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A FLORA AND VEGETATION SURVEY OF THE MOUNT WESTDALE–DOBADERRY SWAMP RESERVE SYSTEM

PREPARED FOR
THE DEPARTMENT
OF FISHERIES AND WILDLIFE
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1.0 INTRODUCTION

The Westdale group of three contiguous nature reserves have between them a diverse range of topographic features and soils. As a consequence they have a very varied vegetation and flora, the distribution of both of which is intimately related to the rapidly changing topography and soils.

Sixty-two vegetation types, or mixed types, have been recorded and mapped for the reserve group and three hundred and thirty seven native plant species recorded. This highlights the value of these three reserves for the conservation of flora and vegetation. Of particular interest are some of the areas with understories of *Dryandra* ssp. which have not been burnt for a very long time and areas of vegetation types which apparently fall outside the vegetation site types described by Havel(1975a).

2.0 LOCATION and ACCESS

The reserves lie within the Shire of Beverley and are on the eastern edge of the Northern Jarrah Forest, some 96 kilometres by road from Perth and 30 kilometres west, south-west from Beverley.(See map one)

Two roads run through the reserve system and there is easy access to the reserves from them. These are, Dale West Road [which runs east from Brookton Highway] and Dobaderry Road wich runs north from Dale West Road. Many parts of the reserves can be visited by two-wheel drive vehicle but others need a four-wheel drive and care must be taken near the granite areas when the ground is wet to avoid bogging.

3.0 RESERVATION HISTORY

The Mt. Westdale - Dobaderry Swamp group of reserves, consists of three gazetted Nature Reserves with a combined area of approximately 4,005 ha. which were vested in the West Australian Wildlife Authority [WAWA] between March 1975 and August 1981.

The three nature reserves which form the study area are:-

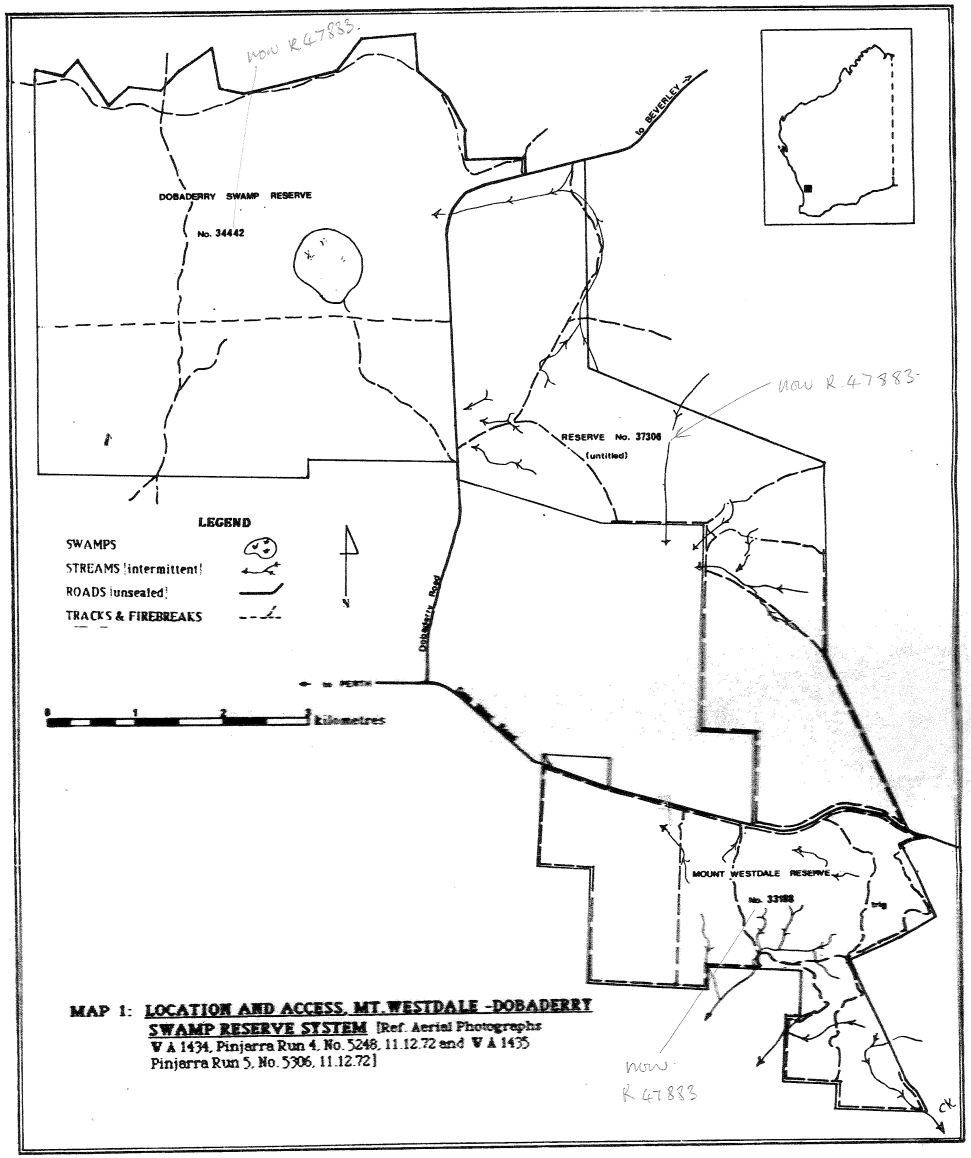
1. Mt Westdale, reserve no. C33188 [Avon Loc. 28495], the smallest and most southerly of the reserves with an area of 802.4201 ha was vested on 14.3.75 for the purposes of flora and fauna conservation. The north-western area of the Mt Westdale reserve is a designated wildlife sanctuary.

2. Dobaderry Swamp, reserve no. C34442, [Avon Loc. 22516, 28575] with an area of 1895.332 ha is the largest and most northerly of the group. Dobaderry Swamp was vested in the WAWA on 24.12.76 after its potential for agricultural purposes was also considered.

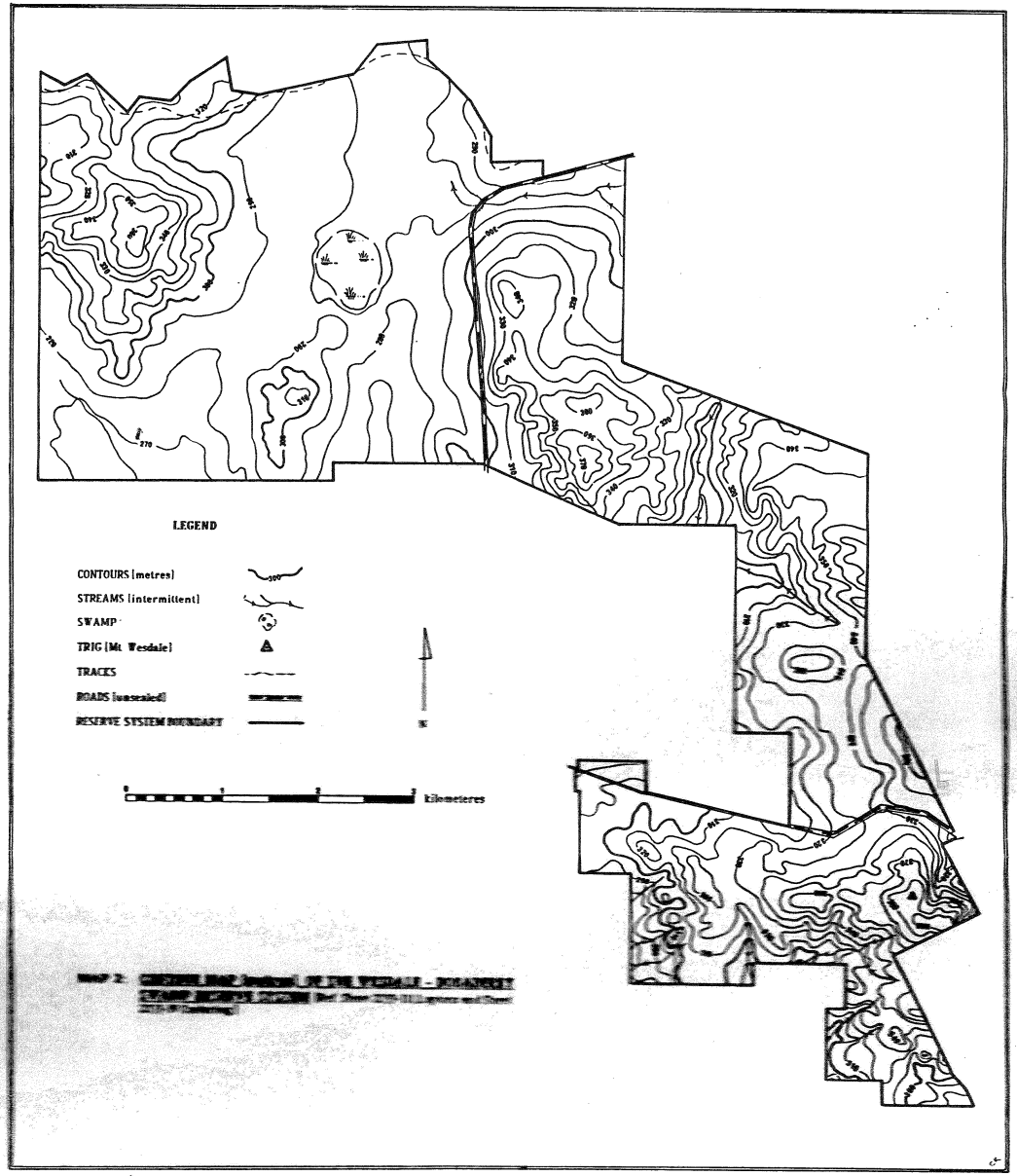
3. Reserve C37306 [Avon Loc. 28697], this reserve does not have a formal title. It has an area of 1307.3644 ha and was the most recent of the group to be gazetted and vested in the WAWA for the conservation of flora and fauna, on 14.8.81.

Reserve C37306 links Dobaderry Swamp Reserve to Mt Westdale reserve thus forming a combined nature reserve of 4005.1165 ha. This reserve system is the second largest area of continuous bushland in the western part of the Pingelly Management District vested in the West Australian Wildlife Authority.

In the System Six Study [DCE., 1883, rec. C35.3] it was recommended that the status of the reserves be change from C class to A class.



MAP 1: LOCATION AND ACCESS, MT. WESTDALE -DOBADERRY SWAMP RESERVE SYSTEM [Ref. Aerial Photographs: W A 1434, Pinjarra Run 4, No. 5248, 11.12.72 and W A 1435 Pinjarra Run 5, No. 5306, 11.12.72]


LEGEND
CONTOURS (metres)
STREAMS (intermittent)
SWAMP
TRIG (Mt Wesdale)
TRACKS
ROADS (unsealed)
RESERVE SYSTEM BOUNDARY
N
0
1
2
3
kilometeres

4.0 LAND USE of the SURROUNDING AREAS

The reserve system lies at the eastern edge of the Northern Jarrah Forest and as a consequence abuts areas with differing land uses.

The land to the east and south of the reserves is predominantly cleared land with less than 15% natural vegetation cover [D.C.E. 1980, Map IV]. Agriculture is the dominant landuse, with sheep and cereal (mainly wheat) being the dominant farm types. [Murray, 1979]. The clearing of this land began as early as 1831, following the discovery of a "valley with fertile, lightly timbered and well grassed pastures", by the enterprising, Ensign Robert Dale, the Acting Assistant Surveyor of the Swan River Colony [Cameron, 1979]. This fertile valley was later to be known as the Avon Valley. Mt Dale, Dale River and more recently the Electorate of Dale perpetuate his memory [Whiteley, 1970]. Mt Westdale in the reserve system also has its name derived from his.

The southern boundary of Dobaderry Swamp reserve is bordered by vacant Crown Land. System Six recommendation C35.2 [DCE 1983] is that this area of vacant crown land be declared a Class C Reserve for the conservation of flora and fauna and that the reserve be vested in the W.A. Wildlife Authority. This recommendation is endorsed as the area concerned has vegetation types poorly represented in the reserve system. The Authority has previously made an unsuccessful application for this area.

Within the State Forest, to the north and west of the reserve system there are three Management Priority Areas. [DCE, 1983], these are:-

(i) Adjoining the northern and western boundaries of Dobaderry Swamp Reserve is SULLIVAN MPA. The outstanding feature of this MPA is the swamp vegetation. (The core area of this MPA abuts the northern boundary of Dobaderry Swamp Reserve [Fig 27, DCE 1983])

(ii) Directly to the north of the Sullivan MPA (approx. 5 km), separated by an area of cleared agricultural land (approx. 5 km x 10 km) is the GUNAPIN MPA. As for the Sullivan MPA the purpose of Gunapin MPA is the conservation of flora and fauna and landscape and catchment protection. [Fig 27, DCE, 1983]

(iii) To the south-west (approx. 5 kms) is the RUSSELL MPA which is bordered by the Brookton Highway. This MPA is of importance for it has the largest remaining area of uncut Wandoo woodland in system six. [Fig 26, DCE, 1983]

So the reserves not only adjoin relatively undisturbed state forest on two sides but are in close proximity to three Management Priority Areas in that State Forest and act as a buffer for one, SULLIVAN MPA. (It should be noted however, that due to the vegetation types present in the reserve system, that this does not detract from it's conservation value)

5.0 CLIMATE

5.1 INTRODUCTION

The climate of the Mt.Westdale-Dobaderry Swamp area is characterized by a mild, wet winter season (April to September) and a hot, dry summer season (October to March), with these characteristics it falls into the "Mediterranean" climatic regime [Beard, 1979] or "csb", the equivalent in Koppen's climatic classification syatem [Gentilli, 1972]

Mediterranean climates are also further classified by Bagnouls and Gaussen [1957, Quoted in Beard, 1979] on the length of the dry season. As this area has a "dry season" of five to six months - it becomes a warm-mediterrranean climate (see Section 5.4, Figure one).

As there is no meteorological recording station for the area under study records from surrounding stations in the region have been used to provide a climatic setting. These stations are of varying distances from the reserve and record different combinations of climatic data.[TABLE 1]

TABLE 1. METEOROLOGICAL RECORDING STATIONS IN CLOSE PROXIMITY TO THE WESTDALE - DOBADERRY SWAMP RESERVES SYSTEM

STATION	NO.	LOCATION TO RESERVE	RECORDINGS MADE
Beverley	010515	29km north-east	temp. & rainfall
Brookton	010524	32km south-east	temp. & rainfall
Oakland	010620	10km south	rainfall only
Redlands	010634	10km south-east	rainfall only
Talbot House	010642	15km north-east	rainfall only

The Great Southern Regional Climatic Survey (Bureau of Meteorology, 1966) presents a composite climatic survey of the region and was used as a guide in interpreting information from the available, updated records.

3.2 RAINFALL

Rainfall, for the area is strongly seasonal with a reliable winter wet season and a long summer 'drought'. The mean annual rainfall (Oakland) is 555mm, of which 428mm (>75%) falls during the period May to September. (Just over 50% (226mm) of total rainfall is received in the two winter months of June and July.) The mean annual rainfall for Beverley, is 419mm with 314mm of this being received for the same period May to September.

This difference between these localities reflects the diminishing rainfall gradient experienced from west to east, and serves to illustrate that Oakland is thus, a more representative recording site for the reserve, as it is located on a similar longitude. (This difference in rainfall received is diagramatically illustrated in Fig. one the ombrothermic diagram.)

The driest months are November to March, when the monthly rainfall averages range from nine to 16 mm (Oakland). Rainfall values recorded monthly for Oakland are presented in TABLE 2, below.

3.3 TEMPERATURE

The study area has mild, cold winter with a mean daily temperature of 12.8° C (ranging from 4.7° C to 17.8° C) and a relatively hot summer, with a mean daily temperature of 27° C, and a mean maximum of 32.9° C. The mean daily maximum for the hottest month, January, is 34.1° C.

TABLE 2. TEMPERATURE AND RAINFALL DATA REPRESENTATIVE OF THE STUDY SITE. [Note. Table is a composite of Meteorological data for Beverley (no. 010515), Oakland (no. 010620) and Westdale (Bureau of Meteorology, 1966)]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
DAILY MAXIMUM TEMPERATURE [°C] BEVERLEY													
MEAN	34.1	33.6	30.8	25.5	21.1	17.8	17.0	17.6	20.0	24.0	28.0	32.6	25.2
86 % ILE	39.5	38.9	36.6	30.8	25.5	20.4	19.7	20.2	23.6	29.1	34.3	38.0	
14 % ILE	29.1	28.0	25.6	20.0	17.7	15.4	14.4	15.0	16.5	19.0	23.2	27.0	
DAILY MINIMUM TEMPERATURE [°C] BEVERLEY													
MEAN	16.4	16.9	14.9	10.8	7.7	6.0	5.3	4.7	5.2	7.7	11.0	14.6	10.1
86 % ILE	19.5	20.5	18.6	15.4	12.0	10.0	9.4	8.8	9.5	12.2	15.2	18.1	
14 % ILE	13.0	13.4	11.0	6.1	3.5	1.7	1.1	0.8	1.0	3.5	6.9	11.0	
AVERAGE MONTHLY AND ANNUAL RAINFALL [mm] OAKLAND													
AVERAGE	10	14	16	31	73	115	111	82	47	33	14	9	555
MEDIAN	2	4	7	22	66	107	100	71	40	27	10	4	547
No. of RAINDAYS	1	2	3	5	10	14	15	13	10	7	4	2	86
AVERAGE MONTHLY AND ANNUAL RAINFALL [mm] WESTDALE [xx]													
AVERAGE	8	10	18	28	74	106	103	81	45	43	16	12	535

[xx] Calculated from data presented as inches in Bureau of Meteorology, 1966.

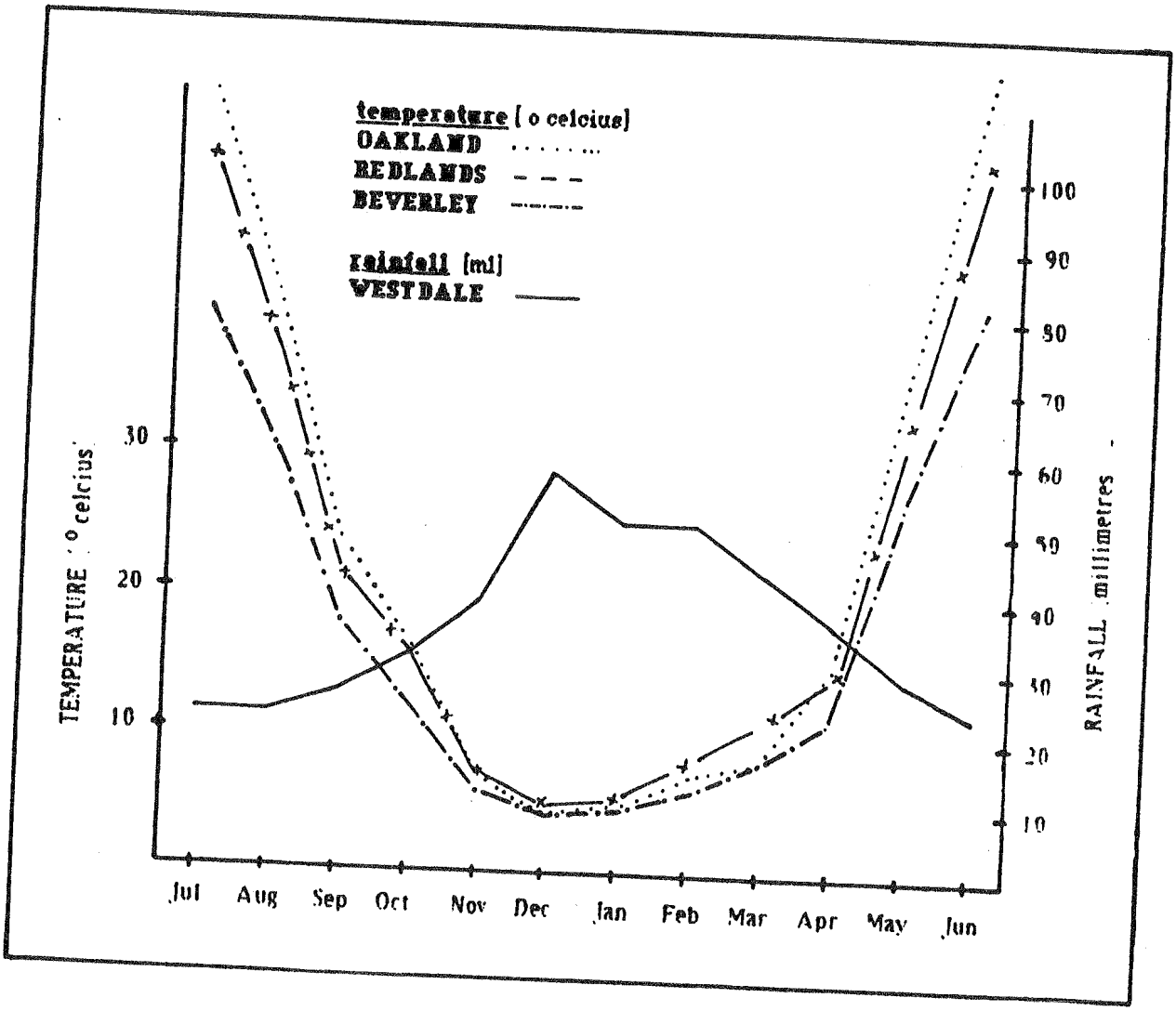
3.4 OMBROTHERMIC DIAGRAM

An ombrothermic diagram [after Bagnouls and Gaussen, 1957, quoted in Beard 1979] for Beverley (with rainfall for Oakland superimposed) is presented in Figure One. Here, the monthly mean rainfall is plotted against the temperature on a double scale. From such a representation, months where the rainfall line falls below the temperature are assumed to be "dry", when precipitation is said to be inadequate for plant growth [Beard, 1979].

The diagram shows that the dry season for Beverley extends from

mid-September to just into April, almost seven months. A calculated dry season for Oakland (i.e. more representative of Westdale) is slightly shorter. It extends from October to the end of March, a month shorter than the 'estimated' dry season for Beverley.From the above it appears that the temperature would also be slightly lower at Westdale, thus this factor combined with the increased rainfall for Oaklands would certainly indicate that the "dry" season for the study region is shorter.

FIGURE ONE OMBROTHERMIC DIAGRAM FOR WESTDALE-DOBADERRY RESERVE SYSTEM



6.0 FLORA SURVEY

6.1 AIMS

The aims of the flora survey were as follows:-

(1) To locate any populations of rare species on the reserves.

(2) To document the value of the reserve system for the conservation of flora by listing as much of the flora found there as possible.

(3) To provide flora identifications to assist in the vegetation survey.

6.2 METHODS OF FLORA SURVEY

Plant specimens were collected at the vegetation recording sites (see below) and also, where time permitted, at other locations. The specimens were identified by keying out and comparison to herbarium specimens at the West Australian Herbarium.

6.3 LIMITATIONS OF THE FLORA SURVEY

The major limitation of the flora survey reported here is the fact that the time available in the field was very limited in view of the size of the reserve system and the diversity of the vegetation and topography found on it. There is also a sampling bias towards the commoner vegetation types and those which were sampled more frequently due to their being variable in representation. Conversely there is a sampling bias away from areas where it was easy to classify the vegetation. An example of this is the granite areas which were poorly sampled (especially the herbfields). There is also a bias against introduced species (due to a lack of time).

6.4 FLORA RECORDED FROM THE WESTDALE GROUP OF RESERVES

Three hundred and forty-seven plant species were recorded from the reserve system. Of these, four species were pteridophytes (ferns), one species a gymnosperm (pine) and ten of the three hundred and fourty-two angiosperms (flowering plants) were introduced (alien) species (four monocots and six dicots). Of the three hundred and thirty-two native angiosperms, eighty - seven were monocotyledons and two hundred and fourty-five were dicotyledons.

It is probable that the three hundred and forty-seven plant species recorded from the Westdale group of reserves represents no more than sixty percent of the flora of the reserves. This is likely as :-

(i) On many occassions plant species observed were not collected had to be ignored due to lack of time,

(ii) the flora survey was carried out as an adjunct to the vegetation survey and therefore sites were selected with the vegetation survey in mind rather than the flora survey,

and (iii) many parts of the reserve system were not examined in any detail.

6.5 DIVERSITY OF THE FLORA

6.5.1 Comparison

The relative diversity of the flora is difficult to estimate due to the lack of published studies of comparable areas of forest. The flora is certainly more diverse than that of areas further east in the wheatbelt such as Bendering Reserve (5119ha, 210 km east of Perth), for which 287 native vascular plants species have been recorded [Muir, 1977]. More species have been recorded further south in the forest around the Worsley Refinery Site and Mt. Saddleback (18,600ha), where 412 vascular plant species were recorded

during the stage one survey [Dames and Moore, 1981]. This latter study is obviously not a complete survey of the flora of the area studied which was much larger than the current study area.

Muir [1977] also gives figures of species per km^2 for several reserves:-

Bendering Reserve	5.9 spp / km^2
Tarin Rock/Nth Tarin Rock Reserves	8.7 spp / km^2
Tutanning Reserve	22.0 spp / km^2

Against this the Westdale Group of Reserves has 8.4 spp / km^2. Muir [1977] points out the obvious deficiencies in this approach, but there are few other data available. On present knowledge Tutanning Reserve (on the western side of the wheatbelt) has a much higher diversity per km^2 than Westdale, but has been much more intensively studied and has more areas of heathlands than at Westdale. It seems unlikely that even with intensive collecting the Westdale Reserve System flora list would reach the 881 species required to equal the diversity at Tutanning.

6.5.2 Distribution of Flowering Plant Species in Families

The native species of flowering plants recorded were from 10 families of monocotyledons and 37 families of dicotyledons.

