

MOORADUNG NATURE RESERVE



by
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WESTERN AUSTRALIAN NATURE RESERVE MANAGEMENT PLAN NO. 7
(DRAFT)

MOORADUNG NATURE RESERVE

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Of great assistance was the expertise provided by those who identified wildlife species - their names are given in the text. Particular thanks are due to Mr K.J. Atkins who identified many plant species.

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PART A
THE RESERVE

1. THE RESERVE - SUMMARY

Mooradung Nature Reserve (Reserve No. 32448, area 631.7 ha) lies near the eastern edge of the Darling Range in the Shire of Boddington (Fig. 1). The reserve is sited about 12 km to the south-east of the town of Boddington with Lucey Road providing public access (Fig. 2,3). Privately owned land surrounds the reserve, and this is mostly cleared for agriculture (Fig. 4). The remaining bushland adjoining the reserve will probably be cleared within the next ten years.

While quite small in area Mooradung Nature Reserve is by far the largest nature reserve within the Shire of Boddington. However the Shire does contain extensive areas of forested land. The area of forest closest to the reserve, at Mount Saddleback, lies some 11 km to the south-west (Fig. 2).

The greater part of the reserve consists of upland country and its associated gravel soils. Jarrah (Eucalyptus marginata) woodland is the predominant vegetation with Wandoo (E. wandoo) occurring along drainage systems and Marri (E. calophylla) scattered throughout. Small areas of granite rock and heath vegetation provide further diversity.

Mooradung Nature Reserve contains a range of flora and fauna and by virtue of its location provides a sample of wildlife within the transition zone between the forested land of the Darling Range to the west and woodland in the lower rainfall areas to the east.

Species of particular note which have been recorded from the reserve include the Crested Shrike-tit (Falcunculus frontatus) a bird which has been gazetted as rare and endangered; Grevillea cirsiifolia, a plant gazetted as rare and endangered; and the Slender Mallee (Eucalyptus decurva) which is regionally uncommon.

By virtue of its location and the diversity of wildlife it contains the reserve is an important part of the system of nature reserves.

2. HISTORY OF THE RESERVE

Mooradung Reserve was originally set aside for the purpose of "Protection for Agricultural Department (Research Station)". Prior to becoming a nature reserve the area was extensively logged and some logging trails are still visible today.

District Wildlife Officer D. Mell inspected the reserve in August 1973. In his Departmental report he concluded that the reserve was an interesting piece of land for conservation by virtue of its size and the diversity of its wildlife.

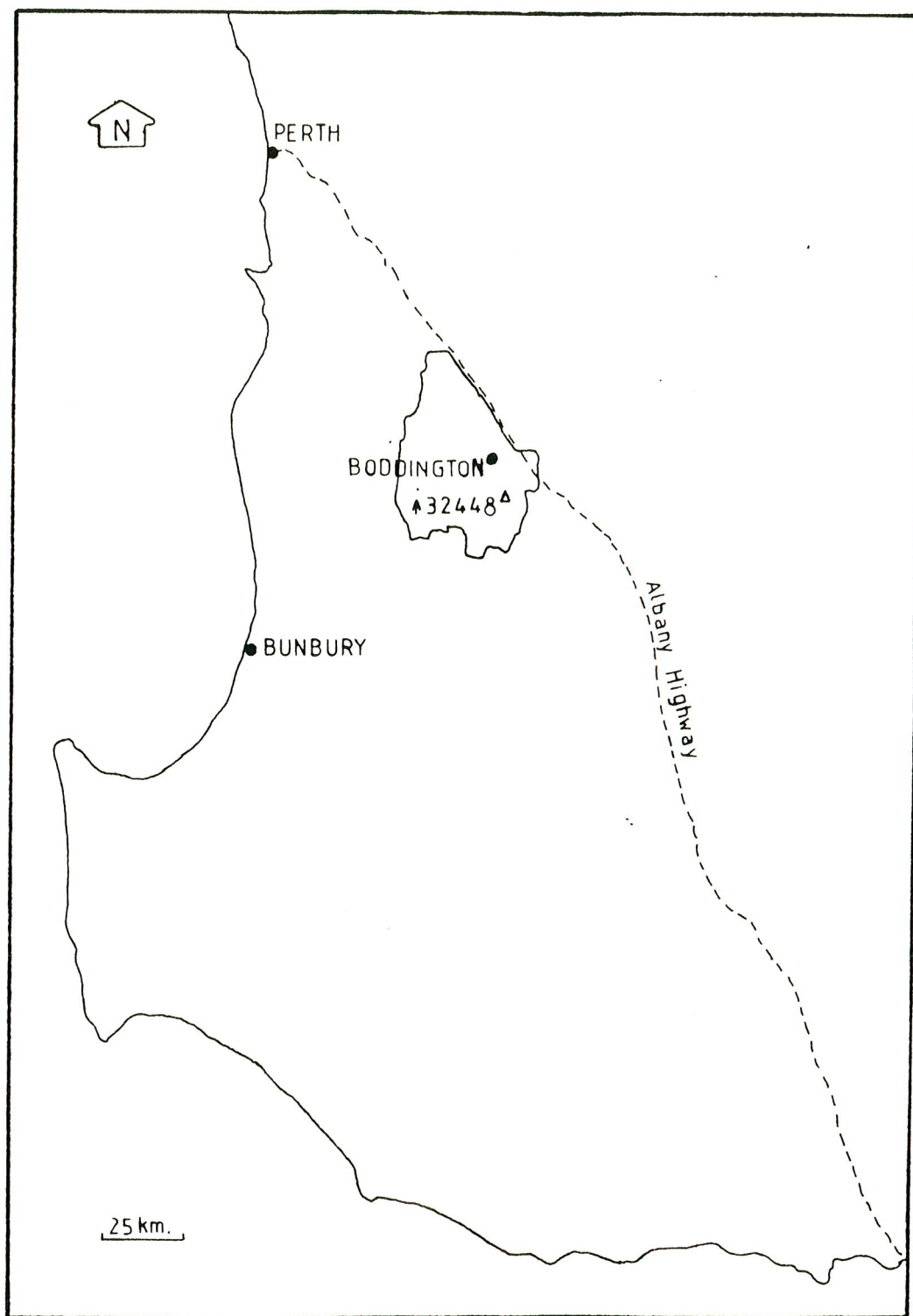


Figure 1: Location of the Shire of Boddington and Mooradung Nature Reserve (No. 32448)

Drawn from Forests Dept. 1:50,000 series maps, Crossman & Murray

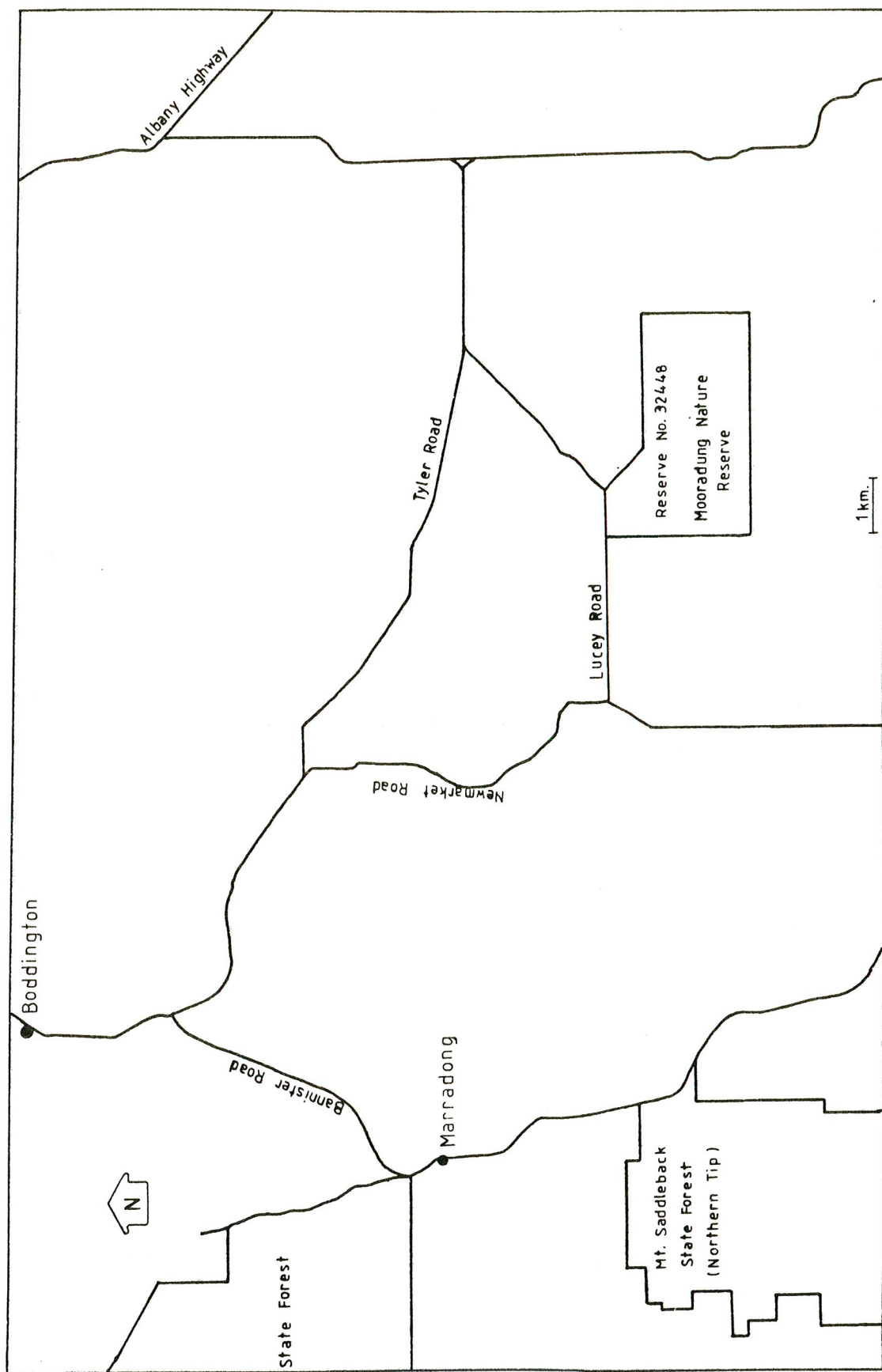


Figure 2: Mooradung Nature Reserve: locality (Source: Forests Department 1:50 000 series)

