FLORISTIC AND VEGETATION SURVEY OF BIRDWHISTLE NATURE RESERVE

Prepared for :

Executive Director
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and Land Management

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By :

Anne Coates
Consultant Botanist
P.O. Box 36
NEWDEGATE WA 6355

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1.0 INTRODUCTION

1.1 Project Description

The following project description is largely taken from the Consultancy Offer and Agreement and provides background information with regard to the purpose of the current survey.

Birdwhistle Nature Reserve (No. 19120) lies across the boundary between the Wheatbelt Shires of Wickepin and Narrogin and contains 396 ha of undisturbed upland vegetation. The reserve has significant nature conservation value, being more than four times the median size of the nature reserves of the Narrogin District of the Department of Conservation and Land Management.

The reserve contains a great range of soil and vegetation types, including areas of morrel, wandoo, blue, brown and silver mallet, various mallees, plus yellow sand grey sand and lateritic kwongan. Several specific plant species of interest are also known to occur, namely *Banksia grandis* (Bull Banksia), *Nuytsia floribunda* (Christmas Tree), *Hakea baxteri*, *Dryandra cynaroides*, *Dryandra subpinnatifida* and *Calothamnus planifolius*.

Given this vegetation diversity and the value of individual species there is a need to describe in detail the vegetation and flora of this reserve and adjoining areas of uncleared bushland.

The present survey will provide information that can be used -

(a) as a basis for prescribing current and future operations work;
(b) to identify sample sites for faunal survey; and
(c) to identify any adjoining areas which should be incorporated into the District's land acquisition programme.

1.2 Project Requirements

The vegetation and floristic survey of Birdwhistle Nature Reserve (19120), Gravel Reserve 5318 (vested in the Shire of Narrogin), and areas of uncleared bushland on privately owned Locations (Nos 12795, 9323, 10711, 9813, 5206, 8039 and 9361) is to address the following specific objectives :

1. Approval will be sought from the relevant private landholders before undertaking work on private property.

2. A vegetation map will be produced showing the major vegetation types.

3. Vegetation types will be described using the system of Mr B. Muir, with floristic classification. Specific sites on which descriptions are based will be accurately recorded on a map.

4. Photographs of each vegetation type will be provided in the final report.

5. Vegetation types, or specific sites which require special management consideration, will be identified and their significance described.

6. Specimens of new species recorded and any species of scientific interest will be collected and lodged at the Narrogin District Office of the Department of Conservation and Land Management. Samples of flowering specimens will also be lodged at the Western Australian Herbarium.

7. Areas of adjoining bushland will be evaluated for their nature conservation value. On the basis of survey work, the consultant will recommend whether of not specific areas should be included into the nature reserve.

8. Separate flora lists for the nature reserve, gravel reserve and each area of adjoining bushland will be submitted with the final report.

1.3 Physical Environment

a) Climate

The area has a typical wheatbelt climate with hot dry summers and mild wet winters. Rainfall recorded at the Wickepin Post Office between 1911 and 1984 gives a mean annual rainfall of 421mm. Wickepin is situated approximately 8kms north of Birdwhistle Nature Reserve. The mean annual rainfall for Wickepin is 84mm less that that recorded for Narrogin township approximately 29kms to the west south west of the reserve. Most of the rain falls in winter from May to August with occasional thunderstorms in summer. Areas in the region receiving over 400 mm in annual average rainfall are referred to as the Inner Wheatbelt by Beard (1980) and differ in character from the drier eastern areas of the Outer wheatbelt.

The closest meteorological recording station for data on temperatures and relative humidity in the region is the Narrogin Post Office. Winters are mild with the mean temperature of the coldest month above 10°C. The mean temperature of the hottest month exceeds 25°C with mean maximum temperatures for the hottest month reaching 31°C. Beard (1980) classes the regime with its 7 dry months as Dry Warm Mediterranean.

b) Geology and Soils

The region is underlain by the Yilgarn Block, a very ancient ri gid "shield" area composed mainly of Archaean granite and gneiss with some altered volcanics and sediments. The granitic rocks have been given ages varying from 2200 to 3100 million years (Beard 1980). The region is bounded by the Darling Fault in the west and by the greenstone belts of the southern areas and murchison provinces in the east.

The Yilgarn Block was subject to erosion in Palaeozoic and Mesozoic times contributing sediments to adjacent sedimentary basements and by the end of the Cretaceous a continuous gently undulating plain was formed (Beard 1980). An extensive cover of lateritic soil developed on the plateau probably during the late Cretateous and Tertiary. This Tertiary duricrust is now largely eroded but is still preserved along drainage divides (Chin 1986).

The deep weathering of basement rock which occurred at the time of laterite formation has resulted in the development of today's soil profile. This profile is characterised by a laterite or ironstone crust which grades downwards into a leached kaolinised (clay) zone of deeply weathered bedrock. The soft kaolinised zone is susceptible to erosion, so that distinctive low breakaways and benched slopes occur (Chin 1986).

Colluvium and alluvium is a mixture of silt, sand and gravel derived from both Tertiary deposits and Precambrian basement (granitic rocks). Most colluvium was formed on slopes where mechanical breakdown of bedrock provided detritus which was then transported downslope by water or soil creep (Chin 1986).

Today's landscape is undulating with substantial remnants of laterite crusted plateau in the form of ridges, spurs, mesas and buttes. Hills are bounded by deeper, colluvium-covered slopes with occasional granite outcrops, more resistant to erosion, protruding as rock domes or tors. The geology of the region has been mapped at a scale of 1:250,000. The information in Figure 1 has been taken from the Corrigin grid square of the 1:250,000 Geological Survey series. From this figure it can be seen that most of the Birdwhistle Nature Reserve and adjoining bushland occurs on map unit $C_{lr}1$ (laterite over deeply weathered bedrock). Small areas of granitised rock and colluvium are also present. Alluvium is mapped on the extreme southern section of the area surveyed on private land.

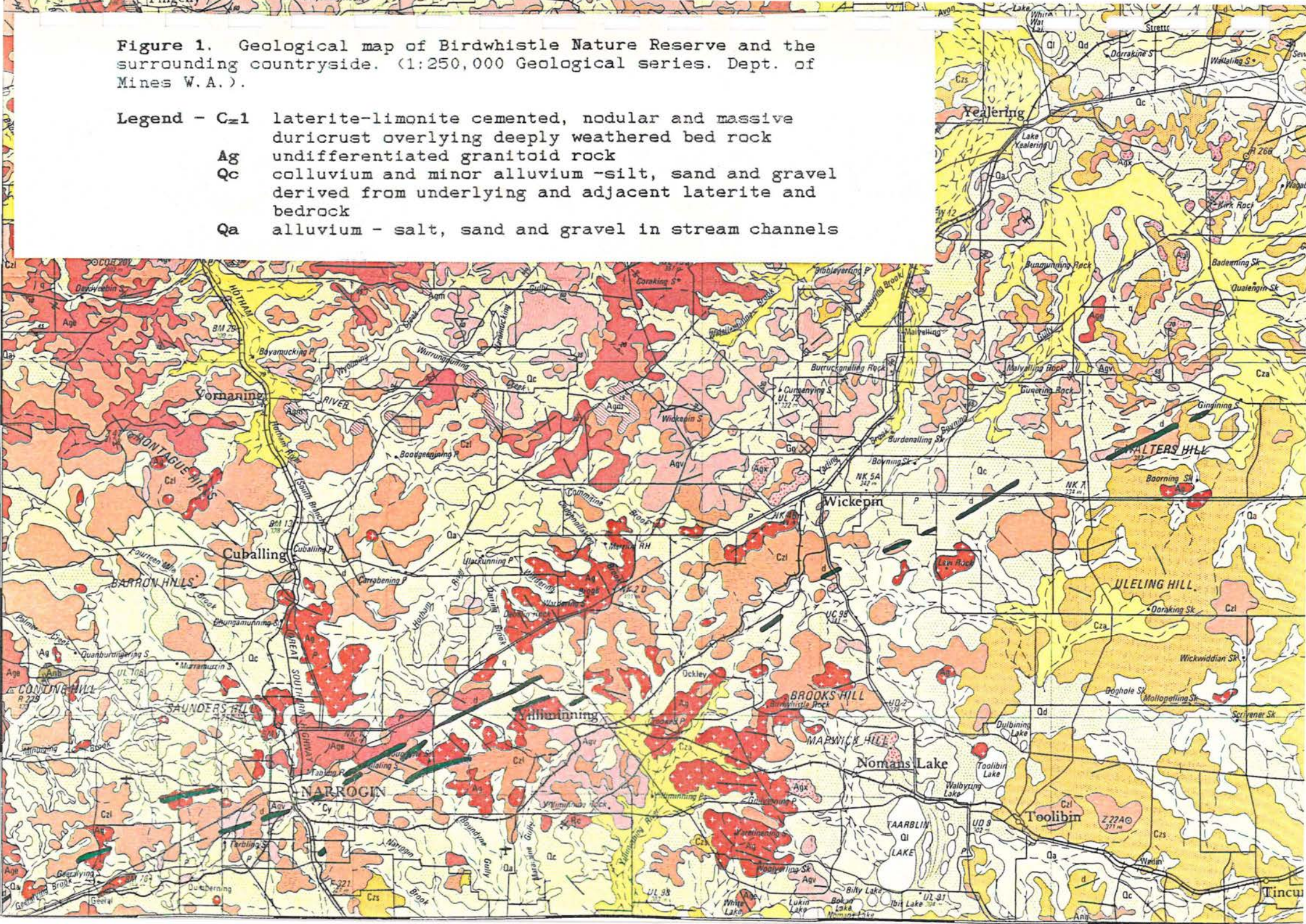


Figure 1. Geological map of Birdwhistle Nature Reserve and the surrounding countryside. (1:250,000 Geological series. Dept. of Mines W.A.).

Legend – **C$_z$1** laterite-limonite cemented, nodular and massive duricrust overlying deeply weathered bed rock

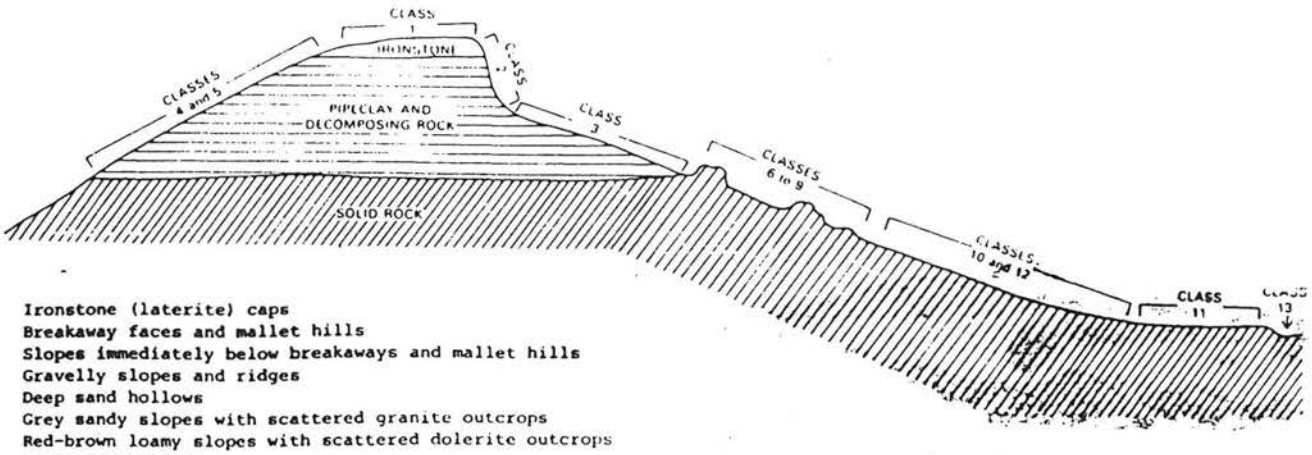
Ag undifferentiated granitoid rock

Qc colluvium and minor alluvium -silt, sand and gravel derived from underlying and adjacent laterite and bedrock

Qa alluvium - salt, sand and gravel in stream channels

The soils of the areas have been mapped in Sheet 5 of the Atlas of Australian Soils (Northcote *et al.* 1967). The landscape/Map unit covering the survey area is Ms7 defined as gently sloping to gently undulating plateau areas with long and very gentle slopes and, in places abrupt erosional scarps. Chief soils are sandy yellow earths (Gn 2.21) containing ironstone gravels and yellow earthy sands (Vc 5.22) on upper slopes and on erosional surfaces leached sands (Vc 2.12) containing ironstone gravels. Sandy depressions of leached sands (Vc 2.22) also occur. As mapped landscape/Map unit Ms7 also includes areas of Unit Uf1. The terrain of this landscape unit is undulating with ridges, spurs and lateritic mesas and buttes. Main soils on ridge tops are gravelly yellow duplex soils (Dy 3.82, 5.82, 5.81) and on lower slopes a variety of duplex soils and ironstone boulders from upslope.

Figure 2 provides a diagram of a typical landscape profile for the Upper Great Southern region (375-500mm annual rainfall zone). Birdwhistle Nature Reserve is situated on the eastern edge of the region.



Class 1	Ironstone (laterite) caps
Class 2	Breakaway faces and mallet hills
Class 3	Slopes immediately below breakaways and mallet hills
Class 4	Gravelly slopes and ridges
Class 5	Deep sand hollows
Class 6	Grey sandy slopes with scattered granite outcrops
Class 7	Red-brown loamy slopes with scattered dolerite outcrops
Class 8	Steep rocky hills
Class 9	Granite bosses
Class 10	Lower slopes (wandoo flats)
Class 11	Valley flats (salmon gum/yorkgum flats)
Class 12	Natural drainage depressions
Class 13	Main creek channels and banks

Figure 2. Cross-section of the 13 land classes in a typical landscape of the Upper Great Southern region. (Taken from Bulletin 4016, W.A. Department of Agriculture.)

1.4 Physical Features of the Reserve and Adjoining Uncleared Bushland

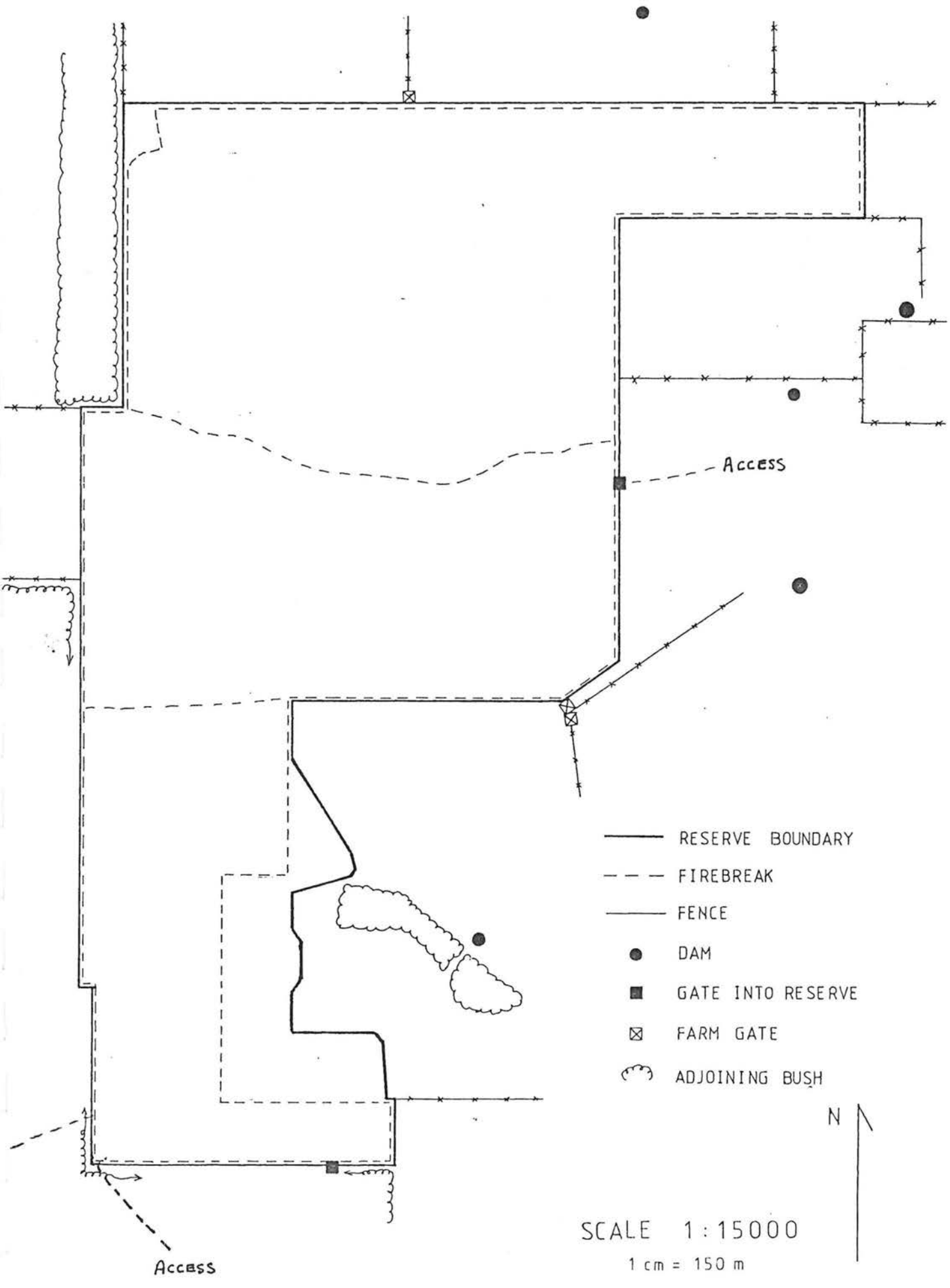
Birdwhistle Nature Reserve (19120) is situated 8 kms south of Wickepin township and 29 kms north north east of the Narrogin townsite. The southern sections of the reserve and adjoining bushland lie within the boundaries of the Narrogin Shire with the northern section situated in the Shire of Wickepin.