In the Monocotyledons the numerically important families are:-

Cyperaceae	21 species
Restionaceae	7 "
Liliaceae	19 "
Haemodoraceae	11 "
Orchidaceae	17 "

In the Dicotyledons the numerically important families are:-

Proteaceae	47 species
Mimosaceae	11 "
Fabaceae	37 "
Myrtaceae	35 "
Epacridaceae	18 "
Asteraceae	16 "

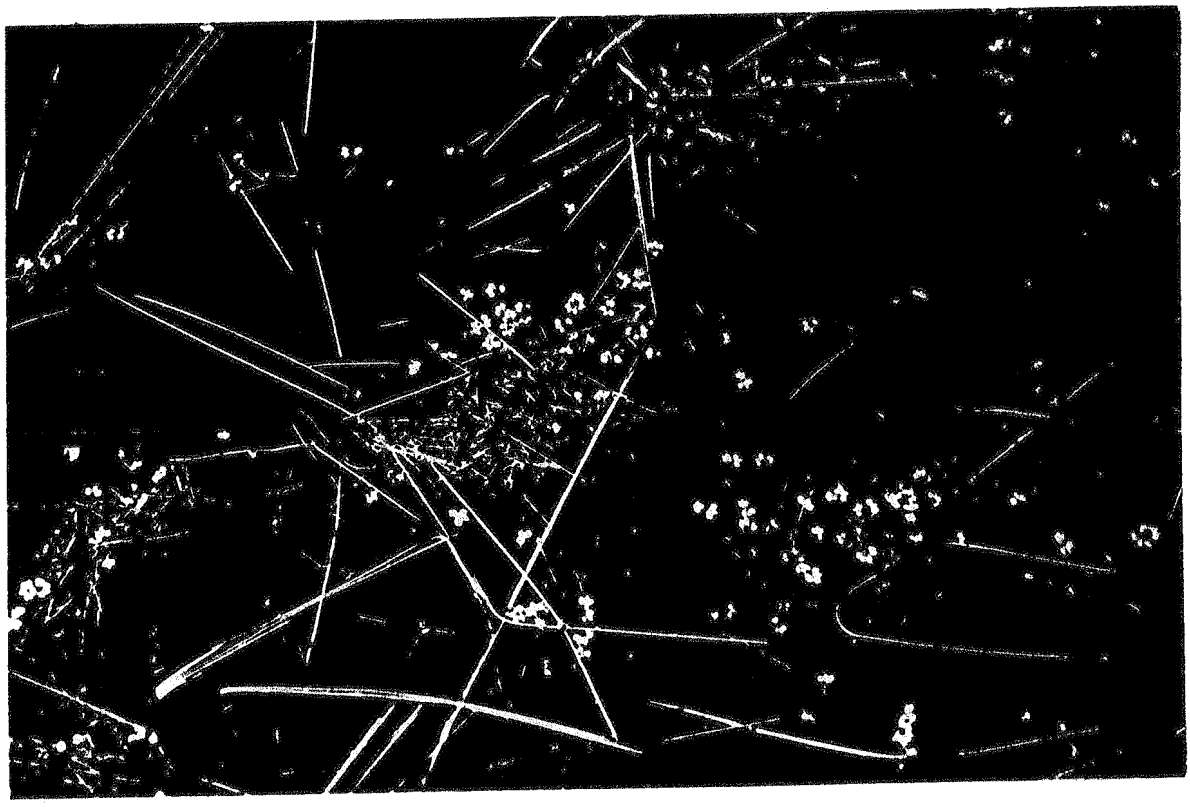
This is typical of the assemblages of plants found in many parts of the south west of Western Australia.

6.6 NOTEWORTHY SPECIES

A number of species collected during the current survey were of particular interest, either because they are known to be rare or because they are poorly known (some previously unknown) species, which further investigation will probably show to be rare or having restricted ranges. In addition, there are species from taxonomically confused groups which also may be rare or restricted.

(i) *Hydrocotyle lemnoides* (Apiaceae)

This is a gazzetted rare species, the only one known from the reserve system. It is an aquatic with floating leaves found (seasonally) in the Dobaderry Swamp itself. The population of this species at the swamp is very sensitive to fire. The seeds are very small and an intensive fire through the swamp could conceivably destroy much, or all, of the seed source. This species may also be present in the swamps in the State Forest to the north of the reserve system.



PHOTOGRAPH ONE: *Hydrocotyle lemnoides*, a gazzetted rare species found on Dobaderry Swamp.

(ii) *Gahnia* sp. (1) (MET. 3644,3605) (Cyperaceae)

This species is not uncommon on the reserve system. It is apparently undescribed and is not widespread.

(iii) *Hakea* aff. *sulcata* (MET 3817) (Proteaceae)

This species was only seen once on the reserve system and appears to be previously uncollected and undescribed.

(iv) *Petrophile drummondii* (Proteaceae)

A poorly collected species (9 specimens in W.A. Herbarium, mostly from north of the reserve system).

(v) *Acacia ?chrysocephala* (Mimosaceae)

This may be an unusual variant of this species or may be a new species.

(vi) *Gompholobium* sp. (MET 3765) (Papilionaceae)

This is apparently the first collection of this species which may be rare and restricted.

(vii) *Latrobea* sp. (MET 3864a) (Papilionaceae)

This species was seen once on the reserve, it could not be matched in the Western Australian Herbarium and may be rare. It is not a showy species so this may have contributed to it not previously being collected.

(viii) *Dodonaea* sp. (MET 3663, 3753) (Sapindaceae)

This species could not be matched in the W.A. Herbarium. It is probably restricted and may be rare.

(ix) *Hibbertia* sp. (MET 3812) (Dilleniaceae)

This species is undescribed and is not widespread, however, it is locally common in the reserve system.

(x) *Eremaea ?violacea* (MET 3909) (Myrtceae)

This species is at least close (taxonomically) to *E. violacea*. It may be a very large range extension for that species, or may be a new taxon.

(xi) *Andersonia brevifolia* (Epacridaceae)

This species is not well known and is represented by only seven specimens in the W.A. Herbarium.

(xii) A small number of species are from genera which are taxonomically confused these speciesmay be rare. These are *Lepidosperma* sp. (1) (MET 3614), *Schoenus* sp. (1) (MET 3882) (both Cyperaceae) and *Leucopogon* sp. (MET 3581) (Epacridaceae)

6.7 CONCLUSIONS

The Mt. Westdale - Dobaderry Swamp Reserve System is important for the conservation of populations of a significant number of native plant species. It is particularly important for the fourteen species listed in section 6.6, but in this context it should be appreciated that in the future the pressures of development, coupled with competition from weed species and the impacts of man's other activities (e.g. frequent burning, use of fertilisers) will mean that many species that are not presently considered rare or restricted will become so. The value of the reserve for flora conservation is increased by its location on the eastern edge of the forest block i.e. on the edge of the wheatbelt, which has been very extensively cleared for agriculture without adequate areas being left for the conservation of the native flora and fauna.

It is also likely that intensive flora collection on the reserves would locate populations of other rare or restricted species.

7.0 VEGETATION SURVEY

7.1 AIMS

The aims of the vegetation survey were as follows:

(i) To map the vegetation of the reserves at the formation level, with each formation to be further sub-divided where possible.

(ii) To provide a series of site descriptions based on the Muir [1976] system to describe the range of vegetation found on the reserves.

(iii) To identify vegetation/habitat types which, as a matter of priority, should remain undisturbed. Particular attention to be given to identifying those areas from which fire should be excluded.

(iv) Identify natural low fuel areas on the reserves.

7.2 APPROACH TO MAPPING

7.2.1 Mapping System Used

After a preliminary examination of the reserves, it was decided that the use of the vegetation site type system developed by Havel [1975 a, b] for the Northern Jarrah Forest would be the best system to use, though some modifications and extensions would be necessary.

The reasons for this decision were:-

(i) Very similar stands varying in cover of the tree stratum by a few percentage points would be mapped at the formations level as different formation (woodland and forest) although they might have very similar understories e.g. Type M sites 14 and 24, this would complicate interpretation of the vegetation and the development of management strategies.

(ii) The system has been used in adjacent forest areas and found to be workable [E. Mattiske pers. comm.].

(iii) When the studies on the adjacent areas are available comparisons will be possible.

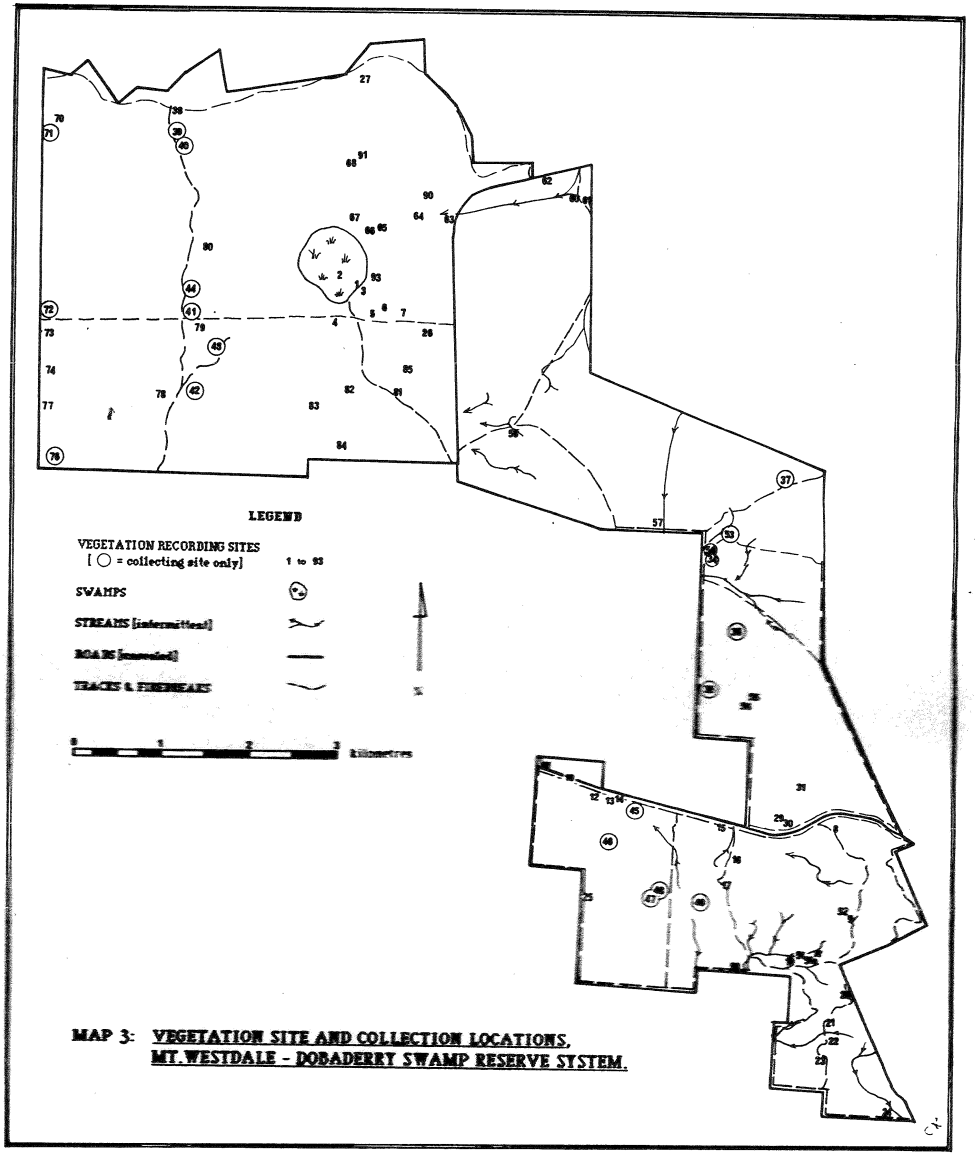
(iv) The map produced would carry the maximum information that could be obtained in the time available for the study; and much more information than a map at the formation level. e.g. even if the formation "Open forest" had been subdivided on the map into *Eucalyptus wandoo* Open Forest, *E. accedens* Open Forest, *E. marginata* Open Forest, and *E. calophylla* Open Forest this would have given little information on the the understorey structure or composition. To then divide the understories of, for example, Wandoo woodland and forest along parallel lines would have produced a vegetation map of significantly more complexity than the one presented. Also given the degree of logging in the reserve system it is doubtful that sites could be reliably assigned to the formation type (woodland or forest) they would achieve at climax.

(v) If, in the future, more precise (detailed) mapping is required the units mapped could be subdivided rather than it being necessary to start from 'scratch' as the site type units, though many are very broad containing many different communities,are felt to, be natural.

7.2.2 Methodology of Vegetation Survey

Black and white aerial photography at 1:40,000 was available and the study was initially based on interpretation of stereo pairs of these photographs using a stereoscope and the naked eye.

Overlays marking areas of uniform photograph texture were drawn up, initially at 1: 40,000. These areas were then examined in the field for allocation to a vegetation site type. Detailed descriptions of representative areas were made and boundary locations were also checked during the field survey.



MAP 3: **VEGETATION SITE AND COLLECTION LOCATIONS, MT. WESTDALE - DOBADERRY SWAMP RESERVE SYSTEM.**

Due to the small size of many of the individual areas of the different vegetation types, problems were experienced working at 1: 40,000, so enlargements at 1: 25,000 were obtained and the information transferred to this scale.

Traverses were made using a four wheel drive vehicle along existing tracks and firebreaks, the vehicle traverses were supplemented by foot traverses which were necessary in many parts of the reserve due to the relatively small size of the individual areas of many of the vegetation types and the lack of tracks.

7.3 LIMITATIONS OF THE VEGETATION SURVEY

The units mapped each contain a range of plant communities. (Some, eg. MG, are more variable than others such as M.) This needs to be borne in mind when using the map to make sure that an overly simplistic interpretation is not being made. To avoid this, the map should be read in conjunction with the text descriptions. Also lack of time has meant that some of the variation on the reserves has not been covered in the descriptions and mapping. At times individual areas had to be put into the site types they are closest to even if the fit was poor.

7.4 THE VEGETATION OF THE MT. WESTDALE - DOBADERRY SWAMP RESERVE SYSTEM

The vegetation of the reserve system is complex both in the range of types of vegetation present and in its mosaic like spacial distribution. To some degree the latter is simplified by its relationship to the topography,however examples of different vegetation types do occur in topographically different places, e.g. examples of site type M occur on valley slopes below breakaways and also on low hillslopes.

The vegetation of the reserves is dominated by a small number of tree species over very varied understories. It ranges from lowland swamp vegetation to the vegetation of open sandy valleys, medium sized and narrow loamy valleys, gentle gravelly slopes, lateritic breakaways, lateritic uplands and various types of granitc outcrops and streams. The tree species are Jarrah (*Eucalyptus marginata*), Marri (*Eucalyptus calophylla*), Wandoo (*Eucalyptus wandoo*) and Powderbark Wandoo (*Eucalyptus accedens*) with Flooded Gum (*Eucalyptus rudis*) in the swamps, *Allocasuarina huegelliana* around the granitic outcrops and *Banksia attenuata, B. menzesii* and *B. prionotes* along the edges of drainage areas and in site type J vegetation.

Where a tree species occurred as partly old stands and partly regrowth following logging, these have been lumped in the Muir descriptions.
Detailed recording of the different sites (heights and percentage covers) is given in Appendix One.

7.4.1 Vegetation Types

(a) Wandoo (*Eucalyptus wandoo*) Types

Havel [1975] only recognised three site types with a Wandoo (*Eucalyptus wandoo*) overstory. This was because his study area did not venture to the extreme eastern side of the forest and was based on a limited number of plots. As a consequence it has been found necessary to allocate some map areas to new site types. These may only be valid for the reserve or may eventually be found to exist over wider areas. To avoid confusion with Havel's site types they have been given lower case letters.

(i) Site Type M

This vegetation type usually has pure stands of Wandoo over a low open understorey characterised by Macrozamia reidlei and Hakea lissocarpha. [Havel 1975a]. The percentage cover of the Wandoo recorded for this site type on the reserve varies from 20 to 40%, ten percent each side of the division from forest to woodland. The understories observed in areas of site type M in the reserve system varied from sites with *Macrozamia* and few other plants to sites with fairly dense (but low) shrub layers. Sites marked ?M on the vegetation map were placed in this type with reservation and need further study.

Muir Descriptions

Site 4:

Woodland over Low Heath C over Open Dwarf Scrub D over Very Open Low Sedges and Very Open Herbs.

Site 24:

Forest over Low Heath C over Open Dwarf Scrub D over Very Open Herbs.

Site 14:

Forest over Thicket over Dwarf Scrub C over Low Sedges.

Sites 4 and 24 are quite typical but site 14 is atypical and has been included here to keep the number of types to a manageable level, it has a

PHOTOGRAPH TWO: Showing the dominant, Wandoo (*Eucalyptus wandoo*), over *Macrozamia reidlei*. Depending on individual site characteritics the understorey can be as open as this or include a well developed low shrub layer.

patchy stratum of *Leptospermum erubescens* and has *Xanthorrhoea preissii* replacing *Macrozamia reidlei*. This seems to reflect the sandier conditions at this site, it was noticeable throughout the reserves that *Leptospermum erubescens* occurs sporadically in

various vegetation types in pockets of sandier soil.

Site 38:

Forest over Open Dwarf Scrub C over Low Heath D over Open Low Sedges and Very Open Low Grass.

This site has a small amount of depauperate Jarrah (*Eucalyptus marginata*) and Marri (*Eucalyptus calophylla*) under the Wandoo (*E. wandoo*) forest. This, and the diverse understorey, indicate that this site, although closest to type M, is intermediate between type M and type H.

Site 83:

Woodland over Low Scrub B over Open Dwarf Scrub C over Dwarf Scrub D over Open Low Sedges and Very Open Herbs.

The overstorey at this site is a mixture of Wandoo (*Eucalyptus wandoo*) and Jarrah (*E. marginata*), this coupled with the soil (grey sand with lateritic pebbles) and the presence in the understorey of *Conospermum stoechadis* and *Synaphea reticulata* indicates an affinity to site type J. The absence of *Hakea lissocarpha* is also significant.

Topographic position: On valley slopes, often below breakaways and on the slopes of hills eg. the hill on the south side of Dobaderry Swamp.

Soils: Orange brown loam to sandy loam with pisolitic gravel, or silty grey sand with lateritic gravel (Site 38).

(ii) Site Type MG

This vegetation type has stands of Wandoo (*Eucalyptus wandoo*) sometimes mixed with Powderbark (*Eucalyptus accedens*) or Jarrah

(*Eucalyptus marginata*) over understories which typically have various species of *Dryandra* as the most abundant species or at least as major components. As the unit has been applied in this study it includes sites where Wandoo occurs over understories which include other genera of Proteaceae (*Petrophile* and *Hakea*) as major components of the understorey. This has been done because they often occur in a mosaic to small to map and intergrade. They presumably offer similar food (nectar) resources and shelter.

Muir Description

Site 10:

Forest over Open Low Woodland over Low Heath C over Low Heath D over Very Open Herbs and Very Open Sedges.

MG is a quite variable type with understories ranging from ca. 40cm to more than 2m tall, however, to divide it would mean creating a considerable number of divisions and, to be consistent, doing the same for the Powerbark Wandoo *(Eucalyptus accedens)* and Jarrah (*Eucalyptus marginata*) vegetation types(pG and HG) with similar understories. *Dryandra armata* occurs as the most abundant species on gravelly low rises (such as site 10) and areas of gentle slopes, *Dryandra sessilis* and *D. carduacea* occur towards breakaways and quite frequently on areasof gentle slopes with very thin soil. In many places *Allocasuarina humilis* is a significant member of the understorey, and in patches is the most abundant species. *Hakea trifurcata* occurs in sandy patches on mid to upper slopes and more extensively on lower slopes. Thus there seems to be a relationship between understory type and soil depth as follows (depth increasing) *Dryandra sessilis* and *D.carduacea - Dryandra armata* and *Melaleuca* aff *scabra* -

Allocasuarina humilis - Hakea trifurcata. This apparent trend would need to be confirmed by detailed studies. Probably soil composition and moisture availability would be found to be important as well as soil depth. The *Hakea trifurcata* may on detailed study be found to warrant separation as a distinct type(s). A very moist site (site 11) with *Hakea trifurcata* has been treated as a variant of type L.

Topographic position: generally on fairly gentle slopes, from near the topographic highs (behind breakaways) through mid slopes and occassionally quite low down the topographic sequence, e.g. downslope (west) of site 58 where there is an extensive area of MG type with a *Dryandra armata* understorey on soil containing lateritic pebbles washed down from the 'escarpment' above Dobaderry Road.

Soil: Lateritic gravels to orange sand with lateritic gravel fraction.

The use of MG to cover areas such as those described above is an extension of the concept of an MG intergrade type described by Havel [1975b] to cover areas of Wandoo Woodland or forest on shallow soils over granite to areas of Wandoo on shallow soils over laterite [E. Mattiske pers. comm.] similarly HG and pG are further extensions to overstoreys of Jarrah and Powderbark Wandoo. This naming system has ben maintained in the current study, however, it seems unfortunate that an extension to a very different soil type (lateritic soils) with very different understories has been created.

(iii) Site Type L

This site type typically has stands of Wandoo (*Eucalyptus wandoo*) with an admixture of Blackbutt (*Eucalyptus patens*) over an understorey that includes *Hakea lissocarpha, Diplolaena drummondii, Hypocalymma angustifolium, Hibbertia montana* and *Acacia pulchella* [Havel 1975a]

Muir descriptions

Site 50:

Woodland over Open Low Woodland B over Low Scrub A over Low Heath C over Dwarf scrub D over Very Open Low Sedges and Very Open Low Herbs.

Site 11:

Forest over Dense Low Heath D over Open Low sedges and Very Open Herbs.

This site is atypical as it has a dense layer of *Hakea trifurcata* , its placement here is tentatative , see the note under MG above.

Site 57:

Dense Tall Forest over Dense Low Heath D over Open Low Sedges.

The canopy at this site is right on the border (70%) of the cover requirement for Dense and Mid-dense Forest.

Topographic position: Lower slopes and bottoms of broad valleys and bottoms of some smaller valleys.

Soil: Brown sandy loam. Site 11 is unusual in having a cream coloured silty sand.

(iv) Site Type Y

This site type typically has *Eucalyptus wandoo* over an understorey that includes *Hakea lissocarpha, Hypocalymma angustifolium, Baeckea camphorosmae, Hibbertia lineata* and *Gastrolobium calycinum* (Havel,1975a) Most of the examples seen on the reserves have a much sparser than usual understorey. They also have a quite dense cover of the dominant (*Eucalyptus wandoo*, 25-35m, 70% cover) which probably accounts for this.

PHOTOGRAPH THREE An example of an area of site type Y, note the open understorey and the fairly dense overstorey of Wandoo (*Eucalyptus wandoo*) even after the obvious logging.

Muir Description

Site 25:

Tall Forest over Open Dwarf Scrub C over Open Low Sedges and Very Open Herbs.

Topographic position: Valley floors and drainage lines (in flatter areas).

(v) Site Type a

This site type falls outside Havel's [1975a] site types, it occurs on the almost flat bed of a broad stream (which flows towards Dobaderry Swamp but appears to have no actual entrance into it) and is quite variable. It has Wandoo (*Eucalyptus wandoo*) over an understorey of shrubs and sedges or just sedges (in patches). It occupies a similar position topographically to type Y it differs in having a much more open overstorey and a quite different understorey. Sites occupied by Type a appear to be depositional with sandy soils while those occupied by Type Y appear to be erosional with more clayey soils. The understorey species observed include *Verticordia densiflora*, *Verticordia pennigera*, *Lepidobolus preissianus*, *Lhotzkya ericaea* and *Conospermum scaposum*.

Muir Description

Site 60:

Open Woodland over Dense Thicket over Dwarf Scrub D over Very Open Herbs;

or Open Woodland over Dwarf Scrub D over Very Open Herbs;

or Open Woodland over Open Herbs;

or Open Woodland over Open Low Sedges.

This 'site type' has few understorey species and as they range from herbs and low sedges to 1.8m tall shrubs the presence or absence of one or two (presumably reflecting micro-changes in soil conditions) can

significantly change the Muir [1976] description of the vegetation. Patchiness was observed at many of the sites examined on the reserves and it is considered that the patchiness exhibited at this locality should be treated as an extreme of this.

Site 63:

Dwarf Scrub C over Low Heath D over Low Sedges and Very Open Herbs.

While site 63 has no Wandoo it is obviously close to site 60, the Wandoo at which could possibly best be considered fringing to it rather than over it. The narrowness of the watercourse confuses the situation somewhat. Site 63 has a *Banksia attenuata* and *Banksia menzesii* woodland strip between it and a Marri (*Eucalyptus calophylla*) community to the south. Where the transition to the *Banksia* woodland is gradual there is a belt of *Petrophile drummondii* Heath A to Dense Heath A. Other sites within the outflow area that site 63 lies in have somewhat different species assemblages, but obviously need to be mapped together.

Site 74:

Woodland over Dwarf Scrub C over Dwarf Scrub D over Low Sedges.

Soil: Creamy-grey, silty sand (setting hard) (Site 60), dull yellow sand over white sand (Site 63), creamy grey sand with some silt (Site 74).

Topographic position: Site 60 occurs in the bottom of a stream bed and site 63 in an outflow area to the east of Dobaderry Swamp.

(vi) Site Type b (?-M/F)

This site type falls outside Havel's [1975a] classification, it occurs on the sides of a valley above a stream (the bed of which has site type a vegetation) and on sand banks next to site type a vegetation, one area was seen on a gentle hillslope. The understorey is close to that of Havel's site type F so b is

probably an intermediate between M and F with the superficial sand layer controlling the understorey and the deeper soil controlling the overstorey (Wandoo).