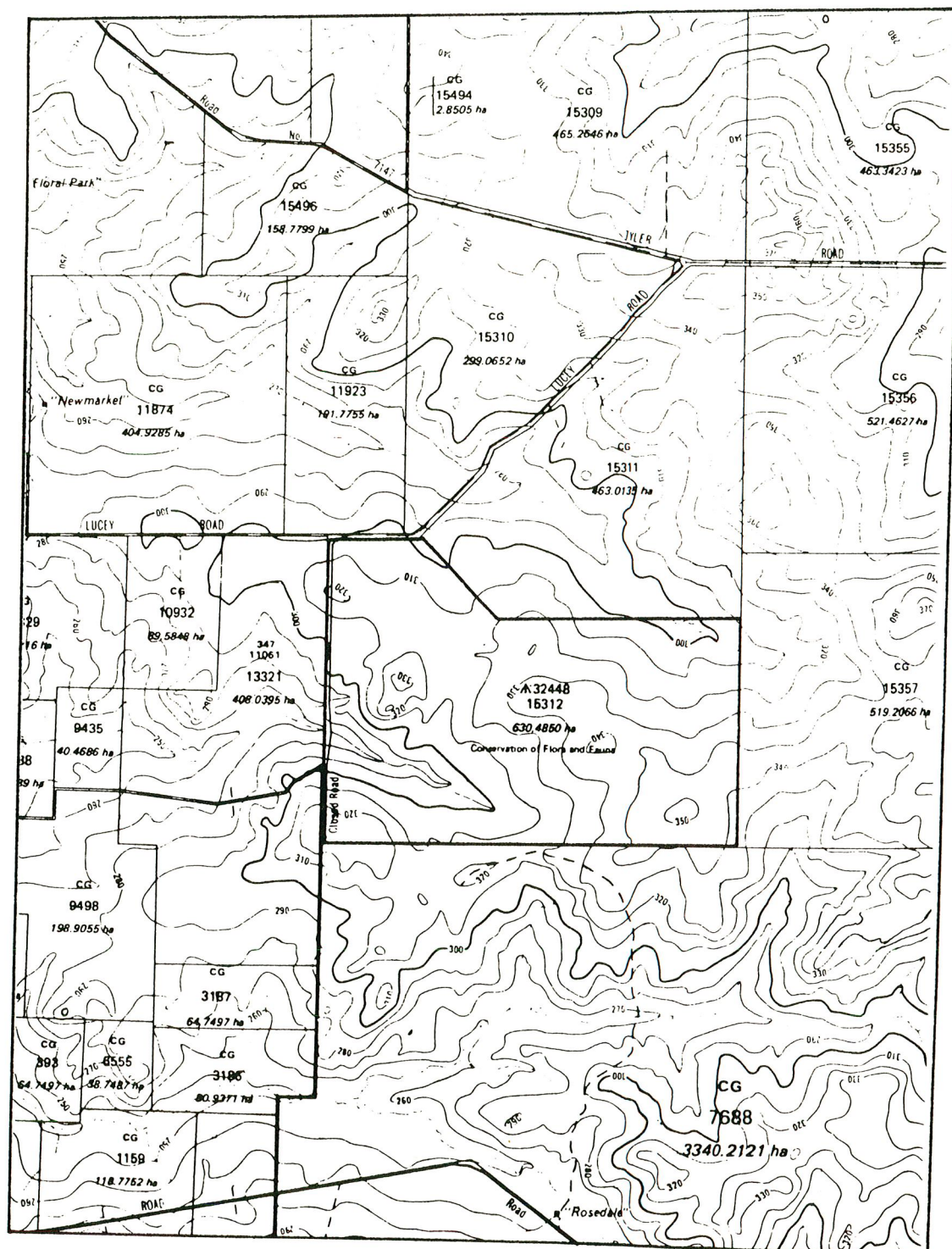
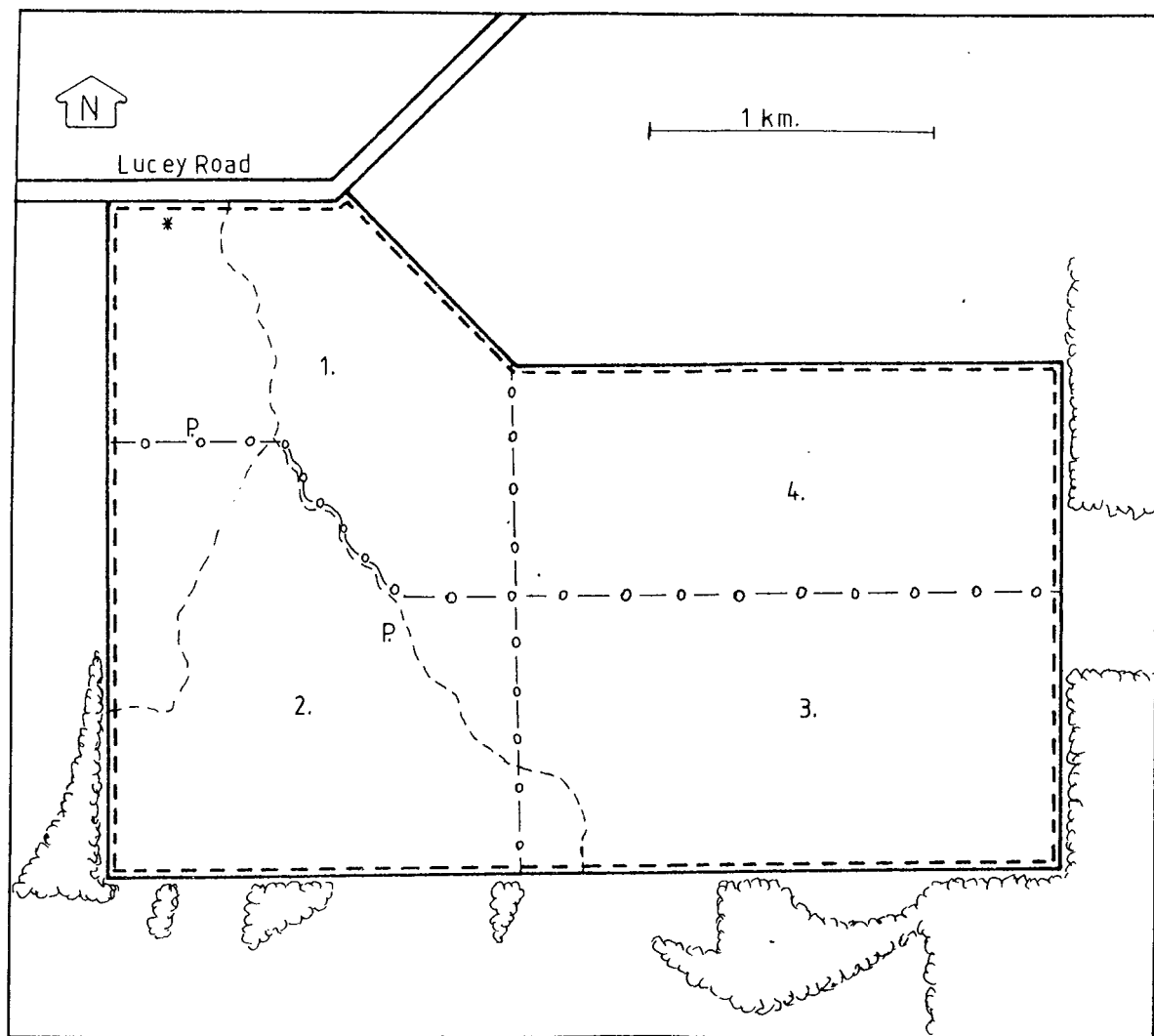


Figure 3. Mooradung Nature Reserve : cadastral information
(Source: Lands and Surveys 1:50 000 series 2232-III)



- Reserve Boundary
- Firebreak
- ... Track
- Proposed Firebreak
- ☁ Adjoining Uncleared Land, as at 16.12.1981
- * Washdown Site for "Dieback" Hygiene
- 1,2,etc. Block Numbers
- P. Sites Tested for Phytophthora cinnamomi

Figure 4. Mooradung Nature Reserve: firebreaks, tracks, proposed firebreaks, adjoining uncleared land, sites tested for Phytophthora cinnamomi.

Following this report the purpose of the reserve was changed to Conservation of Flora and Fauna and the reserve was vested in the Western Australian Wildlife Authority. These actions appeared in the Government Gazette of March 7, 1984.

Boddington Shire Council opposed the gazettal of the nature reserve and in a letter to the Department of Lands and Surveys written in March 1974, Council stated that while they supported the preservation of flora and fauna, there were already large areas of State Forest within the Shire. On this basis Council expressed strong opposition to Mooradung Reserve being retained for conservation and they suggested that the reserve be released for farming.

As a consequence of these objections Chief Research Officer A.A. Burbidge inspected the reserve accompanied by Senior Technical Officer T. Evans during May 1974. In their Departmental report they noted that, while their inspection revealed few unique or outstanding plants and animals, the reserve provided protection for a typical range of the flora and fauna of the region. They also pointed out that State Forest is subject to disturbance in the form of timber felling and bauxite mining, and that the reserve is a most useful link between State Forest in the Darling Range and that to the east at Dryandra. As a result of this report the purpose and vesting of the reserve was retained.

In recent years concern has been expressed by some landholders adjoining the reserve concerning management of the area for fire protection. Consequently the Boddington Bush Fire Advisory Committee sought clarification of the Department of Fisheries and Wildlife's fire policy with respect to the reserve. Given this interest in the reserve, together with its status as the largest nature reserve on the western edge of the Pingelly Management District, information on the characteristics of the reserve has been collated in this document to a) detail the conservation values of, and b) present a plan of management for, the reserve.

3. LOCATION AND PHYSICAL FEATURES

Mooradung Nature Reserve (33°06'S, 116°33'W) is situated in the Shire of Boddington and lies about 12 km to the south-east of the Town of Boddington and 12 km to the west of the Albany Highway. Access to the reserve is by Lucey Road (Fig. 2). The reserve is 631.7 ha in area and approximately rectangular in shape, being about 3.5 km east-west and 2.0 km north-south.

Farmland surrounding the reserve is used for cereal growing and as pasture for stock. Uncleared, privately owned land adjoining the reserve is shown in Figure 4.