The reserve is irregular in shape (Figure 3) and covers an area of 396 ha. It is completely surrounded by farmland including adjoining areas of uncleared bushland to the south and west. These areas of bushland total 208 ha and were included in the present survey. Approximate areas of uncleared bushland on each location are as follows : location 12795, 21 ha + 7 ha; loc. 9323, 50 ha; loc. 10711, 5 ha; loc. 9813, 39 ha; loc. 5206, 15 ha; loc. 8093, 26 ha; loc. 9316, 45 ha. The present survey also included gravel reserve No. 5318 (11ha) which is vested in the Shire of Narrogin. The southern boundary of the gravel reserve lies along Birdwhistle Road (gravel).

Most areas of privately owned bushland adjoining the reserve are fenced off from stock except for the 5 ha on loc. 10711 and the eastern section of loc. 9361. Access to the reserve is through the farm on the eastern boundary or through the gravel reserve and loc. 9361 on the southern boundary.

The terrain of the Birdwhistle Nature Reserve and adjoining bushland is undulating with ridges and lateritic mesas and buttes to 400m (Figure 4). The area mainly covers the upper portion of the landscape including substantial areas of laterite crusted plateau. Breakaways are common throughout the area. Streamlines can be seen in the low lying areas in the south and south-east sections of the areas surveyed.

Figure 3 BIRDWHISTLE NATURE RESERVE 19120



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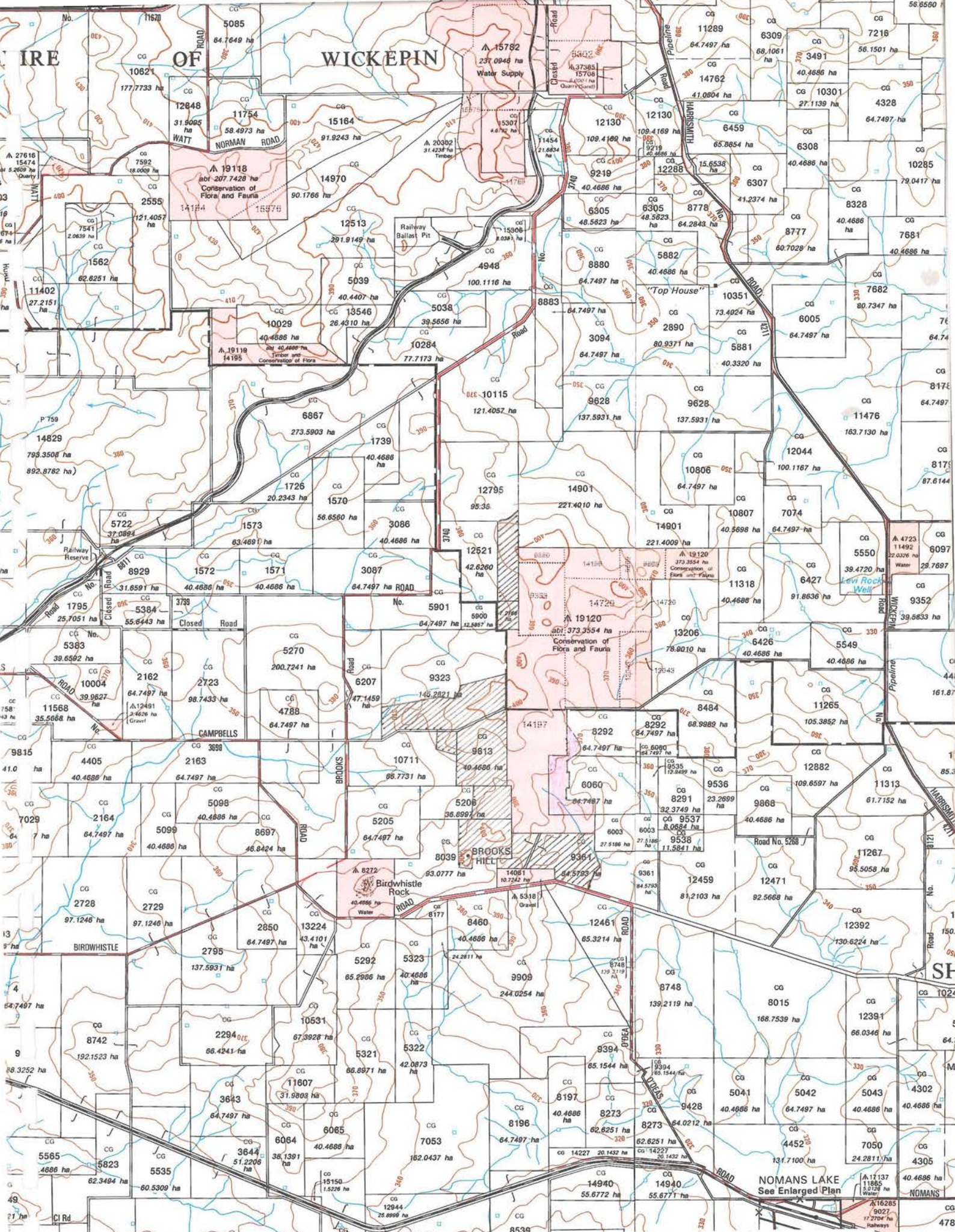


Figure 4. Topographical and Cadastral map of Birdwhistle Nature Reserve and adjacent land. (1:50,000 map series. Dept. of Land Administration.

1.5 History of the Reserve

Birdwhistle Nature Reserve was originally set aside for the purpose of "Timber Mallet". On June 4th, 1965 the purpose was changed to the Conservation of Flora and Fauna and the reserve was vested in the W.A. Wildlife Authority, now the National Parks and Nature Conservation Authority. On January 30th, 1987 adjoining bushland on locaions 8292 (~3 ha) and 6060 (19 ha) were purchased by the Department of Conservation and Land Management and added to the reserve giving a total of 396 ha.

2.0 METHODS

The ground survey of the vegetation and flora of the Reserve and adjoining uncleared bushland was carried out in May 1987.

General vegetation divisions were noted using black and white aerial photography at a scale of 1:10,000 and 1:40,000. Areas of interest thus delineated were examined in the field and the vegetation and soils at selected sites described. Because of time limitations some areas were not covered in detail in the ground survey and mapping was carried out by extrapolation of known vegetation associations using the aerial photographs.

Vegetation association descriptions were based on the classification system devised by Muir (1977) which was specifically designed for describing wheatbelt vegetation (Table 1).

Voucher specimens of most plant species encountered were collected and identified using keys and by comparison with specimens at the Western Australian Herbarium. Experts involved in revising particular genera were consulted wherever possible to ensure accuracy with identification.

TABLE 1 MUIR SYSTEM OF VEGETATION CLASSIFICATION

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70 - 100% [d]	MID DENSE 30 - 70% [c]	SPARSE 10 - 30% [i]	VERY SPARSE 2 - 10% [r]
T Trees > 30 m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15 - 30 m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5 - 15 m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees< 5 m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs> 2 m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5 - 2.0 m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1 0-1.5 m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5 - 1.0 m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0 - 0.5 m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch grass> 0.5 m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass< 0.5 m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges > 0.5 m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges < 0.5 m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns, Mosses, Liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

3.0 VEGETATION

Previous Surveys

Birdwhistle Nature Reserve and the adjoining areas of uncleared bushland are situated in the Avon Botanical District. This District includes much of the Wheatbelt Region west of the extensive mallee areas of the Roe Botanical District. Beard (1980) mapped the vegetation of the Corrigin grid square at a scale of 1:250,000. From this work it can be noted that two map units cover the area of the nature Reserve and adjacent land. These are as follows :

1. Woodlands of *Eucalyptus astringens* (brown mallet) and *E. accedens* (powderbark wandoo).

2. Woodlands of *Eucalyptus wandoo* (wandoo, whitegum) and *E. loxophleba* (york gum).

The above vegetation associations are typical of the Narrogin Vegetation System which belongs to the Inner Wheatbelt. In this system remnants of laterite-crusted plateau are covered by woodlands of *Eucalyptus astringens* and *E. accedens* with only local patches of heath. Woodlands of *E. loxophleba* and *E. wandoo* on the upper and *E. loxophleba* on the lower slopes. A few prominent granite outcrops are also found.

Birdwhistle Nature Reserve is situated within the Narrogin Vegetation System but close to the north eastern boundary. In the present survey *E. accedens* was not found and the vegetation of the reserve had many characteristics in common with Systems to the north and east including the Pingelly, Corrigin and Dumbleyung Systems.

The Nature Reserve has been mapped for mallet classificaion by the previous Forestry Department at a scale of 10 chains to 1 inch (Figure 5). Areas delineated include;

1. Areas carrying mallet
2. Densely stocked mallet
3. Wandoo-*Dryandra* sometimes with *Allocasuarina* ridges
4. *Allocasuarina*-Wandoo (*Allocasuarina* sometimes pure with granite outcrops)
5. Wandoo-slope (poor gravel where wandoo is stunted.
6. Morrell-Salmon gum. Jam and *Allocasuarina* (good loam)
7. Barren patches devoid of trees usually mallee and blackboy.

Current Survey

In the present survey the vegetation of Birdwhistle Nature Reserve and the adjoining bushland is analysed in more detail (Figure 6). The area is covered by an intricate mosaic of plant communities. This mosaic pattern is a marked feature of wheatbelt vegetation and is linked to topography, pedological and/or geological features (Beard 1980).

The vegetation was primarily divided into Tree communities (Low Forest, Woodland, Low Woodland), Kwongan communities (heathland, shrublands) and Mallee communities (Tree mallee, shrub mallee, Open Shrub Mallee) and further into species associations within these groupings. Table 2 lists the 14 vegetation associations described and mapped in this study. A list of species recorded at each site is listed in Appendix 2 along with site data on vegetation structure, topography and soils.

On the reserve and adjacent uncleared bushland *Eucalyptus astringens* (brown mallet)/*E. gardneri* (blue mallet) Forest covers many of the lateritic summits and slopes including rounded and flat topped hills and also the slopes below the breakaways. *E. gardneri* replaces *E. accedens* (powderbark) in the *E. astringens-E. accedens* association mapped by Beard (1980) and typical of the Narrogin Vegetation System. Small areas of *E. falcata* (silver mallet) woodland also occur on the lateritic plateau and this species is sometimes found in association with *E. astringens* and *E. gardneri*. The Birdwhistle

Nature Reserve is part of the intermediate zone where these three species of mallet intermingle. Major areas of *E. astringens* are found mainly to the west of the reserve while *E. gardneri* and *E. falcata* occur mainly further east.

Substantial areas of *Dryandra* Heath are also found on the lateritic uplands of the reserve and adjacent bushland. This reflects the lower rainfall in the eastern extremes of the Narrogin Vegetation System. In the higher rainfall areas of the system to the west only small areas of heath occur on similar positions in the landscape. The *Dryandra* heath occurs on flat and sloping terrain and, in places, on the "backslope" of breakaways. Patches of *Beaufortia incana* Heath also occur on the lateritic duricrust.

Eucalyptus wandoo (wandoo, whitegum) woodlands cover most of the low lying areas below the lateritic uplands with *E. wandoo* over *Dryandra* Heath (Woodland - Type 2) on gravelly sands on the lower slopes. *E. wandoo* woodlands - Type 1 have a variable understorey ranging from scattered shrubs to a very open shrub stratum with patches of *Hypocalymma angustifolium* or *Melaleuca uncinata* scrub. These woodlands occur on sandy loams on lower slopes and drainage floors.

The complexity of the mosaic pattern is increased with small areas of *E. salmonophloia* (salmon gum) woodland, *E. longicornis* (morrel) woodland and Mallee on clay loams. *E. salmonophloia* and *E. longicornis* occur on flat, low lying areas with mallee on the sloping terrain above. Granitic soils and low lying country with loamy sands support woodlands of *Allocasuarina huegeliana* (Sheoak) with areas of *Eremaea pauciflora* Heath on pockets of poorly drained grey and yelow sand and low mixed heath on sand over laterite. Photograph 1 shows *Dryandra* heath covering the slopes of the lateritic uplands with *Eucalyptus wandoo* woodlands on lower slopes and drainage lines. *E. astringens* and *E. gardneri* can be seen in the distance on the summit of the lateritic hill on the left hand side of the photograph.

Table 2 - Vegetation Associations of Birdwhistle Nature Reserve and adjacent uncleared bushland

Woodlands, Low Woodlands, Low Forests

	Map Unit
1. *Eucalyptus wandoo* (wandoo, whitegum) Woodland - Type 1	Ew1
2. *Eucalyptus wandoo* (wandoo, whitegum) Woodland - Type 2	Ew2
3. *Eucalyptus astringens* (brown mallet)/*E. gardneri* (blue mallet) Forest	Ea
4. *Eucalyptus falcata* (silver mallet) Woodland	Ef
5. *Allocasuarina huegeliana* (sheoak) Woodland	Ah
6. *Eucalyptus longicornis* (morrel) Woodland	El
7. **Eucalyptus salmonophloia* (salmongum) Woodland	Es

Mallee

8. Mallee	Mc
9. Mallee over *Melaleuca* Heath	Mm
10. Open Mallee over *Dryandra* Heath	Md

Kwongan (shrub/heath communities)

11. *Dryandra* Heath	Kd
12. *Eremaea pauciflora* Heath	Ke
13. *Beaufortia incana* Heath	Kb
14. Low Mixed Heath	Km

* Not found on Birdwhistle Nature Reserve

Photograph 1 View across Birdwhistle Nature Reserve facing north and showing *Dryandra* Heath, *Eucalyptus wandoo* woodlands and brown mallet/blue mallet in the distance.

FOREST, WOODLAND ASSOCIATIONS

Ew1 *Eucalyptus wandoo* (wandoo, whitegum) woodland - Type 1

Diagnosis Low Woodland A over variable understorey

Description

Stratum 1 *Eucalyptus wandoo* trees, stratum 8-15m. Canopy cover generally 10-30% but patchy in places. Scattered trees of *Allocasuarina huegeliana* are often present.

Stratum 2 Variable in density but often with an open shrub stratum or none. Patches of *Hypocalymma angustifolium* shrubs 1-1.5m, 10-30% canopy cover or *Melaleuca uncinata* shrubs varying from 1-2m, 10-30% canopy cover often occur. Other common Stratum 2 species include *Oxylobium parviflorum, Leptospermum erubescens, Hakea lissocarpha* and *Hakea incrassata*.

Stratum 3 In some areas *Mesomelaena preissii* sedges form an open stratum, canopy cover 2-30% and small areas of *Borya sphaerocephala* Herbs, 30-70% canopy cover, occur in patches.

Comments *Eucalyptus wandoo* woodland - Type 1 most commonly occurs on the sandy loams of gentle lower slopes and drainage floors. The understorey is very variable and changes in density over short distances. Scattered trees of *Allocasuarina huegeliana* are usually present and may become more dense in some areas merging into *A. huegeliana* woodlands. Some weed invasion was recorded in both these vegetation associations.

Mir Descriptions

Site 4 Low Woodland A over *Hypocalymma angustifolium* Dwarf

Scrub C/scattered shrubs.

Site 6 Low Woodland A over Open Low Scrub B over Dwarf Scrub D (patches of *Hypocalymma angustifolium* Low Scrub B.

Site 12 Low Woodland A

Site 16a Low Woodland A over *Hypocalymma angustifolium* Low Scrub B/Low Heath D/scattered shrubs.

Site 21c *Eucalyptus wandoo/Allocasuarina huegeliana* Low Woodland A

Site 23 Low Woodland A over *Hypocalymma angustifolium* Low Scrub B/ *Melaleuca uncinata* Thicket/*Leptospermum erubescens* Low Scrub B/scattered shrubs.