Muir Descriptions

Site 61:

Woodland over Thicket over Dwarf Scrub C over Dwarf Scrub D over Open Low Sedges and Open Herbs.

Site 62:

Tall Woodland over Open Scrub over Low Heath C over Open Dwarf Scrub D over Open Low Sedges.

Site 77:

Woodland over Scrub over Open Dwarf Scrub C over Low Sedges and Very Open Herbs.

Site 66:

Forest over Scrub over Dwarf Scrub C over Dense Low Sedges.

Soil: Grey sand, apparently quite deep at site 62 and forming a bank next to the water course at sites 61 and 77. Sometimes with a few lateritic pebbles(66).

Topographic position: Site 62 is on a slope above a watercourse and sites 61 and 77 appear to be banks or sheets of sand next to broader watercourses. Site 66 is the lower part of a dune which slopes down to a drainage area.

(vii) Site Type c

This site type falls outside Havels [1975a] classification, it ocurs as a band

around the edge of Dobaderry Swamp and has Wandoo (*Eucalyptus wandoo*) over Jam (*Acacia acuminata*) with a quite rich herb layer, it may be a variant of site type Y.

Muir Description

Site 3:

Woodland over Low Woodland over Open Herbs.

Soil: Grey clayey sand.

Topographic position: very slight slope.

This site type abuts several different site types around the swamp. Near to site 3 it abuts a slope with site type M and also a dune with Marri (*Eucalyptus calophylla*) woodland (site type ?Z) and in fact is the very gentle lower slope of this dune which partly surrounds the lake. On the West side of the swamp it abuts an area of York Gum (*Eucalyptus loxophleba*) woodland. Unlike many of the sites sampled this had a quite diverse herb layer.

(viii) Mixed Type L/Y

The areas mapped as mixed type L/Y have some similarities to the areas mapped as type a but are floristically closer to types L and Y, these lower (topographically) Wandoo areas need further study. However, there are differences in the occurrence of indicator species and other species which contribute to the vegetation of these areas. Areas with *Hakea lissocarpha* and *Gastrolobium calycinum*, but without *Macrozamia reidlii* and fitting neither L nor Y well, have been put in L/Y. Areas without these (or only very small amounts of one of them) and with a shrub layer of *Verticordia densiflora* and *Verticordia pennigera* have been placed in type a (note also the discussion above, see (v) Site Type a).

Muir Description

Site 70:

Woodland over Open Low Scrub A over Open Dwarf Scrub C over Low Sedges.

Soil: grey-brown fine, silty loam.

Topographic position: Very gently sloping area between two low granitic outcrops in lower part of reserve system.

In other areas of L/Y *Diplaena drummondii, Baeckea camphorosmae* and *Hypocalymma angustifolia* were observed, these are indicator species for Types L and Y and have not been observed in areas referred to Type a.

(ix) Site type i

This is a Wandoo variant of type G, possibly a G/Y or the true M/G. Site type G "is more correctly a complex of types ranging from lichen - covered rocks, through *Borya nitida* herbfields on thin soil veneers, through largely treeless thickets of *Grevillea bipinnatifida, Hakeelliptica, Hakea undulata, Hakea trifurcata, Hakea lissocarpha* and several *Acacia* and *Melaleuca* species, to an open low woodland of Darling Range ghost gum with an admixture of Marri and Jarrah on the somewhat deeper soils..." [Havel 1975b]. This concept is extended here to include a fairly distinct 'type' i with a Wandoo (*Eucalyptus wandoo*) overstorey and a fairly open understorey which usually includes *Grevillea bipinnatifida, Hakea trifurcata, Borya scirpoidea, Dryandra fraseri, Gastrolobium calycinum* and a significant percentage of *Xanthorrhoea preissii*. Type (i) occurs downslope from granitic outcrops

or areas of site type M which are downslope from granite outcrops in lower areas of the reserve system; it occurs at three localities in the reserve system. The overstorey cover is quite dense (to 50%) and tall (to 35m) which is unusual in the reserve system. It may be best considered as a mixed site type G/Y with the *Grevillea bipinnatifida*, *Borya* and *Dryandra fraseri* indicating type G, the *Gastrolobium calycinum* common to types G and Y and the dense overstorey of Wandoo typical of areas of site type Y.

Muir Description

Site 73:

Tall Forest over Scrub over Open Dwarf Scrub C over Dwarf Scrub D over Open Herbs and Open Low Sedges.

Soil: Grey loam.

Topographic position: Slight slopes below granitic outcrops in the lower areas of the reserve system.

(x) Site Type n

One area has been referred to this type which is outside the types proposed for Wandoo areas by Havel(1975a). It is downslope from one of the areas of i and has some similarities. However it differs in the absence of *Grevillea bipinnatifida*, *Hakea lissocarpha*, and *Dryandra fraseri* and by having a much smaller amount of *Gastrolobium calycinum*, somewhat different soil and a more open overstorey. The understorey species present included *Xanthorrhoea preissii*, *Borya scirpoidea*, *Mesomelaena costale* and *Lepidosperma* sp.(1).

Muir Description

Site 78:

Forest over Scrub over Open Dwarf Scrub D over Open Herbs and Open Low Sedges.

Soil: Grey sandy loam with some lateritic pebbles.

Topographic position: Slight slopes, below areas of type (i) which in turn are below granite outcrops.

(xi) **Mixed site type Y/F** (close to b - M/F)

This vegetation type was observed in one part of the reserve, adjoining areas of type Y and b. In species composition and place in the landscape it seems to be intermediate between types Y and b or F. So it can be considered an intermediate between Y and F as b is itself an intermediate type between Y or M and F. A distinctive feature of this vegetation type is the open nature of the understorey which is almost entirely sedges, herbs and grasses with only scattered shrubs.

Muir Description

Site 82:

Woodland over Open Herbs over Low Sedges.

Topographic position: in a low area in the lower part of the reserve system.

(xii) **Mixed type i/G**

One site was referred to this mixed type no detailed recording was made(due to lack of time).

(xiii) Mixed type Y/i

One site was referred to this mixed type, no detailed recording was made.

(xiv) Mixed type MG/L

One site was referred to this mixed type, no detailed recording was made.

(xv) Mixed type F/J/Y

One site was referred to this mixed type, no detailed recording was made.

(b) Flooded Gum (*Eucalyptus rudis*) Types

The different sites observed with *Eucalyptus rudis* as the tallest stratum are very different in terms of there site conditions (soils and water conditions) as well as in the understory species present. As aconsequence of this it was felt necessary to give them different "site types" to maintain consistency in the level of division of the vegetation.

(i) Site Type d

This site type forms a band around part of Dobaderry Swamp and is seasonally inundated. It has a sparse upper storey (emergents) of Flooded Gum (*Eucalyptus rudis*) over *Melaleuca viminea* and *Melaleuca laterita*, sedges and a seasonal aquatic herb population.

Muir Description

Site 1:

Open Low Woodland A over Scrub over Open Low Shrub B over Very Open Tall Sedges over Very Open Low Sedges over Open Herbs (aquatic).

Soil: Grey silty sand

Topographic position: Almost the topographic low in the reserves, the central portion of the swamp is slightly lower.

(ii) Site Type e

This site is a small seasonal swamp. It has rapidly changing vegetation with slight changes in topography.

Muir Description

Site 6:

Low Woodland A over Scrub over Open Dwarf Scrub C over Open Tall Sedges.

On the western side of the swamp there is a belt of *Kunzea ericifolia* to 5m tall (but with a 'shrub' habit) with *Acacia pulchella* var. *glaberrima* to 1.5m. On the eastern side there is a belt of *Adenanthos barbigera*. These have not been included in the Muir description because they represent ecotonal variants of the vegetation. The Low Woodland A has a stratum of *Eucalyptus rudis* (10-12m, 5%) over a stratum of *Melaleuca preissiana* (8m, 5-10%), both of which individually would be classified as Open Low Woodland A.

The understorey of this 'swamp' is quite different to that of Dobaderry Swamp not only in the absence of *Melaleuca viminea* and *Melaleuca laterita* but in the different species of sedges present. This is due to the different water and soil conditions, at the time of the first visit Dobaderry Swamp was inundated and site 6 had no free water.

Soil: Grey sand

Topographic position: Near the topographic low in the reserve system, but it was dry, while Dobaderry Swamp (which is quite close) was full, so it is presumably slightly higher.

(iii) Site type f

One location in a drainage line north east of Dobaderry Swamp was given this designation which falls outside Havel's (1975a) site type concepts. It is a depression in the drainage line to the north east of Dobaderry Swamp and has stunted Flooded Gum (*Eucalyptus rudis*) over *Actinostrobus arenarius, Melaleuca laterita, Hakea varia, Verticordia pennigera* and *Callistemon phoniceus.*

Muir Description.

Site 91:

Open Low Woodland A over Open Low Woodland B over Open Low Scrub A over Open Dwarf Scrub D.

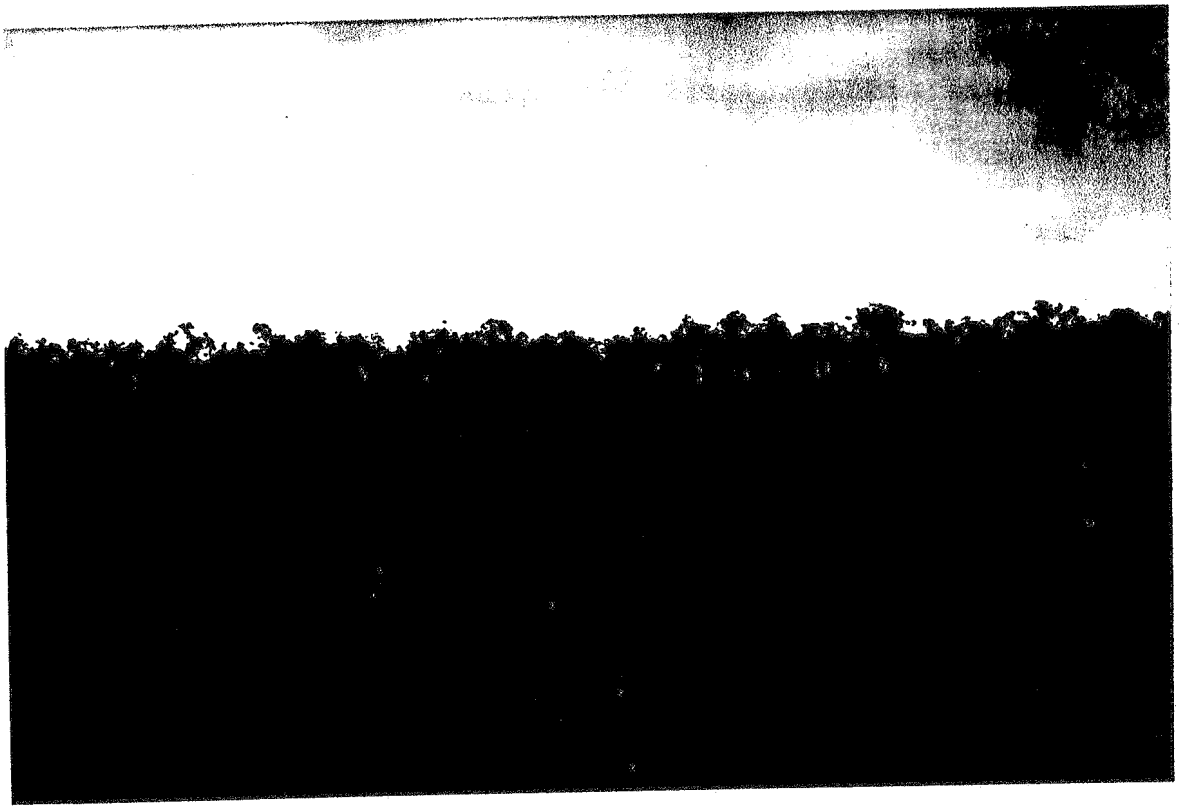
(c) Heath Vegetation Types (except heaths associated with granitic outcrops)

The vegetation of the reserve system is mostly woodlands and forests, however there are areas of heath.In contrast to the heathlands found in the Wheatbelt the heaths found in the Westdale-Dobaderry Swamp Reserve System are species poor. They have 1-3 dominant species and few other species and are found on the very leached soils found in the drainage complexthat lies on the east side of Dobaderry Swamp and in the centre of the swamp itself. The heaths associated with the granitic outcrops found through the reserve system are treated under site type G(1) (see below).

(1) Subtype h(1) *Melaleuca laterita* Heath

This vegetation type forms the central portion of Dobaderry Swamp. It consists of a stratum of *Melaleuca laterita* with a very occasional *Hakea*

marginata over two species of sedges and (seasonally) aquatic herbs and in the shallower parts geophytes such as *Tribonanthes*. It was flooded at the time of the initial visit.



PHOTOGRAPH FOUR: *Melaleuca laterita* heath on Dobaderry Swamp with Wandoo (*Eucalyptus wandoo*) woodlands and forest in the background. [Site 2]

Muir Description

Site 2:

Heath B over Open Tall Sedges over Very Open Low Sedges and Open Herbs (Aquatic).

The vegetation of this unit has to cope with inundation in winter and extreme aridity in summer and this presumably accounts for the floristic simplicity of the shrub layer.

Soil: Grey silty sand.

Topographic position: The bed of a seasonal swamp (lake?).

(2) Subtype h(2) *Allocasuarina acuaria* Heath

Three small areas of *Allocasuarina acuaria* Heath occur in the drainage system between Dobaderry Swamp and Dobaderry Road.

Muir Descrition

Dense heath B over Open Dwarf Scrub C over Dwarf Scrub D over Open Low Sedges.

Soil: Coarse grey sand.

Topographic position: Slight slope in low-lying drainage compex area east of Dobaderry Swamp.

(3) Subtype h(3) *Petrophile drummondii* Heath

This also occurs in the drainage system between Dobaderry Swamp and Dobaderry Road. It has a dense cover of *P. drummondii* to about 1.5m over a fairly simple understorey. No detailed recording was made.

(4) Subtype h(4) *Leptospermum erubescens* Heath

One area of this vegetation type occurs south of Dobaderry Swamp in a seasonally damp site. It has *L. erubescens* to about 1.5m with a moderate cover. No detailed recording was made.

(5) Subtype h(5) *Leptospermum erubescens / Petrophile drummondii*

This vegetation type occurs in the drainage system between Dobaderry Swamp and Dobaderry Road, it presumably occurs on sites that are intermediate to those on which the preceding two types are found on. No detailed recording was made.

(d) Powderbark Wandoo (*Eucalyptus accedens*) Types

(i) Site Type p

This site type falls outside Havel's [1975a] classification, which does not include any Powderbark Wandoo (*Eucalyptus accedens*) Types. It has a fairly dense stratum of Powderbark wandoo over a diverse, but low and open understorey with a few *Macrozamia reidlei, Xanthorrhoea preissii* and *Hakea trifurcata* over a variety of smaller shrubs and herbs It is fairly obviously similar to site type M, which can occur in similar topographic situations. Occasionally type p occurs immediately above type M on the slope below a breakaway and the occurrence of p rather than M may indicate a more leached soil, or better drained site.

PHOTOGRAPH FIVE: Site Type p, Powderbark Wandoo (*Eucalyptus accedens*) over a very mixed low understorey.

Muir Description

Site 16:

Forest over Open Low Scrub B over Low Heath D over Very Open Tall Sedges over Very Open Herbs.

Soil: Orange-brown silty lateritic gravel.

Topographic position: Slope (about 20_SUo_sd) beneath breakaway, facing west.

(ii) Site Type pp

This site type also falls outside Havel's [1975a] classification. It is similar in topographic position to site type p but has a very different understorey, both in structure and floristic composition as it has a fairly dense shrub layer (*Gastrolobium trilobum* 1.6m tall, 40% cover) over a floristically poorer and much more open small shrub (less than 0.5m) layer than in type p. There seems to be no obvious reason (such as slope) why there should be such a marked difference in understorey between types p and pp, however, the relative absence in pp of small, presumably shallower rooted, species indicates that these are very dry sites.

Muir descriptions

Site 21:

Woodland over Heath A over Open Dwarf Scrub c over Open Dwarf Scrub D.

Sedges and herbs are present, but do not reach the 2% minimum cover required to be included in the descriptions.

The Powderbark Wandoo had been logged at this site and includes regeneration (2-4m, <5% cover). When undisturbed by logging this site

may be a forest rather than a woodland type.

Where this site type includes creeklines a few Marri (Eucalyptus calophylla) often occur.

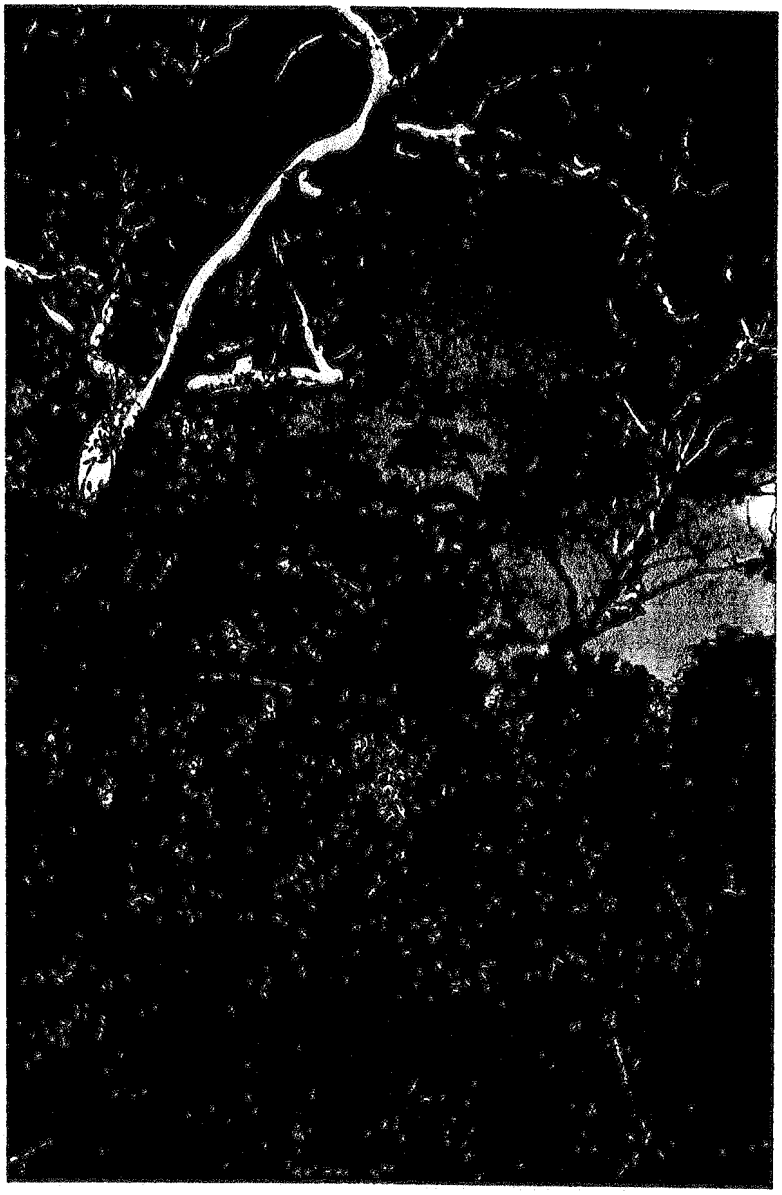
Topographic position: Slopes below breakaways.

PHOTOGRAPH SIX: Site Type pp, Powderbark Wandoo (*Eucalyptus accedens*) over an open shrub layer of *Gastrolobium* with very few other species.

(iii) Site Type pG

This site type is much more variable in its understories than either of the two preceding types. The understories are typically dominated by species of *Dryandra* (*D. sessilis, D. armata, D. carduacea and D. nobilis*). However, in a similar fashion to site type MG, in places species of *Petrophile* and *Hakea* are prominent in the understorey. There is often

an admixture of Wandoo with the Powderbark Wandoo (e.g. site 12, 40% Powderbark and 20% Wandoo respectively) and these areas intergrade to MG/pG, in creeklines an admixture of Marri often occurs.



PHOTOGRAPH SEVEN: Site Type pG, Powderbark Wandoo (*Eucalyptus accedens*) over understories dominated by *Dryandra carduacea* [Site 22].

Muir descriptions

Site 22:

Woodland over Dense Thicket over Open Low Scrub B over Open Dwarf Scrub D.

Sedges and herbs are present but do not reach the minimum 2% cover required to be included in the description.

Site 12:

Forest over Dense Thicket over Open Low Scrub B over Open Dwarf Scrub D over Very Open Low Sedges.

There are herbs present, but they do not reach 2% cover.

Soils: Pale orange brown to orange brown sandy gravels.

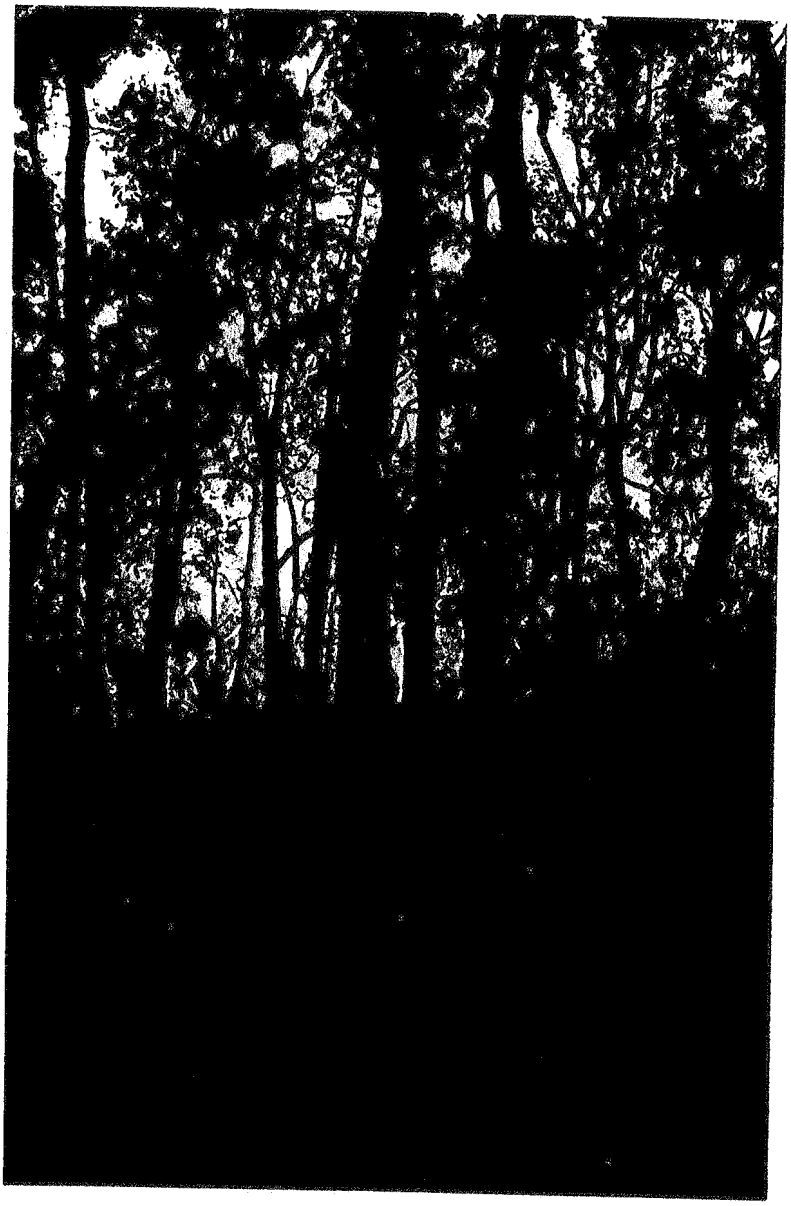
Topographic positions: Slopes below breakaways (e.g. site 15), rarely creeklines high up in profile (e.g. site 22), on breakaways and the upper part of slopes behind breakaways.

Site 15 is very atypical with *Melaleuca ?scabra* (35% cover) and *Allocasuarina humilis* (10% cover) prominent in the understorey which is dominated by *Dryandra armata* (50% cover). This understorey type was more commonly observed under Jarrah or Wandoo (i.e. in type HG or MG).

(e) Marri (*Eucalyptus calophylla*) Types

(i) Site Type C

This site type typically has Blackbutt (*Eucalyptus patens*) not Marri (*Eucalyptus calophylla*) as the tree stratum though Marri may occur as an admixture [Havel, 1975a]. It seems however, to be the closest to the vegetation observed at site 19, the Blackbutt being replaced by Marri due to the drier conditions on the eastern edge of the forest.



