglomerata*. There is usually very little understorey, but there are occasional patches of *Melaleuca ornata* or *M. cardiophylla* (1-2 m), or mixtures of these species. Scattered lower shrubs of *Templetonia sulcata*, *Grevillea pteridifolia*, *Dodonaea humifusa* may also occur with occasional taller shrubs of *Santalum acuminatum* (2 m).



Photograph Seven : *Eucalyptus conglomerata* (Port Lincoln Mallee) Low Open Forest. [Site 15]

SITE 15

Muir Description - Dense Tree Mallee over Low Scrub B over Dwarf Scrub D on light grey/brown loamy clay with 3% laterite/quartz pebbles.

S1 - *E. conglobata* 3-4 m and 40-70% cover.

S2 - *Melaleuca adnata* 5% and *M. cardiophylla* 1.2 m and 10% cover with *M. uncinata*.

S3 - *Daviesia hakeoides* 5%, *Dodonaea humifusa* and *Grevillea pteriloba* 5%.

Comments - Variable dominance and height of *Melaleuca* species in this association.

SITE 27

Muir Description - Tree Mallee

E. conglobata to 70% cover with very sparse understorey of occasional *Grevillea pteriloba*, *Phacelium filifolium* and *Templetonia sulcata*.

SITE 50

As for Site 27.

M5. *Eucalyptus phenophylla* LOW WOODLAND

This vegetation type represents a mixed area of mallees over heath and occurred on both reserves.

The mallee *Eucalyptus phenophylla* (4-5 m) forms an open canopy over a mid-dense upper shrub layer (1.5-2.0 m) of *Gastrolobium spinosum*, *Banksia sphaerocarpa* and *Dryandra armata*, with a mid-dense lower shrub layer of *Allocasuarina microstachys*, *Hakea falcata*, *Melaleuca sericea* and *Persea tortifolia*. A sparse layer has scattered plants of *Caustis dioica* and *Schoenus* sp. [AN710].

SITE 26

Muir Description - Open Tree Mallee over Open Low Scrub C over Low Heath A.

S1 - *E. phenophylla* to 4-5 m and 10-15% cover.

S2 - Heath species to 1.5 m and 5-10% cover including *Dryandra armata*, *Banksia sphaerocarpa* and *Gastrolobium spinosum*.

S3 - *Allocasuarina microstachya* < 20% with *Caustis dioica* 2%, *Persoonia tortifolia* 2%, *Melaleuca sericata* 5% and *Hakea falcata*.

Comment - Mixed area with remnant heath between heath and woodland areas.

M6. *Eucalyptus flocktoniae*, *E. conglobata* LOW OPEN FOREST

This open vegetation type occurs on degraded breakaway slopes on either pale grey brown or red-brown loamy clay, with surface laterite pebbles to 40% cover.

The mallees (both 2.5-6 m) form a mid-dense canopy over a sparse understorey of shrubs which include *Templetonia sulcata*, *Daviesia benilhamii* and *Melaleuca uncinata* sedges of *Gahnia ancistrophylla*. The understorey of site 44 differs in having up to 50% foliage cover of *Melaleuca cardiophylla*.

SITE 33

Muir Description - Shrub Mallee on pale grey-brown loamy clay with surface quartz and laterite pebbles to 40% cover.

S1 - *E. flocktoniae* and *E. conglobata* 2.5-4 m and 30% cover.

Occasional plants of *Templetonia sulcata*, *Daviesia* sp., and *Gahnia ancistrophylla* in understorey.

Comments - Degraded breakaway area.

SITE 44

Muir Description - Tree Mallee over Heath A/B on red-brown clay loam.

S1 - *E. flocktoniae*, *E. conglobata* to 6 m and 30% cover.

S2 - *Melaleuca cardiophylla* to 50% cover in patches.

M7. *Eucalyptus albens* LOW WOODLAND

There are numerous small, isolated, stands of the mallee *Eucalyptus albens* occurring as emergents over heaths in the study area on light grey sands. Most are too small to be mappable.

The stand described here was one of the few mappable stands, beneath the *Eucalyptus albens* it had an open shrub layer dominated by *Melaleuca pungens*.

SITE 36

Muir Description - Open Tree Mallee over Open Dwarf Scrub C on light grey sand.

S1 - *Eucalyptus albens* < 3.5 m and 30% cover.

S2 - *Melaleuca pungens*, 10%, to 1.5 m, *Hakea baxteri* 3% and mixed shrubs.

M8. *Eucalyptus conglobata*, *E. eremophila* LOW CLOSED FOREST

This unit occurs below breakaways on pale brown, loamy soil with scattered lateritic surface pebbles.

This unit occupies similar positions to unit M4 and has some structural and floristic similarities to it. However it differs in having a layer of *E. eremophila* to 8 m tall above the *Eucalyptus conglobata*. This gives a total cover of for the trees of 78% at the one site recorded. There was very little understorey, with only scattered shrubs of *Grevillea* and *Melaleuca incana*.

SITE 51

Muir Description : Dense Tree Mallee on pale brown loamy clay with 50% laterite and quartz surface.

S1 - *E. conglomerata* (6 m) and *E. eremophila* (8 m) with 78% cover.

M9. *Eucalyptus incrassata* LOW WOODLAND

As with type M7 (*Eucalyptus sibirica* Low Woodland) this association has open mallee over a heath-like understorey.

The upperstorey has *Eucalyptus incrassata* with 5-25% cover, 3-3.5 m tall. The understoreys are variable and mixed, usually reflecting the composition of nearby heath areas.

The sites below are patchy, interzonal areas in the western parts of Reserve 19089.

SITE 51

Muir Description - Open Tree Mallee over Heath B/Low Heath C over Dwarf Scrub D on pale grey sandy loam.

S1 - *E. incrassata* to 3 m and 25% cover

S2, 3, 4 - As for Sites 52 and 53 but less dense and including *Lambertia inermis*.

Comments - This site is representative of patchy but widespread mallee over heath. Heath species vary and are related to nearby heath associations.

SITE 55

Muir Description - Very Open Mallee over Low Scrub B over Low Heath C/D on brown-grey loamy sand with 50-60% laterite pebbles.