Mooradung Nature Reserve lies between 280 and 340 m above sea level (Fig. 5) and consists in the main of upland

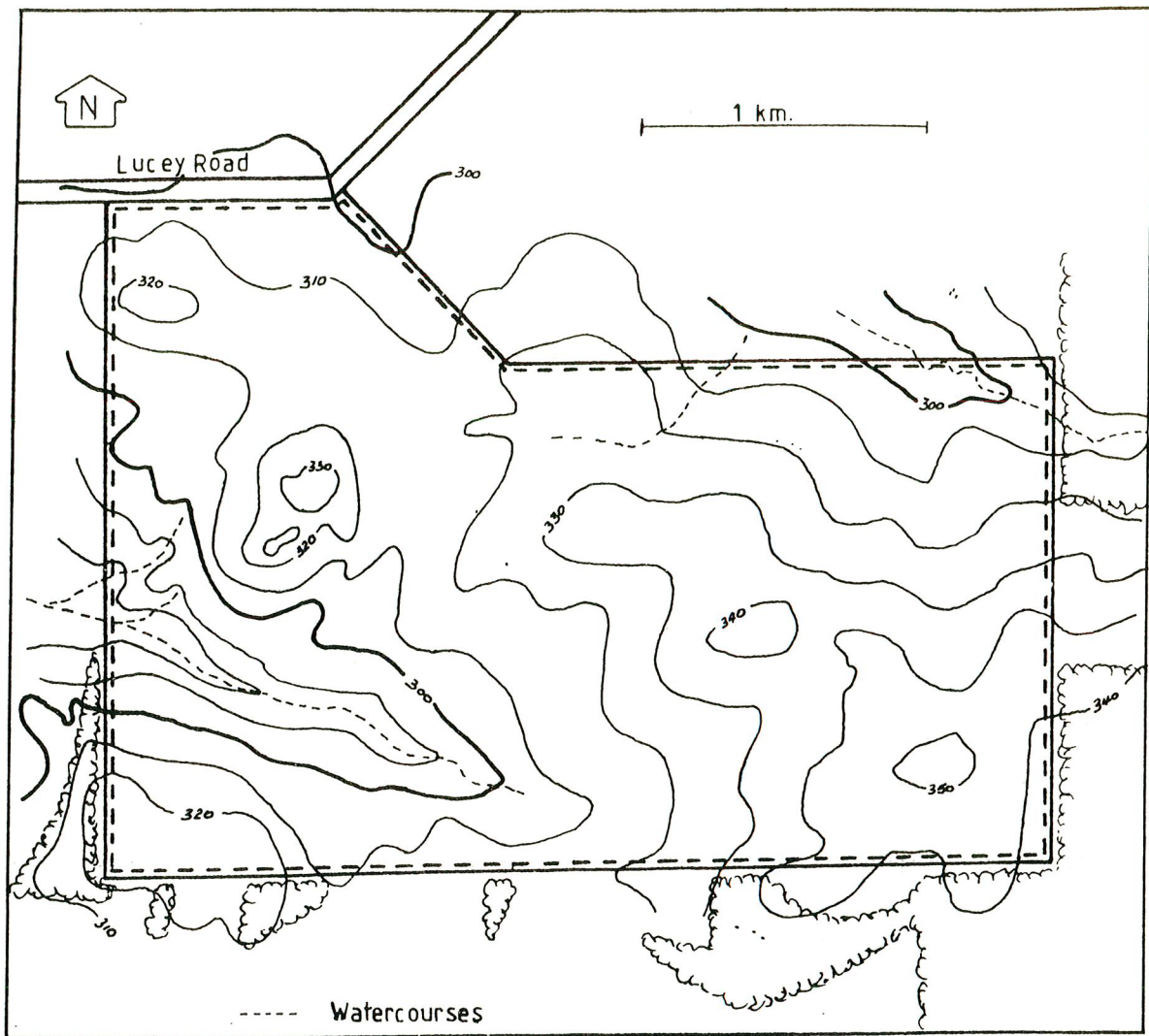


Figure 5. Mooradung Nature Reserve: topography and features
(Source: Lands and Surveys 1:50 000 series 2232-III)

country formed by several laterite ridges and an area of exposed granite. Although dissected by three creek lines no permanent water exists on the reserve.

Surface soils on the reserve range from sand and sandy loam to lateritic gravel with most soils containing a gravel component. Darker coloured loams occur in the region of the granite outcrop.

The climate of the region is Mediterranean and the average annual rainfall at the nearest weather station, Marradong (Fig. 2), is 755 mm.

4. VEGETATION

Mooradung Nature Reserve lies in the Dale Subdistrict of the Darling Botanical District as defined by Beard (1980). Beard described the vegetation and soils of the Dale Subdistrict as being Jarrah (Eucalyptus marginata) forest on ironstone gravels with Marri-Wandoo (E. calophylla-E. wandoo) woodlands on loamy soils, both over sclerophyll understories. At a more regional level Heddle *et al.* (1980) have described the Darling System which includes land about 10 km to the west of Mooradung Nature Reserve. From comparison with their work it is apparent that the vegetation of the Mooradung Nature Reserve has affinities with that of the eastern section of the Darling Plateau and in particular the "Yalanbee and Dwellingup Complex in Low Rainfall".

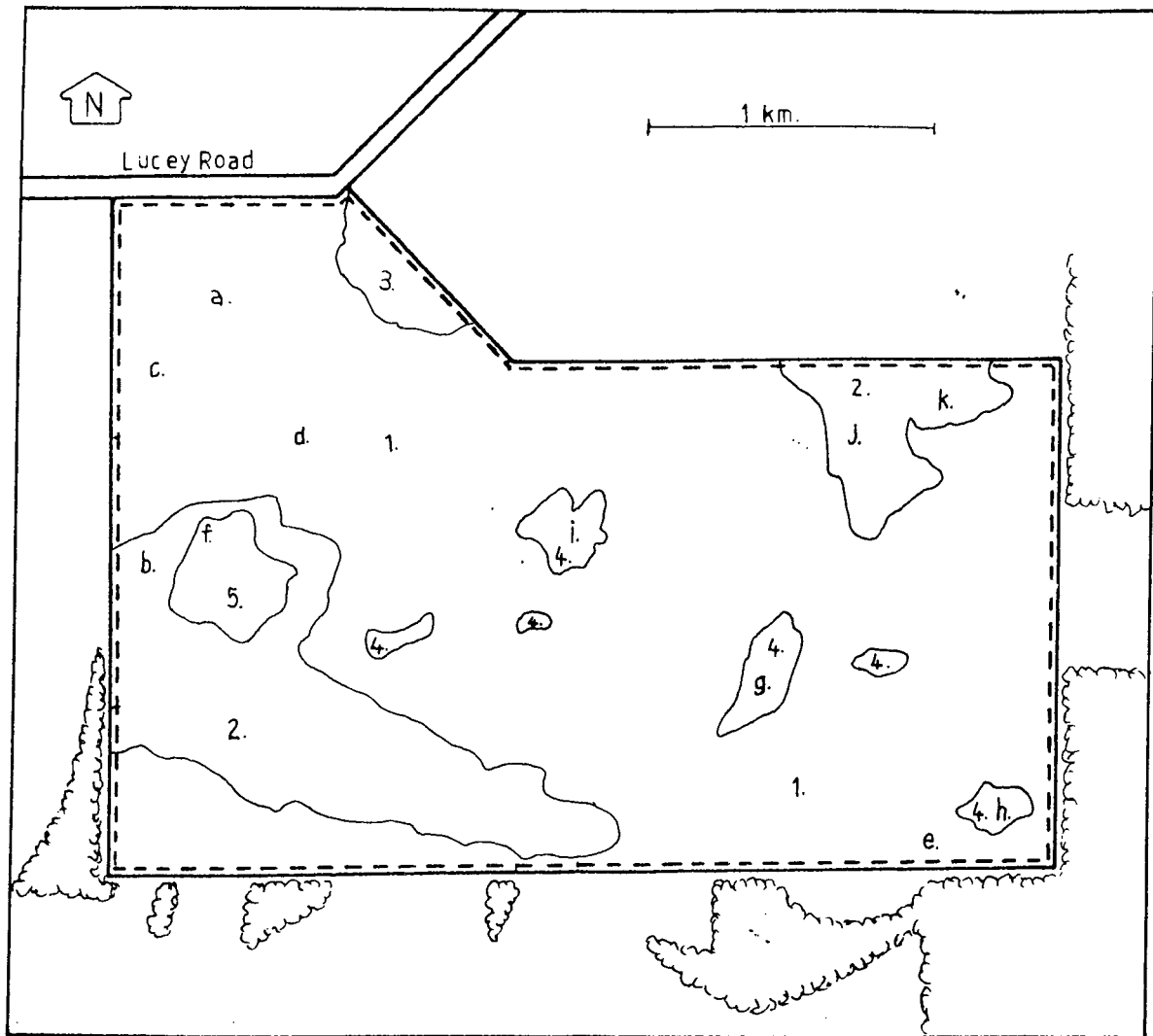
The vegetation of Mooradung Nature Reserve has been mapped at a broad scale using aerial photography taken in January, 1973 (Fig. 6). Most of the vegetation boundaries shown have been examined on the ground. Work on the vegetation and floristics of the reserve was carried out by the author between 1979 and 1981, with additional work in 1983.

Three vegetation formations occur on the reserve - woodland, heath and granite complex. Of these by far the largest in area is woodland. Although the areas of heath and granite complex are much more limited in extent they contain a number of plant species not found elsewhere on the reserve and therefore make a significant contribution to the floral diversity.

WOODLAND

While the canopy within woodlands on Mooradung occasionally reaches densities which could be defined as forest within the classification system devised by Muir (1977, Appendix IA), the areas are predominantly woodland in character. The following woodland types have been described for the reserve.

1. Jarrah Woodland. Jarrah (Eucalyptus marginata) is the most common tree species on the reserve with Marri (E. calophylla) occurring sporadically



1. Jarrah Woodland.
2. Wandoo Woodland.
3. Jarrah-Marri-Wandoo Woodland.
4. Heath.
5. Granite Complex.
- a,b,etc. Plant Association Survey Sites.

Figure 6. Mooradung Nature Reserve: vegetation (Source: Lands and Surveys, January 1973 aerial photography)

throughout. Understories within the Jarrah woodlands vary considerably in composition depending on soils and topography. Higher in the landscape lateritic gravel soils carry, on some sites, a low woodland stratum of Bull Banksia (Banksia grandis) or Sheoak (Allocasuarina fraseriana) over a sparse shrubland. Tall shrublands of Parrot Bush (Dryandra sessilis) and Pingle (Dryandra carduacea) are also present at some sites. Lower in the landscape these strata disappear and are replaced by shrubs less than two metres in height. Scrub Sheoak (Allocasuarina humilis) is the most abundant understorey shrub in these areas with other common shrubs being Bossiaea ornata, Daviesia spp, Couch Honeypot (Dryandra nivea), Grevillea sp., Honeypot (Hakea lissocarpa) and Buttercups (Hibbertia spp).