PHOTOGRAPH EIGHT: Type C, with Marri (*Eucalyptus calophylla*) over an understorey including *Acacia celastrifolia*, *Hypocalymma angustifolia* and *Brachycome praemosum*. [Site 19]

Muir description

Site 19:

Forest over Heath B over Very Open Herbs

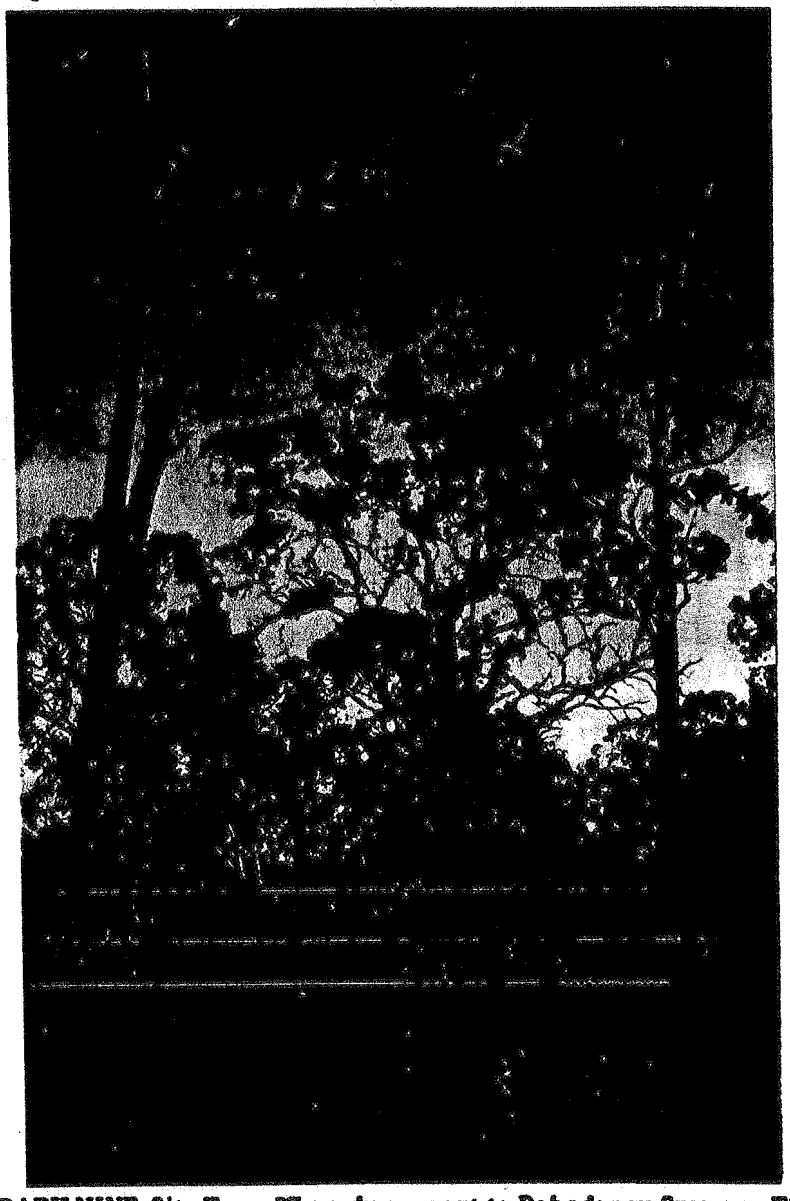
There is a layer of taller shrubs (*Hakea undulata and H. trifurcata*) and a sedge layer but neither has cover of 2% and so do not appear in the description

Soil: Dark orange-brown sandy loam.

Topographic position: Creekline (not steep) in mid to lower part of topographic profile.

(ii) Site Type ?Z

This vegetation type was observed on a dune at the south to south eastern side of Dobaderry Swamp (site 5) and extends in a band around the Swamp. It has a lower stratum of Jarrah (*Eucalyptus marginata*), other areas assigned to this type occur at the bend in Dobaderry Road and have no, or very little Jarrah, which dominates typical exmples of type Z(Havel,1975a).



PHOTOGRAPH NINE: Site Type ?Z on dune next to Dobaderry Swamp. The

Marri (*Eucalyptus calophylla*) is approximately 35m tall. The understorey includes *Hakea prostrata*, *Macrozamia reidlei*, *Xanthorrhoea preissii* and *Jacksonia sternbergiana*. [Site 5]

Muir description

Site 5:

Tall Woodland over Open Woodland over Scrub over Open Low Scrub A over Open Dwarf Scrub C over Open Dwarf Scrub D over Very Open Low Sedges and Very Open Herbs.

Soil: Dark brown sand

Topographic position: On dune near south-eastern corner of Dobaderry Swamp.

(f) Jarrah (*Eucalyptus marginata*) Types

(i) Site Type HG

This site type falls outside Havel's [1975] classification. Its understorey is usually dominated by *Dryandra* species and is similar to that in some areas of types MG and pG, although no areas with the understorey dominated by *Dryandra nobilis* were noted under Jarrah. In one area of the southern section of the reserves the *Dryandra* layer is replaced by *Daviesia nudiflora*. This area could be split off as a Jarrah analogue of the pp type which has Powderbark over *Gastrolobium* or *Daviesia* (see site 52), although the physical characteristics of the sites are different (soils, slope) and the cover of the understorey of this Jarrah variant is much higher. This community should not be confused with the varient of type J which has

a *Gastrolobium* dominated understorey. (It has not been possible to examine this allocation closely, these latter areas might more accurately be classed as variants of site type F; the important point for this study is that they are both real entities in the field).

PHOTOGRAPH TEN: Site Type HG, Jarrah (*Eucalyptus marginata*) over an understorey dominated by *Dryandra carduacea*.

Muir Descriptions

Site 23:

Woodland over Heath A over Heath B over Dwarf Scrub D over Open Low Sedges and Very Open Herbs.

Site 52:

Woodland over Scrub over Low Scrub A over Open Low Scrub A over

Dwarf Scrub D over Very Open Low Sedges.

(As noted above this site could be split off from HG as a Jarrah analogue of pp).

Soils: Pisolitic gravels with some loam, or orange brown silty sand with 50% pisolitic gravel.

Topographic position: On slopes behind breakaways (usually below MG or pG in the vegetation sequence, but occasionally this is reversed) in the higher parts of the reserve, or on low gravelly-lateritic rises in the Jarrah (*Eucalyptus marginata*) areas of the lower parts of the reserve.

(ii) Site Type H

This site type occurs on gravelly sands (Yellow-grey sand or loamy sand merging into lateritic gravel at depth) and can be further subdivided into three subtypes [Havel, 1975a]. Two subdivisions have been recognised in the present study area; H(1) and H(2).

(1) Subtype H(1)

This subtype has a very mixed understorey with *Dryandra armata* (to 10%), *Petrophile* spp., *Hakea* spp., *Daviesia* spp., *Casuarina humilis*, *Calothamnus sanguineus*, *Lepidobolus preissianus* and *Gompholobium* spp. amongst others. This subtype tends to occur downslope from HG and (as the presence of *Dryandra armata* shows) has some affinity to that type .

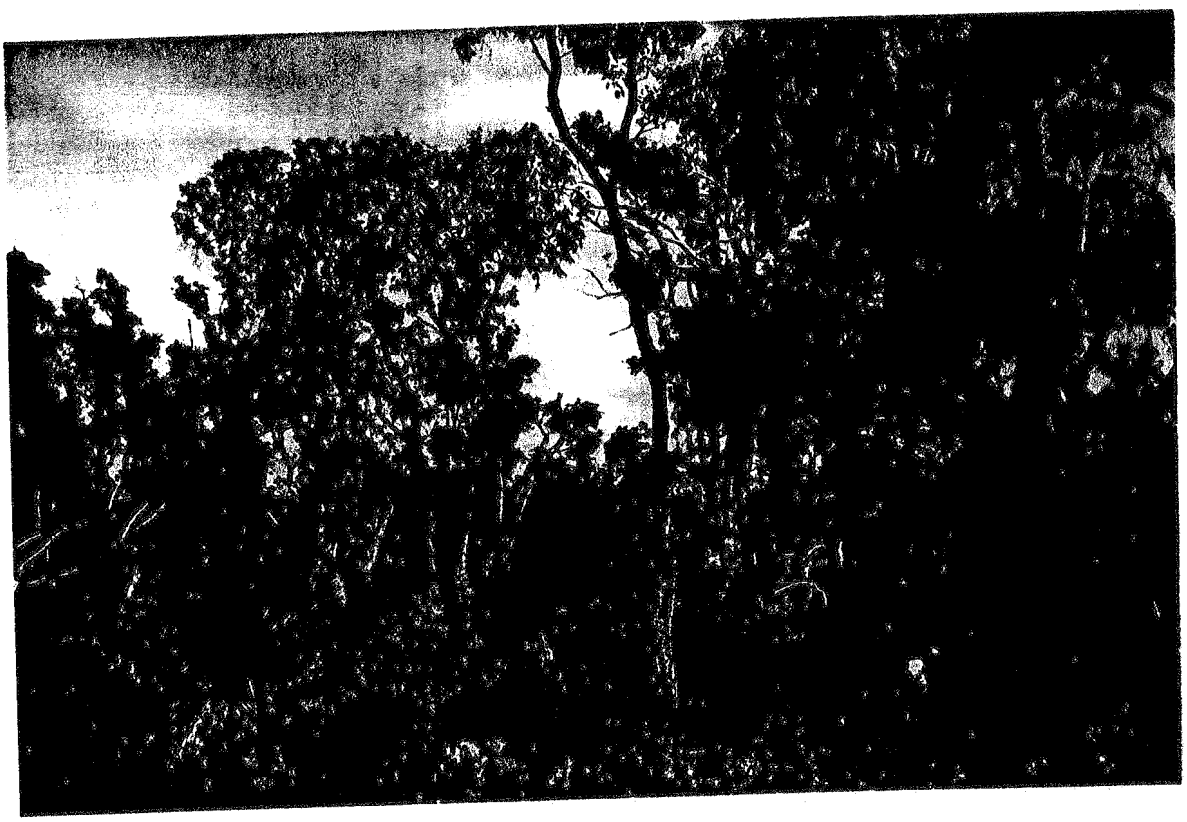
Muir Descriptions

Site 8:

Forest over Heath B over Dwarf Scrub C over Dwarf Scrub D over Open Low Sedges.

Site 20:

Woodland over Low Scrub A over Dwarf Scrub B over Low Heath C over Open Dwarf Scrub D over Very Open Low Sedges.



PHOTOGRAPH ELEVEN: Site Type H(1). Jarrah (*Eucalyptus marginata*) over a diverse understorey.(site 8)

These two sites show somewhat different structural and floristic composition with site 8 having one less shrub storey (1.5-2m) a denser 1.0-1.5m shrub level and a thinner 0.5-1.0m shrub level. The cover of sedges is quite different also with site 8 having 10% of *Mesomelaena* which indicates an affinity with subtype H(2). (See below)

Soils: Yellow orange sand over pisolitic gravel. Orange brown sand with fine lateritic gravel.

Topographic position: Mid to lower slopes at heads of valleys.

(2) Subtype H(2)

This subtype has a much less mixed understorey than subtype H(2) and is characterised by a very significant percentage of *Mesomelaena*. In the reserve system this subtype was observed downslope from granitic areas and upslope from site type F areas.

Muir Descriptions

Site 80:

Forest over Open Low Woodland B over Heath A over Open Dwarf Scrub D over Low Sedges.

Towards the lower edge of this community *Stirlingia latifolia* appears, this is considered to represent intergradation to the adjoining Type F community rather than to the third subtype of H, which is characterised by this species. There is some tendency towards site type B but the site is not wet enough to be allocated to this type. Subtype H(2) is quite distinctive and presumably offers different food and shelter resources to animals than subtype H(1), it has different soils and may be moister than H(1) in the wetter parts of the year.

Soil: Grey sand over creamy sand.

Topographic position: Slight slopes in the lower portion of the reserve site 80 was facing east but a community of this subtype near the Dobaderry Swamp faces west.

(iii) Site type J

This site type usually has a mixture of Jarrah (*Eucalyptus marginata*) and Marri (*Eucalyptus calophylla*). At the wet end of the range (of the site type) Blackbutt (*Eucalyptus patens*) is also usually present, and at the dry end *Banksia attenuata* [Havel, 1975a]. No Blackbutt has been observed in the reserve system, but *Banksia attenuata* does occur in one of the two variants (subtypes) of site type J that occur at Westdale. The first subtype occurs as scattered patches to the west and north of Dobaderry Swamp, in the large area of type F found in the lower area of the reserve system. The second subtype has a *Gastrolobium* species (M.E.T.3877) prominent in the understorey and occurs in a few places in the reserve (above J or F in the topographic sequence).

(1) Subtype J(1)

The areas of this subtype recorded have scattered *Banksia attenuata* (and occasionally *B. menziesii*) under Jarrah (*Eucalyptus marginata*) with a lesser to equal proportion of Marri (*Eucalyptus calophylla*) with *Nuytsia floribunda, Adenanthos barbigerus, Conospermum stoechadis* and *Lyginia barbata* as indicator species. Some areas referred to this subtype do not have any *Banksia* present but on the understorey species present (and absent!) are type J rather than type F.

There is a fairly obvious affinity between the vegetation of this subtype and the *Banksia* woodlands that fringe the drainage systems to the east and south east of Dobaderry Swamp. These *Banksia* woodlands could be considered to be an extreme development of subtype J(1), but are structurally and floristically different enough to warrant separation, though there are some species common to both and the soils are similar.

PHOTOGRAPH TWELVE: Subtype J_1, showing *Banksia attenuata*, *Adenanthos barbigerus* and Marri (*Eucalyptus calophylla*) over a mixed understorey. [Site 26]. Jarrah (*E. marginata*) is usually also present.

Muir Description

Site 26:

Open Woodland over Low Woodland A over Low Scrub A over Low Scrub B over Dwarf Scrub C over Open Dwarf Scrub D over Very Open Low Sedges.

Soil: Grey Sand with a white surface, without lateritic pebbles (which are present in the soil of the surrounding type F area), appear to be quite deep.

Topographic position: Very slight slopes in the broad low lying area of

the reserve, occasionally found on slightly steeper slopes, e.g. site twenty six which is on Catchment Road.

Subtype J(1) and type F are usually quite distinct with a fairly abrupt transition but occasional sites which are intergrades do occur, e.g. site 27.

(2) **Subtype J(2)**

This subtype has a *Gastrolobium* understorey under a Jarrah overstorey, no detailed site has been recorded and the allocation to J was made in the field. As with the *Mesomelaena* variant (H2) of type H the topographic position (and in this case the absence of Marri) indicates that more detailed examination would see this subtype placed under type F rather than type J.

(iv) **Mixed type H2/J2**

One area was referred to this mixed type. It has an understorey midway between H2 & J2. No detailed recording was made.

(v) **Site Type F**

This site type has "*Eucalyptus marginata* almost without admixture or second storey" [Havel, 1975a] with *Caustis dioica*, *Stirlingia latifolia* and *Daviesia pectinata* amongst the indicator species. *Leptocarpus scariosus* another indicator of site type F was not observed, this species normally indicates moist sites and is probably absent due to the easterly location of the study area.

Muir Description

Site 79:

Woodland over Open Low Shrub A over Open Dwarf Scrub C over Dwarf Scrub D over Open Low Sedges.

Site 67:

Woodland over Open Low Shrub A over Low Shrub B over Open Low Shrub B over Open Dwarf Scrub D over Open Low Sedges.

Site 68:

Forest over Open Low Shrub A over Low Heath C over Open Dwarf Scrub D over Low Sedges.

Soils: Grey sand with lateritic pebbles (not at the surface though)

Topographic position: Lower slopes of hills, low areas (with type J - and *Banksia attenuata, B. menziesii* woodland scattered through it in small patches on more deeply leached soils).

Site 67 and 68 show some differences, but are fairly close to each other and intergrade. Site 67 has 15% *Caustis dioica* and site 68 has 50%. Site 79 has only 5% *Caustis dioica*, it is very close to an area of site type J and shows some intergradation to type J by, for example, having a small amount of *Lyginia barbata* an indicator of site type J.

(vi) **Mixed type F/J**

Sites 27 and 84 are from areas that are intermediate between type F and subtype J(1). This is shown by the presence of *Adenanthos barbigerus* and *Banksia attenuata* indicating type J and *Caustis dioica* indicating type F. *Nuytsia floribunda* and *Stirlingia latifolia* which are also present at this site can indicate either.

Muir Descriptions

Site 27:

Open Tall Woodland over Open Woodland over Open Scrub over Open Low Scrub A over Low Scrub B over Dwarf Scrub C over Dwarf Scrub D over Very Open Tall Sedges over Open Low Sedges.

The 'Open Scrub' component is *Kunzea ericifolia* which is in bands, ie. it is not uniformly distributed.

Soil: Grey sand with a white surface.

Topographic position: Slight slope on rise to Catchment Road.

Site 84:

Open Tall Woodland over Open Woodland over Open Scrub over Open Low Scrub A over Dwarf Scrub D over Open Low Sedges

This site, though mixed, tends more to F than J, the map area that it occurs in tends even more towards F at its southern end, i.e. as it moves away from a drainage area bordered by *Banksia* woodland (an extreme of type J).

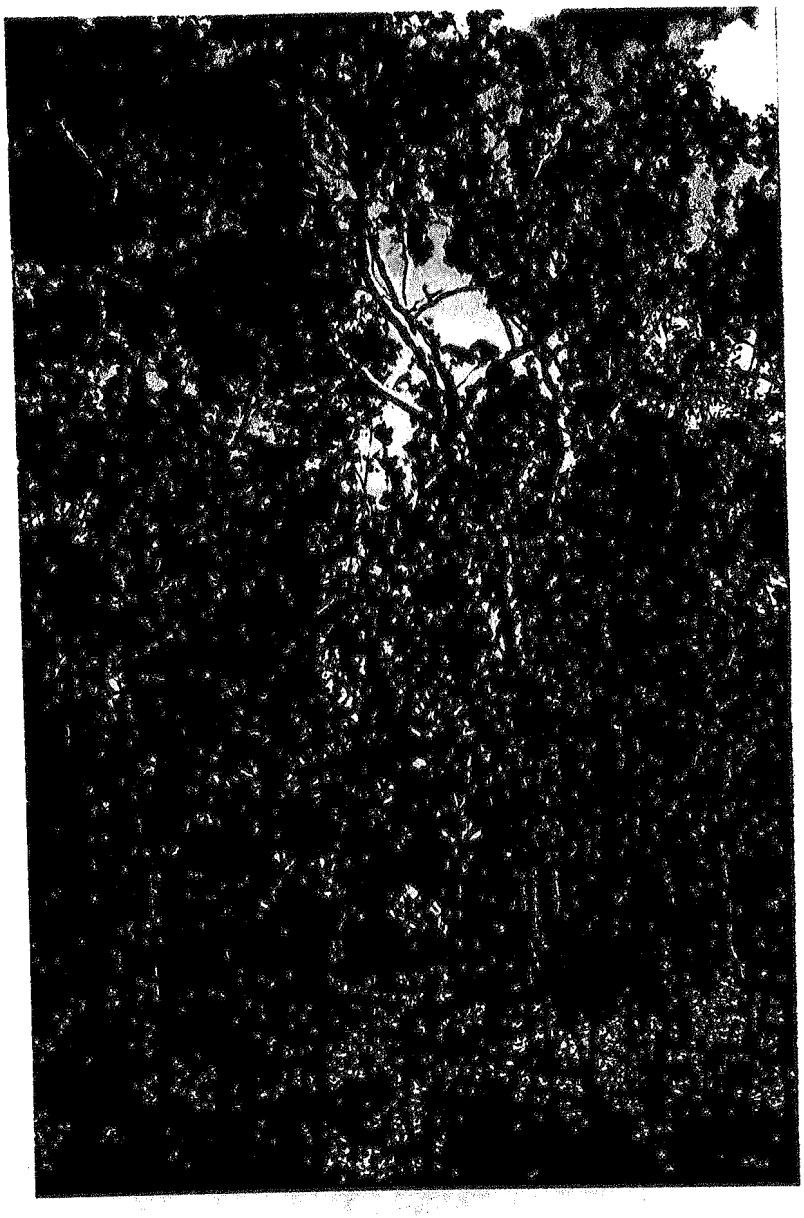
Soil: Grey sand with a few lateritic pebbles

Topographic position: Very gentle slope.

(g) Mixed Type MG/pG

There are a range of sites where Wandoo (*Eucalyptus wandoo*) and Powderbark Wandoo (*Eucalyptus accedens*) occur together over understories which are generally dominated by *Dryandra* species but which may have other Proteaceae (*Petrophile* and/or *Hakea*) dominant. These sites are obviously intergrades between MG and pG. Where only a minor proportion of one of the two Wandoos was present the site has been mapped as one type or the other (i.e. MG or pG), when more than a third of the second *Eucalyptus* species

was present it was mapped as the mixed site type MG/PG. Some of these sites (e.g. Site 31) also have Jarrah (*Eucalyptus marginata*) present and represent an intergrade, or mixed site, between MG, pG and HG.



PHOTOGRAPH THIRTEEN: Mixed Type MG/pG, Wandoo and Powderbark-wandoo (*Eucalyptus wandoo* and *Eucalyptus accedens*) over *Dryandra sessilis*.

Muir Descriptions

Site 31:

Woodland over Open Low Scrub A over Open Low Scrub over Open Dwarf Scrub D over Very Open Herbs and Very Open Low Sedges.

Site 54:

Woodland over Heath A over Low Scrub B over Low Heath C over ? (Time permitted only the major species to be recorded at this site).

Soils: Orange, silty pisolitic gravels, pale orange-brown loam with fine pisolitic gravel.

Topographic position: Gently undulating areas, low rises.

(h) Mixed Site Type MG/HG

This intermediate type is less common than MG/pG, but nevertheless does occur. It has a mixture of Wandoo (*Eucalyptus wandoo*) and Jarrah (*E. marginata*) over *Dryandra*, or other Proteaceae, species.

PHOTOGRAPH FOURTEEN: Mixed Type MG/HG, Wandoo and Jarrah (*Eucalyptys*

wandoo and *Eucalyptus marginata*) over *Dryandra carduacea*. (Site 13)

Muir Description

Site 13:

Forest over Open Scrub over Dense Heath A over Dwarf Scrub D over Very Open Herbs.

Soil: Orange sandy lateritic gravel.

Topographic position: Occurs on slopes behind breakaways.

(i) **Mixed site type MG/F/J**

One area (site 81) was mapped that was referred to this category it occurs near to a drainage area with Banksia woodland (an extreme of type J) and adjoins areas of type b, which is a mixed type itself (M/F). It has a mixed overstorey of Wandoo (*Eucalyptus wandoo*) and Marri (*Eucalyptus calophylla*) over *Dryandra sessilis* and then *Caustis dioica*.

Muir Description

Site 81:

Open Woodland over Thicket over Open Dwarf Scrub D over Low Sedges.

Soil: Pale yellow-grey sand (presumably with laterite at depth, though this was not checked).

Topographic position: Gentle slope on side of broad low valley in lower part of reserve system

(j) **Mixed type HG/pG**

Two areas were assigned to this mixed site type. They have an overstorey of

Jarrah and Powderbark over *Dryandra* understories. No detailed recording of site data was made.

(l) Mixed type M/H

One area was assigned to this mixed type, no recording was made, it has Jarrah over *Macrozamia reidlei*. Possibly it represents an area of type Z with a better fit to this type than those areas referred to ?Z as it has the correct overstorey species.

(m) Mixed Type J/M

One area was assigned to this mixed type.

(n) Mixed type J/HG

One area was assigned to this mixed type.

(o) Granite Outcrop types (type G)

As noted earlier Havel's [1975b] type G is a complex of types ranging from lichen covered granite rocks to open woodlands. A Wandoo type i with an understorey of granite indicating species has been treated earlier, it occurs over large enough areas to make it practical to map as a seperate entity. On a strict interpretation type i falls outside of Havels type G [see Havel 1975b, p.56,57)] as would the forests of *Allocasuarina huegelii* which surround many of the granite outcrops in the reserve system, although this seems to be an omission from Havel's discussion rather than a deliberate exclusion.

The approach taken here is to describe the range of vegetation which occurs (or at least that part which was sampled in the time available) around granite outcrops in the reserve system, to treat the *Allocasuarina huegeliana*

forests as one unit (G(2)) and lump the heath areas and areas with a very open, or depauperate overstorey of Wandoo (*Eucalyptus wandoo*) and Marri (*Eucalyptus calophylla*) as type G(1), along with the herbfields and areas of rock with lichens. Most of the areas mapped as G have outcrops of granite with surrounding forests of *Allocasuarina huegeliana*. It has not been possible to map the different subtypes seperately.

One area of *Acacia acuminata* (Jam) Low Forest A was observed (Site 51) as part of a granite complex, it has been referred to G(3).

(1) **Subtype G(1)**

Muir Descriptions

Site 58:

Heath B over Dwarf Scrub C over Low Heath D over Very Open Low Sedges and Very Open Herbs.

Soil: Cream-brown granitic loam with some pisolitic gravel.

Topographic Position: In a steeply sloping valley floor cut into the 'escarpment' above (east of) Dobaderry Road.

Site 29:

Dense Herbs! (Mostly *Borya* and *Stylidium*).

This herbfield gives way to a *Mesomelaena stygia* community and then a scrub / heath community dominated by *Allocasuarina microstachya*.

Soil: Shallow, brown clayey sand.