S1 - *E. incrassata* to 3.5 m and 4-5% cover.

S2 - *Hakea ferruginea* 3-5%, *Beaufortia incana* 8%, *Dryandra armata* 10% and *Hakea baxteri* 2%.

S3 - *Banksia sphaerocarpa* 5% with *Isopogon buxifolius* 3%, *Dryandra cuneata* 2% and *Lasiopetalum microcardium*.

Comment - This type intergrades with sand heath associations (e.g. H12)

SITE 66

Muir Description - Open Tree Mallee over Heath B over Low Heath C/D.

S1 - *E. incrassata* to 3.5 m and 20% cover.

S2/3 - Mixed heath type including *Dryandra* spp., *Hakea* spp., *Metaleuca* spp. and *Banksia sphaerocarpa*.

Comment - This site occurs within larger areas of heath and the type is often patchy and unmappable.

M10. *Eucalyptus phenophylla*, *E. aff. occidentalis* LOW CLOSED FOREST

This association was only noted at one site, near the north-western boundary of Reserve 19089.

Beneath the very dense low mallee upper layer there was a patchy understorey of *Metaleuca uncinata* to 1.2 m tall with 30-40% cover.

SITE 61

Muir Description - Dense Tree Mallee over Heath B.

S1 - *E. aff. occidentalis* and *E. phenophylla* to 3-4 m and 80% cover.

S2 - *Metaleuca uncinata* to 1.2 m and 30-40% cover,

M11. *Eucalyptus flocktoniae*, *E. incrassata* LOW OPEN FOREST

This association was also only recorded at one site, it is similar to the other mallee associations in structure. The *Eucalyptus flocktoniae* and *E. incrassata* (4-6 m tall) form a dense tree layer over a sparse understorey of scattered shrubs, which include *Hakea lissocarpa*

and *Phelipium tuberculatum*, and low sedges of *Schoenus* sp.

SITE 68

Muir Description - Tree Mallee over Open Dwarf Scrub D over Open Low Sedges on brown sandy loam.

S1 - *E. flocktoniae* and *E. incrassata* 4-6 m and 50% cover.

S2 - Scattered *Hakea lissocarpa*.

S3 - *Phelipium tuberculatum* 0.5 m and *Schoenus* sp. to 20% cover.

M12. *Eucalyptus incrassata*, *E. leptophylla*, *E. conglobata* LOW OPEN FOREST

The three mallees in the overstorey of this association form a mid-dense canopy over a mid-dense shrub layer of *Melaleuca uncinata* (2 m) and *Melaleuca* sp. [A1524] over open low sedges of *Lepidosperma drummondii*. The same mixture of mallees was also seen over an understorey of scattered *Dryandra armata*, *Hakea incrassata* heath in areas near site 70.

SITE 70

Muir Description - Tree Mallee over Low Scrub A over Very Open Low Sedges.

S1 - *E. conglobata*, *E. leptophylla*, *E. incrassata* to 4 m and 35% cover.

S2 - *Melaleuca uncinata* to 2 m and 30% cover.

S3 - *Lepidosperma drummondii* 0.5 m and < 10% cover.

5.2.3 Shrubland

S1. *Leptospermum erubescens* OPEN SHRUBLAND - CLOSED SHRUBLAND

This association varies considerably in height (1.5 - 3 m) and density (15-80%). It occurs as bands or discrete patches over or near heath areas and is distinguished by the abundance of *L. erubescens*. Understorey species can include *Calytrix lechenaultii*, *Allocasuarina humilis*, *Hakea corymbosa*, *Banksia sphaerocarpa*, *Schoenus* sp. and *Mesomelaena preissii*. The density of the understorey species also varies considerably.

SITE 10

Muir Description - Thicket over Open Dwarf Scrub C over Open Low Sedges.

S1 - *L. erubescens* to 3 m and 50-80% cover.

S2 - *Calytrix lechenaultii*, 80 cm, 5% cover with *Mesomelaena preissii*, 40 cm, 2%.

Comment - This type occurred in a band approximately 50 metres wide along the ecotone between areas of woodland and heath.

SITE 76

Muir Description - Low Scrub B over Low Heath D and Open Low Sedges

S1 - *Leptospermum erubescens* to 1.5 m and 15% cover.

S2 - *Calytrix lechenaultii*, 50 cm and 30-50%, *Melaleuca sericea* 5-8%.

S3 - *Mesomelaena preissii* < 0.5 m and 10-15%, with *Caustis dioica*.

Comment - This site occurs in a small mixed area between woodland and mallee.

S2. *Lambertia inermis* OPEN SCRUB - HIGH SHRUBLAND

Most of the areas dominated by *Lambertia inermis* seen were in the northern part of reserve 19089 on sandy soils. The shrubs were generally 2-3.5 m tall and had a variable cover of between 10 and 50%. Some denser patches did occur but were too small to be mapped.

Grevillea concinna (< 3 m and 10% cover), *Petrophile teretifolia* and *Banksia baueri* also occurred in the upper layer of this association. The lower stories consisted of mixed heath species and sedges including *Meibomia pungens*, *Banksia baueri*, *Petrophile ericifolia* and *Caustis dioica*.



Photograph Eight : *Lambertia inermis* Open Scrub - High Shrubland. [Site 35]

SITE 35

Muir Description - Open Scrub over Low Heath C on yellow-brown loamy sand.

S1 - *Lambertia inermis* < 3 m and 10% cover.

S2 - *Meibomia pungens* 30%, *Petrophile teretifolia* 10% and *Banksia baueri* 1%.

Comment - The height and amount of *L. inermis* is very variable in this area, it's cover can be up to 50% in patches. *Grevillea concinna* can also be important reaching three metres tall and up to 10% cover.

SITE 57

Muir Description - Scrub over Low Scrub B over Open Dwarf Scrub C over Open Dwarf Scrub D on yellow grey sand.

S1 - *Lambertia inermis* to 3.5 m and 20% cover.

S2 - *Dryandra cynaroides* 8%, *Banksia baueri* < 10%, *Hakea baxteri* 2% and *Petrophile ericifolia* 5%.

S3 - *Banksia sphaerocarpa*, *B. violacea*, *Verticordia serrata*, 2%, *Baeckea* sp., *Melaleuca pungens* 2%.