2. Wandoo Woodland: Two pure stands of Wandoo (E. wandoo) occur on the reserve. These woodlands are sited on more loamy soils along drainage lines and adjacent to the granite outcrop. Understories within Wandoo woodlands are varied and commonly include Bossiaea eriocarpa, York Road Poison (Gastrolobium calycinum) and Honeypot (Hakea lissocarpa).

GRANITE COMPLEX

The granite exposure on the reserve is shown in Figure 6. While there is little exposed granite at the site some of the plant species which occur there - such as Sheoak (Allocasuarina huegeliana), Pincushions (Borya nitida) and Stypantra imbricata - are frequently found associated with granite. Jam (Acacia acuminata), a species common in the agricultural areas to the east, has only been recorded in association with the granite.

HEATHS

The heaths which occur on the reserve are small in size however they contain species, such as Drummond's Gum (Eucalyptus drummondii), which have not been recorded elsewhere.

Dominant species in heaths range from Scrub Sheoak (Allocasuarina humilis), to various combinations such as Scrub Sheoak with Prickly Dryandra (Dryandra armata, and Scrub Sheoak with H. trifurcata. The most floristically diverse area of heath occurs centrally in the reserve ("i" in Fig. 6).

Descriptions were made by the author of vegetation associations at eleven sites on the reserve. While these provide a broad picture of the reserve's vegetation they do not detail all associations that are present. The association descriptions and a plant list for the reserve are given in Appendices IB and IC respectively.

PLANT SPECIES OF NOTE

Two of the plant species which have been recorded from the reserve are of particular interest. One, Grevillea cirsiifolia, is gazetted as rare and endangered. Of further note is the fact that the reserve is outside the previously known geographical range of this species (Rye and Hopper, 1981).

The second species of individual interest is the Slender Mallee (Eucalyptus decurva). This plant grows within two quite separate regions. The northern region is approximately bounded by a line connecting Mogumber, Brookton and Boddington; while the southern region is contained roughly in a region bounded by Hopetoun, Kalgan, and Geekabee Hill (east of Cranbrook). The Slender Mallee on Mooradung Nature Reserve is therefore a southern outlier of the northern populations of the species. It should be noted that a specimen lodged in the Western Australian Herbarium was collected from the Boddington area. Locality details with the specimen suggest that it was collected on or near the reserve. A local farmer has informed the author of mallees growing on private property near the reserve, a matter which requires further investigation.

5. FAUNA

No detailed study has been made of the fauna of Mooradung Nature Reserve. The following account is based on Departmental reports by District Wildlife Officer D. Mell (August 1973), and Chief Research Officer A.A. Burbidge and Senior Technical Officer T. Evans (May 1974); a short survey by consultants employed by Worsley Alumina Pty Ltd (late Spring 1983); and opportunistic records by the author from 1979 to 1983 inclusive. The common and scientific names used for mammals, reptiles and amphibians in this plan are according to the Western Australian Museum.

MAMMALS

Live trapping for mammals was undertaken on the reserve by the author during June and September 1980. Further live trapping was carried out during late Spring of 1983 by consultants employed by Worsley Alumina Pty Ltd. Neither of these surveys was intensive, nor was any attempt made to comprehensively assess all the habitats available on the reserve. Mammal species recorded from the reserve are shown in Table 1.

Table 1. Mammal species recorded from Mooradung Nature Reserve.

Species		Source ¹
Western Grey Kangaroo	<u>Macropus fuliginosus</u>	A,B,C,D
Brush Wallaby	<u>Macropus irma</u>	B,C,D
Dunnart ²	<u>Sminthopsis</u> sp.	D
Bat (?Gould's Wattled Bat)	? <u>Chalinolobus gouldii</u>	B
Echidna	<u>Tachyglossus aculeatus</u>	D
European Fox (I)	<u>Vulpes vulpes</u>	B
Mouse (I)	<u>Mus musculus</u>	C,D
European Rabbit (I)	<u>Oryctolagus cuniculus</u>	B

¹A = Mell; B = Burbidge and Evans; C = Wallace; D = Worsley
 Alumina Pty Ltd

²Mummified juvenile remains;

I = Introduced species.

BIRDS

The 56 bird species which have been recorded from Mooradung Nature Reserve are listed in Appendix II. This number of species accords well with that which would be expected to occur on an area of similar size in the wheatbelt (compare with Kitchener et al., 1982; Fig. 2).

The bird species recorded from the reserve represent an excellent sample of the terrestrial birds of the region. While many of the species are either permanent residents of the reserve, for example the Golden Whistler, Jacky Winter and Splendid Wren; or regionally nomadic, for example the Red-capped Robin and White-cheeked Honeyeater; others are migratory. Included among the latter are the Rainbow Bee-eater, White-winged Triller, Pallid Cuckoo and Sacred Kingfisher.

Although Mooradung Nature Reserve does not lie at the extreme range of any bird species, the species list does to some extent reflect the location of the reserve between State Forest to the west and the wheatbelt to the east. The Red-capped Robin, Jacky Winter, White-winged Triller and Rainbow Bee-eater are all more common in bushland to the east and are not typical of State Forest to the west; while the main populations of the Red-capped Parrot lie to the west of the reserve (Serventy and Whittell, 1976).

Of note is the record of the Crested Shrike-tit on the

Reserve. Species recorded from the reserve are shown in Tables 2 (reptiles) and 3 (amphibians).

Table 2. Reptiles recorded on Mooradung Nature Reserve.

Species		Source ¹
Geckoes		
<u>Phyllurus milii</u>	Thick-tailed Gecko	D
Dragons and Monitors		
<u>Pogona minor minor</u>	Dwarf Bearded Dragon	D
<u>Varanus gouldii</u>	Gould's Goanna	C
Skinks		
<u>Cryptoblepharus plagiocephalus</u>		D,B
<u>Ctenotus impar</u>		D
<u>Egernia napoleonis</u>		D
<u>Lerista distinguenda</u>		D
<u>Morethia obscura</u>		D
<u>Tiliqua rugosa rugosa</u>	Bobtail	D
Snakes		
<u>Pseudonaja affinis affinis</u>	Dugite	D
<u>Rhinoplocephalus gouldii</u>		D

¹ B = Burbidge and Evans; C = Wallace; D = Worsley Alumina Pty Ltd

Table 3. Amphibians recorded on Mooradung Nature Reserve.

Species	Source ¹
<u>Crinia georgiana</u>	D
<u>Heleioporus psammophilus</u>	D
<u>Pseudophyrne guentheri</u>	B

¹B = Burbidge and Evans;

D = Worsley Alumina Pty Ltd

Of the reptile and amphibian species recorded from Mooradung Nature Reserve two are worthy of further comment. The known distribution of Gould's Goanna (Storr, 1980) and Heleioporus psammophilus (Tyler et al. 1984) appear to lie largely outside the Darling Range including that part near Mooradung. While this may reflect lack of collecting, the reserve may also lie near the edge of part of the geographic range of these species.

6. CONSERVATION VALUES

The conservation values of Mooradung Nature Reserve are fourfold. Firstly, apart from mammals, the reserve contains a representative sample of the upland flora and fauna of the region. Although areas of State Forest lie within 11 km of the reserve it is important to note that the closest, at Mt Saddleback, does not include all the wildlife species recorded on the reserve. For example some 10% of the plant species occurring on the reserve have not been recorded at Mt Saddleback (data as at Spring 1983), an area which has been intensively studied by Worsley Alumina Pty Ltd. This emphasizes the need for a number of conservation areas within any given region if the full range of flora is to be conserved.

Secondly, the reserve lies between the forests of the Darling Range to the west and the woodlands of the wheatbelt to the east. While the vegetation and landforms of the reserve are closely allied with those found on the eastern edge of the Darling Range, species occurring on the reserve such as Jam (Acacia acuminata), Sheoak (Allocasuarina huegeliana), Red-capped Robin (Petroica goodenovii) and Jacky Winter (Microeca leucophaea) illustrate the fact that the reserve is influenced by its proximity to the wheatbelt. Therefore the reserve has a conservation function in providing a representative sample along the transition between the flora and fauna of the Darling Range and that of the wheatbelt. This function

will be of increasing importance with the continued clearing and degradation of native vegetation on private land and road verges.

Thirdly, not only does the reserve provide habitat for resident bird species but also for a variety of nomadic and migratory species. Reserves such as Mooradung provide "stepping stones" of natural habitat for the latter two groups.

Finally, the reserve contains two species which are gazetted as rare and endangered. These are the plant Grevillea cirsiifolia and the Crested Shrike-tit (Falcunculus frontatus). A third species, the Slender Mallee (Eucalyptus decurva), is regionally uncommon. The reserve is also at the southern limit of the northern populations of this species.

7. FIRE HISTORY

According to reserve neighbours, only one wildfire has occurred on the reserve since 1950. This started from a lightning strike to the north-west of the reserve in about 1961. Apparently this wildfire burnt all of the reserve with the exception of a section in the south-west corner. Apart from this fire, the whole reserve was lit by adjoining landholders in February or March 1973. Shortly after this fire the reserve, then a proposed nature reserve, was inspected by District Wildlife Officer D. Mell. From his report and comments by reserve neighbours it appears that 90% or more of the reserve was burnt.

Prior to 1973, and several times since, reserve neighbours have burnt sections of the reserve perimeter for fire protection purposes.

In April 1981, officers from the Department of Fisheries and Wildlife carried out a prescribed burn on part of the reserve (Fig. 7) to reduce fuel levels. This burn was of moderate intensity and about 70-80% of the litter and shrub layers were burnt.

8. PAST MANAGEMENT

In December 1972 a District Wildlife Officer was based at Waroona for the first time. From then until 1978 this officer was the sole regional representative of the Department of Fisheries and Wildlife working through the area within which Mooradung Nature Reserve is located. The major function of District Wildlife Officers is to implement the enforcement and licencing provisions of the Wildlife Conservation Act. However they are also involved in management activities; particularly where there is no management team established.