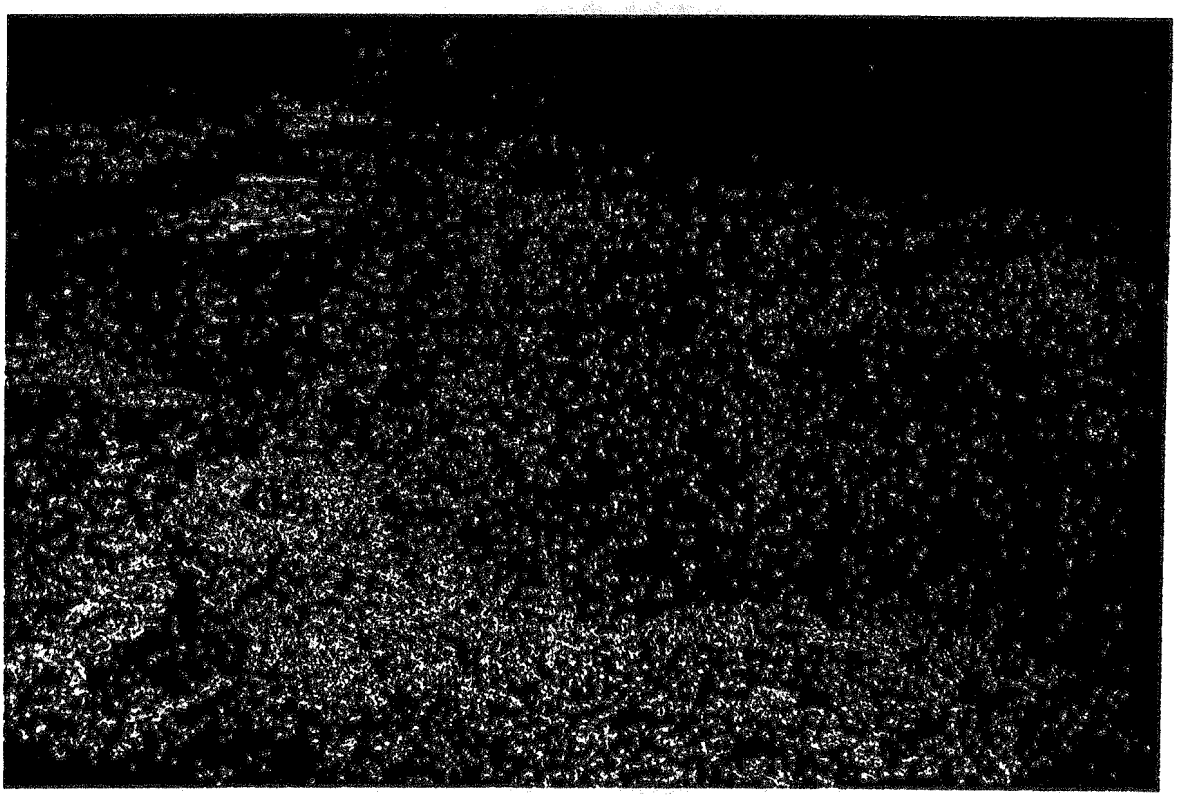
Topographic position: On a gentle slope at the edge of a small granite outcrop.

Site 30:

Dwarf Scrub C over Low Heath D over Low Sedges.

Soil: Poorly sorted gravelly (lateritic) silt.

Topographic position: Slope between a low granitic outcrop and the lateritised area above it.



PHOTOGRAPH FIFTEEN: Granite outcrop, sheet type showing transitions from rock (with lichens) to herbfield (*Borya*) to granite heath, in this case with *Persoonia ?striata*, *Allocasuarina microstachya* and *Baeckea crispiflora*. [Sites 29 & 30]

Site 55:

Open Low Scrub A over Heath B over Dwarf Scrub C over Low Heath D.

Only the major species were recorded at this site. The area it lies in is referred to site type G with some reluctance as no exposure of granite was observed and the species present are not indicators of granite. The species compostiton is very similar to that of the understorey of the surrounding woodland (a *Hakea* , *Petrophile* variant of MG/pG, see site 54). Possibly it has granite under the pisolitic soil with the latter having controlled the suite of species developed. *Eucalyptus drummondii* ocurs at the edges of this area, it was otherwise seen near granite outcrops.

Soil: Very pale yellow-brown loam with pisolitic gravel (? over granite).
Topographic position: Slight slope.

Site 18:

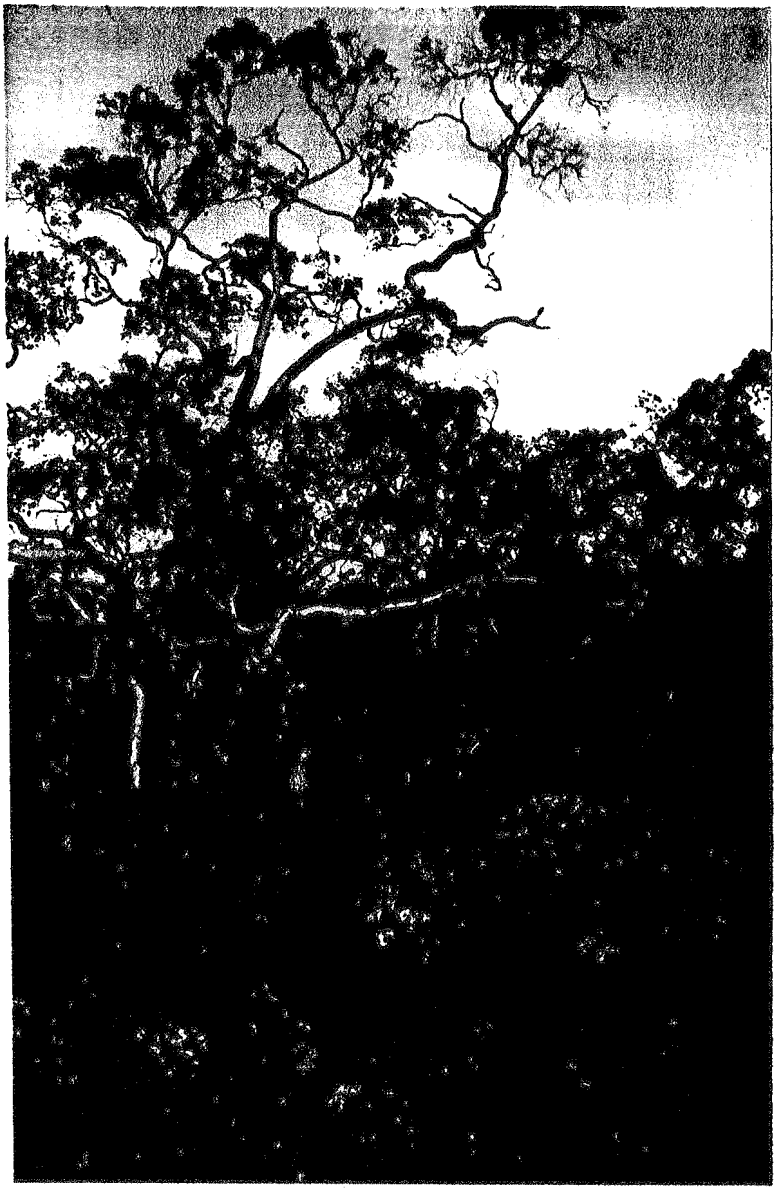
Open Low Scrub B over Dense Low Heath D (Sedges and Herbs were present but at less than 2% cover each).

Soil: Grey-brown, silty loam with some lateritic gravel (ca 8cm deep) over clay with lateritic gravel.
Topographic position: This site is on a valley side with a moderate slope and is downslope from a granite outcrop which has *Allocasuarina* forest around parts of it.

Site 17:

Open Woodland over Low Scrub A over Heath B over Open Dwarf Scrub C

over Open Dwarf Scrub D over Very Open Low Sedges and Open Low Ferns.



PHOTOGRAPH SIXTEEN: Granite outcrop, boulder type with Marri (*Eucalyptus calophylla*) and Wandoo (*E. wandoo*) over a very mixed understorey . [Site 17]

Site seventeen is a 'boulder outcrop' rather than a 'sheet outcrop' and the vegetation occurs in the soil between the boulders. Scattered

individuals of *Allocasuarina huegeliana* occur at the edges of the outcrop area.

Soil: Dark brown loam.

Topographic position: The outcrop lies near the head of a valley.

(2) Subtype G(2)

This is a subtype of the granite outcrop types (see above) which can be treated seperately because of its distinctive composition. It has an overstorey of *Allocasuarina huegeliana*, usually with very little understorey and is very common around the granitic rocks in the reserve system. In spring this vegetation type would have an annual and geophyte herb layer (mainly Asteraceae and Orchidaceae).

Muir Description

Site 51a

Dense Low Forest A

Topographic position: Gentle slope next to granitic outcrop.

(3) Subtype G(3)

This is a subtype of the granite outcrop types (see above) which can be treated seperately because of its distinctive composition. It has an overstorey of *Acacia acuminata* (Jam) with a floristically fairly simple understorey and occasional emergents of Wandoo (*Eucalyptus wandoo*) only one area of this type of vegetation was seen in the reserve system.

Muir Description

Site 51

Low Forest A over Low Heath C over Very Open Low Sedges.

Topographic position: Slight slope next to a low granitic outcrop, which is lower than the area with the type G(3) vegetation.

Soil: Grey sandy loam.

(p) York Gum (*Eucalyptus loxophlebs*) Woodland

One small area of York Gum (*Eucalyptus loxophlebs*) Woodland occurs on the south west edge of Dobaderry Swamp. It is the only York Gum in the reserve system and has almost no shrub understorey only a herb layer.

(q) *Eucalyptus drummondii, Banksia attenuata, B. menziesii* Woodland

This type falls outside Havel's [1975a] system. It occurs in parts of the drainage complex that lies between the Dobaderry Swamp and the 'escarpment' above (east of) Dobaderry road. It has a very open layer of *Banksia menziesii, B. attenuta, Nuytsia floribunds* and *Eucalyptus drummondii* over a dense shrub layer of *Petrophile drummondii, Leptospermum erubescens* and *Eremaea pauciflora*. *Eucalyptus drummondii* is not common and occurs on higher points in the unit, under the shrub layer there is a sedge layer of *Caustis dioica* and *Schoenus* sp.(M.E.T. 3758).

Muir Description

Site 64:

Open Low Woodland A over Open Low Woodland B over Open Scrub over Heath A over Dwarf Scrub C over Low Heath D over Low Sedges.

Topographic position: Low rise in drainage complex.

Soil: Coarse, grey sand.

(r) **Mixed type F/*Eucalyptus drummondii, Banksia attenuata, B. menziesii* Woodland**

One area was assigned to this mixed type in the field, no detailed recording was made.

(s) ***Banksia attenuata, B. menziesii* Woodland**

This site type occurs around two drainage areas in the reserve system and along one stream. It represents an extreme of type J, which would have Jarrah (*Eucalyptus marginata*) and Marri (*Eucalyptus calophylla*) over *Banksia attenuata* and possibly *B. menziesii*.

The present site type has *Banksia attenuata, B. menziesii* and less frequently *B. prionotes* with only very occasional Jarrah (*E. marginata*), which occur on low rises within the unit. The areas where this unit occurs appear to be where banks of sand have accumulated after being washed down the adjoining slopes.

Muir Description

Site 85:

Low Woodland A over Thicket over Low Scrub A over Low Heath C over Open Dwarf Scrub D over Open Herbs and Open Low Sedges.

Site 90:

Open Low Woodland A over Scrub over Heath A over Low Heath C over Low Sedges.

Topographic position: Very slight slope around (at edge of) drainage areas.

Soil: Grey sand.

(t) ***Banksia prionotes* Woodland**

One area of *Banksia prionotes* Woodland occurs in the reserve system between Dobaderry Swamp and the drainage system east of it.

Muir Description

Low Woodland A over Scrub over Open Low Scrub A over Very Open Herbs.

Topographic position: Very slight slope at bottom of dune around Dobaderry Swamp.

Soil: Grey sand.

(u) Mixed type M/?Z

One area was assigned to this mixed type.

(v) Mixed type b/J

One area was assigned to this mixed type.

8.0 FIRE HISTORIES and FUEL LOADS of the RESERVES

8.1 FIRE HISTORIES

The following information on the fire history of the reserves prior to the current survey was made available from Departmental Files.

Mount Westdale Nature Reserve [Res. 33188]

No information prior to 1973, from inspection in that year it appeared that there had been hot, patchy burns, mostly in the areas of *Dryandra armata*.

On May 5th, 1976 the south-east portion of the reserve was burnt by a local farmer.

On June 17th, 1977 part of the east boundary adjoining the property of Mr Bailey was fringe burnt.

Dobaderry Swamp Reserve [Res. 34442]

No information prior to 1976, from inspection in that year the reserve had not been burnt recently except along the lower part of the western boundary where a strip 20 metres wide had been burnt.

Reserve 37306 [un-named]

No information prior to 1980. Wildfire from clearing burn burnt four hectares mid-way along the eastern boundary. (?1980)

In general while some parts of the reserve system have been burnt recently, many parts, especially of the lateritic uplands of Mt Westdale Reserve and Reserve No. 37306 have escaped burning for considerable periods. In these

areas there are small areas (of a few hectares) that have obviously been burnt more recently and it would seem likely that these have been ignited by lightning and then been put out by accompanying rain.

Concurrently with the vegetation mapping subjective asessments of the time (in years) since the last fire were made. These assessments are shown on map four. From this map it would appear that three areas of significant size have been burnt within the last three to four years. These are:-

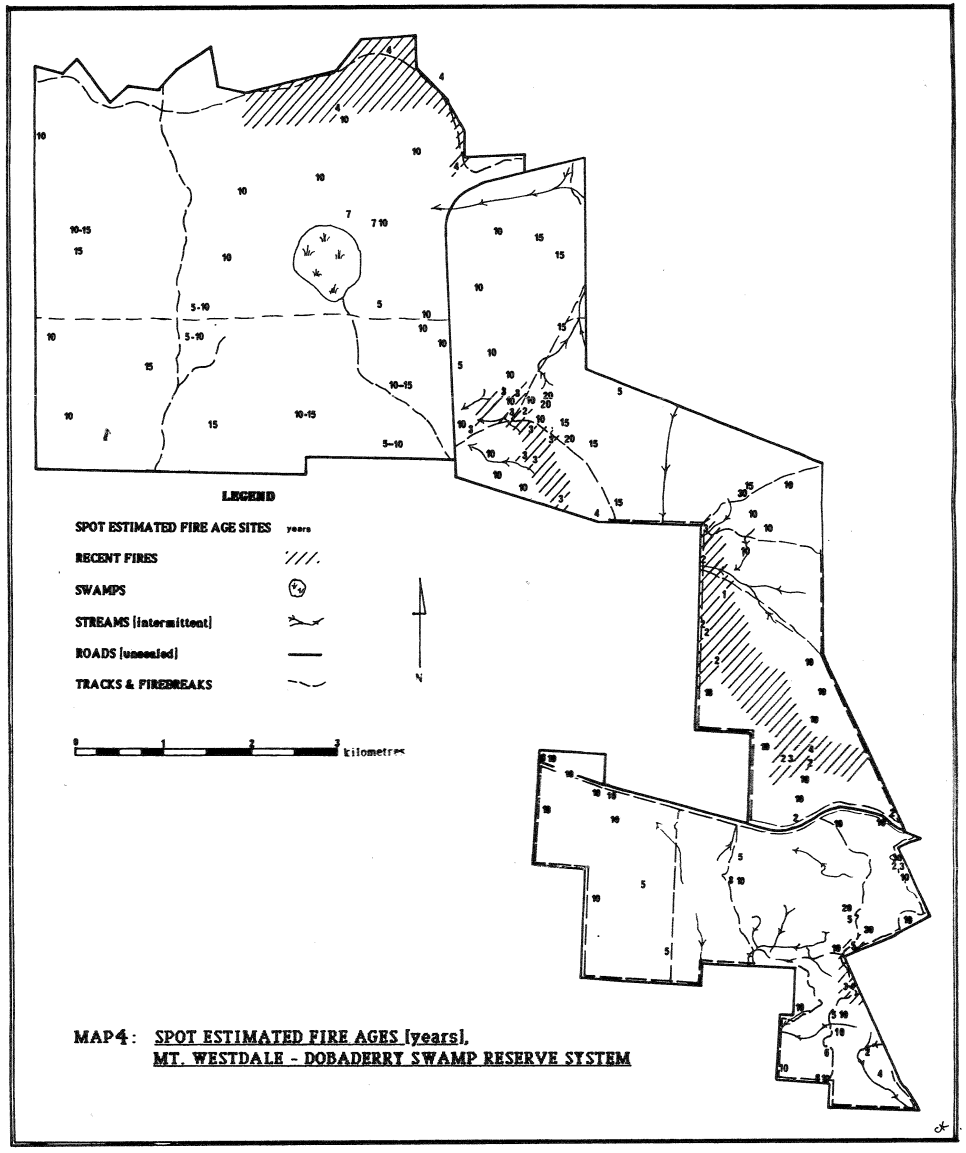
(1) An area across Reserve 37306 from the centre of the eastern boundary. This would include the area mentioned above, but is much more extensive.

(2) An area on the south-west corner of the part of Reserve 37306 adjacent to Dobaderry Road.

(3) An area along the northern edge of Dobaderry Reserve. This fire apparently burnt into the reserve from adjoining State Forest and died out when it burnt into areas of Wandoo (*Eucalyptus wandoo*) woodland with naturally low fuel load understories.

8.2 FUEL LOADS ON THE RESERVES

The large range of vegetation types on the reserves mean that there are a corresponding range of fuel load situatuions. This situation is further complicated by the logging and fire histories of the individual sites, the mosaic distribution of the individual areas of the different vegetation types and the very different flammabilities of the different understorey types depending on the the leaf (or phyllode) type (size, degree of division) and the



MAP 4: SPOT ESTIMATED FIRE AGES (years),
MT. WESTDALE - DOBADERRY SWAMP RESERVE SYSTEM

TABLE FOUR: A SAMPLE OF ESTIMATED FUEL LEVELS IN A RANGE OF VEGETATION TYPES FROM THE MT. WESTDALE - DOBADERRY SWAMP RESERVE SYSTEM

VEGETATION SITE TYPE	SHRUB FUEL tonnes/hectare	TRASH tonnes/hectare	TOTAL tonnes/hectare
M	5 - 10	-	5 - 10
M	< 5	-	< 5
L/Y	5	-	5
p	5 - 10	-	5 - 10
p	5 - 10	-	5 - 10
pp	5 - 10	-	5 - 10
p/pG	15	5	20
pG (*D. sessilis*)	15 - 20	5	20 - 25
pG (*D. notabilis*)	20	5	25
H	15	5	20
HG	20 - 25	5	25 - 30
HG (*D. sessilis* & *D. carduacea*)	15 - 20	5	20 - 25
HG (*D. carduacea* & *Gastrolobium*)	20 - 25	5	25 - 30
MG (*D. armata*)	10	-	10
F (burnt 4 - 5 years previously)	5 - 10	-	5 - 10
F (unburnt > 10 years)	15	-	15
F (open variant)	5	-	5
F	10	-	10
H_2	5	-	5
Ba/Bm	20 - 25	-	20 - 25

presence or absence of oils and resins in the plants. Thus the species composition of the shrub layer is important in planning fuel reduction burns and fire control programmes as it influences flamability through leaf size and volatile oil content. [Sneeuwjagt, 1973]

The level of shrub and trash fuel loads on the reserves varies from quite low to quite high. Areas of Wandoo (*Eucalyptus wandoo*) and Powderbark Wandoo (*Eucalyptus accedens*) woodland and forest with open understories (eg. types L, Y, L/Y and p) have quite low trash and shrub fuel levels. Conversely areas with dense shrub layers (eg. types PG, HG and MG) have quite high litter loads and also high scrub loads. Some however, are not as inflammable as they look because the species in them have large leaves and no volatile oils.

Table four gives a sample of the range of fuel levels in the reserve system. From the table it can be seen that fuel levels range from a total of about five tonnes per hectare to thirty tonnes per hectare. In conjunction with the vegetation map this table can be used to understand the distribution of naturally low fuel level areas in the reserve system and to appreciate the way that these areas can be used in the management of the reserve system.

9.0 AREAS IN THE RESERVE SYSTEM WHICH SHOULD BE PROTECTED FROM FIRE OR OTHER DISTURBANCE

9.1 INTRODUCTION

Four reasons are advanced for protecting *particular* areas in the reserve system from fire and other disturbances such as roadworks and firebreaks. They are:-

(1) Areas should be protected which have a particular feature to the vegetation which would be lost or diminished if the area was burnt or disturbed. For example, older stands of vegetation are of value for scientific study as they are important in providing chronosequences that are not cut short [Gill, 1977].

(2) Areas which have populations of rare species of plants should be protected as these populations might be destroyed or severely reduced by fire (or frequent fire) or by other disturbance.

(3) Areas of vegetation types of limited occurrence in the reserve system should be protected to maintain the diversity of vegetation present both in the reserve system and in the wider system of biologicalreserves in the state.

(4) Areas of vegetation which offer a food or shelter resource for animals and which are of limited extent in the reserve system should be protected so that the populations of animals that may be dependant on those resources are not adversly affected.

The list of specific areas given below is not considered exhaustive. The Mount Westdale - Dobaderry Swamp Reserve System has a very diverse vegetation and flora and the survey reported here should only be considered as sampling this diversity, not recording all of it. In this context particular note should be taken of the points made in the vegetation section that, some of the vegetation types are very broad and would almost certainly be subdivided if knowledge of the vegetation of the eastern edge of the forest was more advanced and that some areas were allocated to a particular type with reluctance but no suitable alternative was available and time did not permit more detailed study.

9.2 SPECIFIC AREAS

(a) Dobaderry Swamp and the immediate surrounding vegetation, including the stand of York Gum (*Eucalyptus loxophleba*), the fringe of Wandoo (*E. wandoo*) woodland (vegetation type c) and the Marri (*E. calophylla*) woodland (Site type ?Z) on the dune surrounding the swamp.

The swamp has a very large population of *Hydrocotyle lemnoides*, a gazetted rare species not previously reported from this area. The effect of a fire through the swamp (which is dry in summer) on the population of this species (then present as seed) is not known. The swamp vegetation (Site types h 1 and d), the York Gum stand and the particular Wandoo Woodland type (type c) fringing the swamp are only found once on the reserve system.

(b) The area of *Banksia prionotes* woodland adjacent to the east, north-east side of the dune surrounding the swamp. Only one stand of this species was seen on the reserve although a few scattered individuals were seen in areas with *B.*

menziesii and *B. attenuata*. This stand may be important as a food resource for local populations of animals.

(c) Areas of Wandoo (*Eucalyptus wandoo*) and Powderbark Wandoo (*E. accedens*) in the centre of the eastern side of Mt. Westdale reserve with understories of *Dryandra nobilis, D. carduacea* and *D. sessilis* which have largely not been burnt for a long time.

These areas appear to have had a number of small fires (presumably from lightning strikes) which have only burnt small areas before being extinguished. The result is a mosaic pattern of different age stands of the understorey species, with a number of stands probably being greater than 30 years old. This area should be protected from fire so that these old stands will survive, as they offer good protection for animals, a good food (nectar) source and may be valuable in the studies of the effects of fire on such communities.

(d) An area of site type C (a creek type) in the southern central area of Mt. Westdale Reserve. Only one area of this type was observed on the Reserve System.

(e) An area of Jarrah (*Eucalyptus marginata*) with an understorey of *Dryandra sessilis* to five metres tall wich has probably not been burnt for at least 30 years. The *Dryandra*'s are actually trees rather than shrubs and this site is valuable both intrinsically and for its potential as an area of value for scientific study. The area lies in the centre of Reserve No. C37306.

(f) The areas of different heath types east and north-east of Dobaderry Swamp in the Dobaderry Reserve. These areas are very variable and include areas of

Casuarina heath, *Leptospermum - Petrophile* heath and *Leptospermum* heath. This is the only area in the reserve system with these heath types. They offer good shelter and are adjacent to the areas of *Banksia* woodland which offer a food reasource.

(g) In the same general area as (f), there are mixed *Banksia* woodlands and *Banksia* woodlands with *Eucalyptus drummondii*. These areas are probably important as a food (nectar) source for birds and mammals and are the major areas of *Banksia* woodland in the reserve system. The extent is relatively limited.

(h) An area of *Dryandra nobilis* to four metres tall in a creekline in the south-western part of Mt. Westdale Reserve. This stand does not appear to have been burnt for posssibly 20 years or more and is quite atypical for the species which was rarely seen above two metres in the reserve system. (site 22)

(i) The areas of the following vegetation types which were each only observed once in the reserve system; n, i/G, Y/i, MG/L, F/J/Y, e, f (this area also has most of the few individuals of *Actinostrobus arenarius* on the reserve system), H_2/J_2, MG/F/J, M/H, F/*Eucalyptus drummondii*, *Banksia attenuata*, *Banksia menzesii* Woodland.

Each of these areas is of interest for the variation that they contain(for locations see the vegetation map).

The fact that other areas in the reserve system have not been specifically mentioned does not mean that they have low value for conservation . To the contrary, representing as they do the

vegetation of the eastern edge of the remaining forested area the reserve system as a whole is of great conservation value. This value is enhanced by the fact that the vegetation of the lateritic uplands present in the reserve system seems to be poorly represented in the adjoining areas of state forest.

10.0 MANAGEMENT OF THE RESERVE SYSTEM

10.1 INTRODUCTION

The Westdale Dobaderry - Swamp Reserve System has a diverse flora, vegetation and topography, obviously therefore, its management will be complex. The following points are relevant to a discussion of the management objectives for the Mt. Westdale - Dobaderry Swamp Reserve System.

(1) The reserves have been created for the protection of the native flora and fauna.

(2) The vegetation of the reserve system is diverse with more than sixty vegetation types, a number of which are only present in small areas.

(3) There are areas on the reserves which have not been burnt for greater than 20 to 30 years. These areas are of value for their own right and for scientific study. This value would be significantly reduced if these areas were burnt.

(4) The reserves have a diverse flora, including a population of one gazzetted rare plant and populations of other ,less well known species, which may in time become gazzetted as rare or restricted species. The response of many of these species to different fire regimes is unknown.

(5) The reserves between them have a range of topographic situations, from fairly open, gently undulating areas in the Dobaderry Swamp Reserve, to steep slopes, breakaways and gullies in Mt. Westdale Reserve and Reserve No. C37306.

(6) The different vegetation types have a wide range of fuel levels and flammabilities. The fuel levels vary from quite low to quite high and the areas with low fuel levels are apparently a barrier to fires of at least some intensities (eg. the three to four year old fire on the north side of Dobaderry Swamp Reserve which burnt through areas of site type F and J and then stopped at the edge of an area of site types Y and L/Y).

(7) There has not been a systematic fauna survey of the reserve system. The wide range of habitats would presumably mean that a wide range of fauna could be expected to be present in the reserves.