S4 - *Dryandra nives* 2%, *Caustis diocis* 2%, *Petrophile* aff. *longifolius*.

2.2.4 Heaths

H1. Mixed (*Dryandra*, *Hakea*, *Melaleuca pungens*, *Banksia baueri*)

OPEN SHRUBLAND - SHRUBLAND

This association is quite variable in the percentage cover and height of the species present, but can be distinguished by the presence of *Dryandra* and *Hakea* species. *Melaleuca pungens* is also usually present. It is generally < 1.5 m tall and dense patches of *Dryandra armata* or *D. conferta* occur scattered through it. Some areas assigned to this unit are intermediate to other heath units but have been placed under this unit as they appear to be closer to it than to the unit they grade towards.

SITE 2

Muir Description - Heath B over Dwarf Scrub C over Dwarf Scrub D on grey brown sandy loam.

S1 - *Banksia baueri* 1.5 m, 8%, *Hakea incrassata*, 3%, *Melaleuca pungens* 5%, *Dryandra armata*.

S2 - *Petrophile ericifolia*, 5%, *Banksia sphaerocarpa*, 3%, *Isopogon teretifolius*

2% cover.

S3 - *Beaufortia micrantha* 10%, *Dryandra nives* 2%, *Melaleuca seriate* 2%, as well as mixed low shrubs and sedges.

SITE 11

Muir Description - Open Low Scrub A over Heath B over Dwarf Scrub C over Open Low Sedges on grey sandy loam with laterite.

S1 - *Hakea crassifolia* 1%, *Leptospermum erubescens* 1-2%, *Grevillea concinna* 1%.

S2 - *H. crassifolia* 10%, *Gastrolobium spinosum* 3%, *Dryandra* aff. *conferta*, *D. armata* 5% and *Melaleuca pungens* 5%.

S3 - *Banksia sphaerocarpa*, *Melaleuca seriate*, *Isopogon teretifolius* and *Adenanthos* aff. *flavidiflorus*.

S4 - *Caustis dioica*, *Loxocarya* sp.

Comments - This site is intermediate between heath types one and three. The area in which the site lies had a wide range of species present which varied considerably in their cover and height through the area.

SITE 17

As for Sites 1 and 2. Additional species included *Hakea prostrata* (1 m) and occasional trees (3 m) of *H. laurina*.

SITE 20

Muir Description - Low Heath C over Low Heath D.

S1 - *Dryandra armata*, 25%, *Hakea incrassata* 2%, *Isopogon teretifolius*, *Melaleuca pungens* and *Dryandra cirsioides*.

S2 - *Beaufortia interstans* 5% with *Acacia drummondii*, *Hakea falcata* and *Petrophile media*.

Comment - Very variable mixture of H1 and H3.

SITE 39

Muir Description - Heath B over Dwarf Scrub C.

S1 - *Melaleuca pungens* 30%, *Hakea incrassata* 10%, *Dryandra armata* 10% with *Gastrolobium spinosum* 5%, *H. crassifolia* 5% and *Isopogon teretifolius* 2%.

S2 - *Melaleuca seriale* 2%, *Loxocarya flexuosa*, *Hakea lehmanniana* and *Beaufortia micrantha* 5%.

Comment - Mixed Heath 1 and Heath 6 type with variable dominance.

H2. *Hakea subsulcata* OPEN HEATH

This distinctive association is dominated by *Hakea subsulcata* to two metres tall and from 30-50% cover, with a mixed lower understorey to one metre tall and 30% cover. *Dryandra armata* may also be present in considerable amounts and to a height of 1.4 m. Only small areas of this heath were recorded.

SITE 5

Muir Description - Heath B over Dwarf Scrub C.

S1 - *Hakea subsulcata* < 1.5 m and 50% cover, *Isopogon divergens* 1.3 m, 5%, *Dryandra armata* 1%.

S2 - *Dryandra vestita* < 1 m and 3%, *Banksia sphaerocarpa*, *Gastrolobium spinosum* and *Hakea incrassata*.

Comment - A small area dominated by *H. subsulcata* downslope from areas of heath types 1 and 3.

SITE 48

Muir Description - Heath A over Heath B over Open Dwarf Scrub C.

S1 - *Hakea subsulcata* 2 m and 30% cover.

S2 - *Dryandra armata* 1.4 m < 50% with *Melaleuca pungens* 1.3 m and 5%.

S3 - *Gastrolobium spinosum* 1 m, 1%, *Isopogon teretifolius* 5%.

Comment - Very patchy area with a mixture of Heath types 2 and 7 and situated between mallet and woodland areas.

SITE 67

Muir Description - Heath B over Low Heath C over Open Dwarf Scrub D on orange brown loam with 80% laterite.

S1 - *Hakea subsulcata* < 30%, *Dryandra armata* 5%, *Hakea lehmanniana* 1%, *Melaleuca pungens* 30% and *Gastrolobium spinosum* 1-2%.

S2 - *Beaufortia incana* 30%, *Dryandra armata* 10%.

S3 - *Hakea falcata* 1%, *Banksia sphaerocarpa* 1%.

Comment - A very mixed heath area mainly of types 2 and 6. Occurs as a small patch between woodland and mallee.

H3. *Beaufortia interstans*, *Dryandra* spp. LOW OPEN HEATH-LOW SHRUBLAND

This association has *Beaufortia interstans* to one metre tall and from 30-60% cover mixed with *Dryandra* species and other heath species. It occurs in small areas on sand over laterite, particularly on Reserve 19090.

SITE 1

Muir Description - Low Heath C over Open Dwarf Scrub D on pale grey-brown sandy loam.

S1 - *Beaufortia interstans* 1 m and 60% cover, *Isopogon teretifolius* 2%, *Banksia sphaerocarpa*, *Dryandra vestita*, *Melaleuca seriata* and *Banksia violacea*.

S2 - *Dryandra* aff. *conferta* 2%, *Adenanthos flavidiflorus*, *Hakea incrassata*,

H. falcata and *Gastrolobium spinosum*.

Comment - Small area on sand over laterite, patches of *Beaufortia interstans* dominant, otherwise mixed.