Site 30 Low Woodland A over Very Open Sedges/scattered shrubs.

Site 43 Low Woodland A over Open Dwarf Scrub C/scattered shrubs/*Mesomelaena preissii* Open Low Sedges.

Site 50 *Eucalyptus wandoo/Allocasuarina huegeliana* Low Woodland A

Site 53 Low Woodland A over *Allocasuarina campestris* Thicket/Scattered shrubs/*Melaleuca uncinata* Low Scrub A.

Site 56 Low Woodland A (*Eucalyptus longicornis* emergent).

Site 58 Low Woodland A over scattered shrubs/*Melaleuca uncinata* Low Scrub B.

Photograph 2 *Eucalyptus wandoo* Woodland with scattered shrubs at site 4.

Ew2 *Eucalyptus wandoo* (wandoo, whitegum) Woodland - Type 2

Diagnosis Low Woodland A over scrub (ranging through Low Scrub A/Heath B/Low Scrub B)

Description

Stratum 1 *Eucalyptus wandoo* trees, stratum 8-15m, 10-30% canopy cover in general, but density varies.

Stratum 2 *Dryandra sp. nov.* shrubs 1-2m, canopy cover 30-70%.

Comments *Eucalyptus wandoo* woodland - Type 2 is found on the lower slopes on sand with gravel. This vegetation association forms an intermediate zone between the *Dryandra* Heath on the laterite uplands and the *Eucalyptus wandoo* woodland - Type 1 on the low lying drainage lines.

Muir Descriptions

Site 8 Low Woodland A over *Dryandra sp. nov.* Low Scrub B/Heath B
Site 22a Low Woodland A over Heath B (scattered *E. astringens*)
Site 46 Low Woodland A over *Dryandra sp. nov.* Low Scrub A

Photograph 3 *Eucalyptus wandoo* Woodland with an understorey of predominantly *Dryandra* sp. nov. shrubs. (*E. wandoo* Woodland -Type 2)

Ea *Eucalyptus astringens* (brown mallet)/*E. gardneri* (blue mallet) Forest

Diagnosis Low Forest A/Dense Low Forest A

Description

Stratum 1 *Eucalyptus astringens* and *E. gardneri* trees with some *E. falcata*, stratum 8-12m, 50-100% canopy cover.

Lower Stratum

No distinct understorey is present. Scattered shrubs of *Melaleuca uncinata*, *Dodonaea bursariifolia* and *Callitris roei* are commonly present.

Comments Mallet forests occur on the lateritic uplands on flat and rounded hills and ridges and also on the slopes below the breakaways. *E. astringens* and *E. gardneri* commonly occur in separate adjacent areas with *E. falcata* sometimes present. It was not possible to map areas of blue and brown mallet separately with the available aerial photography.

Muir Descriptions

Site 2 Low Forest A
Site 32 Low Forest A/Dense Low Forest A
Site 45 Dense Low Forest A
Site 51 Low Forest A

Photograph 4 Area of Mallet with *Eucalyptus gardneri* (blue mallet) dominant. (Site 2).

Photograph 5 Area of mallet with *Eucalyptus astringens* (brown mallet) dominant. (Site 2).

Ef *Eucalyptus falcata* (silver mallet) Woodland

Diagnosis Low Forest A/Low Woodland A

Description

Stratum 1 *Eucalyptus falcata* trees, stratum 8-15m, canopy cover 10-70%, patchy in places.

Lower Stratum

No distinct understory is usually present. A very open stratum of *Callitris roei* trees, 1.5-3m, was found at Site 5. Species commonly present as scattered shrubs include *Hakea nitida, Beaufortia incana* and *Dryandra nobilis.*

Comments Small areas of *E. falcata* woodland occur on the lateritic uplands including the summits of hills and breakaways.

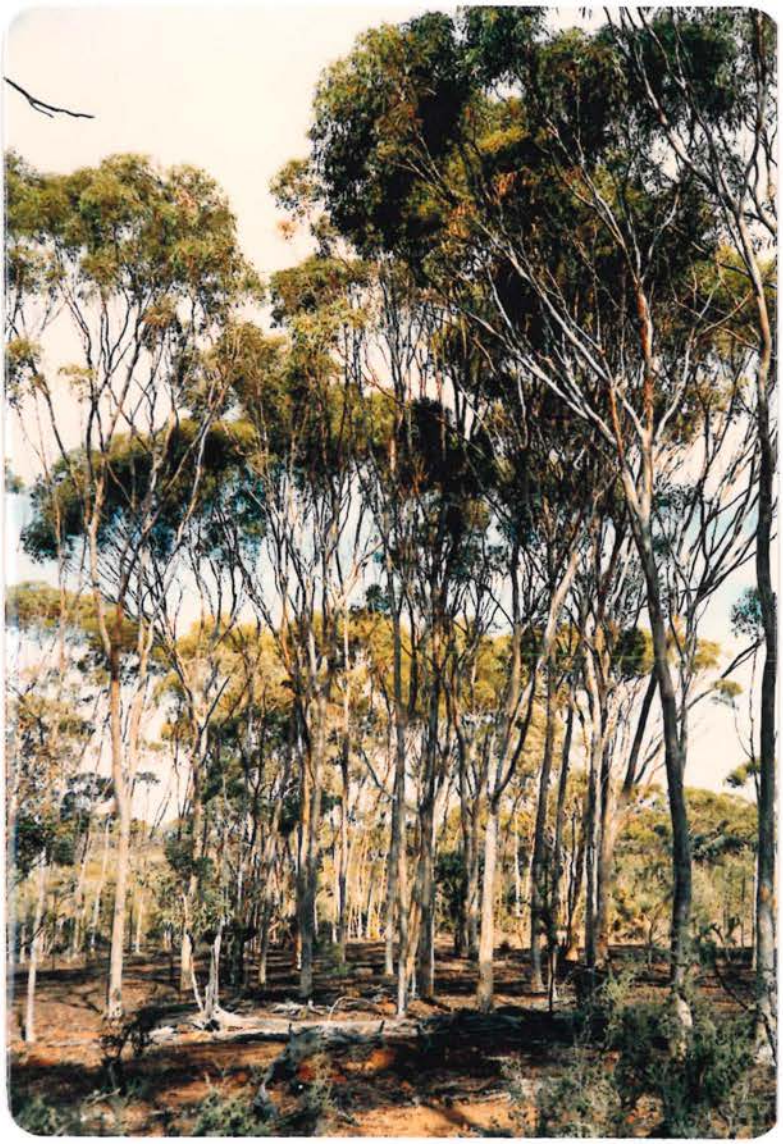
Muir Descriptions

Site 5 Low Forest A/Low Woodland A over *Callitris roei* Open Low Woodland B/scattered shrubs

Site 11 Low Woodland A

Site 47 Low Woodland A

Photograph 6 *Eucalyptus falcata* (silver mallet) Woodland at Site 47



Ah *Allocasuarina huegeliana* (sheoak) Woodland

Diagnosis Low Forest A/Low Woodland A over variable understorey

Description

Stratum 1 *Allocasuarina huegeliana* trees, stratum 8-10m, 10-70% canopy cover. Scattered trees of *E. wandoo, Acacia acuminata, Eucalyptus loxophleba* occur at different sites.

Stratum 2 Usually a lower stratum is absent but mixed shrubs 0.1-0.5m, canopy cover 10-70% form a patchy understorey at site 44 with areas of *Melaleuca uncinata*, 1.5-2m, 30-70% canopy cover and *Leptospermum erubescens*, 1.5m, 30-70% canopy cover.

Stratum 3 *Lepidospermum resinosum* sedges, stratum 0.5-1m, 30-70% canopy cover form an understorey at site 15 with areas of *Borya sphaerocephala* Herbs, 10-70% canopy cover.

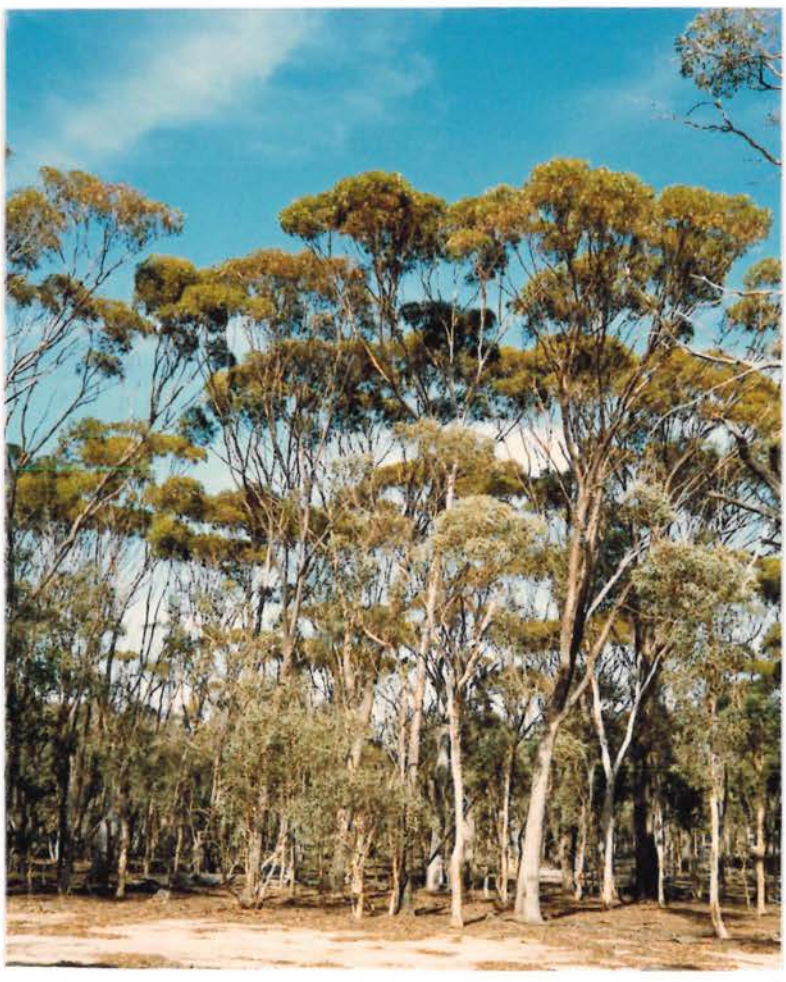
Comments *Allocasuarina huegeliana* woodlands occur on sandy loams in low lying areas. At site 15 granitic rock is found at the surface and an understorey of sedges and *Borya sphaerocephala* is formed.

Muir Descriptions

Site 15 Low Forest A over Open Tall Sedges (areas of *Borya sphaerocephala* Herbs and scattered *E. wandoo*).
Site 21a Low Forest A (scattered trees of *Acacia acuminata*)
Site 21b Low Forest A
Site 44 Low Woodland A over Dwarf Scrub D/Low Heath D (areas of *Melaleuca uncinata* Heath A and *Leptospermum erubescens* Heath B)
Site 59 Low Forest A (scattered trees of *Eucalpytus loxophleba*).

Photograph 7 *Allocasuarina huegeliana* (sheoak) Woodland at site 15 with an understorey of *Lepidosperma resinosum* sedges.

Photograph 8 *Eucalyptus longicornis* (morrel) with an understorey of *E. wandoo* at site 16b.



E1 *Eucalyptus longicornis* (morrel) Woodland

Diagnosis Woodland (from Open Low Woodland A to Forest)

Description

Stratum 1 *Eucalyptus longicornis* trees, stratum 12-20m, variable in density but usually 10-30% canopy cover.

Lower Stratum

Eucalyptus wandoo trees 6-8m occasionally form a lower stratum 6-8m, 30-70% canopy cover. Scattered shrubs of *Dodonaea bursariifolia*, *Acacia erinacea*, *Astroloma drummondii* and *Helichrysum lepidophyllum* are common.

Comments *Eucalyptus longicornis* woodlands are found on loams and clay-loams on flat to gently sloping terrain at the base of slopes. The morrel trees become scattered amongst the Tree Mallee association further upslope. At site 49 the Tree Mallee form an understorey in the *E. longicornis* Woodland.

Muir Descriptions

Site 9 Forest/Woodland over *E. wandoo* Low Forest A
Site 16b Low Woodland A over *E. wandoo* Low Forest B/Low Forest A
Site 19 Woodland
Site 25 Woodland
Site 40 Open Low Woodland A over Open Tree Mallee/scattered shrubs
Site 49 Woodland over Tree Mallee

Bs *Eucalyptus salmonophloia* (salmon gum) Woodland

Diagnosis Woodland

Description

Stratum 1 *Eucalyptus salmonophloia* trees, stratum 16-25m, 10-30% canopy cover.

Lower Stratum

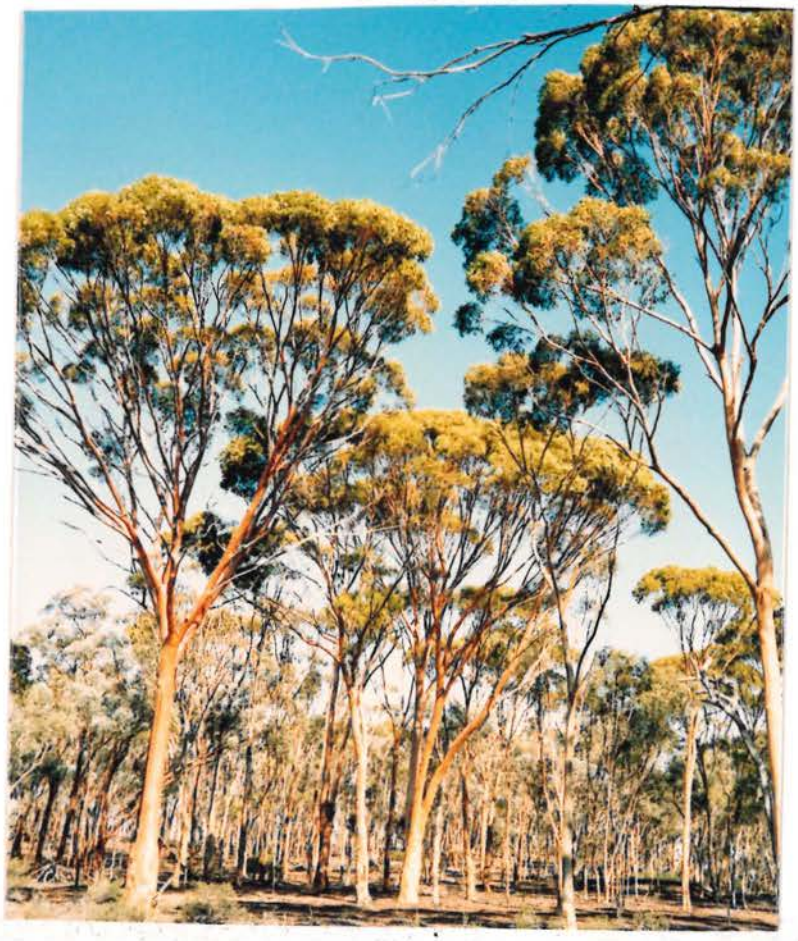
No distinct understorey is present. Scattered shrubs including *Acacia erinacea* are common.

Comments *E. salmonophloia* woodlands occur on loam and clay loam soils on flat to gently sloping areas. Only two small areas of salmongum woodland were mapped in the present survey on uncleared farmland adjacent to the reserve. *E. salmonophloia* is present on the reserve but only as an emergent in Tree Mallee at Site 36.

Muir Descriptions

Site 52 Woodland
Site 54 Woodland

Photograph 9 *Eucalyptus salmonophloia* (salmon gum) Woodland at site 54. An area of mallet can be seen in the background.



MALLEE ASSOCIATIONS

Mc Mallee

Diagnosis Tree mallee

Description

Stratum 1 Mallee, stratum 6-10m, 30-70% canopy cover. *Eucalyptus conglobata* is usually prominent with scattered trees of *E. longicornis* emergent to 12m.

Lower Stratum

A distinct understorey is absent. Scattered shrubs of *Dodonaea bursariifolia* and *Acacia erinacea* are common.

Comments *Eucalyptus conglobata* tree mallee are found on clay-loam soils on the slopes below the lateritic uplands. Trees of *Eucalyptus longicornis* increase in density towards the base of the slopes and commonly merge into *E. longicornis* woodlands.

Muir Descriptions

Site 17 Tree Mallee (scattered *E. longicornis*)
Site 26 Tree Mallee (scattered *E. longicornis*)
Site 36 Tree Mallee (scattered *E. salmonophloia*)
Site 37a Dense Tree Mallee/Tree Mallee
Site 41 Tree Mallee
Site 55 Tree Mallee (scattered *E. longicornis*)

Photograph 10 Area of Mallee at site 41. *Eucalyptus conglobata*, *E. flocktoniae* and *E. pluricaulis* (ms) were recorded at this site.