Between 1974 and 1978 management of the reserve was largely restricted to enforcement and licencing work and since 1978 instances of rubbish dumping and timber cutting

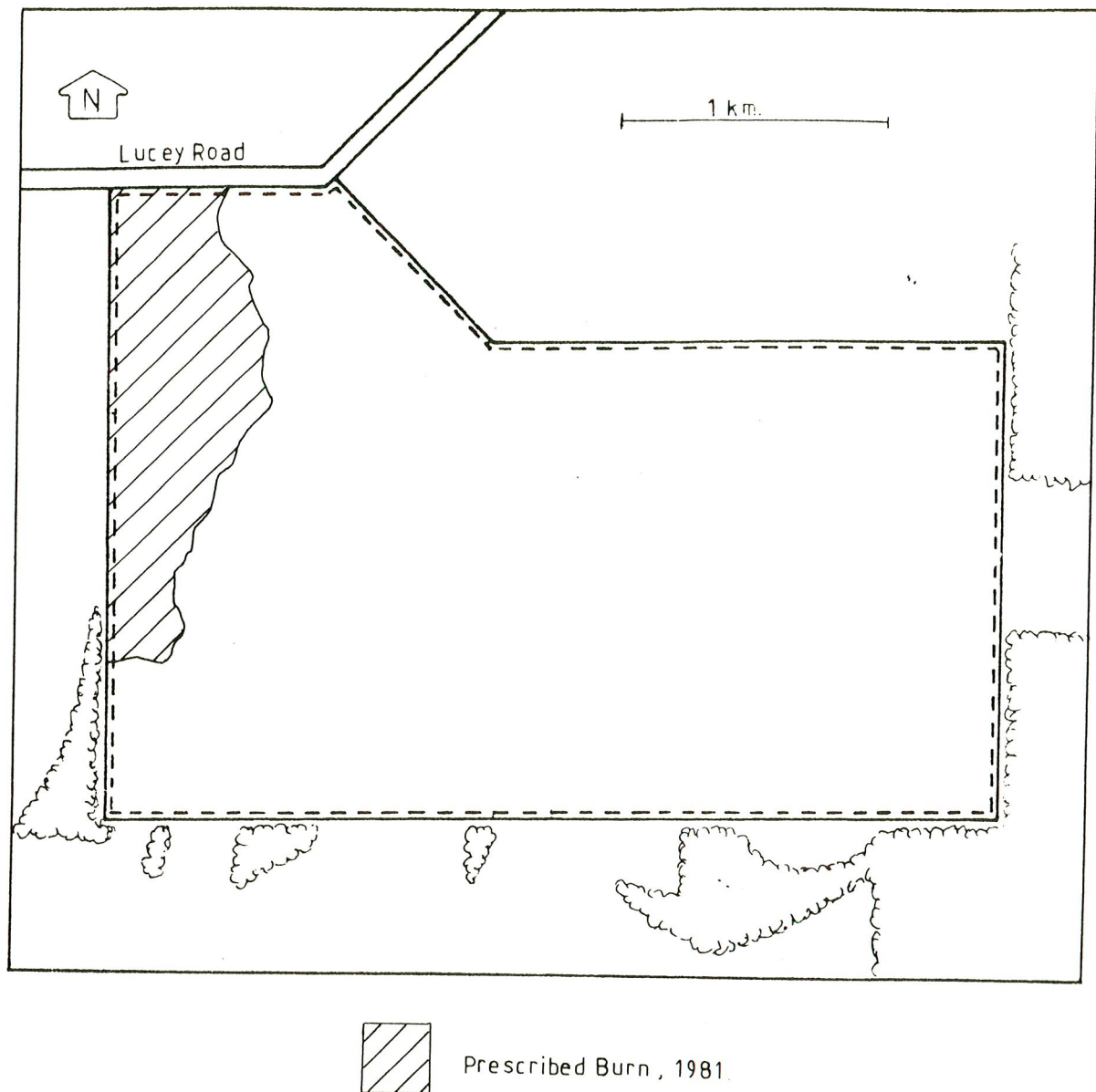


Figure 7. Mooradung Nature reserve: prescribed burn, 1981.

on the reserve have been investigated.

With the appointment of the Department's first reserve management team to Pingelly in 1978, the PRMT (Pingelly Reserve Management Team) became responsible for regional management of the reserve. The first involvement of this group with the reserve was in March 1979 when the PRMT assisted with a clearing burn on nearby private property.

A six metre firebreak was constructed by the PRMT around the perimeter of the reserve in December 1979. This firebreak has been maintained by an adjoining landholder under contract to the Department of Fisheries and Wildlife. As part of the firebreak maintenance programme officers from the PRMT sprayed eucalypt regrowth on the firebreaks with herbicide in both 1981 and 1982.

Further management work undertaken on the reserve by the PRMT has included biological survey, a prescribed burn in 1981, and the testing of two sites (Fig. 4) for Phytophthora cinnamomi ("jarrah dieback"). None of the samples taken from the reserve showed the presence of P. cinnamomi.

PART B
PLAN FOR MANAGEMENT

1. MANAGEMENT OBJECTIVES

The prime objective for management of Mooradung Nature Reserve will be to maintain the wildlife (flora and fauna) conservation values of the reserve. The second objective of management will be to ensure, as far as is practicable, that the management of the reserve is compatible with the management of adjoining agricultural lands.

To achieve these objectives management will be required in the following fields during the term of this plan:

Protection from Fire

To protect the assets of both the reserve and the adjoining land steps will be taken to minimise the occurrence and impact of uncontrolled fires that may occur on the reserve.

Protection from Phytophthora cinnamomi

To prevent both the introduction of this fungus into the reserve and the possible transport of infected material into, from or within the reserve. Although no infection has been recorded, this does not preclude the possibility that undetected infections exist on the reserve.

Protection from Declared Plants and Animals

To eradicate or control such animals or plants as may be declared from time to time under the provisions of the Agriculture and Related Resources Protection Act (1976 as amended).

Prevention of Misuse

To take such measures as are deemed necessary to prevent the misuse - such as rubbish dumping and timber removal - of the reserve.

Management Records

To maintain a current system of records concerning the management activities undertaken on the reserve, including updated lists of the flora and fauna found on the reserve.

Public Use

To assist as far as is practicable any person, either amateur or professional, who wishes to undertake research or educational activities on the reserve provided that these activities do not adversely affect the conservation values of the reserve. The reserve will also be available to the general public for those forms of public use, such as bushwalking and birdwatching, which do not contravene either the provisions of the Wildlife Conservation Act and Regulations (1950, as amended) or the provisions of this Plan.

2. FIRE PROTECTION

Fire protection measures for the reserve will take into consideration both the conservation values of the reserve and the need to protect adjoining landholders from wildfires burning on the reserve. The fire protection programme for the reserve will involve:

- (a) maintenance of existing firebreaks;
- (b) the construction and maintenance of an internal firebreak system;
- (c) a programme of prescribed burning;
- (d) establishment of procedures for notifying the Department of Fisheries and Wildlife of wildfires on or adjacent to the reserve; and
- (e) involvement of the Department of Fisheries and Wildlife in suppression of wildfires on or adjoining the reserve.

INTERNAL FIREBREAK SYSTEM

At present vehicular access within the reserve is confined to two tracks (Fig. 4). The condition of these tracks is deteriorating due to both erosion and the regrowth of vegetation. Furthermore, the tracks are not well placed for prescribed burning and wildfire suppression. For these reasons, the tracks will be closed and the ground ripped to encourage further regeneration of vegetation. A new system of internal firebreaks will be constructed as shown in Figure 4. It is proposed that these firebreaks will be constructed during 1985.

Given that the reserve is located within the geographical range of Phytophthora cinnamomi, it will be necessary to restrict vehicular use of the firebreak system during the currency of this plan (see Section 3).

MAINTENANCE OF FIREBREAKS

Once constructed all firebreaks will be kept free of fuel and in a condition which will readily permit the passage of four-wheel drive vehicles. Whenever possible adjoining landholders will be contracted to carry out firebreak maintenance works.

PRESCRIBED BURNING

Prescribed burning on nature reserves may be carried out either to reduce fuel levels to assist in the control of wildfires (abatement burning), or to alter habitat to favour particular species of wildlife (biological burning). Any burning carried out for biological reasons will also have an abatement function given that fuel loads will be reduced by such burning.

At present the relationships between fire and wildlife are not sufficiently understood to enable burning for biological purposes to be undertaken on Mooradung Nature Reserve. Consequently the prescribed burning which is undertaken will have the aim of reducing fuel levels on the reserve to assist in the control of wildfires either entering or leaving the reserve.

While the relationship between fire and wildlife is poorly understood, it is possible to burn native vegetation at a frequency which is detrimental to conservation values. For this reason it is important that a cautious approach be adopted in prescribed burning programmes for the reserve, particularly with respect to the frequency with which fire is used.

External Buffer Strips

Given the need both to adopt a cautious approach to the use of prescribed burning, and to protect the reserve and adjoining landholders from wildfires, a 50 m buffer strip will be established around the boundary of the reserve. This buffer strip will include the perimeter firebreak and an area of burnt bush. The internal edge of the buffer strip will be defined by a single cut line constructed using a bulldozer. Where the topography of the reserve does not permit a firebreak to be constructed 50 metres inside the boundary, the internal edge of the buffer will be placed deeper into the reserve if this is practicable. It is intended that the internal edge of the buffer strip will be constructed in 1984.

Landholders adjoining the reserve will be permitted to burn the buffer strip where it adjoins their property subject to the following conditions:

1. Burning is carried out in accordance with the Bush Fires Act and Regulations.
2. No section of the buffer strip is burnt more frequently than once every five years.
3. The PRMT (Pingelly Reserve Management Team) is notified of the date of an intended burn no less than one month prior to the burn taking place. (Early notification of intention to burn will enable the PRMT to establish monitoring sites);
4. Burning is carried out in a manner that does not threaten the remainder of the Reserve;

These conditions may be varied at the discretion of the Reserve Management Officer based at Pingelly. For example, permission may be granted to burn a specific section of the buffer strip at a greater frequency if the Reserve Management Officer considers that this is appropriate.

It must be stressed that the use of buffer strips may create management problems. For example, frequent buffer burning may promote the invasion into the reserve of exotic plants (e.g. wild oats) although it is thought that the predominantly gravel soils of the reserve will prevent this occurring. Given the problems associated with buffer strips, the buffer system established on the reserve will be experimental and its usefulness will be reassessed at the end of the term of the present plan.

To assess the changes which occur on the buffer strips during the life of this plan, officers from the PRMT will monitor fuel levels and vegetation characteristics at a minimum of three sites on the buffer strip. Officers from the PRMT will also monitor the rate of weed invasion into the reserve at several places along the buffer strip.

Block Burning

Other than within the buffer strip, prescribed burning on the reserve will have the following objectives:

- (a) to reduce the fuel levels on the reserve with minimal damage to the conservation values of the area; and
- (b) to establish, through the monitoring of specific sites on the reserve, an information base for future prescribed burning programmes.

To achieve the monitoring objectives, at least one monitoring site will be established by the PRMT within each block prior to its being burnt. The monitoring method used will incorporate measures of fuel levels, floristics and the reproductive responses of plant species to fire.

For the purposes of prescribed burning and wildfire control the reserve will be divided into four compartments as shown in Figure 4.