SITE 28

Muir Description - Low Scrub B over Low Heath C over Dwarf Scrub D.

As for Site 1.

Sites 17 & 20 were located in areas intermediate to heath type 1 and are discussed under that unit.

H4. *Beaufortia incana*, *Hakea crassifolia* SHRUBLAND-LOW OPEN HEATH

An isolated patch (site 3) of this unit occurred within a larger heath area. It had *Hakea crassifolia* to 1.5 metres tall, but only 3% cover, over larger amounts of *Banksia incana* (1 m, < 30%) and a mixture of other species of Proteaceae and Myrtaceae.

SITE 3

Muir Description - Low Scrub B over Low Heath C on brown orange sandy loam.

S1 - *Hakea crassifolia* 3%, *Hypocalymma angustifolium* 1%.

S2 - *Isopogon divergens* 5%, *Beaufortia incana* 30%, *Isopogon teretifolius* 2% and *Banksia sphaerocarpa* 2%.

H5. *Melaleuca pungens* LOW OPEN HEATH

This association is widespread within the study area. The cover of the *M. pungens* is less than 40% and its height varies from 1-1.4 m. Other important species present included *Dryandra cynaroides* and *D. cirsioides*. The association is made distinctive by its even appearance.

SITE 34

Muir Description - Heath B over Dwarf Scrub C over Open Dwarf Scrub D on yellow brown loamy sand.

S1 - *Melaleuca pungens* 1.4 m, 40% cover.

S2 - *Dryandra cynseroides* 2%, *Dryandra cirsioides* 3%, *Petrophile ericifolia* 2%, *Hakea incrassata* and *Banksia sphaerocarpa*.

S3 - *Mesomalaena preissii* 40 cm and 2% cover, *Verticordia serrata* and *Petrophile media*.

SITE 31

As for Site 34 but with *Melaleuca pungens* < 1 m and 40% cover. The 0-0.5 m stratum at this site is was quite diverse.

6. *Melaleuca pungens* - *Beaufortia incana* LOW CLOSED HEATH

This association was dominated by a very dense mixture of *Melaleuca pungens* (50%) and *Beaufortia incana*. It occurred in the north-western part of Reserve 19089 on laterite and like the previous unit can be distinguished by its even appearance.

SITE 59

Muir Description - Dense Low Heath C over Open Dwarf Scrub D on light brown-grey loam with 80% surface laterite.

S1 - *Melaleuca pungens* 50%, *Beaufortia incana* < 40%, *Isopogon teretifolius* 3% and *Banksia sphaerocarpa* 8%.

S2 - *Melaleuca sericea*, *Calothamnus quadrifidus*, *Beaufortia micrantha* 2% and *Hibbertia pungens* 1%.

SITE 39 - Mixed Heath Types 1 and 6.

H7. *Dryandra* spp. - *Hakea* spp. LOW OPEN HEATH

This mixed heath was common in parts of Reserve 19089 with soils comprised largely of lateritic gravel. A distinguishing feature was the presence of emergent plants of *Dryandra armata* with about 10% cover.

SITE 63

Muir Description - Low Heath C over Low Heath D on grey sand with 80% surface laterite.

S1 - *Dryandra armata* 10%, *Hakea ferruginea* 2%, *D. cirsioides*, *Hakea crassifolia* 4%, *H. lehmanniana* 3%, *Isopogon terifolius* 4% and *Hakea incrassata*.

S2 - *Allocasuarina microstachya* 5%, *Dryandra vestita* 5%, *Beaufortia micrantha* 8%, *Petrophile media* 2% and *Baeckea crispiflora* 3%.

H8. *Allocasuarina microstachya* LOW OPEN SHRUBLAND

This low, open association was seen in Reserve 19090. The *Allocasuarina microstachya* has up to 30% cover and grows to approximately 40 cm high. There were occasional emergent plants of *Allocasuarina campestris* and *Hakea crassifolia* to 4 m and 3 m tall respectively. Similar vegetation was observed in other areas.

SITE 21

Muir Description - Open Dwarf Scrub C over Low Heath D.

S1 - Occasional *Allocasuarina campestris* (4 m), *Acacia leptopetala* (3 m) and *Hakea crassifolia* 2 m.

S2 - *Calothamnus quadrifidus* < 5%, *Dryandra armata* 1%.

S3 - *Allocasuarina microstachya* 30%, *Hakea falcata*, *Melaleuca seriata* 5%, *Baeckea crispiflora*.

Comment - At this site the type occurs as a mosaic with Mallee Type 3.

H9. *Beaufortia interstans* - mixed LOW OPEN HEATH

This heath type was recorded in the western part of Reserve 19089. It is a low, open association whose appearance is dominated by the grey-green shrubs of *Beaufortia interstans* even though there are occasional emergents of *Dryandra conferta* and *D. armata* as well as other shrubs in the *Beaufortia* layer.

SITE 58

Muir Description - Low Heath D on grey-white sandy loam

S1 - Occasional *Dryandra conferta* and *D. armata* to 1.2 m.

S2 - *Beaufortia interstans* < 60% cover with *Hakea lehmanniana* 5%, *Melaleuca seriata* 5% and *Hibbertia pungens* 5%.

H10. MIXED LOW SHRUBLAND

The two sites described below are loosely grouped due to their low, open appearance and mixture of heath and sedge species. The areas assigned to this unit are on loamy sand soils and have *Melaleuca seriata* as a common species.

SITE 49

Muir Description - Open Dwarf Scrub C over Dwarf Scrub D and Very Open Low Sedges.

S1 - *Banksia sphaerocarpa*, *Verticordia brownii* 5%.

S2 - *Melaleuca seriata* 8%, *Dodonaea ? pinifolia* 2%, *Schoenus minutulus* 2%, *Caustis dioica* < 10%.

Comment *Leptospermum erubescens* 1.5 metres tall occurs as an emergent in patches, with up to 50% cover.