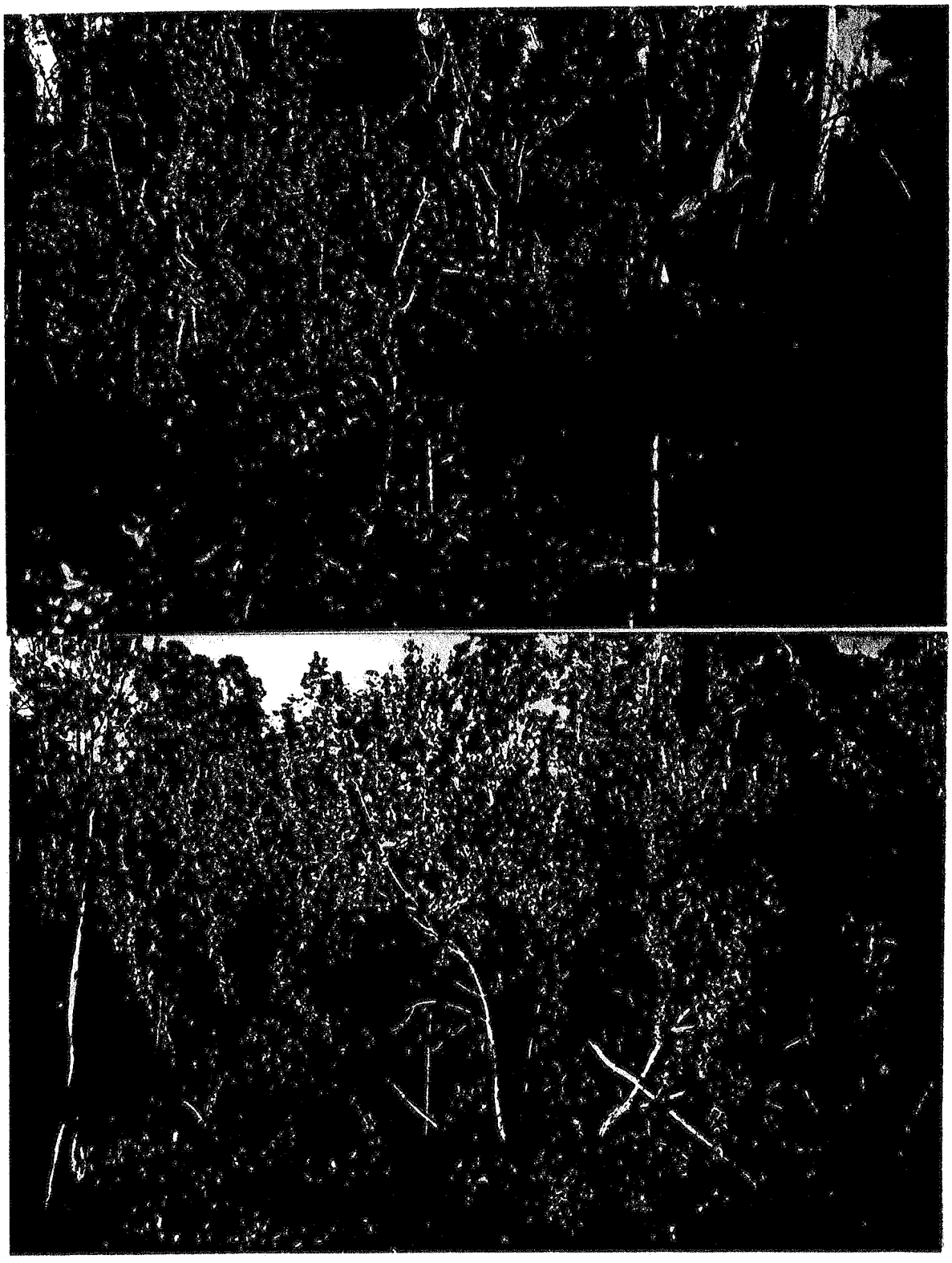
(8) The reserves are separated from each other by wide roads, which act as firebreaks, and have good firebreaks through them.

(9) On the west and north of the reserve system there is state forest which is largely burnt on a four to eight year rotation, this significantly reduces the likelihood of a large scale fire burning from the reserves through to agricultural land as it reduces the likelihood of fires burning into the reserves from these state forests. To the east and south of the reserve system there is some uncleared land, but mostly cleared land.

(10) There is pressure from adjacent land owners for more frequent burning of the reserves to prevent severe wildfires. This seems to be largely based on the presence of long unburnt stands of *Dryandra* species which are not the most inflammable understorey types on the reserves, but *look* very inflammable. 'flammable' - surely?!

(11) The lack of frequent fires (or at least of frequent **widespread** fires) in Mt. Westdale Reserve and Reserve No. C37306 has allowed the development

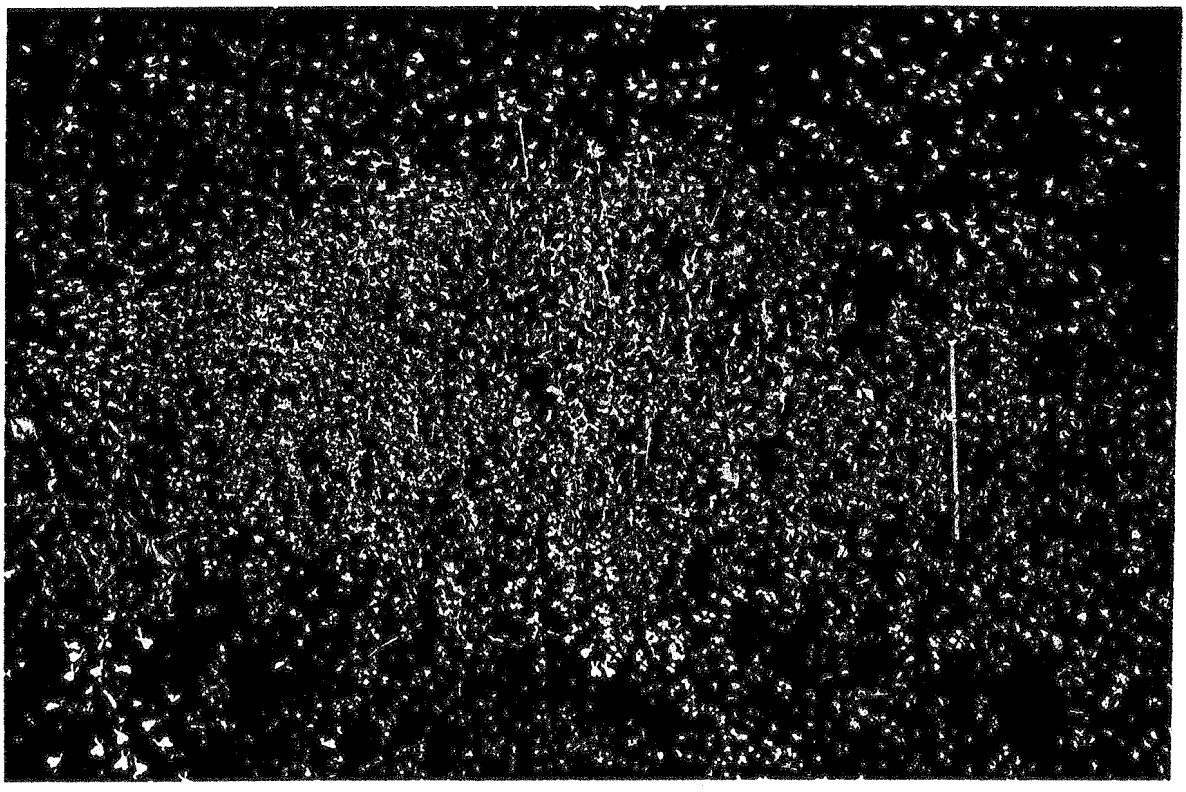
of a range of different aged stands. This presumably maximises the available range of animal habitats and minimises the risk of the elimination of species of plants which require more than a few years to come to seed.



PHOTOGRAPHS SEVENTEEN & EIGHTEEN: Burnt and unburnt stands of *Dryandra*

nobilis on opposite sides of a track showing the loss of shelter value and the opening up of the vegetation to weeds after fire.

(12) The reserves have only a small number of weed species and these are generally neither virulent nor widespread. The most susceptible areas for weed invasion seem to be the lower lying Wandoo (*Eucalyptus wandoo*) types such as L and Y which have very open understories combined with moist soil conditions for an extended part of the year. These are especially vulnerable where they abut farmland. Herbfield areas on shallow granite are also vulnerable and rabbits, through their droppings, appear to be promoting the spread and growth of weeds in such areas.



PHOTOGRAPH NINETEEN: * *Anagallis arvensis* and * *Cerastrium glomeratum*, introduced species growing on rabbit droppings on a granite rock herbfield and crowding out the native flora.

10.2 OBJECTIVES FOR MANAGEMENT OF THE RESERVE SYSTEM

Simply stated, the objectives of management for the reserves should be to maintain the diversity of of the flora and fauna found on them. This is simplistic and needs to be extended to include the **quality** of the populations present, that is their size and age structures need to be considered.

If the above objectives for the management of the reserve system are accepted and the points made in section 10.1 are held in mind, then management of the reserves should be based around the following strategies:-

(i) Minimum use of fire, preferably limiting its use to edge burns and selected burns to make the existing firebreaks and low fuel areas more effective in the control of wildfires. Possibly in the future when (or if) more resources are available, small area burns should be considered to maintain the diversity of the age structure of the vegetation. Certainly broadscale burning should not be used, as this would reduce the diversity of age structures present and may cause significant loss of plant nutrients (through volalitisation in smoke and in solution after rainfall) if carried out on the short rotations practised in the nearby State Forest.

(ii) Minimum disturbance other than fire to minimise the spread of introduced weeds or disease organisms such as *Phytothphora cinnamomi*. The lower Wandoo areas (eg. L, Y, L/Y) should be avoided as they are prone to weed invasion (control burning of these areas should be avoided for the same reason). No evidence was seen that indicated the possible presence of *Phytothphora*.

(iii) Control of feral animals (particularly rabbits) as these can have a

deleterious impact on the fauna and assist in the spread of weeds. The control measures used, need to be such that they also do not have a deleterious impact on the flora and fauna.

(iv) Wildfire control should be consistent with the management objectives. For example the use of bulldozers, or fire retardents that can act as fertilisers would be undesirable as they can aid the spread of weeds. (Bulldozers can also initiate erosion, destroy trees and shrubs that would otherwise resprout and open areas to vehicular traffic.)

One suggestion for control of wildfires is to plan to fight them on the low level fuel areas where (hopefully) they would be slowed by the lower amounts of fuel. As the low fuel areas are generally fairly open they are also more practical for access during firefighting without the need to buildose access tracks.

(v) Exclusion of stock, as these can damage vegetation by grazing, trampling and introducing weeds.

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APPENDIX ONE

Vegetation Site Data

species	height	% cover
[a] Wandoo (*Eucalyptus wandoo*) types		
(i) Site Type M		
Site 4		
Eucalyptus wandoo	25-30m	20-25%
Macrosamia reidlei	1m	<5%
Acacia lasiocarpa var. *sedifolia*	80cm-1m	30%
Bossiaea eriocarpa	50cm	5%
Hakea lissocarpha	40cm	<1%
Olearia rudis	40cm	<1%
Hibbertia commutata	20cm	<1%
Loxocarya flexuosa	10cm	<10%
Stylidium ciliatum		<1%
Caladenia patersonii var. *longicaudata*		<1%
Drosera macrantha		<1%
Pterostylis recurva		<1%
Stylidium caricifolium		<1%
Site 24		
Eucalyptus wandoo	25-30m	40%
Acacia acuminata	8m	<1%
Macrosamia reidlei	1m	15%
Acacia lasiocarpa var. *sedifolia*	80cm	<10%
Hibbertia commutata	15cm	1%
Bossiaea eriocarpa	35cm	<5%
Hakea lissocarpha	10cm	<1%
Phyllanthus calycinus	20cm	<1%
Diplolaena drummondii	45cm	<1%
Opercularia vaginata	15cm	<1%
Patersonia occidentalis	25cm	<1%
Lomandra effusa	10cm	<10%

Lepidobolus preissianus	20cm	<5%
Neurachne alopecuroidea	20cm	<1%
Stackhousia brunonis	30cm	<1%
Astroloma sp.	5cm	<1%
Muehlenbeckia adressa	40cm	<1%
Stylidium ciliatum	12cm	<1%
Podolepsis gracilis		<1%
Helipterum manglesii		1%

Site 14

Eucalyptus wandoo	18-25m	40%
Eucalyptus calophylla	15m	1%
Leptospermum erubescens	2-2.5m	60%(in patches)
Xanthorrhoea preissii	1m	5%
Bossiaea eriocarpa	50cm	5%
Acacia pulchella var. *glabberima*	60cm	1%
Astroloma epacridis	35cm	<1%
Hakea incrassata	60cm	<5%
Lepidobolus preissianus	20cm	40%
Loxocarya flexuosa	10cm	10%
Lepidosperma tenue	35cm	<1%
Dampiera preisii	20cm	<1%
Patersonia occidentalis	25cm	<1%

Site 38

Eucalyptus wandoo	25-30m	40%
Eucalyptus marginata	5m	<1%
Eucalyptus calophylla	15m	1%
Xanthorroea preisii	0.5-1m	10%
Macrosamia reidlei	1m	<1%
Hakea lissocarpha	25cm	15%
Melaleuca aff. *scabra*(1)	50cm	15%
Baeckea camphorosmae	20cm	<1%
Persoonia ?striata	15cm	<1%
Opercularia vaginata	10cm	<1%
Daviesia microphylla	10cm	<1%
Hibbetia commutata	10cm	<1%
Petrophile striata	20cm	<1%
Astroloma sp.	2cm	<1%

Dryandra nivea	20cm	1%
Patersonia rudis	30cm	1%
Loxocarya fasciculata	10cm	5%
Schoenus sp. (mat)	2cm	<1%
Neurachne alopecuroidea	3cm	5%
Lepidosperma costale	50cm	5%
Lepidosperma pubisquameum	15cm	<1%
Stylidium petiolare	10cm	<1%
Stylidium sp.	2cm	<1%

Site 83

Eucalyptus wandoo	15-30m	10
Eucalyptus calophylla	1-1.5m	15%
Hakea prostrata	0.5-1m	<5%
Lepidosperma sp	50cm	5%
Bossiaea eriocarpa	35cm	10%
Gastrolobium calycinum	20-50cm	10%
Dryandra nivea	10cm	5%
Loxocarya fasciculata	10cm	5%
Loxocarya flexuosa	10cm	5%
Conostylis setigera	10cm	<1%
Astroloma sp. (mat)	5cm	<1%
Synaphea reticulata	10cm	<<1%
Conosperm stoechadis	80cm	<<1%
Patersonia rudis	20cm	1%
Stylidium piluliferum	2cm	<5%
Lepidosperma tenue	20cm	<1%
(Incomplete, other herbs/sedges		<1% each

(ii) Site Type M/G

Site10

Eucalyptus wandoo	18-25m	30%
Eucalyptus calophylla	18-25m	5<5%
Eucalyptus marginata	10-15m	<5%
Dryandra armata	80cm	60%
Bossiaea eriocarpa	60cm	5%
Synaphea petiolaris	40cm	<1%
Leschenaultia biloba	30cm	<1%

Grevillea moticola	60cm	<1%
Borya scirpoidea	5cm	<5%
Lepidobolus preissianus	15cm	<5%
Dampiera alata	20cm	<1%
Acacia wildenowiana	15cm	<1%
Conostylis caricina	15cm	<1%
Chamaexeros serra	10cm	<1%
Gompholobium marginatum	15cm	<1%
Lomandra micrantha		<1%

(iii) Site Type L

Site 50

Eucalyptus wandoo	18m	30%
Acacia saligna	4m	5%
Acacia pulchella	1.8m	15-20%
Hakea lissocarpha	1m	20%
Hypocalymma angustifolia	1m	5-10%
Trymalium ledifolium	60cm	<5%
Diplolaena drummondii	50cm	5%
Phyllanthus calycinus	30cm	10%
Hibbertia ?montana	30cm	5%
Lepidosperma scabra	40cm	5%
Ptilotus drummondii	25cm	<1%
Pelagronium littorale	10cm	<1%
Acaena echinata	15cm	<1%

(Not complete for herbs)

Site 11

Eucalyptus wandoo	18-25m	5%
Eucalyptus wandoo	8-15m	20% (regrowth)
Eucalyptus calophylla	18-25m	<5%
Eucalyptus calophylla	8-15m	5%
Hakea trifurcata	1.8-2m	60%
Gastrolobium calycinum	1m	<1%
Bossiaea eriocarpa	30cm	15%
Diplolaena drummondii	40cm	<1%
Hakea prostrata	50cm-2.2m	<1%
Hypocalymma augustifolium	1.8cm	<1%
Conostylis setigera	10cm	1%

Loxocarya flexuosa	10cm	10%
Lepidosperma tenue	15cm	<1%
Dryandra nivea	15cm	<1%
Patersonia occidentalis	25cm	<1%
Patersonia juncea	15cm	<1%
Stackhousia brunonis	25cm	<1%
Stylidium ciliatum		<1%
Caladenia discoidea		<1%
Stylidium brunonianum		<1%

Site 57

Eucalyptus wandoo	15-25m	40-50%
Acacia pulchella	40cm	50%
Bossiaea eriocarpa	25cm	35%
Diplolaena drummondii	50cm	5%
Hibbertia montana	15cm	<5%
Hakea lissocarpha	40cm	5-10%
Glischrocaryon aureum	50cm	<5% (patchy)
Leptospermum erubescens	50cm	<1%
Conostylis setosa	5cm	<1%
Loxocarya flexuosa	5cm	20%

(iv) Site Type Y

Site 25

Eucalyptus wandoo	25-35m	70%
Acacia lasiocarpa var. *sedifolia*	50-80cm	10%
Orthrosanthos laxas var. *gramineus*	15cm	<1%
Lagenifera huegelli	40cm	<1%
Loxocarya flexuosa	10cm	15-20%
Lepidosperma tenue	12cm	<5%
Thysanotus patersonii		<1%
Levenhookia dubia	3cm	<1%
Ptilotus drummondii	15cm	<1%

(v) Site Type a

Site 60

Eucalyptus wandoo	15-20m	10%
Lhotskya ericaea	1.5-1.8m	80%
Verticordia densiflora	50cm	25%
Verticordia pennigera	20cm	5%
Stylidium sp. (dead)	10cm	5%

Site 63

Conospermum stoechadis	80cm	15%
Hakea sulcata	80cm	<5%
Verticordia densiflora	50cm	15%
Verticordia pennigera	20cm	25%
Conospermum scaposum	15cm	<1%
Lepidobolus preissii	10cm	30%
Lyginia barbata	25cm	10%
Stylidium sp. (dead)	5-10cm	5%

Site 74

Eucalyptus wandoo	10-25m	15%
Hakea sp. (MET 3873)	2-2.5m	<1% (patchy)
Hakea prostrata	2m	<1%
Verticordia densiflora	50cm	15%
Verticordia pennigera	30cm	15%
Lepidobolus preissianus	10cm	50%
Hakea lissocarpha	20cm	<1%
Dryandra nivea	15cm	<1%
Patersonia occidentalis	25cm	<1%
Lepidosperma sp. (MET 3874)	20cm	5%
Haemodorum simplex	30cm	<1%
Lepidosperma costale	50cm	<1%
Ptilotus sp. (dead)		
Compositae spp. (dead)		

(vi) Site Type b

Site 61

Eucalyptus wandoo	25m	30%
Jacksonia sternbergiana	2-3m	50%
Hakea prostrata	1.8m	20%

Borya scirpoidea	5cm	10%
Lepidobolus preissianus	10cm	10%
Lepidosperma ?tenue	20cm	<5%
Mesomelaena tetragona	40cm	1%
Dryandra nivea	15cm	<1%
Conostylis setigera	8cm	<1%

Site 66

Eucalyptus wandoo	25m	40%
Xanthorrhoea preissii	1-2m	15%
Hakea prostrata	1.5-2.5m	5%
Gastrolobium calycinum	80cm	10%
(patchy some areas greater)		
Macrosamia reidlei	80cm	1%
Bossiaea peduncularis	80cm	15%
Astroloma sp.	5cm	<1%
Caustis dioica	25cm	35%
Loxocarya flexuosa	10cm	40%
Patersonia occidentalis	35cm	10%
Lepidosperma tenue	12cm	5%
Ptilotus manglesii	8cm	<1%

(vii) Site type c

Site 3

Eucalyptus wandoo	20m	20%
Acacia acuminata (adult)	10-13m	
Acacia acuminata (regrowth)	4-5m	15%
Hakea prostrata	3m	<1%
Hibbertia commutata	35cm	<1%
Macrosamia reidlei	80cm	<1%
Bossiaea peduncularis	80cm	<1%
Acacia saligna	2.5m	<1%
* *Erodium cicutarium*	5cm	1%
Caladenia mensiesii		<1%
Millotia tenuifolia	5cm	<1%
Podolepis lessonii	10cm	<1%
Senecio glossanthus	10cm	<1%
Lagenifera hueglii	3cm	<1%
Brachycome ciliaris	5cm	<1%

Verticordia densiflora	80cm	10%
Caustis dioica	20cm	10-30% (patchy)
Persoonia ?striata	15cm	10% (patchy)
Borya scirpoidea	5cm	20%
Conospermum stoechadis	60cm	1% (patchy)
Hakea lissocarpha	40cm	5-15% (patchy)
Loxocarya flexuosa	15cm	<5% (patchy)
Lepidobolus preissianus	10cm	<1%
Dryandra nivea	15cm	<1% (patchy)
Gastrolobium calycinum	60cm	<5% (patchy)

Site 62

Eucalyptus wandoo	25-35m	30%
Hakea prostrata	2m	<1%
Macrozamia reidlei	1m	10-20%
Jacksonia sternbergiana	2-3m	<5% (to 40% in patches)
Gastrolobium calycinum	70cm	35% (to 90% in patches)
Bossiaea eriocarpa	30cm	5%
Loxocarya flexuosa	7cm	15%
Tetraria octandra	10cm	<1%
Patersonia juncea	10cm	<1%
Lepidosperma pubisquameum	15cm	1%
Ptilotus manglesii	5cm	<1%
Schoenus sp. (mat type)	3cm	<1%
Dianella revoluta	40cm	<1%
Borya scirpoidea	5cm	<1%

Site 77

Eucalyptus wandoo	30m	20%
Jacksonis sternbergiana	4m	<1%
Hakea prostrata	2-4m	5%
Xanthorrhoea preissii	1-3m	20%
Gastrolobium calycinum	0.5-1m	<5%
Hakea lissocarpha	80cm	<1%
Jacksonia ulicina	40cm	<1%
Conospermum stoechadis	40cm	<1%
Caustis dioica	30cm	40%
Loxocarya flexuosa	10cm	10%

Helipterum demissum	5cm	<1%
Triglochin centrocarpa	5cm	<1%
Chamaescilla corymbosa	10cm	<1%
Wurmbea dioica ssp. *alba*	5cm	<1%
Caladenia filamentosa var. *denticulata*		<1%
Parentucelia latifolia	5cm	<1%
Sebaea ovata	4cm	<1%
Frosophyllum macrostachyum var. *ringens*		<1%
Drosera glanduligera	3cm	<1%
Senecio lautus ssp. *dissectifolius*	35cm	<1%
Erodium cygnorum	35cm	<1%
Caladenia hirta		<1%
Gonocarpos nodulosus	8cm	<1%

(viii) Mixed type L/Y

Site 70

Eucalyptus wandoo	30m	15% (cut over)
Gastrolobium calycinum	0.8-1.2m	<5%
Hakea lissocarpha	50cm	<10%
Astroloma sp. (MET 3870)	10cm	<1%
Hibbertia sp. (MET 3869)	12cm	<1%
Astroloma sp. (MET 3871)	2cm	<1%
Lepidosperma costale	30cm	5%
Loxocarya flexuosa	12cm	50%
Lepidosperma sp. (1) (MET 3614)	15cm	1%
Lepidobolus preissianus	10cm	<1% (patchy)
Haemodorum simplex	30cm	1%
Isotoma hypocrateriformis	20cm	<1%

(ix) Site type i

Site 73

Eucalyptus wandoo	20-35m	40-50%
Xanthorrhoea preissii	1-2m	20%
Leptospermum erubescens	1.6m	<1%
Grevillea bipinnatifida	0.5-1m	5%

Hakea lissocarpha	40cm	<10%
Gastrolobium calycinum	50cm	<5%
Dryandra fraseri	30cm	<5%
Persoonia ?striata	30cm	1%
Gonocarpos nodulosus	15cm	1%
Lepidosperma costale	15cm	1%
Tetraria octandra	5cm (grazed)	<1%
Loxocarya flexuosa	10cm	5%
Schoenus sp. (met)	5cm	1%
Borya scirpoidea	5cm	20%
Laxmannia squarrosa	5cm	<1%
Trichocline spathulata	5cm	<1%

(x) Site type n

Site 78

Eucalyptus wandoo	30m	35%
Hakea prostrata	0.5-2.5m	55<5%
Xanthorrhoea preissii	0.5-3m	20%
Gastrolobium calycinum	60cm	1%
Dryandra nivea	15cm	<1%
Patersonia occidentalis	30cm	5<5%
Lepidosperma sp. (1) (MET 3614)		10%
Borya scirpoidea	5cm	10%
Mesomelaena costale	40cm	<10%
Tetraria octandra	15cm	<1%
Loxocarya fasciculata	5cm	<5%
Conostylis setigera	5cm	<1%
Astroloma sp. (MET 3870)	5cm	<1%
Grevillea leptobotrys	10cm	<1%