Ideally the burning programme would be based on a knowledge of the relationships through time between fuel levels, fire behaviour, and the life histories of wildlife. Given that this knowledge is not available, a fire frequency has been chosen which it is believed will achieve the aim of fuel reduction without detrimentally affecting wildlife. It is hoped that the monitoring work will indicate whether or not this burning programme is appropriate.

The programme for prescribed burns is shown in Table 4. All burns will be of moderate intensity and carried out in mid to late autumn depending on seasonal conditions. To provide an unburnt, control area for the purpose of comparison with burnt areas, compartment no. 4 will not be prescribed burnt during the currency of this plan. This block was chosen because it contains:

- (a) representative samples of most of the vegetation types which occur on the reserve;
- (b) a plant species (Eucalyptus decurva) which is poorly represented in the region; and
- (c) a plant (Grevillea cirsiifolia) which has been declared rare and endangered;

It should be noted that while the "year last burnt" for three of the compartments is given as 1973, all have been subject to edge burning since 1973. In some cases this burning has entered deep into the reserve.

Finally, before compartment no. 1 is burnt in 1991, fuel levels will be assessed in conjunction with an officer of the Bush Fires Board and the local Fire Control Officer and a decision made at that time as to whether or not the compartment should be burnt. This is necessary because the burn programmed for 1991 will be the beginning of a new cycle of burning.

Table 4. Prescribed Burning Programme, Mooradung Nature Reserve. Compartment numbers relate directly to those on Figure 4.

Compartment No.	Year Last Burnt	Proposed for Burning
1	part burnt 1981	1991, subject to assessment
2	1973	1985
3	1973	1988
4	1973	Control - no burn

If any fires occur within the reserve which are not prescribed, then the burning programme described here will cease and a new programme will be written.

SUPPRESSION OF WILDFIRES

Fire-fighting

Under the terms of the Bush Fires Act (1954-77) and Regulations, the area within which the reserve occurs is under the control of the local Bush Fire Control Officer during wildfires. In the event of a wildfire occurring on or adjacent to the reserve, the Department of Fisheries and Wildlife is to be notified by a member of the Boddington Bush Fire Brigades or a representative of the Local Authority. On being notified of a wildfire either

on or adjoining the reserve the PRMT will dispatch a minimum of one fire-fighting unit to the area. If no unit is available at Pingelly, a unit will be sent from Perth. Further units will be dispatched from either Perth or Pingelly depending on the severity of the fire and the availability of fire-fighting units. Units of the Department of Fisheries and Wildlife attending wildfires on or near the reserve will be under the control of the senior, local Bush Fire Brigade Officer as required by the Bush Fires Act. This officer will consult with the senior Departmental Officer present concerning fire control methods used on the reserve, particularly if it is proposed that heavy equipment be used. Where it is agreed by both officers that heavy equipment is required to control a wildfire, the costs of such equipment will initially be borne by the Department of Fisheries and Wildlife.

Notification of Wildfires

To ensure that officers from the Department of Fisheries and Wildlife can be contacted in the event of a wildfire occurring on or adjoining the reserve, the PRMT will advise the Shire Clerk of Boddington of the procedure by which Departmental Officers may be contacted. Information sheets will be sent annually to the Shire Clerk so that he can distribute copies to the necessary people.

Notifiable Authority

The Department of Fisheries and Wildlife has taken the necessary steps to become a Notifiable Authority with respect to the reserve. Responsibilities concerning Notifiable Authorities are described in the Bush Fires Regulations. By becoming a Notifiable Authority the Department of Fisheries and Wildlife must be informed prior to burns being carried out adjacent to the reserve during the prohibited and restricted burning periods.

Adequacy of Control Measures

With the acceptance of this plan by the Bush Fires Board, the powers of Bush Fire Control Officers and adjoining landholders to enter the reserve and carry out works under Section 34 of the Bush Fires Act (1954-1977) will cease. Consequently during the life of this plan reserve neighbours should draw the attention of the Director of Fisheries and Wildlife to any inadequacies they perceive in the fire protection measures for the reserve. A joint inspection of the reserve will then be organised and any necessary action will follow.

3. CONTROL OF PHYTOPHTHORA CINNAMOMI

While the destructive effects of the fungus Phytophthora cinnamomi on jarrah (Eucalyptus marginata) have been well publicised, the broader effects of the fungus have not been emphasized in the media. Not only does the fungus

destroy a great many native plants, it must also be expected that the disease will indirectly effect some animals through its impact on habitat.

Soil samples from two sites on the Mooradung Nature Reserve were tested for Phytophthora cinnamomi in 1981, and no evidence of the fungus was found. However, the fungus may well be present but as yet undetected on the reserve. Given the destructive nature of the fungus it will be necessary to take steps to prevent the transport of infected material from or onto the reserve.

The most common means by which the fungus is transported is within soil adhering to vehicles. Therefore, it will be necessary to control the movement of all vehicles on the reserve by classing the firebreaks on the reserve as management access tracks which are to be used only by vehicles undertaking management work. All other vehicles will be prohibited under the Wildlife Conservation Regulations from using these tracks unless permission has been obtained from a permanent officer of the PRMT.

Exceptions to this prohibition are described below. It should be emphasised that the exclusion of vehicles does not prevent people from walking through the area.

Farmers with properties adjoining the reserve may use the firebreaks on the reserve for access to farmland. No washdown procedures will be required if the vehicles and equipment being moved in these cases has only travelled on agricultural land or formed roads. However, vehicles and equipment which have been used in areas which may contain Phytophthora cinnamomi (i.e. all forest areas to the west) must be washed down before entering the reserve.

Only in the event of a wildfire occurring on or adjacent to the reserve will restrictions on the movement of vehicles be suspended.

Officers carrying out management or research duties on the reserve will follow the operational procedures laid down in the Departmental guidelines relating to Phytophthora cinnamomi.

4. DECLARED PLANTS AND ANIMALS

Action will be taken by the Department of Fisheries and Wildlife to control plants and animals on the reserve which are "declared" under the Agriculture and Related Resources Protection Act. The control of declared plants and animals will be undertaken in consultation with the Agriculture Protection Board officer based at Boddington. Where appropriate, the Department of Fisheries and Wildlife will contract the Agricultural Protection Board to carry out control measures.

In the case of native fauna, for example the Grey Kangaroo, primary responsibility for any control measures

which might be used on or adjoining the reserve will be held by the District Wildlife Officer based at Waroona. In the case of the Grey Kangaroo the Shire of Boddington is treated as an open season area. This means that owners or occupiers of land within the Shire may shoot Grey Kangaroos causing damage on their own properties without obtaining a permit. However if the private landholder wishes to employ a licensed shooter, or wishes to sell carcasses and skins, then a Damage Licence must be obtained. Following inspection of a property a District Wildlife Officer may, if necessary, prohibit the shooting of kangaroos on that property until the landholder has obtained a Damage Licence. These conditions for taking kangaroos may be varied from time to time by publication in the Government Gazette.

As with the provisions for fire protection, reserve neighbours are invited to comment on any inadequacies they perceive in the control of pests within the reserve. On receipt of comments the Director will take the appropriate action.

5. RESEARCH AND MANAGEMENT RECORDS

Departmental Research

Departmental research planned for the reserve in the short term will include monitoring of the responses of fuel levels, vegetation structure and floristics to prescribed burning. The vegetation map of the reserve will also be upgraded, with each compartment being mapped by the PRMT prior to prescribed burning.

Management Records

The PRMT will maintain accurate and current records of all management activities undertaken on Mooradung Nature Reserve. These records will include current inventories of the wildlife of the reserve.

6. ACCESS

Given the threat to the reserve posed by Phytophthora cinnamomi vehicular access within the reserve will be subject to authorisation by the permanent officers of the PRMT. This aspect of management is explained in Section 3 above.

7. PUBLIC USE

While members of the public may not take vehicles onto the reserve without the authorisation of a permanent officer based at Pingelly, all of the reserve will remain open to members of the public on foot. In all other respects public use of the Reserve will be guided by Regulation 46 of the Wildlife Conservation Act.

Use of Mooradung Nature Reserve for educational and research purposes, either amateur or professional, will be encouraged. The PRMT will assist as far as is practicable those wishing to undertake research or educational work on the reserve.

8. SIGNS

Signs identifying Mooradung Nature Reserve will be placed at appropriate sites on the reserve. It will also be necessary to signpost firebreaks where these open onto public roads. These signs will be labelled "No Road, Management Access Only". It is the responsibility of the PRMT to establish these signs and to ensure that they conform to the standard specifications for Department of Fisheries and Wildlife nature reserve signs.

9. GENERAL

Uncleared, Public Road

The Department of Fisheries and Wildlife will approach both the Under Secretary for Lands and the Boddington Shire Council to have the uncleared public road along the western boundary of Mooradung Nature Reserve closed and included within the nature reserve. This closure is sought to facilitate the management of the reserve, particularly with respect to access, fire protection and the control of Phytophthora cinnamomi.

Term of the Plan

Unless superseded the term of this plan will be 10 years. Its provisions will be effected as soon as possible following its approval by the Minister of Fisheries and Wildlife as a Working Plan under the provisions of the Wildlife Conservation Act.

Naming

The name "Mooradung Nature Reserve" will be submitted to the Nomenclature Advisory Committee for gazettal as the official name.

Other Provisions

During the currency of this Plan the Director of Fisheries and Wildlife may, subject to the approval of the Western Australian Wildlife Authority, undertake any other work or research or institute any other provisions for management which may become necessary to properly promote the objectives of management stated in Section 1 of this Plan. Members of the public are invited to comment upon the provisions of this plan at any time. The appropriate action will be taken where necessary.

Finally, at the time this plan was written it was proposed that a new land management department would be formed.

The operational procedures defined in this plan may be altered as a consequence. The Boddington Shire Council and reserve neighbours will be informed in writing of any changes to operational procedures.

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APPENDIX IA : STRUCTURAL VEGETATION CATEGORIES (MUIR, 1977)

LIFE FORM/HEIGHT CLASS

CANOPY COVER

	DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
Trees>30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees<5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee Tree Form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee Shrub Form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs>2m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs <0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat Plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
Bunch Grass>0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch Grass<0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges>0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges<0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, Liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

APPENDIX IB : PLANT ASSOCIATIONS

Eleven descriptions of plant associations were made in September 1980. Some of these descriptions were re-assessed in June 1983.

The classification system used for all descriptions is that devised by Muir (1977) and the species nomenclature follows that of Green (1981). Letters with each description relate directly to those used on Figure 6.