SITE 73

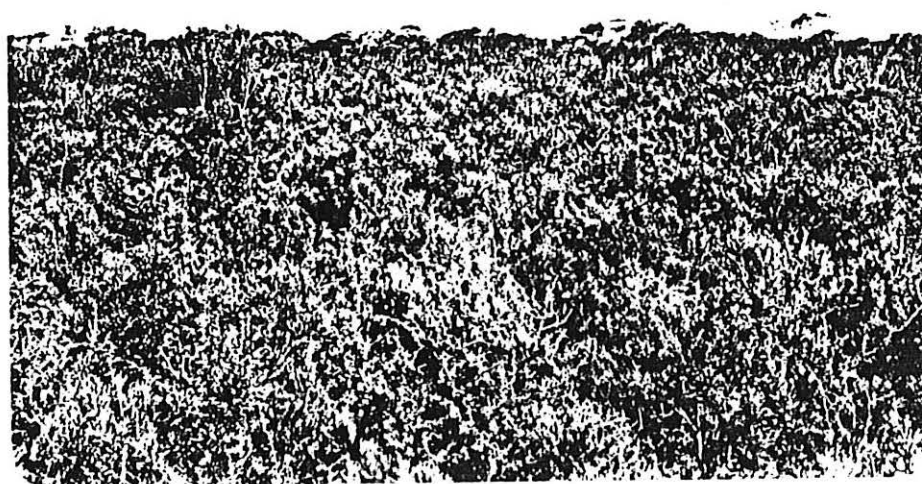
Muir Description - Dwarf Scrub C over Low Heath D on grey/white loamy sand.

S1 - *Hakea incrassata* 10%, *Beaufortia incana* 3%.

S2 - *Maisieuca seriale* 25%, *Isopogon teretifolius* 3%, *Caustis dioica* 3%,
Petrophile media 2%, *Mesomaisena preissii* 2%.

H11. *Petrophile ericifolia* OPEN HEATH

This heath is dominated by the bushy *Petrophile ericifolia* but has a number of other important species. The association is the most common sand-heath type in the reserves and is found in the north-central part of Reserve 19089. It has varying percentages of taller shrubs and can also contain patches of *Lambertia inermis*.



Photograph Nine : *Petrophile ericifolia* Open Heath. [Site 56]

SITE 53

Muir Description - Heath Bover Dwarf Scrub D/Open Low Sedges on white-grey sand.

S1 - *Petrophile ericifolia* to 1.2 m and 50% cover, *Banksia baueri* 1%, *Adenanthos cygnorum* 1%.

S2 - *Caustia dioica* 5-10%, *Phyllota gracilis* 3%, *Petrophile* aff. *longifolia*, *Calytrix flavescens* and *Eremaea pauciflora*.

Comment - There can be up to 5% *Hakea crassifolia* to 1.6 m in patches with occasional *Lambertia inermis* to 3 m,

SITE 56 - As for Site 53.

SITE 74 - As for Site 53 but with *Hakea baxteri* 3% and 1.3m, *Beaufortia micrantha* 5% and 0.5m on grey-white sand.

SITE 65 - Mixed Heath types 11 and 12.

H12. *Eremaea pauciflora*, *Calytrix fraseri* LOW OPEN HEATH

This small area of sand heath differs from Heath association 11 (*Petrophile ericifolia* Open Heath) in that it does not have *Petrophile ericifolia* but has a high percentage of both *Calytrix fraseri* and *Eremaea pauciflora*. A small percentage of taller shrubs (1-1.5 m) is also present, but the dominant species are between 0.5 m and 1.0 m tall. In this area the only recordings of *Banksia attenuata* were made.

SITE 52

Muir Description - Open Low Scrub B over Low Heath C over Dwarf Scrub D on grey-white sand.

S1 - *Banksia baueri*, *Adenanthos cygnorum* 2%.

S2 - *Eremaea pauciflora* < 20%, *Calytrix fraseri* < 30%, with *Dryandra cynaroides*, *Melaleuca pungens* and *Petrophile ericifolia*.

S3 - *Petrophile* aff. *longifolia*, 3%, *Phyllotus gracilis* 3%, *Calytrix flavescens*, *Baeckea floribunda* 2% and a range of low heath species.

Comment - This stand was found on the central eastern side of Reserve 19089.

H13. *Petrophile squamata* - sedges LOW OPEN HEATH

This association was only observed near the north-western edge of Reserve 19089 in a small, poorly drained area. It was differentiated from somewhat similar stands of Low Open Heath by the relatively high cover of *Petrophile squamata*.

SITE 60

Muir Description - Low Heath C/D on brown-grey sandy loam.

This site has a mixture of low heath species including *Petrophile squamata* (0.6 m, 30%), *Allocasuarina microstachya*, *Dodonaea ? pinifolia*, *Lepidosperma brunonianum*, *Borya nitida*, *Verticordia roei*, *Melaleuca sericea* and *Mesomelaena preissii*.

Comment - This site is similar to site 49 in structure but has a different range and dominance of species.

6.0 FAUNA

It was beyond the scope of the field work carried out for this report to make any systematic observations relating to native fauna on the reserves, however some incidental observations were made.

Many kangaroos, and evidence of their presence, were observed. There was heavy grazing of sedge understories in woodland areas but the area seemed able to support the numbers without ill-effect.

A number of bird species were also seen, in particular species of parrot. These were seen to feed heavily on the mallee species in flower (*Eucalyptus conglomerata*). The small areas of shrubland support many small birds and probably small mammals. *Lambertia inermis* is a heavy nectar producing plant which flowers over most of the year and which is a good food source for small birds. The heaths, although not in flower during the survey would also be a habitat for fauna.

7.0 SUMMARY AND CONCLUSIONS

7.1 CONDITION OF THE RESERVES

Both reserves were noted to be in exceptionally good condition. In fact the areas appear to be pristine for the most part, with almost no rubbish (except in the well-defined pit on the edge of Reserve 19089), very little evidence of tree removal and very little in the way of introduced species. From the present study it appears that the reserves have remained largely unaffected by the surrounding agricultural development. Additionally, only one old vehicle track was observed (leading to a small, disused gravel pit) despite the fact that the reserves, though isolated, are easily accessible. There was little evidence of recent fires and this has probably been an important factor in maintaining the good condition of the reserves.