(xi) Mixed Type Y/F

Site 82

Eucalyptus wandoo	25m	25%
Hakea prostrata	1.8m	<<1%
Xanthorrhoea preissii	60cm	<<1%
Macrosamia reidlei	80cm	<<1%
Patersonia occidentalis	40cm	15%
Caustis dioica	15cm	15%

Phlebocarya ciliata	10cm	1%
Lyginia barbata	1m	15%

<u>On Western side</u>

Kunsea ericifolia	5m	20%
Acacia pulchella var. *glaberrima*	1.5m	10% (+ dead plants)

<u>On Eastern side (grades to ?F Type)</u>

Adenanthos barbigera	1.8cm	20%
Caustis dioica	80cm	5%

(iii) Site type f

Site 91

Eucalyptus rudis	8m	5%
Actinostrobus arenarius	2m	5%
Melaleuca laterita	3m	10%
Hakea ?varia	1-2m	1%
Verticordia pennigera	50cm	5%
Callistemon phoenicus	2m	1%

[c] Heath Communities (except heaths associated with granite)

(i) subtype h_1 - *Melaleuca laterita* Heath

Site 2

Melaleuca laterita	1.5m	60%
Leptocarpus co-angustatus	80cm	<5%
Chorisandra enodis	50cm	<5%
Triglochin procera	35cm	<5%
Villarsia sp. (inadequate) (MET 3506)	(aquatic leaves floating)	<5%
Crassula natans	35cm	<5
Ruppia polycarpa	(aquatic)	<15%

(ii) subtype h_2 - *Allocasuarina acuaria* Heath

Site 65

Allocasuarina acuaria	1.3m	90%
?Latrobea sp.	20cm	10%
Petrophile seminuda	50-80cm	5%
Hibbertia subvaginata	15cm	<1%

Lepidobolus preissianus	10cm	10%
Conostylis stilidiodes	3cm	1%
Neurachne alopecuroidea	2cm	10%
Conostylis ?setigera	10cm	<1%
Schoenus sp. (MET 3882)	45cm	10%

[b] Flooded Gum (*Eucalyptus rudis*) types

(i) Site Type d

Site 1

Eucalyptus rudis	10cm	<5%
Melaleuca viminea	2.5-3.5m	15-20%
Melaleuca laterita	1.5m	15-20%
(rarely a small tree to 5m)		
Leptocarpus co-angustatus	80cm	5%
Chorisandra enodis	50cm	5-10%
Hydrocotyle lemnoides (aquatic with floating leaves)		<1%
Triglochin procera	35cm	<1%
Villarsia sp. (3506 - inadequate) (aquatic with floating leaves)		<1%
Tribonanthes australis	30cm	<1%
Ruppia polycarpa (aqautic)		<15%
Microtis orbicularis		<1%
Diuris laxiflora	20cm	<1%
Marsilea drummondi	5cm	<1%

(ii) Site Type e

Site 6

Eucalyptus rudis	10-12m	<5%
Melaleuca preissiana	8m	5-10%
Jacksonia ulicina	2.5m	10%
Petrophile drummondii	2.5m	20%
Leptospermum erubescens	2m	<1%
Hibbertia subvaginata	15cm	5%
Brachyloma concolor	60cm	<5%
(?not previously recorded this far east)		
Synaphea reticulata	15cm	<1%

Astroloma epacridis	40-80cm	<5%
Goodenia pinifolia	40cm	1%
Glischrocaryon aureum ssp. *angustifolium*	30cm	<1%
Hibbertia montana	15-20cm	<1%
Grevillea monticola	25cm	<1%
Olearia rudis	10cm	<1%
Comesperma volubile	15cm	<1%
Thysanotus patersonii	40cm	<1%
Gahnia sp. (1)	25cm	<1%
Stylidium sp.		<1%
Thelymitra sp.	30cm	<1%
Trachymene pilosa	5cm	<1%

(iii) Site type pG

Site 22

Eucalyptus accedens	25m	20%
Eucalyptus calophylla	20m	<1%
Dryandra nobilis	3.5-4m	60%
Hakea aff. *cyclocarpa*	3.5-4m	30%
Mirbelia dilatata	2m	<1%
Gastrolobium trilobum	1.2m	5%
Goodenia pinifolia	30cm	1%
Hibbertia montana	15cm	<1%
Grevillea monticola	10cm	<1%
Leschenaultia biloba	30cm	<1%
Lepidosperma costale	40cm	<1%
Gahnia sp. (1)	30cm	1%
Stylidium rhynchocarpum	20cm	1%
Stylidium sp. (MET 3706)	12cm	<1%
Caladenia flava	12cm	<1%

Site 12

Eucalyptus accedens	25-30m 15-20m	} 40%
Eucalyptus wandoo	15-20m	20%
Dryandra sessilis	2-3m	75%
Dryandra carduacea	1.5m	<5%
Petrophile heterophylla	1.5m	<1%

Lygnia barbata	25cm	15%
Lepidosperma sp.	15cm	1%

[d] Powderbark Wandoo (*Eucalyptus accedens*) Type

(i) Site type p

Site 16

Eucalyptus accedens	20-25m	40%
Xanthorrhoea preissii	1.5m	55<1%
Hakea trifurcata	1m	1%
Macrozamia reidlei	1m	1%
Bossiaea eriocarpa	15cm	25%
Hibbertia montana	20cm	5%
Hibbertia spicata	5cm	<1%
Bossiaea ornata	35cm	<1%
Hibbertia crassifolia	10cm	1%
Hibbertia aff. *pulchra*	35cm	<1%
Microcorys barbata	30cm	<1%
Olearia rudis	30cm	<1%
Grevillea monticola	30cm	<1%
Grevillea ?pulchella	20cm	<1%
Gahnia sp. (1)	30cm	<1%
Patersonia occidentalis	40cm	<1%
Lepidosperma costale	80cm	<1%
Lepidosperma sp. (1)	50cm	<5%
Stylidium ciliatum	3cm	<1%
Stylidium spathulatum	3cm	<1%
Stylidium petiolare	10cm	<1%

(ii) Site type pp

Site 21

Eucalyptus accedens	20m	25%
Eucalyptus accedens	2-4m	<5%
Hakea aff. *cyclocarpa*	2m	<1%
Gastrolobium trilobum	1.6m	40%
Leucopogon capitellatus	1m	<1%

Hakea trifurcata	1m	<1%
Grevillea monticola	50cm	<1%
Petrophile striata	50cm	1%
Hakea lissocarpha	30cm	<1%
Dryandra armata	80cm	<1%
Bossiaea eriocarpa	30cm	5%
Labichea punctata	30cm	<1%
Sphaerolobium medium	30cm	<1%
Hibbertia ?commutata	15cm	<1%
Hibbertia spicata	15cm	<1%
Astroloma sp. (mat type)	5cm	<1%
Lepidosperma sp (1)	50cm	<5%
Conostylis setigera	10cm	<1%
Lepidobolus preissianus	15cm	<1%
Stylidium ciliatum		<1%
Thelymitra nuda	20cm	<1%

Site 15

Eucalyptus accedens	20-25m	25%
Dryandra armata	80cm	50%
Melaleuca ?scabra	50cm	35%
Casuarina humilis	1m	10%
Xanthorrhoea preissii	1.5m	5%

[e] Marri (*Eucalyptus calophylla*) Types

(i) Site type C - Creek Type

Site 19

Eucalyptus calophylla	20-25m	40%
Hakea trifurcata	3m	<1%
Hakea undulata	2-3m	1%
Acacia celastrifolia	1.5m	5%
Hypocalymma angustifolium	1-1.5m	10%
Brachysema praemorsum	1-1.5m	50%
Solfya heterophylla	1m	<1%
Phyllanthus calycinus	30cm	<1%
Trymalium ledifolium	30cm	<1%
Hibbertia spicata	20cm	<1%

Lepidosperma tuberculatum	80cm	1%
Lepidosperma costale	50cm	1%
Hakea lissocarpha	50cm	1%
Agrostocrinum scabrum	60cm	<1%

(ii) Site type ?Z

Site 5

Eucalyptus calophylla	35m	15%
Eucalyptus marginata	15m	5%
Jacksonia sternbergiana	4-5m	<5%
Grevillea vestita	1.5-2m	<5%
Xanthorrhoea preissii	2m	5%
Macrozamia reidlei	1m	5%
Leptospermum erubescens	2.5m	<5%
Conostephium pendulum	40cm	<1%
Bossiaea eriocarpa	30cm	<5%
Petrophile brevifolia	40cm	<1%
Conostylis serrulata		<5%
Anigosanthos humilis		<1%
Loxocarya flexuosa		<1%
Lepidosperma tenue		<5%
Burchardia umbellata		<1%
Caladenia flava		<<1%

[f] Jarrah (*Eucalyptus marginata*) Types

(i) Site type HG

Site 23

Eucalyptus marginata	?25m	?20%
Banksia grandis	5m	<1%
Xanthorrhoea preissii	1-4m	1%
Dryandra carduacea	1.6-1.8m	50%
Jacksonia ?densifolia	1.8m	<1%
Hakeaa ruscifolia	1-2m	1%
Leptospermum erubescens	1-1.5m	1%
Verticordia serrata	1.2m	<1%

Daviesia rhombifolia	1.2m	<1%
Petrophile serruriae	1m	15%
Acacia pulchella		
? var. *pulchella*	60cm	1%
Daviesia decurrens	50cm	1%
Casuarina humilis	50cm	1%
Leucopogon conostephioides	35cm	<1%
Calothamnus sanguineus	40cm	25%
Sphaerolobium medium	30cm	<1%
Synaphea petiolaris	30cm	1%
Gompholobium ovatum	12cm	<1%
Dryandra nivea	15cm	<1%
Conostylis setigera	10cm	1%
Patersonia occidentalis	30cm	1%
Restio megalotheca	30-50cm	25%
Stylidium ciliatum	15cm	<1%
Stylidium spathulatum	15cm	<1%

Site 52

Eucalyptus calophylla	20m	30%
Daviesia nudiflora	2-3m	70%
Dryandra carduacea	1.5m	10%
Xanthorrhoea preissii	1m	5%
Verticordia serrata	50cm	5%
Daviesia preisii	50cm	<1%
Petrophile serruriae	40cm	5%
Dryandra armata	30cm	5%
Leucopogon conostephioides	15cm	5%
Hibbertia aff. *pulchra*	40cm	1%
Bossiaea ornata	20cm	<1%
Calytrix sp. (MET 3830)	80cm	<1%
Patersonia occidentalis	80cm	<1%
Schoenus armeria	10cm	1%
Lepidosperma costale	45cm	<1%
Lyginia barbata	30cm	<1%

(ii) Site type H

subtype H_1

Site 8

Eucalyptus marginata	10-30m	30%
Eucalyptus calophylla	15m	5%
Dryandra armata	60cm	10%
Casuarina humilis	1-1.5m	40%
Leptospermum erubescens	1.2m	5%
Petrophile serruriae	80cm	1%
Calothamnus sarguineus	40cm	40%
Daviesia decurrens	50cm	1%
Bossiaea ornata	15cm	<1%
Leschenaultia biloba	15-50cm	<1%
Hibbertia aff. *pulchra*	15cm	<1%
Calytrix sp. (sterile) (MET 3721)	50cm	<1%
Stirlingia latifolia	40cm	1%
Petrophile striata	40cm	<1%
Hakea trifurcata	1.5m	<5%
Hakea ruscifolia	1-1.5m	<5%
Hakea prostrata	1-2m	1%
Adenanthos barbigera	1.2m	<1%
Persoonia ?striata	40cm	<1%
Xanthorrhoea preissii	1m	<1%
Styphelia tenuiflora	50cm	<1%
Chorisema dicksonii	40cm	<1%
Calytrix leschenaultia	15cm	<1%
Dryandra nivea	10cm	<1%
Lepidosperma costale	30cm	<1%
Conostylis setigera	8cm	1%
Lepidobolus preissianus	15cm	<5%
Mesomelaena stygia	35cm	10%
Schoenus pleiostemoneus	10cm	<1%
Neurachne alopecuroidea	20cm	<1%
Gompholobium ovatum	20cm	<1%
Baeckea preissiana	8cm	<1%
Lepidobolus preissianus	45cm	<1%

Site 20

Eucalyptus calophylla	<25m	15%} much is
Eucalyptus marginata	<25m	15%} regrowth
Hakea prostrata	40cm-2.5m	1%
Xanthorrhoea preissii	1-2m	10%
Leptospermum erubescens	1-1.2m	10%
Hakea trifurcata	1m	10%
Calothamnus sanguineus	80cm	10%
Acacia pulchella		
? var. *pulchella*	60cm	25%
Dryandra armata	50cm	10%
Petrophile striata	50cm	1%
Melaleuca aff. *scabra* (2)	50cm	<1%
Petrophile serruriae	50cm	<1%
Leschenaultia bilobe	50cm	<1%
Daviesia decurrens	50cm	<1%
Hibbertia spicata	50cm	1%
Hibbertia aff. *pulchra*	15cm	<1%
Chorisema dicksonii	50cm	<5%
Bossiaea eriocarpa	40cm	<1%
Synaphea petiolaris	40cm	10%
Sphaerolobium medium	40cm	<1%
Stackhousia pubescens	30cm	<1%
Dianella revoluta	75cm	<1%
Dryandra nivea	10cm	<1%
Lepidobolus preissianus	15cm	<1%
Lepidosperma sp. (1)	80cm	<1%
Lepidosperma costale	30cm	<1%
Conostylis setigera	10cm	<1%
Stylidium ciliatum	3cm	<1%
Kennedia prostrata	5cm	<1%
Gompholobium knightianum	30cm	<1%
Gompholobium ovatum	50cm	<1%
Gompholobium marginatum	25cm	<1%
Boronia ramosa	35cm	<1%
Acacia alata	40cm	<1%
Daviesia rhombifolia	50cm	<1%
Pimelea sp. (1)	50cm	<1%

subtype H_2

Site 80

Eucalyptus marginata	30m	30%
Hakea prostrata (small trees!)	3m	<5%
Leptospermum erubescens	2m	40%
Xanthorrhoea preissii	2.5m	1%
Allocasuarina humilis	1.6m	1%
Macrozamia reidlei	1m	<1%
Hibbertia spicata	50cm	5%
Stirlingia latifolia	60cm	5%
Gompholobium sp.	15cm	<1%
Mesomelaena stygia	50cm	35%
Loxocarya flexuosa	10cm	<1%
Loxocarya fasciculata	5cm	<1%
Lepidosperma squamatum	30cm	<1%
Borya scirpoidea	2cm	<1%
Conostylis setigera	10cm	<1%
Conostylis serrulata		

(iii) Site type J

subtype J_1

Site 26

Eucalyptus marginata	15-30m	5%
Eucalyptus calophylla	15-30m	5%
Banksia attenuata	1-6m	15%
Adenanthos barbigerus	1.4m	20%
Conospermum stoechadis	1m	<5%
Calytrix sp. (sterile)	1.5-1.7m	20%
Allocasuarina humilis	1.4-1.8m	<5%
Hakea ruscifolia	1.2m	<1%
Petrophile drummondii	1.4m	1% (towards lower end of area)
Jacksonia ?densifolia	1m	1%
Brachyloma concolor	1m	<1%
Jacksonia ulicina	1m	<1%
Stirlingia latifolia	80cm	<5%
Conostephium pendulum	40cm	1%

Eremaea pauciflora	30cm	<5%
Hibbertia subvaginata	15cm	1%
Andersonia brevifolia	15-20cm	1%
Phlebocarya ciliata	40cm	<1%
Lepidosperma costale	35cm	<1%
Lyginia barbata	35cm	1%
Anigosanthos humilis	20cm	<1%
Drosera gigantea	30cm	<1%
Lepidosperma squamatum	40cm	<1%
Schoenus curvifolius	25cm	<1%
Amphipogon turbinatus	25cm	<1%

(v) Site F

Site 79

Eucalyptus marginata	25m	30%
Hakea prostrata	2m	<1%
Adenanthos barbigerus	2-3m	<1% (patches)
Leptospermum erubescens	1.5m	20% (patches)
Stirlingia latifolia	60cm	<10%
Calytrix flavescens	25cm	10%
Petrophile brevifolia	30cm	1%
Melaleuca ?scabra	35cm	<1%
Eremaea pauciflora	50cm	60%
Conostephium pendulum	25cm	<1%
Gompholobium ovatum	40cm	<1%
Petrophile sp.	50cm	<1%
Allocasuarina humilis	1m	1%
Conospermum stoechadis	1m	<1%
Gastrolobium sp. (MET 3877)	1m	1%
Hibbertia crassifolia	15cm	<1%
Loxocarya fasciculata	10cm	<1%
Caustis dioica	30-40cm	5%
Anigosanthos ?manglesii	30cm	<1%
Lepidosperma squamatum	40cm	<5%
Loxocarya flexuosa	15cm	5%
Conostylis setigera	10cm	<1%
Conostylis serrulata	20cm	<1%
Lyginia barbata	30cm	<1%
Schoenus curvifolius	15cm	<1%

Site 67

Eucalyptus marginata	25m	30%
Xanthorrhoea preissii	1-2m	10%
Leptospermum erubescens	1.2m	20%
Allocasuarina humilis	1m	5%
Stirlingia latifolia	40cm	<1%
Conospermum stoechadis	80cm	<1%
Baeckea preissiana	80cm	1%
Daviesia rhombifolia	40cm	<1%
Daviesia brevifolia	25cm	<1%
Calytrix flavescens	15cm	<1%
Burtonia conferta	15cm	<1%
Conostephium pendulum	30cm	<1%
Bossiaea eriocarpa	15cm	<1%
Persoonia striata	15cm	<1%
Daviesia decurrens	15cm	<1%
Hibbertia subvaginata	20cm	1%
Synaphea reticulata	10cm	<1%
Dryandra nivea	10cm	<1%
Lepidosperma squamosum	50cm	<5%
Caustis dioica	15cm	15%
Loxocarya fasciculata	5cm	<5%
Mesomelaena tetragona	45cm	<1%

Site 68

Eucalyptus marginata	25m	30%
Eucalyptus calophylla	25-30m	<5%
Xanthorrhoea preissii	1-2m	10%
Leptospermum erubescens	80cm	50%
Hakea prostrata	1.5m	<1%
Daviesia rhombifolia	60cm	5%
Macrozamia reidlei	1m	<1%
Daviesia brevifolia	15cm	<1%
Dryandra nivea	15cm	<1%
Petrophile media	30cm	<1%
Persoonia ?striata	30cm	<1%
Caustis dioica	20cm	50%
Loxocarya fasciculata	8cm	5%
Lepidosperma squamatum	40cm	5%
Lepidosperma sp. (1)	30cm	<1%

Conostylis setigera	5cm	<1%
Patersonia sp. (MET 3710)	30cm	<1%

Site 7

Eucalyptus marginata	30m	20%
Eucalyptus calophylla	20m	<1%
Xanthorrhoea preissii	2m	<1%
Leptospermum erubescens	1.8m	10% (patchy)
Stirlingia latifolia	80cm	?
Allocasuarina humilis	2m	?10%

(vi) Mixed type F/J

Site 27

Eucalyptus marginata	15-35cm	25%
Eucalyptus calophylla	15-30cm	<5%
Banksia attenuata	8m	1%
Nuytsia floribunda	8-10m	<1%
Kunsea ericifolia	4m	10% (in bands)
Xanthorrhoea preissii	1-5m	5%
Adenanthos barbigera	1-2m	5%
Stirlingia latifolia	1m	<5%
Leptospermum erubescens	60-120cm	10%
Conostephium pendulum	50cm	<5%
Brachyloma concolor	50cm	<1%
Jacksonia ?densifolia	50cm	1%
Daviesia decurrens	50cm	<1%
Scholtzia involucrata	50cm	<1%
Calytrix sp.	50cm	<1%
Persoonia ?striata	40cm	<5%
Hibbertia subvaginata	30cm	5%
Synaphea reticulata	10cm	<1%
Hibbertia crassifolia	20cm	<1%
Caustis dioica	50cm	10%
Lepidosperma squamatum	80cm	<10%
Phlebocarya ciliata	40cm	1%
Conostylis setigera	10cm	<1%
Schoenus curvifolius	20cm	<1%
Loxocarya flexuosa	15cm	<1%
Loxocarya fasciculata	12cm	<1%

Anigosanthos humilis	20cm	<1%
Amphipogon turbinatus	15cm	<1%

Site 84

Eucalyptus calophylla	20-35m	5%
Eucalyptus marginata	15-25m	10%
Jacksonia sternbergiana	3m	<1%
Hakea prostrata	2-2.5m	<5%
Stirlingia latifolia	60cm	<1%
Xanthorrhoea preissii	1-2m	5%
Caustis dioica	30cm	35%
Patersonia occidentalis	40cm	25%
Hibbertia subvaginata	25cm	15%
Daviesia pectinata	20cm	1%
Mesomelaena tetragona	20cm	<1%
Lepidosperma sp. (1)	30cm	1%
Loxocarya fasciculata	10cm	1%

(g) Mixed type MG/pG

Site 54

Eucalyptus wandoo	17m	15%
Eucalyptus accedens (plus young ? of both)	15m	15%
Petrophile heterophylla	1.5-2m	30%
Hakea trifurcata	1.5m	20%
Xanthorrhoea preissii	1-2m	5%
Allocasuarina humilis	1m	20%
Dryandra armata	1m	15%
Grevillea hookeriana	1.5m	<1%
Hemigenia sericea	1.5m	<1%

Site 31

Eucalyptus accedens	15-30m	15%
Eucalyptus wandoo	15-30m	10%
Eucalyptus marginata	15-30m	5%
Hakea trifurcata	1.5-2m	<5%
Allocasurina humilis	1.2m	<10%
Xanthorrhoea preissii	50cm-1.6m	5%

Hakea sp.	1m	<1%
Petrophile serruriae	1.2m	1%
Isopogon dubius	1m	<1%
Melaleuca aff. *scabra* (2)	30cm	<1%
Sphaerolobium medium	30cm	<1%
Glischrocaryon aureum ssp. *angustifolia*	40cm	<1%
Patersonia rudis	30cm	<5%
Conostylis setigera	30cm	<1%
Lepidosperma costale	30cm	<1%
Lepidosperma sp. (1)	40cm	1%
Lepidobolus preissi	15cm	5%
Schoenus armeria	10cm	1%
Costylis caricina		<1%

(h) Mixed Type MG/HG

Site 13

Eucalyptus wandoo	20-25m	20%
Eucalyptus marginata	20-25m	20%
Dryandra carduacea	2m	75%
Petrophile heterophylla	2.5m	5%
Petrophile serruriae	75cm	<1%
Xanthorrhoea preissii	2m	<1%
Hakea sterocarpata	40cm	<5%
Synaphea petiolaris	40cm	<1%
Dampiera linearis	40cm	<1%
Petrophile striata	30cm	1%
Bossiaea eriocarpa	30cm	15%
Hibbertia spicata	15cm	<1%
Bossiaea ornata	15cm	<1%
Tetraria octandra	20cm	<1%
Patersonia occidentalis	30cm	<1%
Lepidosperma sp. (1)	45cm	1%
Stylidium ciliatum	5cm	<1%
Dryandra nivea	10cm	<5%
Conostylis setigera	8cm	<1%
Dianella revoluta	50cm	<1%
Andersonia sp. (mat type)		

(i) Mixed Site Type MG/F/J

Site 81

Eucalyptus wandoo	25m	<5%
Eucalyptus calophylla	25m	<5%
Nuytsia floribunda	8m	1%
Dryandra sessilis	3m	40%
Hakea trifurcata	2m	1%
Xanthorrhoea preissii	2.5m	1%
Caustis dioica	30m	30%
Bossiaea eriocarpa	40m	1%
Adenanthos barbigerus	1m	1%
Lepidosperma sp. (MET 3893)	30m	8%
Jacksonia sterenbergiana	2.5m	<1%
Stackhousia pubescens	30m	<1%
Macrozamia reidlei	40m	<<1%

[k] to [n] No detailed sites recorded for these mixed vegetation types

[o] Granite Types

(i) Subtype G_1

Site 58

Melaleuca radula	1.5m	50%
Grevillea pilulifera	45cm	20%
Petrophile sp.	60cm	<5%
Tryrmalium ledifolium	30cm	20%
Isopogon dubius	70cm	<1%
Hakea erinacea	50cm	10%
Acacia pulchella	50cm	<5%
Gastrolobium spinosum	1m	5%
Persoonia ?striata	30cm	<5%
Hakea incrassata	60cm	<5%
Lepidosperma tuberculatum	40cm	<1%
Styrandra grandiflora	40cm	<1%
Neurachne alopecuroidea	10cm	<1%

Schoenus sp. (sterile)	8cm	<5%
Stylidium sp. (sterile)	5cm	1%

Site 29

Borya scirpoidea	5cm	60%
Tribonanthes longipetala	5cm	<1%
Stylidium sp. (MET 3747)	<1cm	5%
Drosera sp. (MET 3748)	2cm	<1%
Ptilotus declinatus	5cm	<1%
Centrolepis aristata	4cm	<1%
Utricularia violacea	5cm	<1%
Trifolium sp. (sterile)	4cm	<1%

Site 30

Baeckea crispiflora	60cm	<5%
Allocasuarina microstachya	60cm	15%
Gastrolobium parvifolium	60cm	1%
Persoonia ?striata	45cm	20%
Leucopogon sp.	40cm	5%
Dodonaea sp. (1)	25cm	5%
Dampiera preisii	10cm	<1%
Hibbertia spicata	15cm	<1%
Verticordia sp.	25cm	<1%
Mesomelaena stygia	45cm	25%
Lepidosperma pubisquameum	10-12cm	15%
Schoenus sp. (mat habit)	2cm	15%
Laxmannia scirpoidea	10cm	<1%

Site 55

Allocasuarina humilis	1.2m	30%
Jacksonia sp.	1m	5%
Hakea trifurcata	1-1.2m	15%
Dryandra armata	80cm	20%
Petrophile ericifolia	1-1.5m	5%
Verticordia pennigera	50cm	<5%
Melaleuca aff. *scabra*		50%
Xanthorrhoea preissii	1-2m	<5%

(only major species recorded)

Site 18

Allocasuarina huegelii	3-8m	1%
Eucalyptus wandoo	8m	<1%
Hakea erinacea	2m	<1%
Acacia pulchella var. *glabrrima*	1-1.2m	<5%
Hypocalymma angustifolium	1m	60%
Trymalium ledifolium	80cm	<1%
Gastrolobium parvifolium	80cm	<1%
Stackhousia huegeli	60cm	<1%
Dryandra fraseri	40cm	25%
Glischrocaryon aureum ssp. *angustifolia*	50cm	5%
Dampiera preissii	25cm	1%
Cryptandra glabriflora	25cm	<1%
Hibbertia spicata	20cm	<1%
Diplolaena drummondii	40cm	<1%
Stylidium sp. (MET 3672)	10cm	<1%
Loxocarya flexuosa	10cm	1%
Opercularia vaginata	12cm	<1%

Site 17

Eucalyptus calophylla	20-25m	<5%
Allocasuarina huegellii	15-20m	<5% (at edges)
Eucalyptus wandoo	20-25m	<5%
Acacia celastrifolia	2m	20%
Hakea undulata	1.6m	1%
Gastrolobium spinosum	1.5m	10%
Acacia pulchella var. *glaberrima*	1.2m	5%
Trymalium ledifolium	1m	20%
Macrosamia reidlei	1m	10%
Eulingia ?quercifolia	1m	<5%
Hakea trifurcata	1m	<5%
Hakea lissocarpha	1m	<1%
Pimelea ciliata	1m	<1%
Phyllanthus calycinus	60cm	5%
Tetratheca pilifera	50cm	<1%
Dodonaea sp. (1)	40cm	5%

Glischrocaryon aureum ssp. *angustifolia*	50cm	<1%
Laxmannia squarrosa ssp. *squarrosa*	20cm	<1%
Cheilanthes tenuifolia	15cm	<5%
Lepidosperma tuberculatum	60cm	<1%
Loxocarya flexuosa		<5%
Stypandra grandiflora	60cm	<1%
Muchlenbeckia adpressa	1m	<1%
Hibbertia spicata	25cm	<1%
Neurachne alopecuroidea	5cm	<1%

(ii) subtype G_2

Site 51a

Allocasuarina huegeliana	10m	95%
Monotaxis lurida	35cm	<1%

(iii) subtype G_3

Site 51

Acacia acuminata	4-15m	40%
Eucalyptus wandoo	20m	<1%
Allocasuarina huegelii	10m	<1%
Acacia pulchella	1.5m	<1%
Hypocalymma angustifolium	1m	20%
Trymalium ledifolium	80cm	10%
Glischrocaryon aureum ssp. *angustifolia*	80cm	<5%
Phyllanthus calycinus	15cm	<1%
Loxocarya flexuosa	10cm	<5%
Haemodorum sp.	30cm	<1%
Monotaxis lurida	35cm	<1%

[p] York Gum (*Eucalyptus loxophleba*) Open Woodland

No detailed sites recorded for this Vegetation Site Type.