Photograph 11 Open mallee over *Dryandra* Heath at site 31

Mm Mallee over *Melaleuca* heath

Diagnosis Shrub Mallee/Open Shrub Mallee over Dense Heath A/ Heath A

Description

Stratum 1 Mallee, stratum 4-8m, 30-70% canopy cover. Stratum 1 species include *Eucalyptus flocktoniae* and *E. hypochlamydea* (ms).

Stratum 2 *Melaleuca* shrubs, stratum 1.5-2m, 30-70% canopy cover. Stratum 2 species include *Melaleuca uncinata* and *M. haplantha* (ms).

Comments Only 2 small areas of this vegetation type were mapped in the present survey with only part of one of these areas in Birdwhistle Nature Reserve. The association occurs on low lying land on clay loam with 10-50% laterite.

Muir Descriptions

Site 37b Shrub Mallee/Tree Mallee over *Melaleuca uncinata* Heath A
Site 42 Shrub Mallee over *Melaleuca uncinata* Heath A

Photograph 12 Mallee with an understorey of *Melaleuca uncinata* shrubs at site 37. Trees of blue and brown mallet can be seen on the edge of the association.

Md Open Mallee over *Dryandra* Heath

Diagnosis Very Open Shrub Mallee/Open Shrub Mallee over *Dryandra sp. nov.* Heath A/Heath B.

Description

Stratum 1 Mallee 2-5m, variable density from 2-30% canopy cover. Stratum 1 species include *Eucalyptus albida, E. incrassata, E. pluricaulis (ms)* and *E. falcata.*

Stratum 2 Shrubs usually 1-1.5m, form an understorey with canopy cover 30-70%. *Dryandra sp. nov.* is prominent. Many stratum 2 species are also found in the *Dryandra* Heath. Other species recorded include *Billardiera sericea, Melaleuca platycalyx, Sollya ?heterophylla, Pityrodia terminalis* and *Corynetheca micrantha.*

Comments Open Mallee over *Dryandra* Heath occurs on sandy loam with 10-20% laterite on gentle slopes. *Dryandra* Heath is found on adjacent soils with a higher laterite component.

Muir Descriptions

Site 31 Very Open Shrub Mallee/Open Shrub Mallee over *Dryandra sp. nov.* Heath B

Site 34 Very Open Shrub Mallee/Open Shrub Mallee over *Dryandra sp. nov.* Heath B

Site 39 Open Shrub Mallee over *Dryandra sp. nov.* Heath A

KWONGAN ASSOCIATIONS

kd ***Dryandra*** **Heath**

Diagnosis Heath (from Dense Heath A to Heath B)

Description

Stratum 1 Usually one stratum discernable with plant species ranging from ground level to 1.5m and rarely to 2m, canopy cover 50-100%. *Dryandra sp. nov.* is prominent. Other species include *Adenanthos cygnorum, Banksia sphaerocarpa, Beaufortia incana, Dryandra cynaroides, D. aff. conferta, D. squarrosa, Hakea gilbertii, Hibbertia pungens, Jacksonia aff. floribunda, Leptospermum erubescens, Xanthorrhoea drummondii, Melaleuca pungens, Hakea lehmanniana, Isopogon teretifolius, Dryandra nivea* plus stratum 2 species where a lower stratum is not discernable.

Stratum 2 Very rarely a lower stratum is discernable of shrubs 0.5-1.0m, 10-30% canopy cover. Stratum 2 species include *Hibbertia pungens, H. enervia, Astroloma drummondii, Leucopogon dielsianus, Gastrolobium obovatum, Lepidosperma gracile, Cryptandra glabriflora, Dampiera glabriflora, Baeckea preissiana.*

Comments *Dryandra* Heath is found on sandy gravels and sandy loams with gravel on remnants of the laterite-crusted plateau. The terrain is sometimes flat but mainly sloping. The heath occurs on the "backslope" of breakaways in places. Scattered mallee and *Eucalyptus wandoo* are sometimes present.

Muir Descriptions

Site 3 Low Scrub A over Dwarf Scrub C

(kd continued)

Site 10 Heath B/Low Scrub B
Site 22b Heath B (scattered *E. wandoo*)
Site 24 Heath B
Site 27 Dense Heath B
Site 28 Heath B
Site 33 Dense Heath B (scattered mallee)
Site 48 Dense Heath A
Site 57 Heath A

Photograph 13 *Dryandra* heath at site 3 with scattered *Xanthorrhoea drummondii*.

ke *Eremaea pauciflora* Heath

Diagnosis Heath (Heath B to Low Heath C) sometimes over Dwarf Scrub D

Description

Stratum 1 Usually one stratum discernable with shrubs to 1.5m, 50-70% canopy cover. *Eremaea pauciflora* is prominent with *Leptospermum erubescens* prominent in small areas. Other common stratum 1 species include *Petrophile brevifolia, Petrophile ericifolia, Synaphaea* sp. nov., *Banksia sphaerocarpa, Allocasuarina huegeliana* (emergent), *Dryandra nivea, D. aff. conferta* and stratum 2 species where a lower stratum is not discernable.

Stratum 2 Occasionally shrubs 0.1-0.5m form an understorey of variable density 10-70% canopy cover. Stratum 2 species include *Verticordia densiflora, Calytrix flavescens, Caustis dioica, Restio sphacelatus, Lyginia barbata, Acacia celastrifolia, Hakea ruscifolia, Baeckea preissiana, Chloanthes coccinea, Dryandra vestita, Hakea aff. falcata* and *Dryandra nivea*.

Comments *Eremaea pauciflora* Heath is found on pockets of yellow loamy sand commonly bleached grey at the surface. Drainage is usually poor. *Nuytsia floribunda* was recorded at 2 sites and *Banksia grandis* at one. Birdwhistle Nature Reserve is at the eastern extreme of the geographical distribution of these species.

Muir Descriptions

Site 1 Low Scrub B over Low HeathD/Dwarf Scrub D
Site 7 Low Heath C over Dwarf Scrub D (scattered shrubs to 2m)
Site 20 Low Heath C (scattered shrubs to 2m)
Site 38 Heath B

kb *Beaufortia incana* Heath

Diagnosis Heath (from Heath B to Low Heath C) usually over Open Dwarf Scrub C/Open Dwarf Scrub D.

Description

Stratum 1 Shrubs 1-1.5m, 50-70% canopy cover with *Beaufortia incana* prominent in places. Many species recorded for this stratum are also found in the *Dryandra* Heath. Typical species include *Dryandra nobilis, Adenanthos cygnorum, Banksia sphaerocarpa, Leptospermum erubescens, Dryandra cynaroides, D. subpinnatifida, Hakea gilbertii, Petrophile heterophylla, Xanthorrhoea drummondii.*

Stratum 2 Shrubs to 1m, usually 10% canopy cover. Stratum 2 species include *Dryandra drummondii, D. ferruginea, Jacksonia* aff. *floribunda* and *Dryandra nivea.*

Comments *Beaufortia incana* Heath is found on the lateritic uplands and merges with *Dryandra* Heath in places. Soils of gravelly sandy loam support this vegetation association on gentle slopes.

Muir Descriptions

Site 13 Heath B over Open Dward Scrub D (scattered shrubs to 2m)
Site 18 Heath B over Open Dwarf Scrub C/Dwarf Scrub C
Site 35 Low Heath C (Open Low Scrub B forming an upper stratum in places).

Photograph 14 *Eremaea pauciflora* Heath at site 1. *Nuytsia floribunda* (Christmas tree) can be seen in the background (centre).

Photograph 15 Heath area at site 13. *Beaufortia incana* is prominent

km Low Mixed Heath

Diagnosis Low Heath C

Description

Stratum 1 Usually one stratum discernable with shrubs to 1.0m, 50-80% canopy cover. Scattered shrubs to 1.5m are often present reaching a canopy cover of 2% in places. Typical species include *Allocasuarina microstachys*, *Banksia sphaerocarpa*, *Dryandra nivea*, *D.* aff. *conferta*, *Eremaea pauciflora*, *Hakea prostrata*, *H. baxteri*, *Hibbertia pungens*, *Leptospermum erubescens*, *Mesomelaena preissii*, *Petrophile ericifolia*, *P. brevifolia*, *Xanthorrhoea drummondii*, *Synaphaea* sp. nov., *Beaufortia micrantha*.

Comments Low Mixed Heath occurs on high ground usually on fairly flat terrain on sandy loam over laterite. *Xanthorrhoea drummondii* emergent to 1.5-2m commonly occurs.

Muir Descriptions

Site 14 Low Heath C
Site 29 Low Heath C

Photograph 16 Low mixed Heath at site 14 with scattered plants of *Xanthorrhoea drummondii*.

4.0 FLORA SURVEY

A total of 207 plant species was recorded for Birdwhistle Nature Reserve. A complete list of these species is found in Appendix 1. Manuscript names (ms) have been used to avoid confusion between undescribed species. Identifications with the Generic name followed by "sp." or ? are uncertain because of lack of flowering material or confusion in the current taxonomy of the group concerned. The nomenclature follows that of Green (1985) unless otherwise stated.

Fifty one of the species listed in Appendix 1 have been previously recorded for Birdwhistle Nature Reserve but were not found in the present survey. These species were mainly ephemeral and herbaceous species and those which are inconspciuous or difficult to identify when not in flower. Members of the Orchidaceae, Stylidiaceae, Droseraceae, *Liliaceae, and Asteraceae were mainly involved although three species of orchid were found on adjacent privately owned land. Due to the time and seasonal constraints of the survey, Appendix 1 does not represent a complete list of the flora present. Further survey work especially in the wildflower season would provide a more comprehensive record of the flora of the reserve.

Eleven plant species recorded during the present survey were found on adjoining bushland only and not on Birdwhistle Nature Reserve. A list of these species is provided in Table 3.

The families Myrtaceae, Proteaceae, Papilionaceae and Mimosaceae were the most strongly represented in the the flora of Birdwhistle Nature Reserve. Of the monocotyledons, members of the family Cyperaceae are the most common. The number of species recorded for the most prominent families is as follows :

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* The family previously called Liliaceae is now represented by 5 families. See Green (1985).

Proteaceae (*Banksia*, *Grevillea* etc.)	47
Myrtaceae (*Eucalyptus*, bottlebrushes etc.)	39
Papilionaceae (pea flowers)	16
Mimosaceae (wattles)	10
Epacridaceae (heath plants)	7
Cyperaceae (sedges)	7
Anthericaceae (lilies)	5
Restionaceae (rushes)	5

Thirty-nine families were represented in the reserve with species richness most apparent in kwongan communities.

Table 3 - Plant species found on bushland adjoining Birdwhistle Nature Reserve only.

Species/Voucher No.	Location Number
Baeckea ?blackettii 1323	5206
Banksia prionotes 1326	5206
Caladenia drummondii 1350	5206
Eycalyptus loxophleba	↑5318
Hibbertia commutata 1347	↑5318
Leporella fimbriata 1241	12795
Loxocarya aspera (ms, Johnson and Briggs) 1239	12795
Melaleuca lecanantha (ms, Barlow, aff. conferta) 1329	12795
Oxylobium ?obovatum 1335	5206
Pterostylis sargentii 1351	9361
Stypandra glauca	12795/↑5318

Using the present data, the overall floristic diversity of the reserve can be estimated at 52 species/km^2. This is high when compared to Tutanning Reserve which has a floristic diversity of 22 species/km^2 and has been intensively studied. The large number of species in the reserve reflects the extent of the Kwongan communities which are species rich. The diversity figures are helpful when comparing areas for floristic richness but must be regarded with caution. As Muir (1977) points out, such estimates depend on the distribution of vegetation types within the reserve boundaries and reserve size, both of which when viewed statistically are largely a matter of chance.

SPECIES OF INTEREST

Species of interest recorded for Birdwhistle Nature Reserve are presented in Table 4.

Rare Plants

Hemigenia viscida, a Gazetted Rare plant, was not encountered during the present survey but may occur on the reserve. This species has been previously included on the flora list for the area with a query on the identification. Only 6 specimens were present in the reference collection in the W.A. Herbarium in May 1988 with 5 collections from the Tammin area and one from the Wongan Hills.

Geographically Restricted Species

Calothamnus planifolius (not recorded in the present survey), *Dryandra cynaroides* and *Dryandra subpinnatifida* have been recorded by Millar (1982) and Rye (1982) as geographically restricted with ranges between 100 and 160 kilometres.

Other species of interest occurring on Birdwhistle Nature Reserve include *Hakea baxteri*, recorded by Leigh *et al.* (1981) as restricted to highly specific habitats, rare but not currently endangered or

vulnerable. *Dampiera carinata* was not encountered in the present survey but has been previously included on the flora list with a query on the identification. *Dampiera carinata* has been recorded by Leigh *et al.* (1981) as restricted to highly specific habitats and vulnerable. Birdwhistle Nature Reserve is also one of the most easterly locations recorded for *Banksia grandis* and *Nuytsia floribunda*.

Thirteen undescribed species were found in the area surveyed. This does not include any plant specimens where the identification was uncertain due to lack of flowering or fruiting material or confusion in the current taxonomy. All the undescribed species have been previously collected and 7 have manuscript names. *Melaleuca lecanantha* (ms) and *Loxocarya aspera* (ms) were not found on the reserve.

Table 5 provides a list of species of interest which include Birdwhistle Nature Reserve within their range of distribution and which occur in habitat types found on the reserve. Further fieldwork at flowering times is needed to verify if these species occur on the reserve.

Table 4 - Species of Interest recorded for Birdwhistle Nature Reserve

Species	Geographical Distribution	Interest	Reference
Calothamnus planifolius	SE Pingelly-E of Nyabing	Restricted geographically	Rye (1982), Leigh *et al*, (1981), Millar (1982)
Dampiera carinata	Mt Ney (NE Esperance)-Coorow	Mainly restricted to highly specific habitats, vulnerable	Leigh *et al*, (1981)
Dryandra cynaroides	Boyagin-Woodanilling	Restricted geographically	Rye (1982), Leigh *et al*, (1981), Millar (1982)
Dryandra subpinnatifida	Pingelly-Broomhill	Restricted geographically	Rye (1982), Millar (1982)
Hakea baxteri	Mainly restricted to highly specific habitats rare but not currently endangered or vulnerable		Leigh *et al*, (1981)
Hemigenia viscida	Wongan Hills, Tammin	Gazetted Rare	Govt. Gazette (No. 94) 25th Sept, 1987

Table 5 - Species of Interest known to occur in the general area but not recorded during the present survey.

Species	Geographical Distribution	Preferred Habitat	Interest	Reference
Acacia varia var. crassinervis	Narrogin-Katanning	sandy gravel over laterite	Geographically restricted	Millar (1982)
Caladenia lavandulacea	York-Tincurrin	sandy loam	Rare and geographically restricted	Millar (1982); Rye *et al*, (1981)
Caladenia triangularis	Clackline-Cranbrook recorded at Wickepin	clay/Wandoo	Rare	Patrick *et al*,(1982)
Gastrolobium rotundifolium	Mingenew, Wagin	Wandoo woodland; on gravelly loam	Known from one or a few localities; not under immediate threat	Priority 2 species CALM internal list
Petrophile crispata	Dale River-Wagin		" Geographically restricted	Millar (1982); Priority 2 species
Thelymitra stellata	Three Springs - W of Lake Grace	sandy or gravelly soil over laterite	Gazetted Rare	Govt. Gazette (No. 94); Patrick *et al*, (1982)
Thysanotus tenuis	Northam, Wagin	recorded on Jam country	Known from several localities, some of which are not under immediate threat	Millar (1982); Priority 3 species

5.0 SUMMARY AND RECOMMENDATIONS

5.1 Management Considerations for Birdwhistle Nature Reserve

The reserve is in excellent condition although some weed invasion was noted in areas adjacent to cleared farmland. Weed species were most apparent on firebreaks, in areas of *Eucalyptus wandoo* Woodland - Type 1 and in *Allocasuarina huegeliana* Woodland. The extent of the weed invasion is not, however, severe enough to cause a management problem at the present time. Many of the introduced plant species that had germinated at the time of the survey could not be identified as flowering material was not available. Species recorded include *Aira caryophyllea*, *Avena ?sativa*, *Briza maxima* and *Ursinia anthemoides*.

There was no evidence of recent fire on the reserve and the firebreak system is fairly extensive. The area has a peripheral firebreak, two firebreaks running east-west through the reserve and firebreaks are also present on adjacent cleared farmland.

The isolation of Birdwhistle Nature Reserve and the restricted access to the area play an important role in minimising disturbance to the flora and fauna. Access from Birdwhistle Road is possible through the gravel reserve (↑5318) and Location No. 9361. The end of this trail winds through an area of blue and brown mallet and enters the reserve at the south-west corner. Spent gun shells were found on the reserve during the survey and it is recommended that this access is blocked to help prevent any further shooting in the reserve.