A few small, low lying areas are prone to waterlogging and tree and shrub death has occurred but this appears to be mostly a natural phenomenon. Because of the low rainfall and the topography of the area there has not been a problem of rising water tables and salt increase. Hopefully, with continued upkeep, the reserves will remain as important conservation resources in an area which has few such resources remaining.

7.2 CONSERVATION VALUE

Reserves 19090 and 19089 contain a range of vegetation formations from open woodland with mature trees to twenty five metres tall, through dense mallee and shrublands to low heaths. Thirty-six plant associations were delineated within these formations for the reserves, including thirteen heath types with distinct relationships to the sand or laterite substrates on which they occur. Although some of these heaths were extensive few were widespread in the reserves. Mallee (low woodland) associations occupy a large proportion of the reserves, with the different units based on varying combinations of the ten mallee species identified. The

reserves were originally established for the protection of mallee species (*Eucalyptus* *astringens*, *E. gardneri*, *E. falcata*) and many good stands of these species are protected on the reserves.

As a consequence of the range of vegetation types found on the reserves a relatively diverse flora was also recorded, even though the survey was carried out at a time of the year when little was in flower and with only a limited amount of time in the field. Two hundred and five plant species, including eighteen *Eucalyptus* (gum tree and mallee) species were recorded. Some of the species recorded were of particular interest (poorly collected, range extensions etc.) and these are commented on above. It is likely that more intensive surveying of the reserves for flora would locate more species of particular interest, particularly if the surveying could be carried out at more appropriate times of the year.

It is obvious from the above that the reserves are an important resource for the conservation of vegetation associations and plant species, especially considering the extensive clearing for agriculture that has taken place in the surrounding wheatbelt areas.

Furthermore, the exceptionally good condition of the reserves must add to their conservation value, as many reserves in the wheatbelt are highly degraded through grazing, weed infestation, timber removal and too frequent burning.

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- Dr Steven Hopper, of the Department of Conservation and Land Management for identification of *Eucalyptus* species.
- Mr Paul Wilson, assisted with identification of some difficult specimens (mostly sterile) from various families.

Photographs taken by Anna Napier.

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APPENDIX ONE : FLORA LIST - RESERVES 19089 AND 19090

GYMNOSPERMAE

CUPRESSACEAE

Callitris roei

ANGIOSPERMAE

POACEAE

Amphipogon turbinatus
Stipa sp. [AN774]

CYPERACEAE

Gahnia ancistrophylla
Lepidosperma brunonianum
Lepidosperma drummondii
Lepidosperma ? tenue
Lepidosperma tuberculatum
Mesomelaena preissii
Schoenus brevisetis
Schoenus minutulus
Cyperaceae sp. [AN750]

RESTIONACEAE

Caustis dioica
Loxocarya flexuosa
Loxocarya fasciculata
Lyginia barbata

LILIACEAE (Sensu lato)

Agrostocrinium scabrum
Borya nitida
Dianella revoluta
Laxmannia squarrosa
Laxmannia ramosa
Lomandra effusa
Xanthorrhoea preissii

HAEMODORACEAE

Conostylis villosa

IRIDACEAE

Patersonia sp.

CASUARINACEAE

Allocasuarina campestris
Allocasuarina huegeliana
Allocasuarina humilis
Allocasuarina microstachya
Casuarina obesa

PROTEACEAE

Adenanthos aff. flavidiflorus
Adenanthos cygnorum
Banksia attenuata
Banksia baueri
Banksia sphaerocarpa var. caesia
Banksia violacea
Conospermum ? distichum
Dryandra armata
Dryandra calophylla
Dryandra cirsioides
Dryandra aff. conferta
Dryandra cuneata
Dryandra cynaroides
Dryandra ferruginea
Dryandra aff. ferruginea
Dryandra fraseri
Dryandra nivea
Dryandra sessilis
Dryandra vestita
Grevillea concinna
Grevillea eryngioides
Grevillea patentiloba
Hakea baxteri
Hakea corymbosa
Hakea crassifolia
Hakea falcata
Hakea aff. falcata
Hakea ferruginea
Hakea incrassata
Hakea laurina
Hakea lehmanniana
Hakea lissocarpha
Hakea marginata
Hakea prostrata
Hakea subsulcata
Hakea varia
Hakea sp. [AN773]
Isopogon buxifolius
Isopogon divergens
Isopogon teretifolius
Lambertia ilicifolia
Lambertia inermis
Persoonia striata
Persoonia ? tortifolia
Petrophile ericifolia
Petrophile aff. longifolia
Petrophile media
Petrophile seminuda
Petrophile squamata
Petrophile trifida
Synaphaea aff. petiolaris

SANTALACEAE

Choretrum glomeratum
Santalum acuminatum
Santalum murraianum

LORANTHACEAE

Nuytsia floribunda

CHENOPODIACEAE

Rhagodia sp. [AN 709]

LAURACEAE

Cassytha sp. [AN 687]

PITTOSPORACEAE

Billardiera coriacea
Billardiera sericea

MIMOSACEAE

Acacia acuminata
Acacia bidentata
Acacia brachyclada
Acacia drummondii
Acacia erinacea
Acacia glaucoptera
Acacia lasiocalyx
Acacia lasiocarpa var. *sedifolia*
Acacia leptopetala
Acacia microbotrya
Acacia pulchella var. *goudyi*
Acacia pycnocephala
Acacia stenoptera

PAPILIONACEAE

Daviesia hakeoides
Gastrolobium crassifolium
Gastrolobium hookeri
Gastrolobium spinosum var. *inermis*
Gastrolobium trilobum
Mirbelia ? microphyllum
Phyllota gracilis
Templetonia sulcata