- a. Woodland of Eucalyptus marginata over Low Scrub B of Allocasuarina humilis over Dwarf Scrub D of Bossiaea ornata and Dryandra nivea over Herbs and Very Open Low Sedges.
- b. Low Woodland A of Eucalyptus wandoo over a variety of sparse shrubs including Gastrolobium calycinum, Hibbertia aff. montana, Macrozamia riedlei, and Xanthorrhoea preissii over Herbs.
- c. Woodland of Eucalyptus marginata over Open Low Woodland B of Banksia grandis over Open Dwarf Scrub C of Hakea lissocarpa over Low Heath D of Bossiaea ornata over Very Open Herbs and Very Open Low Sedges.
- d. Woodland of Eucalyptus marginata over Scrub of Dryandra sessilis over Open Dwarf Scrub C of Allocasuarina humilis and Dryandra sessilis over Very Open Herbs and Very Open Low Sedges.
- e. Woodland of Eucalyptus marginata over Low Woodland A of Allocasuarina fraseriana over Dwarf Scrub D of Hibbertia hypericoides over Very Open Herbs.
- f. Lithic Complex: Species recorded here included the following - Acacia acuminata, Borya nitida, Dryandra fraseri, Gastrolobium calycinum, Hakea lissocarpa, Hibbertia polystachya, Hypocalymma angustifolium, Neurachne alopecuroidea, Stackhousia pubescens, Stylidium sp., Stypandra imbricata and sedges.
- g. Low Heath C of Allocasuarina humilis over Dwarf Scrub D of Dryandra armata over Very Open herbs. Other species recorded included Banksia sphaerocarpa, Hakea trifurcata, H. undulata, Hibbertia sp., Lechenaultia biloba, Leptospermum erubescens, and Patersonia sp.
- h. Open Low Scrub B of Allocasuarina humilis and Hakea trifurcata over Open Dwarf Scrub D of Hibbertia sp. over Very Open Low Sedges and Open Herbs of Borya nitida. Other species present included Leptospermum erubescens and ?Gastrolobium sp.
- i. Low Heath D of Allocasuarina humilis and Dryandra armata over very Open Low Sedges and Open Herbs. This is a very floristically diverse heath, with various species being dominant in different parts of the heath. Other species

recorded included Banksia sphaerocarpa, Calothamnus sp., Calytrix sp., Conospermum sp., Dryandra bipinnatifida, Eucalyptus decurva, E. drummondii, Grevillea sp., Hakea incrassata, H. ruscifolia, Isopogon dubius, Melaleuca sp., Petrophile sp., P. serruriae, and Synaphea sp.

- j. Low Woodland A of Eucalyptus wandoo over Dwarf Scrub D of Bossiaea eriocarpa, Gastrolobium calycinum, and Hakea lissocarpa over Herbs.
- k. Open Low Woodland A of Eucalyptus wandoo over Low Heath C of Gastrolobium calycinum over Low Heath D of Hypocalymma angustifolium over Open Herbs.

APPENDIX IC : FLORA LIST FOR MOORADUNG NATURE RESERVE

All plants names used below follow those of Green (1981) except for the Casuarinaceae, which follow the revision of Johnson (1982).

As the means by which plant species are identified is useful information, the sources of each identification are listed against the relevant species. The codes used for identifying sources are explained below (Table 5).

Table 5: Sources for identification of species in flora list.

Code	Source	Further Information
1	Dr A.A. Burbidge	Field identification.
2	K.J. Wallace	Well known species, for example Jarrah (<u>Eucalyptus marginata</u>), were identified in the field. Other species were identified using the relevant published texts and journal reviews.
2 ¹	K.J. Wallace	These species were checked against voucher specimens held by Worsley Alumina Pty Ltd.
3	W.A. Herbarium	Identifications of voucher specimens sent to the Herbarium.
4	Dr S.D. Hopper	
5	K.J. Atkins	As for K.J. Wallace (2 above) with the exception of <u>Grevillea cirsiifolia</u> which was compared with specimens at the W.A. Herbarium.
6	E. Griffin	
7	M.I.H. Brooker	
8	Worsley Alumina Pty. Ltd.	Identifications by botanical consultants to Worsley Alumina Pty Ltd.

	Source	Pingelly Herbarium Number
Adiantaceae		
<i>Cheilanthes tenuifolia</i> (N.L. Burman) Swartz	1	
Zamiaceae		
<i>Macrozamia riedlei</i> (Fisch. ex Gaud.) C.A. Gardner	2	
Poaceae		
* <i>Briza maxima</i> L.	2	
<i>Neurachne alopecuroidea</i> R.Br.	2,5	495
<i>Poa drummondiana</i> Nees	5	
Cyperaceae		
<i>Lepidosperma angustatum</i> R.Br.	1,5	
<i>L. gracile</i> R.Br.	5	
<i>L. tenue</i> Benth.	5	
<i>Tetraria octandra</i> (Nees) Kuekenenthal	3	761
Restionaceae		
<i>Loxocarya fasciculata</i> (R.Br.) Benth.	5	
Liliaceae		
<i>Borya nitida</i> Labill.	1,2	
<i>Burchardia multiflora</i> Lindl.	5	486
<i>B. umbellata</i> R.Br.	5	534
<i>Dianella revoluta</i> R.Br.	5	
<i>Laxmannia ramosa</i> Lindl.	1	
<i>Lomandra hermaphrodita</i> (C. Andrews) C.A. Gardner	5	
<i>L. micrantha</i> (Endl.) Ewart	5	
<i>L. spartea</i> (Endl.) Ewart	5	
<i>Sowerbaea laxiflora</i> Lindl.	2 ¹ ,5	555
<i>Stypandra imbricata</i> R.Br.	5	
<i>Thysanotus tenellus</i> Endl.	5	535,536
<i>Tricoryne humilis</i> Endl.	5	
<i>Wurmbea dioica</i> (R.Br.) F. Muell.	5	
<i>Xanthorrhoea</i> sp.	1,2	
Haemodoraceae		
<i>Anigozanthos bicolor</i> Endl.	1,2,5	493
<i>A. manglesii</i> D. Don	2,5	488
<i>Conostylis serrulata</i> R. Br.	2,4	539
<i>C. setigera</i> R.Br.	1,2	
<i>Haemodorum laxum</i> R.Br.	1	
<i>Tribonanthes uniflora</i> Lindl.	5	
Hypoxidaceae		
<i>Hypoxis</i> sp.	1	
Iridiaceae		
<i>Orthrosanthus laxus</i> (Endl.) Benth.	5	
<i>Patersonia juncea</i> Lindl.	5	
<i>P. occidentalis</i> R.Br.	5	

<i>P. sericea</i> R.Br. ex Ker-Gawl	5	
Orchidaceae		
<i>Caladenia filamentosa</i> R.Br.	2,5	550
<i>C. flava</i> R.Br.	2	
<i>C. gemmata</i> Lindl.	2,5	1021
<i>C. patersonii</i> R.Br.	2	
<i>Diuris longifolia</i> R.Br.	5	
<i>Elythranthera emarginata</i> Lindl.	2,5	1023
<i>Eriochilus dilatatus</i> Lindl.	1	
<i>Prasophyllum macrostachyum</i> R. Br. var. <i>macrostachyum</i>	4	
<i>Pterostylis vittata</i> Lindl.	2	
<i>Thelymitra crinita</i> Lindl.	4	
<i>T. fuscolutea</i> R.Br.	4	
Casuarinaceae		
<i>Allocasuarina fraserana</i> (Miq.)		
<i>L. Johnson</i>	1,2	
<i>A. huegeliana</i> (Miq.) <i>L. Johnson</i>	5,2	
<i>A. humilis</i> (Otto & Dietr.) <i>L. Johnson</i>	1,2	
<i>A. microstachya</i> (Miq.) <i>L. Johnson</i>	5	
Proteaceae		
<i>Banksia grandis</i> Willd.	1,2	
<i>B. sphaerocarpa</i> R. Br.	1,2	
<i>Conospermum stoechadis</i> Endl.	2	
<i>Dryandra armata</i> R.Br.	2	
<i>D. bipinnatifida</i> R.Br.	2,6	1213
<i>D. carduacea</i> Lindl.	2	
<i>D. fraseri</i> R.Br.	1,2	
<i>D. nivea</i> (Labill.) R.Br.	2	
<i>D. sessilis</i> (Knight) Domin.	1,2	
<i>Grevillea cirsiifolia</i> Meisn.	5,4	1226
<i>G. monticola</i> Meisn.	5	
<i>G. pilulifera</i> (Lindl.) Druce	5	568
<i>G. pulchella</i> (R.Br.) Meisn.	1	
<i>G. tenuiflora</i> (Lindl.) Meisn.	2,5	553
<i>Hakea incrassata</i> R.Br.	2	
<i>H. lissocarpa</i> R.Br.	2,5	1227
<i>H. prostrata</i> R.Br.	1	
<i>H. ruscifolia</i> Labill.	2	
<i>H. trifurcata</i> (Sm.) R.Br.	1,2	
<i>H. undulata</i> R.Br.	2	
<i>H. varia</i> R.Br.	2,5	552
<i>Isopogon dubius</i> (R.Br.) Druce.	2	
<i>I. teretifolius</i> R.Br.	5	
<i>Persoonia trinervis</i> Meisn.	5	1200
<i>Petrophile</i> aff. <i>media</i> R.Br.	5	540,1211
<i>P. serruriae</i> R.Br.	2	
<i>P. squamata</i> R.Br.	2 ¹ ,5	547
<i>P. striata</i> R.Br.	2,5	481,418
<i>Synaphaea</i> ? <i>petiolaris</i> R.Br.	5	
Santalaceae		
<i>Leptomeria cunninghamii</i> Miq.	5	