5.2 Evaluation of Areas of Adjoining Bushland for Nature Conservation

Adjoining bushland to the south and west of Birdwhistle Nature Reserve provides a valuable buffer zone helping to minimise disturbance to reserve flora and fauna. These areas are also of

importance for nature conservation in a region which has largely been cleared for farming. The Department of Conservation and Land Management should therefore look at securing this uncleared farmland for nature conservation by purchase or management agreements.

Priority for acquisition by the Department should be given to those areas containing vegetation associations and/or plant species not present or rare on the Reserve and also those areas which are in good condition. This would increase areas of valuable fauna habitat not found extensively on the reserve.

Vegetation associations which only occur over relatively small areas on the reserve and which are also found on adjoining farmland include *Eucalyptus falcata* Woodland, *Allocasuarina huegeliana* Woodland, *Eucalyptus longicornis* Woodland, and the three mallee assocations. *Eucalyptus salmonophloia* Woodlands only occur in adjoining uncleared bushland. *E. salmonophloia* was recorded as an emergent in Tree Mallee at site 36 on the reserve.

A list of plant species and vegetation associations found in adjoining bushland on each block of agricultural land can be found in Appendix 2 and a list of plant species found on bushland adjacent to the reserve only is presented in Table 3.

A summary of data collected for each location number is as follows:

Bushland on Location 12795 The bushland is fenced off from stock and is in good condition although some weed invasion was recorded. Vegetation associations occuring in this area and not found entensively on Birdwhistle Nature Reserve include *Eucalyptus longicornis* Woodland and *Allocasuarina huegeliana* Woodland. *Loxocarya aspera* (ms), *Leporella fimbriata*, *Melaleuca lecanantha* (ms), were recorded from this area only. Bushland on Location 12795 should be given a high priority for acquisition.

Bushland on Location 9323 The bushland is fenced off from stock and is in relatively good condition although some weed invasion and a small gravel pit were found in the western section. Vegetation associations occuring in this area and not found extensively on the reserve include *Eucalyptus longicornis* Woodland, Tree Mallee and *Eucalyptus salmonophloia* Woodland. All of these associations are situated in the western section of the bushland. Bushland on Location 9323 should be given a high priority for acquisition.

Bushland on Location 10711 The bushland only covers an area of ~5ha and is not fenced off from stock. Both vegetation associations found in this area also cover extensive areas on the reserve. Bushland on Location 10711 should only be given a low priority for acquisition.

Bushland on Location 9813 The bushland area is fenced off from stock and is in good condition with little weed invasion. Although the vegetation associations found on this location also occur over extensive areas of the reserve the area is still of value for nature conservation and acquisition should be given a high priority.

Bushland on Location 5206 The bushland area is fenced and in good condition. Although only a small area the bushland contains four vegetation associations which occur only over small areas of the reserve. These include all three mallee associations and *Allocasuarina huegeliana* Woodland. *Baeckea ?blackettii, Banksia prionotes, Caladenia drummondii, Oxylobium ?obovatum* were found in this area only. Bushland on Location 5206 should be given a high priority for acquisition.

Bushland on Location 8039 Although the area is fenced the western edge of the bushland is degraded. A rubbish dump is situated in the mallet area at the top of the lateritic ridge. A track from the reserve runs to the rubbish dump and into the *Eucalyptus longicornis* Woodland on the western boundary. Most of the eastern section of the bushland is in good condition and includes areas of Open Mallee

over *Dryandra* Heath and a small area of Tree Mallee which do not occur extensively on the reserve. The eastern section of the bushland on Location 8039 should be given a high priority for acqiusition.

Bushland on Location 9361 Areas on the eastern section of the bushland are degraded and are not fenced off from stock. Some weed invasion was found in areas adjacent to Birdwhistle Road. A rubbish dump is situated on the track north of the gravel reserve. This area of bushland covers approximately 45ha and includes five vegetation associations not found extensively on Birdwhistle Nature Reserve and which are mostly in good condition. These include *Eucalyptus salmonophloia* Woodland, *E. longicornis* Woodland and the three Mallee associations. This area should therefore be given a high priority for acquisition.

Bushland on Gravel Reserve †5318 There was no evidence of gravel mining and weed species were only recorded in areas of bushland adjacent to Birdwhistle Road. These included *Avena ?sativa* and *Briza maxima*. *Allocasuarina huegeliana* Woodland with scattered *E. loxophleba* which occurs in this area is not found extensively on the reserve. The purpose of the reserve should be changed to "conservation of flora and fauna" and the reserve vested in the National Parks and Nature Conservation Authority.

6.0 ACKNOWLEDGEMENTS

Thanks are given to the following people :

Mr B. Maslin for the identification of *Acacia* species, Mr. I. Brooker for *Eucalyptus* species, Mr M. Trudgen for *Baeckea* species and Mrs J. Wheeler for species of *Hibbertia*.
The curator of the Western Australian Herbarium for permission to consult the collection.
Anna Napier for her word processing.

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APPENDIX 1

FLORA LIST - BIRDWHISTLE NATURE RESERVE

* Indicates introduced species
NRS indicates species recorded for the reserve but not encountered in the present survey.

ADIANTACEAE
- Cheilanthes austrotenuifolia 1340

CUPRESSACEAE
- Callitris roei

POACEAE
- *Aira caryophyllea
- *Avena ?sativa
- *Briza maxima
- Neurachne alopecuroidea NRS

CYPERACEAE
- Caustis dioica 1222
- Lepidosperma effusum NRS
- L. gracile 1201, 1307
- L. resinosum 1328, 1339
- L. tenue 1237
- L. viscidum 1306
- Mesomelaena preissii 1213

RESTIONACEAE
- Lepidobolus sp. NRS
- Loxocarya parthenica (ms Johnson and Briggs) 1249
- Lyginia barbata 1230, 1231
- Restio megalotheca 1299
- Restio sphacelatus 1221

DASYPOGONACEAE
- Chamaexeros serra 1193
- Lomandra effusa

XANTHORRHOEACEAE
- Xanthorrhoea drummondii

PHORMIACEAE
- Dianella revoluta

ANTHERICACEAE
- Borya sphaerocephala 1238
- Corynotheca micrantha 1258
- Dichopogon capillipes NRS
- Sowerbaea laxiflora NRS
- Thysanotus patersonii NRS

HAEMODORACEAE

Conostylis setigera NRS

ORCHIDACEAE

Caladenia discoidea NRS
Caladenia flava NRS
Elythranthera brunonis NRS
Thelymitra antennifera NRS

CASUARINACEAE

Allocasuarina acutivalvis
A. campestris
A. huegeliana 1252
A. humilis 1296
A. microstachya

PROTEACEAE

Adenanthos cygnorum 1275
Banksia grandis
B. sphaerocarpa var. caesia 1343
Dryandra sp. nov. (aff. armata)
D. cynaroides 1195
D. drummondii 1330
D. ferruginea 1331
D. fraseri
D. nivea 1216
D. nobilis 1272
D. sessilis
D. squarrosa 1273
D. subpinnatifida 1308a
D. vestita 1289
D. sp. nov. (aff. conferta A.S.G. sp. 4) 1196
Grevillea ?leptobotrya NRS
G. tenuiflora 1260
Hakea baxteri
H. ferruginea 1332
H. gilbertii
H. incrassata 1190
H. lehmanniana
H. lissocarpha
H. nitida 1266
H. petiolaris NRS
H. prostrata
H. ruscifolia 1235
H. trifurcata
H. sp. nov. (aff. falcata, large fruited, cream flowers) 1288
Isopogon divergens 1243
I. dubius 1338
I. teretifolius 1198
Lambertia ilicifolia 1336
Persoonia quinquinervis 1295
P. striata
Petrophile brevifolia 1274

P. circinata 1253
P. conifera NRS
P. divaricata 1341
P. ericifolia 1246
P. heterophylla 1263
P. rigida NRS
P. serruriae 1333
P. squamata NRS
P. striata 1334
P. trifida 1215
Synaphaea sp nov. (aff. petiolaris) 1278, 1284

SANTALACEAE

Choretrum glomeratum 1285
Santalum acuminatum
S. murrayanum 1327

OLACACEAE

Olax benthamiana

LORANTHACEAE

Amyema miquellii NRS
Nuytsia floribunda

LAURACEAE

Cassytha pomiformis

DROSERACEAE

Drosera barbigera NRS
D. ?leucoblasta NRS
D. menziesii NRS
D. subhirtella NRS

PITTOSPORACEAE

Billardiera sericea 1234b, 1255
B. variifolia NRS
Sollya heterophylla 1301

MIMOSACEAE

Acacia acuminata
A. assimilis
A. celastrifolia 1233
A. erinacea 1267
A. lasiocarpa var. sedifolia 1245
A. multispicata 1309a
A. pulchella var. subsessilis 1225
A. pycnocephala 1279
A. stenoptera 1206
Acacia sp. nov. 1248

PAPILIONACEAE

Bossiaea eriocarpa NRS
B. spinescens 1342
Chorizema aciculare NRS

Daviesia cardiophylla 1207
D. ?incrassata 1242
D. intricata ssp. intricata (ms Crisp) 1229
D. longifolia NRS
D. rhombifolia 1189
Gastrolobium obovatum 1211, 1283
G. reticulatum
G. spathulatum NRS
Hovea trisperma NRS
Isotropis cuneifolia NRS
Jacksonia sp. nov. (aff floribunda) 1271
J. racemosa NRS
Oxylobium parviflorum 1214

RUTACEAE
Phebalium tuberculosum 1310

TREMANDRACEAE
Tetratheca sp. NRS

EUPHORBIACEAE
Beyeria lechenaultii 1317

STACKHOUSIACEAE
Stackhousia monogyna NRS

SAPINDACEAE
Dodonaea bursariifolia 1251

RHAMNACEAE
Cryptandra glabriflora 1204
C. pungens
Spyridium ?tridentatum 1318

STERCULIACEAE
Lysiosepalum ?rugosum 1337

DILLENIACEAE
Hibbertia enervia 1192
H. helianthemoides NRS
H. pungens
H. sp. nov. (aff. inclusa) 1321

THYMELAEACEAE
Pimelia sp. NRS

MYRTACEAE
Baeckea preissiana 1302, 1236
Beaufortia incana 1194
B. micranthera var. puberula 1256
Calothamnus planifolius NRS
C. quadrifidus 1257
C. sanguineus 1294
Calytrix flavescens 1224

C. ?leschenaultii 1247
C. ? oldfieldii 1254
Eremaea pauciflora 1281, 1220
Eucalyptus albida 1287, 1280
E. astringens
E. conglobata 1308
E. ?eremophila NRS
E. falcata 1197
E. flocktoniae 1292, 1270
E. gardneri
E. hypochlamydea subsp. edysiustes (ms Brooker) 1311
E. incrassata 1293, 1259, 1218
E. longicornis
E. ?occidentalis NRS
E. pluricaulis (ms) → E. salmonophloia
E. stenanthina subsp. aspratilis (ms Brooker) 1305
E. wandoo
Hypocalymma angustifolium
Leptospermum erubescens 1203
L. spinescens
Melaleuca haplantha
(ms Barlow, aff. cuticularis) 1309
M. platycalyx 1300
M. pungens 1202
M. ?scabra 1290, 1234
M. ?subtrigona 1228, 1212
M. uncinata
M. ?urceolaris NRS
Verticordia brownii NRS
V. chrysantha 1324, 1303
V. densiflora 1219
V. grandiflora 1282
V. roei 1291

HALORAGACEAE

Glischrocaryon aureum

APIACEAE

Trachymene ornata NRS
T. pilosa NRS

EPACRIDACEAE

Andersonia lehmanniana
Astroloma drummondii 1208, 1307a, 1250, 1264
Brachyloma concolor 1209
Leucopogon conostephoides NRS
L. dielsianus 1210
L. minutifolius 1261
Leucopogon sp. 1199

CHLOANTHACEAE

Chloanthes coccinea 1217
Pityrodia terminalis 1304

LAMIACEAE

Hemigenia ?drummondii 1276
H. incana 1297
H. ?viscida NRS
Microcorys capitata 1298
Teucrium fililobum 1268

GOODENIACEAE

Dampiera ?carinata NRS
D. lindleyi 1205
Lechenaultia biloba NRS

STYLIDIACEAE

Stylidium caricifolium
S. petiolare NRS
S. repens 1223
S. rhynchocarpum NRS
Stylidium sp. 1 NRS
Stylidium sp. 2 NRS

ASTERACEAE

Helichrysum lepidophyllum 1265
Helipterum manglesii NRS
*Ursinia anthemoides
Waitzia ?acuminata

APPENDIX 2

Vegetation Associations and Species Lists for Bushland Adjoining Birdwhistle Nature Reserve

LOCATION NUMBER 12795

Sites 4, 8, 9 and 10

Vegetation Associations

Eucalyptus wandoo woodland Type 1 (Ew1)
Eucalyptus wandoo woodland Type 2 (Ew2)
Eucalyptus longicornis woodland (El)
Eucalyptus astringens/E. gardneri forest (Ea)
Allocasuarina huelgeliana woodland (Ah)
Dryandra Heath (kd)

Species List

Acacia acuminata
A. pulchella
*Aira ?caryophyllea
Allocasuarina campestris
A. huegeliana
Astroloma drummondii
*Avena fatua/sativa
Banksia sphaerocephala
Borya sphaerocephala
Beaufortia incana
Calothamnus quadrifidus
Dodonaea bursariifolia
Drosera sp.
Dryandra sp. nov.
D. cynaroides
D. nivea
D. sessilis
D. sp. nov. (aff. conferta)
Eucalyptus astringens
E. gardneri
E. longicornis
E. wandoo
Hakea incrassata
H. lissocarpha
H. prostrata
Hibbertia pungens
Hypocalymma angustifolium
Isopogon teretifolius
Jacksonia sp. nov.
(aff. floribunda)
Lepidosperma resinosum
Leporella fimbriata 1241
Leptospermum erubescens
Loxocarya aspera (ms) 1239
Melaleuca lecanantha
(ms, aff. conferta) 1329

Melaleuca pungens
M. ?subtrigona
Oxylobium parviflorum
Stypandra glauca
Verticordia grandiflora
Xanthorrhoea drummondii

LOCATION NUMBER 9323

Sites 49, 50, 51, 52 (small gravel pit)

Vegetation Associations

Eucalyptus wandoo woodland Type 1 (Ew1)
Eucalyptus astringens/E. gardneri Forest (Ea)
Eucalyptus longicornis woodland (El)
Eucalyptus salmonophloia woodland (Es)
Dryandra heath (kd)
Mallee (Mc)

Species List

Acacia pulchella
Allocasuarina campestris
A. huegeliana
A. humilis
Banksia sphaerocarpa
Borya sphaerocaphala
Dodonaea bursariifolia
Dryandra sp. nov.
Eucalyptus astringens
E. conglobata
E. gardneri
E. incrassata
E. longicornis
E. salmonophloia
E. wandoo
Hakea lissocarpha
Isopogon teretifolius
Leptospermum erubescens
Lomandra ?effusa
Loxocarya sp.
Melaleuca pungens
M. ?subtrigona
Oxylobium parviflorum
Xanthorrhoea drummondii

LOCATION NUMBER 10711 (not fenced)

Site 48

Vegetation Associations

Eucalyptus astringens/E. gardneri Forest (Ea)
Dryandra Heath (kd)

Species List

Callitris roei
Cassytha sp.
Dodonaea bursariifolia
Dryandra sp. nov.
Eucalyptus astringens
E. falcata
E. gardneri
E. incrassata
E. wandoo
Hakea lissocarpha
Lepidosperma viscidum
Leptospermum erubescens
Melaleuca ?scabra
M. ?subtrigona
Petrophile circinnata
Spyridium ?tridentatum 1318
Xanthorrhoea drummondii

LOCATION NUMBER 9813

Sites 43, 45

Vegetation Associations

Eucalyptus astringens/E. gardneri forest (Ea)
Eucalyptus wandoo woodland Type 1 (Ew1)
Eucalyptus wandoo woodland Type 2 (Ew2)
Dryandra Heath (kd)

Species List

Acacia acuminata
A. pulchella
Allocasuarina huegeliana

Beyeria leschenaultii
Borya sphaerocephala
Calothamnus quadrifidus
Calytrix ?leschenaultii
Dodonaea bursariifolia
Dryandra sp. nov.
Eucalyptus astringens
E. falcata
E. flocktoniae
E. gardneri
E. wandoo
Hakea incrassata
H. lissocarpha
Lepidosperma viscidum
Lomandra sp.
Loxocarya sp.
Oxylobium parviflorum
Melaleuca uncinata
Mesomelaena preissii
Xanthorrhoea drummondii