RUTACEAE

Boronia crassifolia
Phebalium filifolium
Phebalium tuberculatum

POLYGALACEAE

Cornesperma scoparium

EUPHORBIACEAE

Beyeria leschenaultii

SAPINDACEAE

Dodonaea attenuata
Dodonaea humifusa
Dodonaea ? pinifolia

RHAMNACEAE

Cryptandra leucophracta
Cryptandra aff. parviflora
Pomaderris bilocularis

STERCULIACEAE

Lasiopetalum microcardium

DILLENIACEAE

Hibbertia pungens

THYMELACEAE

Pimelea ? suaveolens

MYRTACEAE

Baeckea crispiflora
Baeckea floribunda/preissiana
Baeckea sp. [AN751]
Beaufortia incana
Beaufortia interstans
Beaufortia micrantha
Beaufortia schaueri
Calothamnus quadrifidus
Calytrix flavescens
Calytrix fraseri
Calytrix leschenaultii
Calytrix ? oldfieldii
Eremaea pauciflora
Eucalyptus alba
Eucalyptus astringens
Eucalyptus celastroides ssp. virella
Eucalyptus conglobata
Eucalyptus eremophila
Eucalyptus falcata
Eucalyptus flocktoniae
Eucalyptus gardneri
Eucalyptus incrassata
Eucalyptus leptophylla
Eucalyptus aff. leptophylla
Eucalyptus longicornis
Eucalyptus aff. occidentalis
Eucalyptus phenophylla (manuscripts name, Brooker and Hopper)
Eucalyptus salmonophloia
Eucalyptus uncinata
Eucalyptus wandoo
Eucalyptus sp. 1 [AN653]
Eucalyptus sp. 2 [AN736]
Hypocalymma angustifolium
Leptospermum erubescens

Leptospermum spinescens
Melaleuca adnata
Melaleuca cardiophylla
Melaleuca conferta
Melaleuca cuticularis
Melaleuca ?depauperata
Melaleuca ?depressa
Melaleuca platycalyx
Melaleuca pungens
Melaleuca seriate
Melaleuca subtrigona
Melaleuca uncinata
Melaleuca sp. 1 [AN707]
Melaleuca sp. 2 [AN701]
Melaleuca sp. 3 [AN739]
Melaleuca sp. 4 [AN683]
Verticordia brownii
Verticordia chrysantha
Verticordia densiflora
Verticordia pholidophylla
Verticordia roei
Verticordia serrata
Verticordia sp. [AN715]

HALORAGACEAE

Glischrocaryon aureum

APIACEAE

Platysace maxwellii

EPACRIDACEAE

Andersonia aff. gracilis
Astroloma sp. [AN776]
Leucopogon conostephioides
Leucopogon cymbiformis
Leucopogon dielsianus
Lysinema ciliatum

LOGANIACEAE

Logania micrantha

CONVOLYULACEAE

Wilsonia humilis

CUSCUTACEAE

Cuscuta australis

BORAGINACEAE

Halgania preissiana

CHLOANTHACEAE

Chloanthes coccinea
Cyanostegia lanceolata
Pityrodia terminalis

LAMIACEAE

Microcorys aff. ericifolia
Microcorys sp. [AN611]
Westringia rigida

GOODENIACEAE

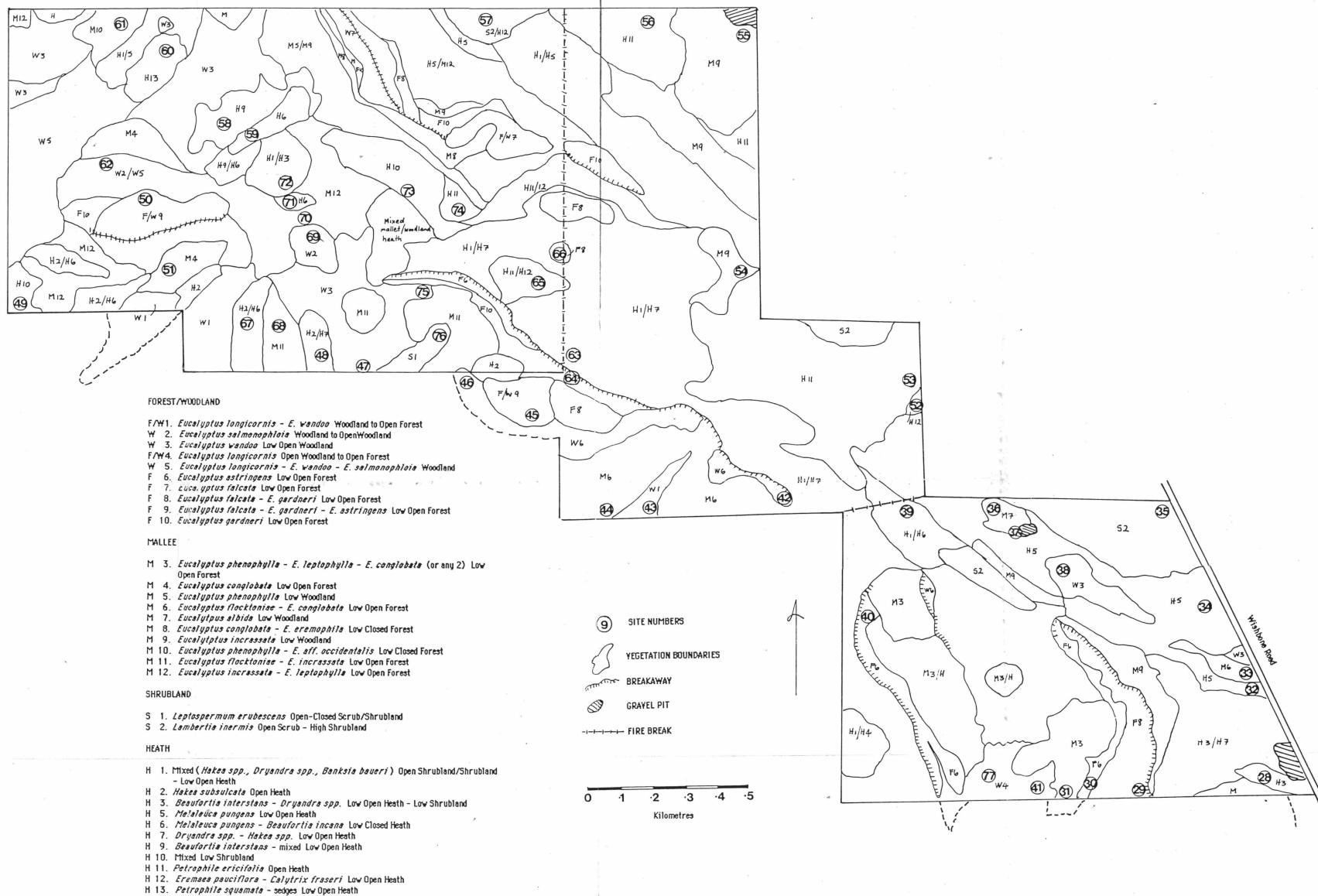
Dampiera linearis
Dampiera oligophylla ssp. juncea

STYLIDIACEAE

Stylidium aff. repens
Stylidium sp.