[q] *Eucalyptus drummondii, Banksia attenuata, Banksia menziesii* Woodland

Site 64

Eucalyptus drummondii	8m	<1%
Banksia mensiesii	4m	1%
Banksia attenuata	6m	1%
Nuytsia floribunda	4m	1%
Adenanthos barbigerus	2m	<5%
Xanthorrhoea preissii	1-2m	1%
Petrophile drummondii	1.5-2m	35%
Leptospermum erubescens	1m	20%
Eremaea pauciflora	40cm	50%
Gastrolobium calycinum	80cm	1%
Scholtzia involucrata	30cm	<1%
Calytrix flavescens	20cm	<1%
Andersonia lehmanniana	5cm	<1%
Caustis dioica	25cm	25%
Schoenus armeria	10cm	15%

[r] Mixed F / *Eucalyptus drummondii, Banksia attenuata, Banksia menziesii*

No detailed sites were recorded for this mixed vegetation type.

[s] *Banksia attenuata, Banksia menziesii* Open woodland

Site 85

Eucalyptus marginata	25m	<1% (occasional emergents)
Banksia mensesii	2-5m	15%
Banksia attenuata	6m (8m)	<5%
Adenanthos barbigerus	3m	40%
Daviesia nudiflora	1.8m	10%
Eremaea pauciflora	0.5-1m	30%
Calytrix leschenaultia	25cm	1%

Calytrix sp. (MET 3891)	1.8m	5%
Petrophile drummondii	1-2m	<5%
Conospernum triplinervium	60cm	<1%
Stirlingia latifolia	40cm	5%
Conostephium pendulum	20cm	1%
Hibbertia subvaginata	20cm	<1%
Brachyloma concolor	30cm	<1%
Amphipogon turbinatus	3cm	<1%
Schoenus curcifolia	4cm	<1%
Drosera sp.	1-2cm	<1%
Loxocarya flexuosa	10cm	<1%
Conostylis serrulata	15cm	<1%
Lyginia barbata	40cm	<1%
Lepidosperma squamatum	45cm	1%
Schoenus subfasciculata	30cm	<1%
Phlebocarya ciliata	30cm	<1%

Site 90

Banksia attenuata	8m	5%
Banksia mensiesii	3m	1%
Adenanthos barbigera	2m+	15%
Leptospermum erubescens	1.5-2m	35%
Petrophile drummondii	1.5-2m	15%
Eremaea pauciflora	0.5-1m	35%
Caustis dioica	20cm	25%
Drosera sp.		<1%
Stylidium sp.		<1%
Schoenus curvifolia	8cm	<1%
Andersonia lehmanniana	30cm	<1%
Lepidosperma sp.	30cm	5%
Lyginia barbata	30cm	<1%

[s] *Banksia prionotes* Open Woodland

Site 93

Banksia prionotes	6-10m	30%
Adenanthos barbigerus	5m	15%
Kunsea ericifolia	5m	5%
Hakea prostrata	3m	1%

Macrozamia reidlei	1m	1%
Bossiaea eriocarpa	20cm	1%
Phlebocarya ciliata	20cm	5%
Jacksonia sternbergiana	4m	10%

APPENDIX TWO

Flora List

PTERIDOPHYTA

5 **OPHIOGLOSSACEAE**
Ophioglossum lusitanicum

7 **ADIANTACEAE**
Cheilanthes tenuifolia

9 **DENNSTAEDTIACEAE**
Pleurosorus rutifolius

13 **MARSILEACEAE**
Marsilea drummondii

GYMNOSPERMAE

18 **CUPRESSACEAE**
Actinostrobus arenarius

ANGIOSPERMAE - Monocotyledoneae

22 **RUPPIACEAE**
Ruppia polycarpa

26 **JUNCAGINACEAE**
Triglochin centrocarpa
Triglochin procera

31 POACEAE

Amphipogon turbinatus

* *Brisa maxima*

* *Brisa minor*

Neurachne alopecuroidea

* *Poa bulbosa*

Stipa compressa

32 CYPERACEAE

Caustis dioica

Chorisandra enodis

Eleocharis acuta

Gahnia sp. (1) (MET 3644, 3605) (apparently undescribed not very widespread)

Lepidosperma costale

Lepidosperma pubisquameum

Lepidosperma sp. (1) (MET 3614)

Lepidosperma scabra

Lepidosperma squamatum

Lepidosperma tenue

Lepidosperma tuberculatum

Mesomelaena stygia

Mesomelaena tetragona

Schoenus armeria

Schoenus curvifolius

Schoenus humilis

Schoenus odontocarpus

Schoenus pleiostemoneus (not previously collected in this area)

Schoenus subfascicularis

Schoenus sp. (1) (MET 3882)

Tetraria octandra

39 RESTIONACEAE

Hypolaena exsulcata

Lepidobolus preissianus

Leptocarpus coangustatus

Loxocarya fasciculata

Loxocarya flexuosa

Lyginia barbata

Restio megalotheca

40 CENTROLEPIDACEAE

Aphelia cyperoides

Centrolepis aristata

52 JUNCACEAE

* *Juncus bufonius*

54 LILIACEAE

Agrostocrinum scabrum

Arthropodium preisii

Borya scirpoidea

Burchardia umbellata

Caesia parviflora

Calectasia cyanea

Chamaescilla corymbosa

Chamaexeros serra

Dianella revoluta

Laxmannia squarrosa ssp. *squarrosa*

Laxmannia squarrosa ssp. *sessilis*

Lomandra effusa

Lomandra micrantha

Lomandra preissii

Stypandra grandiflora

Thysanotus patersonii

Thysanotus sparteus

Trichoryne humilus

Wurmbea dioica ssp. *alba*

55 HAEMODORACEAE

Anigosanthos bicolor ssp. *bicolor*

Anigosanthos humilis

Anigosanthos ?manglesii

Conostylis caricina

Conostylis serrulata

Conostylis setigera

Conostylis stylidioides

Haemodorum simplex

Phlebocarya ciliata

Tribonanthes australis

Tribonanthes longipetala

60 IRIDACEAE

Orthrosanthus laxus var. *gramineus*
Patersonia juncea
Patersonia occidentalis
Patersonia rudis

66 ORCHIDACEAE

Caladenia discoidea
Caladenia hirta
Caladenia filamentosa var. *denticulata*
Caladenia flava
Caladenia mensiesii
Caladenia patersonii var. *longicauda*
Diuris longifolia
Diuris laxiflora
Elythranthera brunonis
Leporella fimbriata
Microtis orbicularis
Prasophyllum macrostachyum var. *ringens*
Pterostylis recurva
Pterostylis rogersii
Pterostylis vittata
Thelymitra fusco-lutea
Thelymitra nuda

ANGIOSPERMAE - Dicotyledoneae

70 CASUARINACEAE

Allocasuarina acuaria (widespreed but not common)
Allocasuarina huegeliana
Allocasuarina humilis
Allocasuarina microstachya

90 PROTEACEAE

Adenanthos barbigera
Banksia grandis

Petrophile seminuda
Petrophile serruriae
Petrophile striata
Stirlingia latifolia
Stirlingia simplex
Synaphea petiolaris
Synaphea reticulata (very short bud form)
Persoonia ?striata

92 SANTALACEAE
Santalum acuminatum

95 OLACACEAE
Olax benthamiana

103 POLYGONACEAE
Muehlenbeckia adpressa

106 AMARANTHACEAE
Ptilotus declinatus
Ptilotsus drummondii
Ptilotus manglesii

113 CARYOPHYLLACEAE
* *Cerastium glomeratum*

143 DROSERACEAE
Drosera macrantha
Drosera glanduligera
Drosera gigantea
Drosera paliacea
Drosera erythorhiza

149 CRASSULACEAE
Crassula natans

152 PITTOSPORACEAE
Billardiera bicolor
Pronaya fraseri
Sollya heterophylla

Banksia menziesii
Banksia prionotes
Conospermum scaposum
Conospermum stoechadis
Dryandra armata
Dryandra bipinnatifida
Dryandra carduacea
Dryandra fraseri
Dryandra nivea
Dryandra nobilis
Dryandra sessilis
Grevillea bipinnatifida
Grevillea hookeriana
Grevillea leptobotrys
Grevillea monticola
Grevillea pilulifera
Grevillea vestita
Hakea aff. *cyclocarpa*
Hakea erinacea
Hakea incrassata
Hakea lissocarpha
Hakea marginata
Hakea prostrata
Hakea ruscifolia
Hakea stenocarpa (a fairly restricted species, not previously recorded east of Perth regions)

Hakea sulcata
Hakea aff. *sulcata* (possibly new species, MET 3817)
Hakea undulata
Hakea varia
Isopogon dubius
Isopogon teretifolius (very pubescent on calyx lobes - this species varies from glabrous to villous hairy)

Persoonia elliptica
Petrophile brevifolia
Petrophile drummondii (a poorly collected but much confused species - 9 collections mostly north of reserve)

Petrophile ericifolia
Petrophile heterophylla
Petrophile media

161 ROSACEAE

Acaena echinata

163 MIMOSACEAE

Acacia acuminata
Acacia alata
Acacia celastrifolia
Acacia ?chrysocephala (may be new species)
Acacia drummondii ssp. *drummondii*
Acacia lasiocarpa var. *bracteolata*
Acacia lasiocarpa var. *sedifolia*
Acacia microbotrya
Acacia nervosa
Acacia pulchella var. *glaberrima*
Acacia pulchella var. *pulchella* (unusual variant)
Acacia saligna
Acacia willdenowiana

164 CAESALPINIACEAE

Labichea punctata

165 FABACEAE

Bossiaea eriocarpa
Bossiaea peduncularis
Bossiaea ornata
Brachysema praemorsum
Burtonia conferta
Chorizema dicksonii
Daviesia brevifolia (may be rare, material on loan)
Daviesia cordata
Daviesia costata
Daviesia decurrens
Daviesia microphylla (may be rare, two specimens in Herbarium, more on loan?)
Daviesia nudiflora
Daviesia preisii
Daviesia rhombifolia
Euchilopsis linearis
Gastrolobium calycinum
Gastrolobium parvifolium

Gastrolobium spathulatum
Gastrolobium spinosum
Gastrolobium trilobum
Gompholobium ovatum
Gompholobium knightianum
Gompholobium marginatum
Gompholobium polymorphum
Gompholobium shuttleworthii
Gompholobium sp. (closest to *G. venustus*. possibly 1st collection)
Hovea trisperma
Isotropis drummondii
Jacksonia densiflora (*?decumbens* - doesn't exactly equal one species but has characters of both. *J. densiflora* is the most common)
Jacksonia restioides
Jacksonia sternbergiana
Jacksonia ulcina
Kennedia prostrata
Latrobea sp. (MET 3864a)
Mirbelia dilatata
Sphaerolobium medium
* *Trifolium* sp. (inadequate)

167 GERANIACEAE

* *Erodium cicutarium*
Erodium cygnorum
Pelargonium littorale

168 OXALIDACEAE

* *Oxalis corniculata* (native and introduced varieties of this species are found in W.A.; the one recorded is introduced)

175 RUTACEAE

Boronia ramosa
Boronia scabra
Diplolaena microcephala
Urocarpus squamuligerus (not very common, slight range extension)

182 TREMANDRACEAE

Tetratheca confertifolia

Tetratheca pilifera

183 POLYGALACEAE

Comesperma volubile

185 EUPHORBIACEAE

Monotaxis lurida

Phyllanthus calycinus

202 STACKHOUSIACEAE

Tripterococcus brunonis

Stackhousia huegelii

207 SAPINDACEAE

Dodonaea sp. (nothing like it in Herbarium) (MET 3663, 3753)

215 RHAMNACEAE

Cryptandra glabriflora

Trymalium ledifolium

223 STERCULIACEAE

Lasiopetalum aff. *glabratum* (probably new species, no matching specimens, MET 3763)

Thomasia foliosa

226 DILLENIACEAE

Hibbertia crassifolia

Hibbertia commutata

Hibbertia montana

Hibbertia aff. *pulchra*

Hibbertia aff. *rhadinopoda*

Hibbertia spicata

Hibbertia subvaginata

Hibbertia vaginata

Hibbertia sp. (1) (MET 3812) (undescribed species, common in the reserve system, but not very widespread)

263 **THYMELEACEAE**

Pimelea angustifolia

Pimelea sp.(1) (MET 3655) (?*P.ciliata* Rye M.S.)

273 **MYRTACEAE**

Baeckea camphrospermae

Baeckea preissiana

Callistemon phoeniceus

Calothamnus preissii

Calothamnus quadrifidis

Calothamnus sanguineus

Calytrix flavescens

Calytrix leschenaultii

Calytrix sp. (sterile)

Eremaea pauciflora

Eremaea purpurea

Eremaea ?violacea (or a new species, if *E. violacea*, then a large range extension) (MET 3909)

Eucalyptus accedens

Eucalyptus calophylla

Eucalyptus drummondii

Eucalyptus foecunda (only a few indviduals on the reserve)

Eucalyptus loxophleba

Eucalyptus marginata

Eucalyptus rudis

Eucalyptus wandoo

Hypocalymma angustifolia

Kunsea ericifolia

Leptospermum erubescens

Melaleuca laterita

Melaleuca preissiana

Melaleuca radula

Melaleuca aff. *scabra* (1)

Melaleuca aff. *scabra* (2)

Melaleuca viminea

Rinzia fumana

Scholtzia involucrata

Thryptomene australis

Verticordia densiflora

Verticordia pennigera

Verticordia serrata

276 HALORAGACEAE

Glischrocarpon aureum ssp. *angustifolia*

Gonocarpus nodulosus

281 APIACEAE

Hydrocotyle callicarpa

Hydrocotyle diantha

Hydrocotyle lemnoides

Trachymene pilosa

288 EPACRIDACEAE

Andersonia brevifolia (7 collections in the W. A. Herbarium)

Andersonia lehmanniana

Astroloma ciliatium

Astroloma epacridis

Astroloma macrocalyx (Reagans Ford - Perth ?geographically restricted)

Astroloma pallidum

Astroloma xerophyllum

Astroloma sp.

Brachyloma concolor

Conostephium pendulum

Leucopogon capitellatus

Leucopogon conostephioides

Leucopgon nutans

Leucopogon sprengeloides

Leucopogon strictus

Leucopogon sp. (MET 3581)

Lysinema ciliatum

Styphelia tenuiflora

293 PRIMULACEAE

* *Anagallis arvensis*

303 GENTIANACEAE

Centaurium erythraea

Sebaea ovata

Villarsia sp. (material inadequate)

313 LAMIACEAE

Hemiandra pungens
Hemigenia sericea
Microcorys barbata

316 SCROPHULARIACEAE

Parentucellia latifolia

323 LENTIBULARIACEAE

Polypompholyx multifida
Utricularia violacea

331 RUBIACEAE

* *Galium murale*
Opercularia vaginata

340 LOBELIACEAE

Isotoma hypocrateriformis

341 GOODENIACEAE

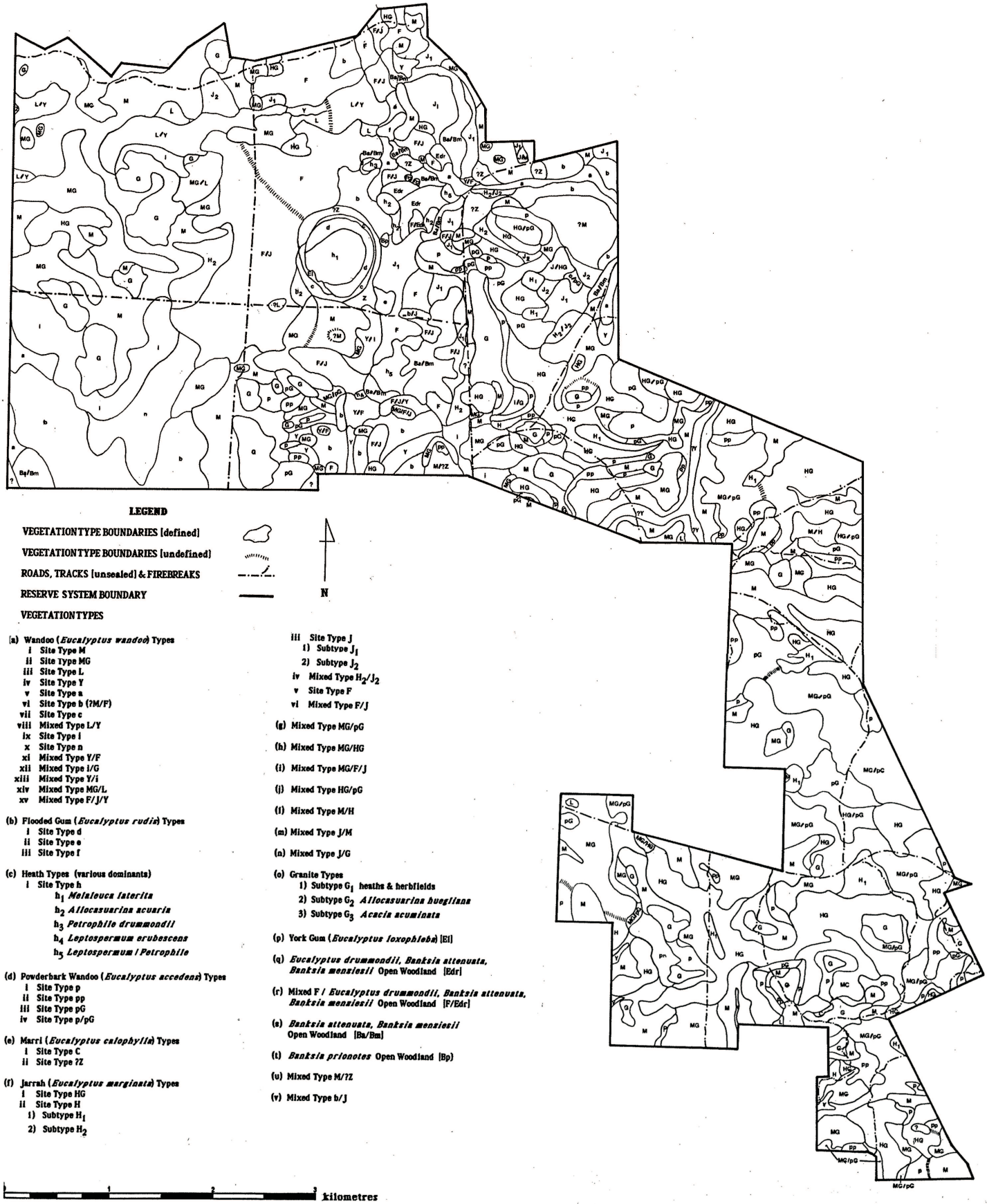
Dampiera alata
Dampiera linearis
Dampiera preissii (range extension)
Goodenia pinifolia
Velleia trinervis

343 STYLIDIACEAE

Levenhookia dubia
Stylidium brunonianum
Stylidium calcaratum
Stylidium caricifolium
Stylidium ciliatum
Stylidium petiolare
Stylidium piliferum
Stylidium rhynchocarpum
Stylidium macrocarpum
Stylidium ?spathulatum (differs in flower colour and distribution to typical *S. spathulatum*)

345 **ASTERACEAE**

Blennospora drummondii
Brachycome ciliaris
Helipterum cotula
Helipterum demissum
Helipterum manglesii
Lagenifera huegelii
Millotia tenuifolia
Olearia rudis
Podolepis canescens
Podolepis gracilis
Podolepis lessonii
Rutidosus multiflora
Senecio glossanthus
Senecio lautis ssp. *dissectifolia*
Siloxeris humifusus
Trichocline spathulata



LEGEND

VEGETATION TYPE BOUNDARIES [defined]

VEGETATION TYPE BOUNDARIES [undefined]

ROADS, TRACKS [unsealed] & FIREBREAKS

RESERVE SYSTEM BOUNDARY

N

VEGETATION TYPES

(a) Wandoo (*Eucalyptus wandoo*) Types
- i Site Type M
- ii Site Type MG
- iii Site Type L
- iv Site Type Y
- v Site Type a
- vi Site Type b (?M/F)
- vii Site Type c
- viii Mixed Type L/Y
- ix Site Type i
- x Site Type n
- xi Mixed Type Y/F
- xii Mixed Type i/G
- xiii Mixed Type Y/i
- xiv Mixed Type MG/L
- xv Mixed Type F/J/Y

(b) Flooded Gum (*Eucalyptus rudis*) Types
- i Site Type d
- ii Site Type e
- iii Site Type f

(c) Heath Types (various dominants)
- i Site Type h
  - h_1 *Melaleuca laterita*
  - h_2 *Allocasuarina acuaria*
  - h_3 *Petrophile drummondii*
  - h_4 *Leptospermum erubescens*
  - h_5 *Leptospermum / Petrophile*

(d) Powderbark Wandoo (*Eucalyptus accedens*) Types
- i Site Type p
- ii Site Type pp
- iii Site Type pG
- iv Site Type p/pG

(e) Marri (*Eucalyptus calophylla*) Types
- i Site Type C
- ii Site Type ?Z

(f) Jarrah (*Eucalyptus marginata*) Types
- i Site Type HG
- ii Site Type H
  - 1) Subtype H_1
  - 2) Subtype H_2
- iii Site Type J
  - 1) Subtype J_1
  - 2) Subtype J_2
- iv Mixed Type H_2/J_2
- v Site Type F
- vi Mixed Type F/J

(g) Mixed Type MG/pG

(h) Mixed Type MG/HG

(i) Mixed Type MG/F/J

(j) Mixed Type HG/pG

(l) Mixed Type M/H

(m) Mixed Type J/M

(n) Mixed Type J/G

(o) Granite Types
- 1) Subtype G_1 heaths & herbfields
- 2) Subtype G_2 *Allocasuarina huegliana*
- 3) Subtype G_3 *Acacia acuminata*

(p) York Gum (*Eucalyptus loxophleba*) [El]

(q) *Eucalyptus drummondii, Banksia attenuata, Banksia menziesii* Open Woodland [Edr]

(r) Mixed F / *Eucalyptus drummondii, Banksia attenuata, Banksia menziesii* Open Woodland [F/Edr]

(s) *Banksia attenuata, Banksia menziesii* Open Woodland [Ba/Bm]

(t) *Banksia prionotes* Open Woodland [Bp]

(u) Mixed Type M/?Z

(v) Mixed Type b/J

0 1 2 3 kilometres

MAP 5: SITE TYPE VEGETATION MAP, MT. WESTDALE-DOBADERRY SWAMP RESERVE SYSTEM