LOCATION NUMBER 5206

Sites 38, 41, 42, 44

Vegetation Associations

Allocasuarina huegeliana Woodland (Ah)
Mallee (Mc)
Mallee over *Melaleuca* Heath (Mm)
Eremaea pauciflora Heath (ke)
Eucalyptus wandoo Woodland - type 1 (Ew1)
Open Mallee over *Dryandra* Heath (Md)

Species List

Acacia acuminata
A. multispicata
Acacia ?sp. nov.
Allocasuarina huegeliana
A. humilis
A. microstachya
Andersonia lehmanniana
Astroloma drummondii
Baeckea ?blackettii 1323
Banksia prionotes
Banksia sphaerocarpa
Beaufortia micrantha
Caladenia drummondii 1350
Daviesia ?incrassata
Dryandra sp. nov.
D. sessilis
D. aff. conferta
Eremaea pauciflora
Eucalyptus conglobata
E. flocktoniae

Eucalyptus gardneri
E. ?stenanthina
E. wandoo
Gastrolobium ?obovatum
Grevillea tenuiflora
Hakea gilbertii
H. lissocarpha
H. incrassata
H. prostrata
Hibbertia pungens
Isopogon teretifolius
Lepidosperma viscidum
Lepidosperma sp.
Leptospermum erubescens
Leucopogon dielsianus
L. minutifolius
Melaleuca pungens
M. ?subtrigona
M. uncinata
Oxylobium parviflorum
Oxylobium ?obovatum 1335
Synaphaea sp. nov.
Verticordia chrysantha
V. densiflora
V. roei

LOCATION NUMBER 8039

Sites 39, 40

Vegetation Associations

Eucalyptus wandoo Woodland - Type 1	(Ew1)
Eucalyptus astringens/E. gardneri Forest	(Ea)
Eucalyptus longicornis Woodland	(El)
Open Mallee over *Dryandra* Heath	(Md)
Dryandra Heath	(kd)
Mallee	(Mc)

Species List

Acacia acuminata
Acacia ?sp. nov.
A. ?pycnocephala
Astroloma drummondii
Banksia sphaerocarpa
Billardiera sericea
Chamaexeros serra
Corynotheca micrantha
Daviesia ?incrassata
Dodonaea bursariifolia
Dryandra sp. nov.
D. nivea
Eucalyptus astringens
E. albida
E. conglobata
E. falcata

Eucalyptus gardneri
E. incrassata
E. longicornis
E. wandoo
Hakea gilbertii
H. lehmanniana
H. nitida
Hibbertia enervia
H. pungens
Lepidosperma sp.
Leptospermum erubescens
Melaleuca pungens
M. ?subtrigona
M. uncinata
Oxylobium parviflorum
Petrophile brevifolia
Xanthorrhoea drummondii

LOCATION NO 9361

Sites 54, 55, 56, 57

Vegetation Associations

Eucalyptus wandoo Woodland - Type 1	(Ew1)
Eucalyptus wandoo Woodland - Type 2	(Ew2)
Eucalyptus astringens/E.gardneri Forest	(Ea)
Eucalyptus salmonophloia Woodland	(Es)
Eucalyptus longicornis Woodland	(El)
Mallee	(Mc)
Open Mallee over *Dryandra* Heath	(Md)
Dryandra Heath	(kd)
Mallee over *Melaleuca* Heath	(Mm)

Species List

Acacia pulchella
A. erinacea
Allocasuarina huegeliana
Astroloma drummondii
Banksia sphaerocarpha
Beaufortia incana
Borya sphaerocephala
Calytrix leschenaultii
Cryptandra pungens
Daviesia ?incrassata
Dodonaea bursarifolia
Dryandra sp. nov.
D. aff. conferta
Eucalyptus albida
E. astringens
E. conglobata

Eucalyptus gardneri
E. incrassata 1344
E. longicornis
E. salmonophloia
E. stenanthina ssp. aspratilis (ms, Brooker)
E. wandoo
Gastrolobium obovatum
Grevillea tenuiflora
Hakea gilbertii
H. incrassata
H. lehmanniana
H. lissocarpha
Hibbertia pungens
Hypocalymma angustifolium
Isopogon divergens
I. teretifolius
Leucopogon minutifolius
Leptospermum erubescens
Melaleuca pungens
M. ?subtrigona
M. uncinata
Oxylobium parviflorum
Petrophile brevifolia
P. trifida
Pterostylis sargentii 1351
Santalum acuminatum
Xanthorrhoea drummondii

GRAVEL RESERVE †5318

Sites 53, 58, 59

Vegetation Associations

Eucalyptus wandoo Woodland - Type 1 (Ew1)
Eucalyptus astringens/E. gardneri Forest (Ea)
Allocasuarina huegeliana Woodland (Ah)
Eucalyptus wandoo Woodland - Type 2 (Ew2)

Species List

Acacia acuminata
A. pulchella
*Aira caryophyllea
Allocasuarina campestris
A. huegeliana
Astroloma drummondii
*Avena ?sativa
*Briza maxima
Borya sphaerocephala
Callitris roei
Calothamnus quadrifidus
Dampiera lindleyi
Dodonaea bursarifolia
Drosera sp.
Dryandra fraseri
Dryandra sp. nov.

Eucalyptus astringens
E. gardneri
E. loxophleba
E. longicornis
E. wandoo
Hemigenia ?incana
Hibbertia commutata
Hypocalymma angustifolium
Isopogon divergens
Lepidosperma tenue 1348
Leptospermum erubescens
Lomandra sp.
Loxocarya sp.
Melaleuca uncinata
Oxylobium parviflorum
Stypandra glauca

APPENDIX 3 - SITE DATA

Site 1 ***Eremaea pauciflora*** **Heath**

Vegetation Description : SBi.SDc/SDi
Soil Type : bleached grey loamy sand
Topography : low lying area, poor drainage

Scattered trees of *Banksia grandis* and *Nuytsia floribundia*.
Eremaea pauciflora prominant 1-1.5m 1220

Banksia sphaerocarpa
Dryandra sp. nov.
Verticordia densiflora 1219
Calytrix flavescens 1224
Restio sphaecelatus 1221
Caustis dioica 1222
Stylidium repens 1223
Acacia pulchella
var. subsessilis 1225
Synaphaea sp. nov. 1226
Hakea ruscifolia 1235
Baeckea preissiana 1236
Dryandra aff. conferta
Leptospermum erubescens
Isopogon teretifolius
Loxocarya ?aspera
Petrophile squamata
P. brevifolia
Melaleuca ?subtrigona 1228
Daviesia intricata ssp.
intricata (ms) 1229
Lyginia barbata 1230, 1231
Acacia celastrifolia 1233
Melaleuca ?scabra 1234a
Billardiera sericea 1234b
Lepidopsperma tenue 1237
Allocasuarina huegeliana
Drosera sp.
Borya ?nitida
Hakea trifurcata
Astroloma ?drummondii
Oxylobium parviflorum
Callitris roei
Dryandra nivea
Petrophile ericifolia

Edge near Mallet has Eucalyptus incrassata 1218
Chloanthes coccinea

Site 2 *Eucalyptus astringens/E. gardneri* Forest

Vegetation Description : LAc trees 8-12m, scattered shrubs
Soil Type : orange-brown gravelly sandy loam (90%) laterite
Topography : lateritic uplands, gently sloping, flattening out at the summit

Areas of *Eucalyptus gardneri* and *E. astringens*

Melaleuca uncinata
Gahnia? ancistrophylla

Site 3 *Dryandra* Heath

Vegetation Description : SAi. SCi
Soil Type : orange-brown gravelly sandy loam (90% laterite)
Topography : slopes - high ground

Adenanthos cygnorum
Dryandra sp. nov (1.5-2m prominant)
Hakea incrassata 1190
Daviesia rhombifolia 1189
Hibbertia pungens 1191
H. enervia 1192
Chamaexeros serra 1193
Beaufortia incana 1194
Dryandra cynaroides 1195
D. aff. conferta 1196
Acacia stenoptera 1206
Daviesia cardiophylla 1207
Astroloma drummundii 1208
Astroloma sp. 1209
Leucopogon dielsianus 1210
Gastrolobium obovatum 1211
Eucalyptus wandoo (edge)
E. falcata (mallee) 1197
Isopogon teretifolius
Leucopogon sp. 1199
Jacksonia aff. floribunda 1200
Lepidosperma gracile
Melaleuca pungens 1202
Leptospermum erubescens 1203
Cryptandra glabriflora 1204
Damperia lindleyi 1205
Melaleuca ?subtrigona 1212
Mesomelaena preissii 1213
Oxylobium parviflorum 1214
Petrophile trifida 1215
Xanthorrhoea drummondii
Banksia sphaerocarpa

Allocasuarina microstachy
Hakea lehmanniana
H. gilbertii
Allocasuarina huegeliana
Acacia celastrifolia
Baeckea preissiana

Site 4 *Eucalyptus wandoo* Woodland - Type 1

VEGETATION DESCRIPTION : patchy LAi trees 8-15m scattered shrubs
Soil Type : grey brown sandy loam (5% laterite)
Topography : along drainage line, low-lying terrain

Loxocarya aspera (ms) 1239
*Aira ?caryophyllea
Leporella fimbriata 1241
Oxylobium parviflorum
Leptospermum erubescens
Astroloma drummundii
Allocasuarina huegeliana
Acacia pulchella
Hakea incrassata
Borya sphaerocephala (Jc in places)
Hakea lissocarpha
Dryandra sp. nov.
Dryandra aff. conferta
Hypocalymma angustifolium (SCi in places)
Hakea prostrata

Site 5 Silver Mallet (*E. falcata*) Woodland

Vegetation Description : LAc/LAi trees 8-12m
Soil Type : gravelly sandy loam over laterite
Topography : lateritic plateau, summit near breakaway

Scattered *Callitris roei* (LBr in places)

Hakea nitida
Dryandra nobilis (edge)

Site 6 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi. SBr. SDi tree 8-10m
Soil Type : yellow-brown sandy loam
Topography : low lying country, drainage line

Hypocalymma angustifolium (SBi in places)
Santalum murrayanum 1327
Lepidospermua resinosum 1328
Hibbertia pungens
Calothamnus quadrifidus
Hakea lissocarpha
Callitris roei
Dodonaea bursariifolia
Mesomelaena preissii
Dryandra sp. nov.
Xanthorrhoea drummondii

Site 7 *Eremaea pauciflora* Heath

Vegetation Description : SCc. SDi
Soil Type : bleached brown loamy sand/yellow underneath
Topography : low lying, poorly drained

Hakea aff. falcata)
Calothamnus ?quadrifidus) scattered to 2.0m
Dryandra sp. nov.)

Eucalyptus albida
Synaphaea sp. nov.
Mesomelaena preissii
Chloanthes coccinea
Lepidospermua resinosum
Hakea prostrata
Isopogon teretifolius
Hakea incrassata
Petrophile ericifolia
Dryandra nivea
Hakea baxteri
Nuytsia floribunda
Lambertia ilicifoliia 1336
Lysiosepalum ?rugosum 1337
Leucopogon minutifolius
Baeckea preissiana
Melaleuca pungens
Acacia ?pycnocephala
Leucopogon dielsiana
Eucalyptus wandoo
Eremaea pauciflora (prominent)
Dryandra vestita
D. aff. conferta
Allocasuarina huegeliana
Hypocalymma angustifolium
Caustis dioica
Banksia sphaerocarpa
Xanthorrhoea drummondii
Daviesia sp.
Leptospermum erubescens
Hakea lissocarpha
Hakea trifurcata
Callitris roei
Leptospermum spinescens
Allocasuarina microstachya
Petrophile brevifolia
P. ericifolia
Astroloma ?drummundii

Site 8 *Eucalyptus wandoo* Woodland - Type 2

Vegetation Description : LAi *Dryandra* sp. nov. SBi/SBc patchy
Soil Type : gravelly sand
Topography : gentle slope

Isopogon teretifolius
Hakea incrassata
Allocasuarina campestris
Oxylobium parviflorum
Melaleuca ?subtrigona
Dryandra aff. conferta
Borya sphaerocephala
Calothamnus ?quadrifidus

Site 9 *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : Mi/Mc *E. wandoo* LAc
Soil Type : light brown sandy clay loam
Topography : flat to very gentle slope

Eucalyptus longicornis 12-18m
Eucalyptus wandoo 6-8m

Site 10 *Dryandra* sp. nov. Heath

Vegetation Description : SBc/SBi *Dryandra* sp. nov. shrubs prominent
Soil Type : light brown sandy loam 60% laterite
Topography : lateritic uplands, very gentle slope, flat in places

Eucalyptus wandoo
Xanthorrhoea drummondii
Melaleuca pungens
Lepidosperma resinosum
Hibbertia pungens
Beaufortia incana
Jacksonia aff. floribunda
Drosera sp.
Isopogon teretifolius
Melaleuca ?subtrigona
Verticordia grandiflora
Dryandra ?cynaroides
Banksia sphaerocarpa
Dryandra aff. conferta
Dryandra nivea
Melaleuca lecanantha (ms) (aff. conferta) 1329

Site 11 *Eucalyptus falcata* (Silver Mallet) Woodland

Vegetation Description : LAi scattered shrubs, *E. falcata* trees 12-15m
Soil Type : light brown sandy loam 10% laterite
Topography : lateritic uplands, flat to generally sloping

Dryandra sp. nov.
D. nobilis
Xanthorrhoea drummondii
Callitris roei (dense on edges)
Beaufortia incana

Site 12 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi scattered shrubs, trees 5-15m
Soil Type : yellow-brown sandy loam, 10% laterite
Topography : low-lying country, gentle slope and flat

Scattered trees of *Eucalyptus falcata* and *E. longicornis* in places.

Dryandra sessilis
Calitris roei
Calothamnus quadrifidus
Hakea lissocarpha
Hypocalymma angustifolium
Hakea nitida
Lepidosperma tenue

Site 13 *Beaufortia incana* Heath

Vegetation Description : SBc. SDr scattered shrubs to 2m
Soil Type : yellow-brown sandy loam 50-90% laterite
Topography : gentle slope, lateritic uplands

Dryandra drummondii 1330
D. ferruginea 1331
Hakea ferruginea 1332
Petrophile serruriae 1333
P. striata 1334
Dryandra sessilis
D. nobilis
Callitris roei
Xanthorrhoea drummondii
Dryandra sp. nov.

Oxylobium cuneata 1335a
Gastrolobium ?plicatum 1335b
Eucalyptus albida
Callitris roei
Petrophile heterophylla
Banksia sphaerocarpa
Melaleuca ?subtrigona
Hakea baxteri
Isopogon teretifolius
Caustis dioica
Jacksonia aff. floribunda
Petrophile circinnata
Melaleuca pungens
Beaufortia incana (prominent in in places)
Dryandra cynaroides
D. subpinnatifida
D. nivea
Leptospermum erubescens
Adenanthos cygnorum
Hibbertia pungens
Hakea lehmanniana
Petrophile trifida

Site 14 Low Mixed Heath

Vegetation Description : Mixed shrubs SCc
Soil Type : yellow-brown sandy loam 30% laterite over laterite
Topography : flat to gentle slope, lateritic uplands

Beaufortia incana
Dryandra nivea
D. drummondii
D. cynaroides
D. aff. conferta
D. ferruginea
D. sp. nov.
Hakea incrassata
Petrophile brevifolia
Adenanthos cygnorum
Petrophile circinnata
Allocasuarina microstachya
Mesomelaena preissii
Eremaea pauciflora
Isopogon teretifolius
Petrophile ?divaricata
Melaleuca pungens
Hibbertia pungens
Hakea baxteri
Xanthorrhoea drummondii
Hakea lissocapha
H. prostrata
Petrophile ericifolia
Banksia sphaerocarpa
Melaleuca ?subtrigona
Hakea lehmanniana
Leptospermum erubescens
Caustis dioica

Site 15 *Allocasuarina huegeliana* (sheoak) Woodland

Vegetation Description : LAc *(Lepidosperma resinosum)*. Vtc. *Allocasuarina huegeliana* trees 6-8m; scattered *E. wandoo*
Soil Type : brown loamy sand
Topography : low-lying, flat terrain

Lepidosperma resinosum
Cheilanthes austro tenuifolia
Borya sphaerocephala (Jc) in places
*Ursinia anthemoides
Waitzia ?acuminata

Site 16a *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi (patchy). trees 5-6m; *Hypocalymma angustifolium* SBi/SDc/scattered shrubs
Soil Type : light brown sandy loam
Topography : lower gentle slope and flat terrain

Hypocalymma angustifolium
Borya sphaerocephala
Caustis dioica
Dryandra aff. conferta
Hakea incrassata
Mesomelaena preissii
Xanthorrhoea drummondii
Hakea lissocarpha
Loxocarya sp.
*Ursinia anthemoides
Acacia acuminata
Lomandra sp.
Petrophile divaricata
Persoonia striata
Eremaea pauciflora
Isopogon divaricata
Melaleuca ?subtrigona
Oxylobium parviflorum

Site 16b *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : LAi. *E. wandoo* LAc/LBc
Soil Type : orange-brown sandy clay loam
Topography : flat terrain at the bottom of the slope

Borya sphaerocephala
Acacia ?pulchella
Loxocarya sp.