ASTERACEAE

Helichrysum lepidophyllum
Helipterum sp.
Olearia muelleri
Olearia revoluta
Podolepis capillaris

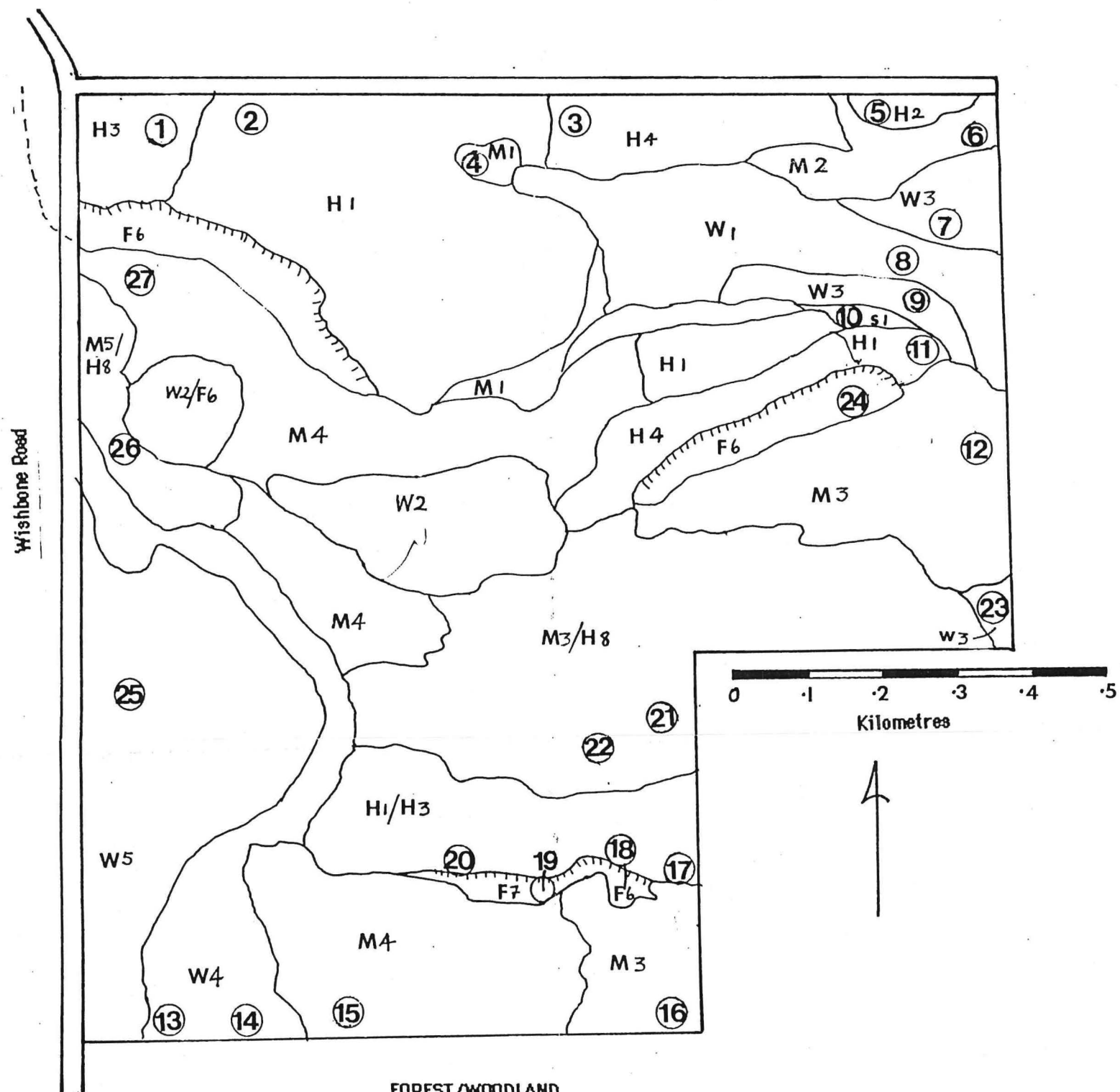


MAP ONE: VEGETATION TYPES, DONGOLOCKING NATURE RESERVE, NO. 19089

MAP A

MAP TWO: VEGETATION TYPES, DONGOLOCKING NATURE RESERVE, NO. 19090

MAP B



FOREST/WOODLAND

- W 3. *Eucalyptus wandoo* Low Open Woodland
- F/W4. *Eucalyptus longicornis* Open Woodland to Open Forest
- W 5. *Eucalyptus longicornis* - *E. wandoo* - *E. salmonophloia* Woodland
- F 6. *Eucalyptus astringens* Low Open Forest
- F 7. *Eucalyptus falcata* Low Open Forest

MALLEE

- M 1. *Eucalyptus falcata* - *E. incrassata* - *E. alba* Low Woodland
- M 2. *Eucalyptus leptophylla* Low Woodland
- M 3. *Eucalyptus phenophylla* - *E. leptophylla* - *E. conglobata* (or any 2) Low Open Forest
- M 4. *Eucalyptus conglobata* Low Open Forest

SHRUBLAND

- S 1. *Leptospermum erubescens* Open-Closed Scrub/Shrubland

HEATH

- H 1. Mixed (*Hakea* spp., *Dryandra* spp., *Banksia* *baueri*) Open Shrubland/Shrubland - Low Open Heath
- H 2. *Hakea subsulcata* Open Heath
- H 3. *Beaufortia interstans* - *Dryandra* spp. Low Open Heath - Low Shrubland
- H 4. *Beaufortia incana* - *Hakea crassifolia* Shrubland - Low Open Heath
- H 8. *Allocasuarina micrastachya* Low Open Shrubland

- ⑤ SITE NUMBERS
- VEGETATION BOUNDARIES
- BREAKAWAY