Ranunculaceae		
<i>Clematis pubescens</i> Huegel ex Endl.	1,2 ¹ ,5	485
Droseraceae		
<i>Drosera bulbosa</i> Hooker	3	1220
<i>D. erythrorhiza</i> Lindl.	2	
<i>D. gigantea</i> Lindl.	5	
<i>D. leucoblasta</i> Benth.	5	
<i>D. menziesii</i> R.Br.	5	1054
<i>D. pallida</i> Lindl.	5	
<i>D. platystigma</i> Lehm.	5	
<i>D. stolonifera</i> Endl.	2,5	567
Pittosporaceae		
<i>Sollya heterophylla</i> Lindl.	5	
Leguminosae Subfam. Mimosoideae		
<i>Acacia alata</i> R.Br.	5	
<i>A. insolita</i> E. Pritzell	6	
<i>A. nervosa</i> D.C.	2 ¹	
<i>A. pulchella</i> R.Br.	2,5	484
<i>A. willdenowiana</i> H.L. Wendl.	5	489
Leguminosae Subfam. Caesalpinioideae		
<i>Labichea punctata</i> Benth.	8,5	546
Leguminosae Subfam. Papilionoideae		
<i>Bossiaea eriocarpa</i> Benth.	1,2	
<i>B. ornata</i> (Lindl.) Benth.	2 ¹ ,5	549
<i>Daviesia costata</i> Cheel	2,5	541
<i>D. decurrens</i> Meisn.	5	548,467
<i>D. preissii</i> Meisn.	5 ¹	
<i>Dillwynia cinerascens</i> R.Br. ex Sims	2 ¹ ,5	494
<i>Gastrolobium calycinum</i> Benth.	1,2	
<i>G. hookeri</i> Meisn.	2,5	533,557
<i>G. knightianum</i> Lindl.	3 ¹ ,5	490,762
<i>G. marginatum</i> R.Br.	2 ¹ ,5	565
<i>G. microcarpum</i> Meisn.	1	
<i>Hovea chorizemifolia</i> (Sweet) DC.	1,2,5	473
<i>Jacksonia sternbergiana</i> Huegel	2,5	542
<i>Kennedia coccinea</i> Vent.	5	
<i>K. prostrata</i> R.Br.	1	
<i>Oxylobium drummondii</i> Meisn.	5	543
<i>Sphaerolobium medium</i> R.Br.	5	482,483
<i>Templetonia drummondii</i> Benth.	5	
Rutaceae		
<i>Boronia crenulata</i> Sm.	2 ¹ ,5	538
<i>B. ramosa</i> (Lindl.) Benth.	5	
<i>Eriostemon nodiflorus</i> Lindl.	5	
Tremandraceae		
<i>Tetratheca hirsuta</i> Lindl.	5	1024
Polygalaceae		
<i>Comesperma calymega</i> Labill.	5	

Euphorbiaceae		
Monotaxis grandiflora Endl.	5	
Phyllanthus calycinus Labill.	5	
Stackhousiaceae		
Stackhousia pubescens A. Rich	2,5	559
Rhamnaceae		
Cryptandra arbutiflora Fenzl	8,5	571
Spyridium complicatum F. Muelll.	5	
Trymalium ledifolium Fenzl	2,5	470
Sterculiaceae		
Thomasia sp.	5	
Dilleniaceae		
Hibbertia hypericoides (DC.) Benth.	2 ¹ ,5	472,551
H. microphylla Steud.	5	
H. aff. montana Steud.	2 ¹ ,5	561
H. polystachya Benth.	2 ¹ ,5	560,570
Thymelaeaceae		
Pimelia angustifolia R.Br.	5	767
P. aff. angustifolia R.Br.	5	1075
P. rosea R.Br.	2,5	491
P. suaveolens (Endl.) Meisn.	2,5	416,492
Myrtaceae		
Baeckea camphorosmae Endl.	1,2 ¹ ,5	1161
Calothamnus preissii Schauer	5	
C. sanguineus Labill.	2,5	468
Eucalyptus calophylla Lindl.	1,2	
E. decurva F. Muell.	7	1210
E. drummondii Benth.	2,5	1209
E. marginata Donn ex sm.	1,2	
E. wandoo Blakely	1,2	
Hypocalymma angustifolium Endl	1,2,5	1055
Kunzea preissiana schauer	5	544
Leptospermum erubescens Schauer	2	
Melaleuca scabra R.Br.	2,5	
Haloragaceae		
Glischrocaryon aureum (Lindl.) Orchard	2,5	420
Gonocarpus cordiger (Fenzl) Endl. Ex Nees	5	
Apiaceae		
Pentapeltis peltigera (Hooker) Bunge	5	
Trachymene pilosa Sm.	2	
Xanthosia candida Benth.	5	
Epacridaceae		
Astroloma ciliatum (Lindl.) Druce	1	
A. pallidum R.Br.	5	564
Leucopogon capitellatus DC.	5	562
L. propinquus R.Br.	1,2,5	674
Leucopogon sp.	2,5	569
Leucopogon sp.	2,5	572
Styphelia tenuiflora Lindl.	1,2,5	562

Lamiaceae		
Hemiandra linearis Benth.	5	417
Hemigenia aff. dielsii (Hemsley)		
C.A. Gardner	5	
Scrophulariaceae		
*Parentucellia latifolia (L.) Caruel	5	556
Rubiaceae		
Opercularia vaginata Labill.	5	
Lobeliaceae		
Isotoma hypocrateriformis (R.Br.) Druce.	2,5	421
Lobelia rhombifolia De Vriese	5	
Goodeniaceae		
Dampiera ?cauloptera DC.	5	
D. linearis R.Br.	5	554
Lechenaultia biloba Lindl.	1,2,5	487
Scaevola striata R.Br.	5	766,1052
Velleia trinervis Labill.	5	
Stylidiaceae		
Stylidium amoenum R.Br.	5	
S. brunonianum Benth.	2,5	765
S. calcaratum R.Br.	5	
S. ciliatum Lindl.	2,5	558,769
S. crassifolium R.Br.	5	
S. schoenoides DC.	2,5	545
S. uniflorum Sonder	1	
Asteraceae		
Craspedia uniflora G. Forster	5	
Helipterum manglesii (Lindl.) Benth.	5	
Lagenifera huegelii Benth.	5	
Olearia paucidentata (Steetz) Benth.	1,2,5	469,1224

*Introduced species

APPENDIX II : BIRD LIST FOR MOORADUNG NATURE RESERVE

Species nomenclature follows the list of recommended names by Anon. (1978).

Common Name	Scientific Name	Source/Breeding Information
DUCKS (ANATIDAE)		
Maned Duck	<i>Chenonetta jubata</i>	D*
LARGE RAPTORS (ACCIPITRIDAE)		
Wedge-tailed Eagle	<i>Aquila audax</i>	C
BUTTON-QUAILS (TURNICIDAE)		
Painted Button-quail	<i>Turnix varia</i>	D
PIGEONS (COLUMBIDAE)		
Common Bronzewing	<i>Phaps chalcoptera</i>	C,D
COCKATOOS (CACATUIDAE)		
White-tailed Black-Cockatoo	<i>Calyptorhynchus baudinii</i>	C,D
PARROTS (PLATYCERCIDAE)		
Red-capped Parrot	<i>Purpureicephalus spurius</i>	C,D
Western Rosella	<i>Platycercus icterotis</i>	C
Port Lincoln Ringneck	<i>Barnardius zonarius</i>	C,D
CUCKOOS (CULCULIDAE)		
Pallid Cuckoo	<i>Cuculus pallidus</i>	B,C
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	D*
OWLS (STRIGIDAE)		
Southern Boobook	<i>Ninox novaeseelandiae</i>	B,D
FROGMOUTH (PODARGIDAE)		
Tawny Frogmouth	<i>Podargus strigoides</i>	B

KINGFISHERS (ALCEDINIDAE)

Laughing Kookaburra	<i>Dacelo novaeguineae</i>	A,B,C
Sacred Kingfisher	<i>Halcyon sancta</i>	C,D

BEE-EATERS (MEROPIIDAE)

Rainbow Bee-eater	<i>Merops ornatus</i>	C,D
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SWALLOWS (HIRUNDINIDAE)

Tree Martin	<i>Cecropis nigricans</i>	C,D*
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PIPITS (MOTACILLIDAE)

Richard's Pipit	<i>Anthus novaeseelandiae</i>	C
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CUCKOO-SHRIKES (CAMPEPHAGIDAE)

Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	C,D
White-winged Triller	<i>Lalage sueurii</i>	C,D

ROBINS, WHISTLERS, MONARCHS, FANTAILS (MUSCICAPIDAE)

Scarlet Robin	<i>Petroica multicolor</i>	C,D*
Western Yellow Robin	<i>Eopsaltria griseogularis</i>	A,B,C,D*
Jacky Winter	<i>Microeca leucophaea</i>	D
Crested Shrike-tit	<i>Falcunculus frontatus</i>	D
Golden Whistler	<i>Pachycephala pectoralis</i>	A,B,C,D
Rufous Whistler	<i>P. rufiventris</i>	C,D
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	C,D
Restless Flycatcher	<i>Myiagra inquieta</i>	A
Grey Fantail	<i>Rhipidura fuliginosa</i>	A,B,C,D*
Willie Wagtail	<i>R. leucophrys</i>	B

WRENS (MALURIDAE)

Splendid Fairy-wren	<i>Malurus splendens</i>	C,D
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THORNBILLS (ACANTHIZIDAE)

Weebill	<i>Smicrornis brevirostris</i>	C,D
Western Gerygone	<i>Gerygone fusca</i>	B,C,D*
Inland Thornbill	<i>Acanthiza apicalis</i>	A,D
Western Thornbill	<i>A. inornata</i>	D*
Yellow-rumped Thornbill	<i>A. chrysorrhoa</i>	C,D*

SITTELLA (NEOSITTIDAE)

Varied sittella	Daphoenositta chrysoptera	C
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TREECREEPER (CLIMACTERIDAE)

Rufous Treecreeper	Climacteris rufa	A
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HONEYEATERS (MELIPHAGIDAE)

Red Wattlebird	Anthochaera carunculata	D
Singing Honeyeater	Lichenostomus virescens	D
White-naped Honeyeater	Melithreptus lunatus	C,D
Brown Honeyeater	Lichmera indistincta	C,D
New Holland Honeyeater	Phylidonyris novaehollandiae	C
White-cheeked Honeyeater	P. nigra	C
Tawny-crowned Honeyeater	P. melanops	D*
Western Spinebill	Acanthorhynchus superciliosus	B,D

CHATS (EPHTHIANURIDAE)

White-fronted Chat	Epthianura albifrons	C
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MISTLETOEBIRD (DICAETIDAE)

Mistletoebird	Dicaeum hirundinaceum	D
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PARDALOTES (PARDALOTIDAE)

Striated Pardolote	Pardalotus striatus	C,D
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WHITE-EYES (ZOSTEROPIDAE)

Silvereye	Zosterops lateralis	B
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MAGPIE-LARKS (GRALLINIDAE)

Australian Magpie-lark	Grallina cyanoleuca	B
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WOODSWALLOWS (ARTAMIDAE)

Dusky Woodswallow	Artamus cyanopterus	C,D*
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MAGPIES, CURRAWONGS (CRACTICIDAE)

Australian Magpie	Gymnorhina tibicen	A,B,C,D
Grey Currawong	Strepera versicolor	C

CROWS, RAVENS (CORVIDAE)

Australian Raven

Corvus coronoides

A,B,C,D

- A = D. Mell
- B = A.A. Burbidge and T. Evans
- C = K.J. Wallace
- D = Worsley Alumina Pty ltd
- * = breeding activity