Site 17 Tree Mallee

Vegetation Description : kTc scattered trees of *E. longicornis*
Soil Type : orange-brown clay loam 80% laterite
Topography : at the base of the slope Morrel LAc

Eucalyptus conglobata
Acacia erinacea
Eucalyptus longicornis
Dodonaea bursarifolia

Site 18 *Beaufortia incana* Heath

Vegetation Description : SBi. SCr/SCi scattered *E. wandoo* further west
Soil Type : orange-brown sandy loam, 30% laterite
Topography : summit of breakaway, laterite plateau

Stylidium repens
Dryandra subpinnatifida
Petrophile heterophylla
Hypocalymma angustifolium
Glischrocaryon aureum
Hakea gilbertii
Hakea incrassata
Banksia sphaerocarpa var caesia 1343
Adenanthos cygnorum
Dryandra drummondii
D. cynaroides
Melaleuca pungens
Calothamnus ?quadrifidus
Melaleuca ?subtrigona
Loxocarya sp.
Allocasuarina huegeliana
Xanthorrhoea drummondii
Leptospermum erubescens
Beaufortia incana
Jacksonia aff. floribunda
Dryandra nobilis
D. nivea

Site 19 *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : Mi scattered shrubs
Soil Type : orange-brown sandy clay loam, 40% laterite
Topography : flat terrain at the bottom of slope

Dodonaea bursarifolia

Acacia erinacea
Eucalyptus conglobata - mallee increasing in density upslope, with Eucalyptus longicornis becoming scattered.

Site 20 *Eremaea pauciflora* Heath

Vegetation Description : SCc
Soil Type : yellow loamy sand
Topography : low-lying, gentle slope/flat

Petrophile ericifolia
Xanthorrhoea drummondii
Leptospermum erubescens
Eremaea pauciflora (prominent)
Melaleuca pungens
Banksia sphaerocarpa
Synaphaea sp. nov.
Caustis dioica
Lambertia ilicifolia
Petrophile heterophylla
Hakea incrassata
Dryandra aff. conferta
D. nivea
D. sp. nov.
Melaleuca ?subtrigona
Isopogon teretifolius
Allocasuarina huegeliana
Leucopogon minutifolius

21a *Allocasuarina huegeliana* (sheoak) Woodland

Vegetation Description : LAc scattered shrubs, scattered trees of *Acacia acuminata* to 8m and *Eucalyptus wandoo*
Soil Type : dark brown sandy clay loam
Topography : flat, low lying area

Dodonaea bursarifolia
Loxocarya sp.
Acacia acuminata
Eucalyptus wandoo
Astroloma ?drummundii

Site 21b ***Allocasuarina huegeliana*** **(sheoak) Woodland**

Vegetation Description : LAc trees 8-10m, no understorey

Eucalyptus wandoo (edge)

Site 21c ***Eucalyptus wandoo*** **Woodland - Type 1**

Vegetation Description : LAi *E. wandoo* trees 8-15m
Allocasuarina huegeliana trees 6-8m,
scattered shrubs
Soil Type : brown sandy loam
Topography : gentle lower slope

Acacia acuminata	Loxocarya sp.
Borya sphaerocephala	Oxylobium parviflorum
Gastrolobium obovatum	Hypocalymma angustifolium
*Ursinia anthemoides	Glischrocaryon aureum

Site 22a ***Eucalyptus wandoo*** **Woodland - Type 2**

Vegetation Description : LAi. SBc
Soil Type : sandy loam, 90% laterite
Topography : gentle slope

Oxylobium parviflorum	Eucalyptus wandoo
Leptospermum erubescens	Dryandra sp. nov. (prominent)
Lomandra sp.	Eucalyptus astringens
Callitris roei	Melaleuca uncinata

Site 22b ***Dryandra*** **Heath**

Vegetation Description : SBc scattered *Eucalyptus wandoo* 6-8m
Soil Type : light brown sandy loam 10% laterite
Topography : slope

Dryandra sp. nov. (prominent)
Beaufortia incana
Dryandra aff. conferta
D. nivea
Allocasuarina huegeliana
Hakea ferruginea
Hakea incrassata
H. gilbertii
Callitris roei
Leucopogon dielsiana
Persoonia striata
Melaleuca pungens
Xanthorrhoea drummondii
Hibbertia pungens
Hakea lehmanniana
Melaleuca ?subtrigona
Petrophile brevifolia
Banksia sphaerocarpa
Isopogon teretifolius
Petrophile heterophylla
P. divaricata

Site 23 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi. scattered shrubs. Wandoo trees 6-15m; understorey patchy/*Melaleuca uncinata* Sc./SBi
Soil Type : grey-brown sandy loam
Topography : low-lying land, gentle slope and drainage line

Dianella revoluta
Calytrix ?leschenaultii 1247
Loxocarya parthenica (ms)
Dodonaea bursarifolia
Eucalyptus conglobata
Melaleuca uncinata (Sc in patches)
Hypocalymma angustifolium (Sbi in places)
Borya sphaerocephala
Hakea lissocapha
Dryandra sp. nov.
Petrophile ?trifida
Xanthorrhoea drummondii
Caustis dioica
Acacia lasiocarpa var. sedifolia 1245
Petrophile ericifolia
Acacia sp. nov. 1248
Astroloma ?drummundii 1250
Allocasuarina huegeliana
*Ursinan anthemoides
Oxylobium parviflorum
Leptospermum erubescens (Sbi)
Lomandra sp.
Dryandra sessilis
Eucalyptus conglobata
Lepidosperma ?tuberculatum
Hakea trifurcata

Site 24 Dryandra **Heath**

Vegetation Description : SBc *Dryandra* sp. nov. prominent
Soil Type : orange-brown sandy loam, 50% laterite
Topography : slope, lateritic uplands

Petrophile circinnata 1253
Calytrix ?oldfieldii 1254
Billardiera sericea 1255
Beaufortia micrantha
var. puberula 1256
Leucopogon minutifolius 1261
Petrophile heterophylla 1263
Beaufortia incana
Xanthorrhoea drummondii
Leptospermum erubescens
Hakea gilbertii
Hakea incrassata
Hibbertia pungens
Melaleuca pungens
Mesomelaena preissii
Acacia multispicata
Calothamnus quadrifidus 1257
Corynotheca micrantha 1258
Eucalyptus incrassata 1259
Grevillea tenuiflora 1260
Eucalyptus wandoo
Dryandra aff. conferta
D. nivea
Allocasuarina huegeliana
Lepidosperma sp.
Dryandra cynaroides
Beaufortia micrantha
Melaleuca ?subtrigona
Stylidium sp.
Petrophile ericifolia
Isopogon teretifolius

Site 25 *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : Mi scattered shrubs and *E. wandoo* trees
Soil Type : orange-brown sandy clay loam
Topography : flat to gently sloping terrain at base of slope

Dodonaea bursarifolia
Astroloma ?drummundii 1264
Helichrysum lepidophyllum 1265
Loxocarya sp.
Melaleuca uncinata
Hypocalymma angustifolium
Hakea nitida 1266
Acacia erinacea 1267
Drosera sp.
Eucalyptus flocktoniae
Stylidium sp.
Hakea incrassata

Site 26 Tree Mallee

Vegetation Description : kTc *E. longicornis* scattered in places (Mr near bottom of slope). Mallee to 8m
Soil Type : orange-brown sandy clay loam, 30% laterite
Topography : slope

Eucalyptus conglobata
Eucalyptus flocktoniae
Oxylobium parviflorum
Acacia erinacea
Dodonaea bursarifolia
Helichrysum lepidophyllum
Eucalyptus astringens
E. wandoo

Site 27 *Dryandra* Heath

Vegetation Description : SBd
Soil Type : orange-brown sandy loam, 50% laterite
Topography : gently sloping terrain

Eucalyptus stenanthina ssp. aspratilis
Eucalyptus albida
Beaufortia incana
Banksia sphaerocarpa
Adenanthos cygnorum 1275
Jacksonia aff. floribundua 1271
Melaleuca pungens
Melaleuca ?subtrigona
Beaufortia micrantha
Leptospermum erubescens
Lepidosperma sp.
Isopogon teretifolius
Callitris roei
Hakea lehmanniana
Petrophile striata
Dryandra sp. nov. (prominent)
D. nobilis 1272
D. cynaroides
D. squarrosa 1273
D. aff. conferta
Petrophile brevifolia 1274
Hemigenia aff. drummondii 1276
Xanthorrhoea drummondii
Dryandra nivea
Hakea gilbertii
Petrophile heterophylla
Cryptandra glabrata
Petrophile ericifolia
Hibbertia pungens
Leucopogon dielsiana

Site 28 ***Dryandra*** **Heath**

Vegetation Description : SBc patchy *Dryandra* sp. nov. (prominent)
Soil Type : orange-brown sandy loam, 70% laterite
Topography : gentle slope

Acacia pycnocephala 1279
Eucalyptus albida 1280
Eremaea pauciflora 1281
Verticordia grandiflora 1282
Gastrolobium obovatum 1283
Hibbertia pungens
Leptospermum erubescens
Hakea gilbertii
Hypocalymma angustifolium
Glischrocaryon aureum
Hakea baxteri
Petrophile trifida
Melaleuca pungens
Dryandra cynaroides
Xanthorrhoea drummondii
Eucalyptus incrassata
Melaleuca ?subtrigona
Allocasuarina huegeliana
A. microstachya
Grevillea tenuiflora

Site 29 Low Mixed Heath

Vegetation Description : Mixed shrubs SCc
Soil Type : yellow-brown sandy loam over laterite
Topography : flat-gently sloping terrain

Leptospermum erubescens)
Xanthorrhoea drummondii) scattered shrubs 1.5-2m
Isopogon teretifolius)
Beaufortia micrantha)
Synaphaea sp. nov. 1284
Eucalyptus albida 1287
Hakea aff. falcata 1288
Dryandra vestita 1289
Melaleuca ?scabra 1290
Verticordia roei 1291
Dryandra nivea
D. sp. nov.
Eremaea pauciflora
Lepidosperma ? tenue 1286
Melaleuca ?subtrigona
Hakea incrassata
Melaleuca pungens
Caustis dioica
Hibbertia pungens
Leucopogon minutifolius
Petrophile brevifolia
Leucopogon dielsiana
Verticordia ?grandiflora

Mesomelaena preissii
Hakea prostrata
Chloanthes coccinea
Petrophile circinnata
Petrophile ericifolia
Allocasuarina
Banksia sphaerocarpa
Dryandra aff. conferta

Site 30 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi. scattered shrubs
Soil Type : yellow-brown sandy loam
Topography : gentle slope and drainage line

Loxocarya sp.
Calytrix sp.
Hakea lissocarpha
Mesomelaena preissii (VLr in places)
Hibbertia pungens
Choretrum glomeratum
Leptospermum erubescens
Dryandra sp. nov.
Xanthorrhoea drummondii
Leucopogon minutifolius
Hakea incrassata

Site 31 Open Shrub Mallee over *Dryandra* Heath

Vegetation Description : kSr/kSi. SBc Mallee patchy over 10% cover in places
Soil Type : yellow-brown sandy loam, 10% laterite
Topography : slope

Eucalyptus falcata
E. albida
E. incrassata
Petrophile circinnata
Xanthorrhoea drummondii
Melaleuca pungens
Isopogon teretifolius
Eremaea pauciflora
Melaleuca ?subtrigona
Beaufortia micrantha
Hibbertia pungens
Dryandra sp. nov. (prominent)
Synaphaea sp. nov.
Dryandra nivea
D. vestita
D. aff. conferta
Mesomelaena preissii
Hakea incrassata
H. lehmanniana
Comesperma ?scoparium
Banksia sphaerocarpa
Billardiera sericea

Site 32 *Eucalyptus astringens/E. gardneri* Forest

Vegetation Description : LAc/LAd no understorey, scattered shrubs trees 8-10m, 70% cover
Soil Type : orange-brown sandy loam, 80% laterite
Topography : lateritic uplands, slopes and ridges

Eucalyptus gardneri dominant, some *E. astringens* and *E. falcata*

Dodonaea bursarifolia
Callitris roei (patch)
Eucalyptus flocktoniae 1292
E. incrassata

Site 33 *Dryandra* Heath

Vegetation Description : SBd scattered Mallee to 3-4m
Soil Type : orange-brown sandy loam, 60% laterite
Topography : slope, lateritic uplands

Isopogon teretifolius
Calothamnus sanguineus 1294
Persoonia quinquinervis 1295
Allocasuarina humilis 1296
Hemigenia incana 1297
Microcorys capitata 1298
Restio megalotheca 1299
Leptospermum erubescens
Dryandra nivea
Jacksoni aff. floribunda
Hibbertia pungens
Melaleuca uncinata
Adenanthos cygnorum
Calothamnus quadrifidus
Caustis dioica
Beaufortia incana
Banksia sphaerocarpa
Xanthorrhoea drummondii
Dryandra aff. conferta
D. cynaroides
D. sp. nov. (prominent)
D. squarrosa
Hakea incrassata
H. lehmanniana
Petrophile heterophylla
Mesomelaena preissii
Cryptandra ?pungens
Melaleuca pungens
Hakea aff. falcata

Site 34 Open Shrub Mallee over *Dryandra* Heath

Vegetation Description : kSr/kSi. SBc mallee patchy
Soil Type : orange-brown sandy loam 20% laterite
Topography : slope

Eucalyptus albida
E. gardneri
E. falcata
E. incrassata
Leptospermum erubescens
Hibbertia pungens
Hakea lissocarpha
Baeckea preissiana 1302
Dryandra aff. conferta
Petrophile ericifolia
P. brevifolia
P. circinnata
Melaleuca platycalyx 1300
Verticordia chrysantha 1303
Dryandra sp. nov. (prominent)
Beaufortia micrantha
Mesomelaena preissii
Isopogon teretifolius
Xanthorrhoea drummondii
Hakea incrassata
H. lehmanniana
Melaleuca ?subtrigona
Leucopogon dielsiana
Calothamnus quadrifidus
Lepidosperma sp.
Callitris roei
Sollya ?heterophylla 1301
Pityrodia terminalis

Site 35 *Beaufortia incana* Heath

Vegetation Description : SCc scattered emergent shrubs to 2m, (SBr in places)
Soil Type : orange-brown sandy loam, 90% laterite
Topography : gentle slopes/laterite uplands

Acacia multispicata 1309a
Hakea gilbertii)
Leptospermum erubescens)1.5-2m
Astroloma drummundii 1307a
Dryandra subpinnatifida 1308a
Lepidosperma gracile 1307
Adenanthos cygnorum
Acacia celastrifolia
Oxylobium parviflorum
Banksia sphaerocarpa (prominent in places)
Allocasuarina ?huegeliana
Beaufortia incana (prominent in in places)
Allocasuarina humilis
Hypocalymma angustifolium

Allocasuarina acutivalvis	Calothamnus quadrifidus
Melaleuca pungens	Jacksonia aff. floribunda
Dryandra cynaroides	Petrophile heterophylla
D. sp. nov.	Baeckea preissiana
D. nivea	Melaleuca ?subtrigona

Site 36 Tree Mallee

Vegetation Description : kTc *E. conglobata* 8-10m, scattered *E. salmonophloia* emergent to 20m, no understorey
Soil Type : clay loam
Topography : slope

Site 37a Tree Mallee

Vegetation Description : kTd/kTc
Soil Type : orange-brown clay loam, 80% laterite
Topography : slope

Eucalyptus astringens	Eucalyptus flocktoniae
Melaleuca uncinata	E. conglobata
Dodonaea bursarifolia	E. longicornis

Site 37b Shrub Mallee over *Melaleuca* Thicket

Vegetation Description : kSc/kTc. *Melaleuca uncinata* (patchy) SAd mallee 30% canopy cover
Soil Type : light brown sandy clay loam, 10% laterite
Topography : flat terrain, very gentle slope in places

Melaleuca haplantha (ms) 1309 (prominent in places)	Melaleuca uncinata (abundant)
	Hakea nitida

Phebalium tuberculosum 1310
Eucalyptus hypochlamydea
ssp. edysiustes 1311
E. flocktoniae
Petrophile ?trifida
Eucalyptus wandoo
E. astringens (edge)

Site 38 *Eremaea pauciflora* Heath

Vegetation Description : SBc *Allocasuarina huegeliana* emergent to 6m
Soil Type : yellow-brown loamy sand
Topography : flat/gentle slope

Eremaea pauciflora (prominent)
Banksia sphaerocarpa
Leucopogon dielsiana
Melaleuca ?subtrigona
Allocasuarina microstachya
Acacia multispicata
Leucopogon minutifolius
Hakea gilbertii
Beaufortia micrantha
Allocasuarina humilis
Grevillea tenuiflora
Hakea incrassata 1312
Leptospermum erubescens
(prominent in places)
Lepidosperma sp
Synaphaea sp.
Astroloma drummundii
Melaleuca pungens
Dryandra sp. nov.
D. aff. conferta
Isopogon teretifolius

Site 39 Open Shrub Mallee over *Dryandra* Heath

Vegetation Description : kSi. SAc
Soil Type : orange-brown sandy clay loam, 20% laterite
Topography : gentle slope

Eucalyptus incrassata
E. wandoo
E. falcata
E. albida
Dryandra nivea
Corynotheca micrantha
Lepidosperma sp.
Xanthorrhoea drummondii
Dryandra sp. nov (prominent)
Melaleuca ?subtrigona
M. pungens
Leptospermum erubescens
Acacia ?pycnocaphala
Hibbertia pungens

Petrophile brevifolia
Billardiera sericea
Hakea lehmanniana
H. gilbertii
Astroloma drummundii
Hibbertia enervia
Banksia sphaerocarpa
Daviesia sp.
Chamaexeros serra

Site 40 *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : LAr scattered *E. wandoo* and *E. astringens*, Morrel 12m
Soil Type : sandy clay loam, 10% laterite
Topography : flat terrain, famland - area degraded

Oxylobium parviflorum
Acacia acuminata
Eucalyptus conglobata (kTc patch)
Dodonaea bursarifolia
Melaleuca uncinata
Acacia ?sp. nov.

Site 41 Tree Mallee

Vegetation Description : kTc scattered shrubs
Soil Type : sandy clay loam, 20% laterite
Topography : slope

Eucalyptus flocktoniae
E. wandoo
E. gardneri
E. ?stenanthina
Melaleuca uncinata
Daviesia ?incrassata
Acacia ?sp. nov.
Eucalyptus conglobata

Site 42 Shrub Mallee over *Melaleuca* Thicket

Vegetation Description : kSc. *Melaleuca uncinata* SAc
Soil Type : light brown loam, 50% laterite
Topography : flat terrain

Eucalyptus ?stenanthina Mallee 4-6m
E. flocktoniae

E. wandoo
Dodonaea bursanifolia
Lepidosperma viscidum
Hakea lissocarpha
Oxylobium parviflorum
Hibbertia pungens

Site 43 *Eucalyptus wandoo* Woodland - Type 1 (adjacent to Nature Reserve)

Vegetation Description : LAi scattered shrubs/SCr
Soil Type : sandy loam
Topography : low-lying land, gentle slope

Melaleuca uncinata
Hakea incrassata
Lepidosperma viscidum
Mesomelaena preissii (VLi patch)
Allocasuarina huegeliana
Acacia acuminata
Calothamnus quadrifidus
Acacia ?pulchella
Beyeria ?leschenaultii
Xanthorrhoea drummondii
Borya sphaerocephala
Dryandra sp. nov.
Oxylobium parviflorum
Dodonaea bursarifolia
Hakea lissocarpha
Calytrix ?leschenaultii
Lomandra sp.
Loxocarya sp.

Site 44 *Allocasuarina huegeliana* (sheoak) Woodland

Vegetation Description : LAi. SDc/SDi *A. huegeliana* trees 4-8m
Soil Type : sandy loam, 5% laterite
Topography : low lying, flat terrain

Verticordia densiflora 1322
Baeckea ?blackettii 1323
Verticordia chrysantha 1324
V. roei 1325
Dryandra sessilis
Leptospermum erubescens (SBc)
Melaleuca uncinata (SAc)
Hakea prostrata
Caladenia drummondii 1350
Banksia prionotes 1326
Leucopogon minutifolius
Dryandra sp. nov.
Synaphaea sp. nov.
Hibbertia pungens
Acacia acuminata
Gastrolobium ?plicatum
Andersonia lehmanniana
Leucopogon dielsiana

Site 45 *Eucalyptus astringens/E. gardneri* Forest

Vegetation Description : LAd trees 8-10m
Soil Type : sandy loam, 80% laterite
Topography : lateritic uplands, slope

Dodonaea bursariifolia
Eucalyptus gardneri (prominent)
E. falcata
Eucalyptus astringens (prominent)

Site 46 *Eucalyptus wandoo* Woodland - Type 2

Vegetation Description : LAi. SAi *Dryandra* sp. nov. prominent
Soil Type : light brown sandy loam, 80% laterite
Topography : gentle slope

Eucalyptus astringens
Dodonaea bursariifolia
Oxylobium parviflorum
Hakea lissocarpha
Lomandra sp.
Melaleuca uncinata (SAi patches)
Borya sphaerocephala
Xanthorrhoea drummondii
Leptospermum erubescens
Callitris roei

Site 47 *Eucalyptus falcata* (Silver mallet) Woodland

Vegetation Description : LAi scattered shrubs; trees 10-12m
Soil Type : orange-brown sandy loam, 90% laterite
Topography : lateritic upland, gentle slope

Callitris roei
Beaufortia incana

Site 48 *Dryandra* Heath

Vegetation Description : SAd *Dryandra* sp. nov. dominant
Soil Type : sandy loam, 90% laterite
Topography : sloping terrain

Spyridium aff. tridentatum 1318	Eucalyptus incrassata
Callitris roei	E. wandoo
Melaleuca ?subtrigona	Hakea lissocarpha
Xanthorrhoea drummondii	Petrophile circinnata
Leptospermum erubescens	Cassytha pubescens
Lepidosperma viscidum	Melaleuca ?scabra

Site 49 *Eucalyptus longicornis* (Morrel) Woodland

Vegetation Description : Mi. kTc Mallee 8m
Soil Type : sandy clay loam
Topography : flat terrain

Eucalyptus conglobata
E. wandoo
E. longicornis

Site 50 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : *Eucalyptus wandoo* and *Allocasuarina huegeliana* LAi scattered shrubs
Soil Type : sandy loam
Topography : low-lying flat terrain

Eucalyptus wandoo	Borya sphaerocephala
Allocasuarina huegeliana	Loxocarya sp.
Oxylobium parviflorum	Leptospermum erubescens
Hakea lissocarpha	Dodonaea bursarifolia
Xanthorrhoea drummondii	Lomandra sp.
Dryandra sp. nov.	

Site 51 *Eucalyptus astringens/E. gardneri* Forest

Vegetation Description : LAc
Soil Type : sandy clay loam, 20% laterite
Topography : lateritic uplands, slope

Scattered Eucalyptus longicornis
E. salmonophloia
E. conglobata
E. wandoo
Eucalyptus astringens (dominant)
Oxylobium parviflorum
Dodonaea bursariifolia

Site 52 *Eucalyptus salmonophloia* (Salmon gum) Woodland

Vegetation Description : Mi no understorey, scattered shrubs, trees 16-20m
Soil Type : brown sandy loam
Topography : gentle slope

Eucalyptus salmonophloia (dominant)
E. longicornis
E. wandoo
E. astringens

Site 53 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi. scattered *E. longicornis*, scattered shrubs
Soil Type : light brown sandy loam, 80% laterite
Topography : lower slopes and drainage line

Oxylobium parviflorum
Astroloma drummundii
Allocasuarina campestris (Sc)
Lomandra sp.
Melaleuca uncinata (SAi)
Dodonaea bursarifolia
*Aira caryophyllea

Top of hill *Allocasuarina huegeliana* Woodland with *Isopogon divergens, dampiera ?lindleyi.*

Site 54 *Eucalyptus salmonophloia* (Salmon gum) Woodlands

Vegetation Description : Mi scattered shrubs; trees 20-25m
Soil Type : brown sandy clay loam
Topography : low-lying, flat terrain

Acacia erinacea
Daviesia ?incrassata
Acacia pulchella

Site 55 Tree Mallee

Vegetation Description : kTc scattered shrubs, scattered *E. longicornis* edge
Soil Type : sandy clay loam, 10% laterite
Topography : slope

Eucalyptus conglobata (prominent)
E. longicornis
E. astringens
Astroloma drummundii
Pterostylis sargentii 1351
Melaleuca uncinata
Dodonaea bursariifolia

Site 56 *Eucalyptus wandoo* Woodland - Type 1

Vegetation Description : LAi scattered shrubs and scattered *Eucalyptus longicornis* emergent to 18m
Soil Type : light brown sandy loam (sheep access)
Topography : gentle slope, drainage line

Astroloma drummundii
Dryandra sp. nov.
Acacia ?pulchella
Melaleuca uncinata
Borya sphaerocephala
Hakea lissocarpha

Site 57 ***Dryandra*** **Heath**

Vegetation Description : SAc
Soil Type : light brown sandy loam, 50% laterite
Topography : laterite crusted plateau, gentle slope

Eucalyptus ?incrassata 1344
Calytrix sp.
Xanthorrhoea drummondii
Eucalyptus wandoo
E. albida
HIbbertia pungens
Dryandra aff. conferta
Melaleuca pungens
Beaufortia incana
Petrophile brevifolia
Santalum acuminatum
Petrophile trifida
Melaleuca ?subtrigona
Cryptandra ?pungens
Hakea lehmanniana
H. gilbertii
H. incrassata
Isopogon teretifolius
Banksia sphaerocarpa
Gastrolobium obovatum
Hypocalymma angustifolium

Site 58 ***Eucalyptus wandoo*** **Woodland - Type 1**

Vegetation Description : LAi scattered shrubs

Soil Type : orange-brown sandy loam
Topography : flat, adjacent to Birdwhisle road

Dryandra fraseri 1346
Hibbertia commutata
Lepidosperma tenue
Callitris roei
Oxylobium parviflorum
Astroloma ?drummundii
Melaleuca uncinata (SBi)
Borya sphaerocephala
Leptospermum erubescens
Hakea lissocarpha
Hypocalymma angustifolium
Dryandra sp. nov.
Calothamnus quadrifidus

Site 59 *Allocasuarina huegeliana* (sheoak) Woodland

Vegetation Description : LAc scattered *Eucalyptus loxophleba* to 8m
Allocasuarina huegeliana to 6-7m
Soil Type : dark brown loam
Topography : gentle slope

Borya sphaerocephala
Stypandra ?glauca
Astroloma drummundii
*Briza maxima
*Avena sativa/fatua
Loxocarya sp.

— LEGEND FOR. —

WICKEPIN GROUP.

WICKEPIN SHEET

On 385B/40

DENSELY STOCKED AREAS.
MALLET Brown. Blue and White.
CARRYING MALLETS. (mallet country.)

WANDOO – DRYANDRA sometimes CASUARINA RIDGES. (mostone.)

CASUARINA – WANDOO (casuarina sometimes pure with granite outcrops.)

WANDOO – SLOPE Poor gravel where WANDOO is stunted.

MORRELL – SALMON GUM. JAM. and CASUARINA. (good loam.)

JAM – MANNA GUM. YORK GUM & CASUARINA.

HELIOS LOOKOUT. sites. High points.
Open view.

Other species noted as they occur.

Barren patches. devoid of trees. usually Mallee & Backboys.

Pegged. Firebreaks.

Thinnings.
A. immediate yield
B. n yield.
A+B. ocurr soon yield

'BIRDWHISTLE ROCK' RESERVE

FIGURE 5

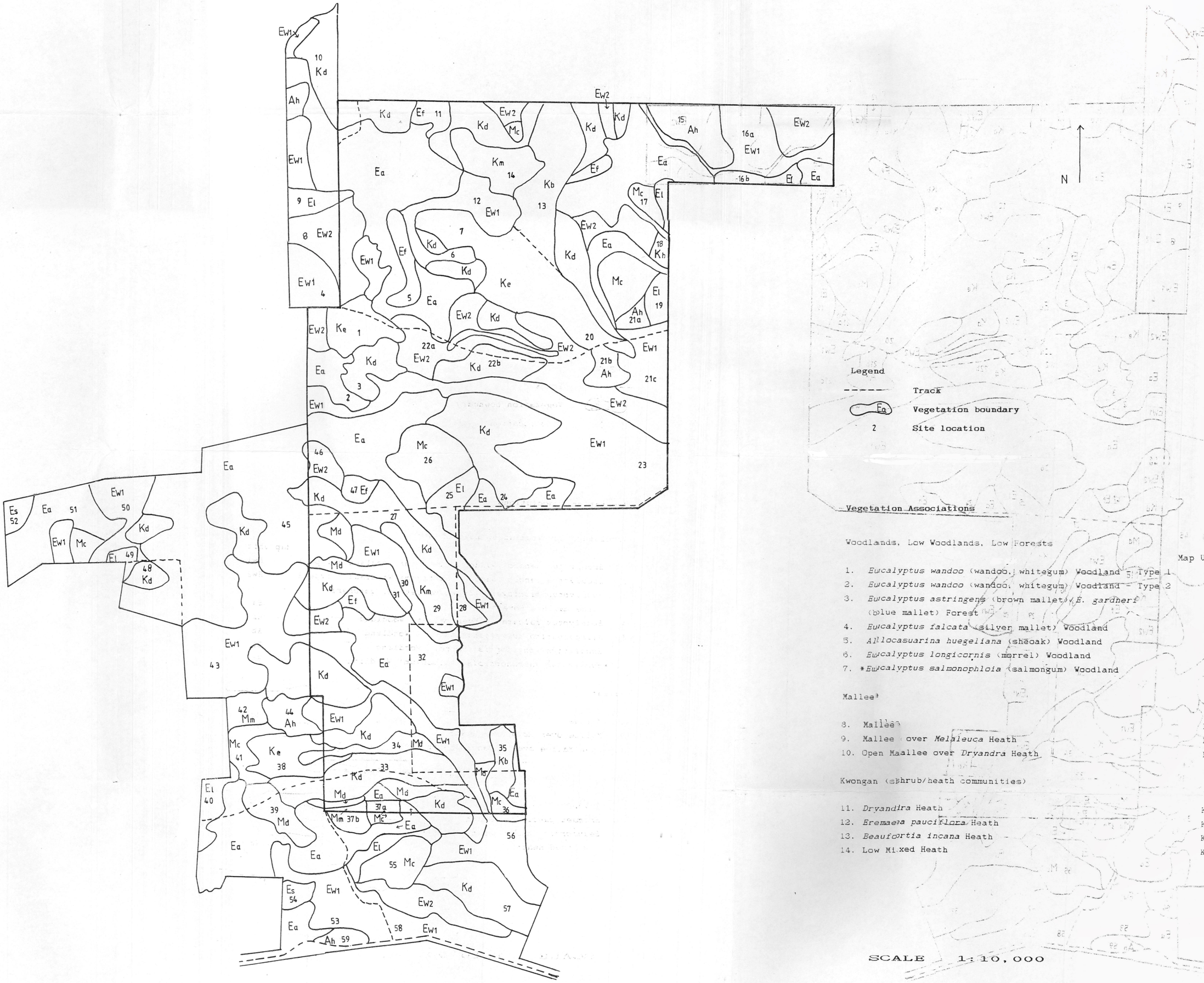
Scale: 10 chains to an inch.

Location 12795 is unimproved.

CANCELLED AREA ONLY

HEAVILY STOCKED – 212.4 ac
MALLET COUNTRY — 49 ac.

FIGURE 6 VEGETATION OF BIRDWHISTLE NATURE RESERVE AND ADJACENT BUSHLAND


Ew1
10 Kd
Ah
Ew1
9 El
8 Ew2
Ew1
4
Ew2 Ke 1
Ea
Kd
3
2
Ew1
Ea
46
Ew2
Kd
47 Ef
Es 52
Ea 51
Ew1 50
Ew1
Mc
Kd
El 49
48 Kd
Kd
45
Md
Ew1
Md
Kd
Ef
Ew2
Ew1
43
Kd
Ea
42 Mm
44 Ah
Ew1
Mc 41
Ke 38
Kd
El 40
39
Md
Ea
Ea
Ea
Kd
Ew2
Kd
Ef 11
Kd
Ew2
Mc
Km 14
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Kb
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25 El
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35 Kb
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37a
Mm 37b
Mc
Ea
Kd
Mc
36
Ea
56
El
55 Mc
Ew1
Kd
Es 54
Ew1
Ew2
57
Ea
53
58
Ew1
Ah 59
Ew2
Ea
Ew1
Mc
El 49
48 Kd
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Mc 17
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El 19
Ah 21a
20
Ew1
21b Ah
21c
Ew2
Ew1
Ew2
Ea
Ew1
Ea
Ea
Ea