II VEGETATION OF EAST YUNA AND BINDOO HILL NATURE RESERVES

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General

East Yuna and Bindoo Hill Nature Reserves lie within the Irwin district of the South-western Botanical Province of Gardner and Bennetts (1956). For geology of the reserves and their location see Dell (this report).

The vegetation of the region has been mapped by Beard and Burns (1976) who also include a list of 247 plants found on East Yuna Nature Reserve. No documented plant collections had been made on Bindoo Hill Nature Reserve prior to my survey.

The vegetation of East Yuna Nature Reserve (EYR) is described briefly in **Appendix 1** and illustrated in **Fig. 4.** A list of plant species recorded at various localities is included in **Appendix 2.**

The vegetation of Bindoo Hill Nature Reserve (BHR) is described briefly in **Appendix 3** and illustrated in **Fig. 5.** A list of plant species recorded at various localities is included in **Appendix 4.**

Methodology

The vegetation of East Yuna and Bindoo Hill Nature Reserves was mapped at Level 1 of the reliability scale set out in Muir (1977a). Each vegetation formation discernible on the air photographs was examined on the ground; at least one location was described in detail within each major association using the classification shown in **Table 1** and discussed in detail in Muir (1977a); and a soil profile was described for each major association.

Level 1 locations shown in **Fig. 4** and **Fig. 5** represent 'sample areas' where the vegetation was examined in detail. The following prefix numbers of the locations represent basic formation types (Muir 1977a).

1 = woodland formations
2 = mallee formations
3 = shrubland formations
4 = heath formations
6 = breakaway complexes
8 = other

The methods used in classifying formations, coding vegetation, preparing plant lists, classifying litter and describing soils are those of Muir (1977a).

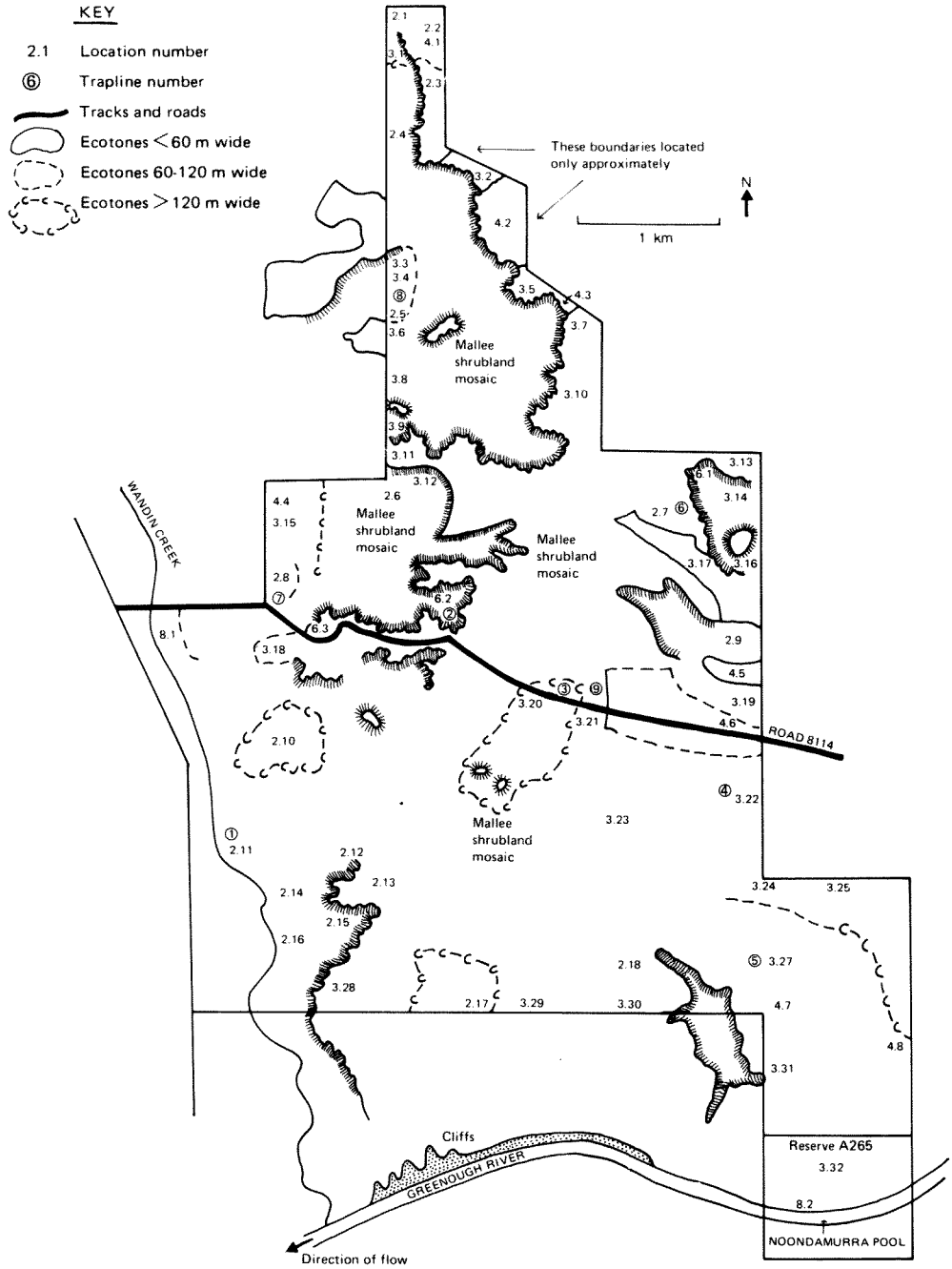

Fig. 4: Map of East Yuna Nature Reserve showing vegetation location numbers, ecotones, and location of traplines.

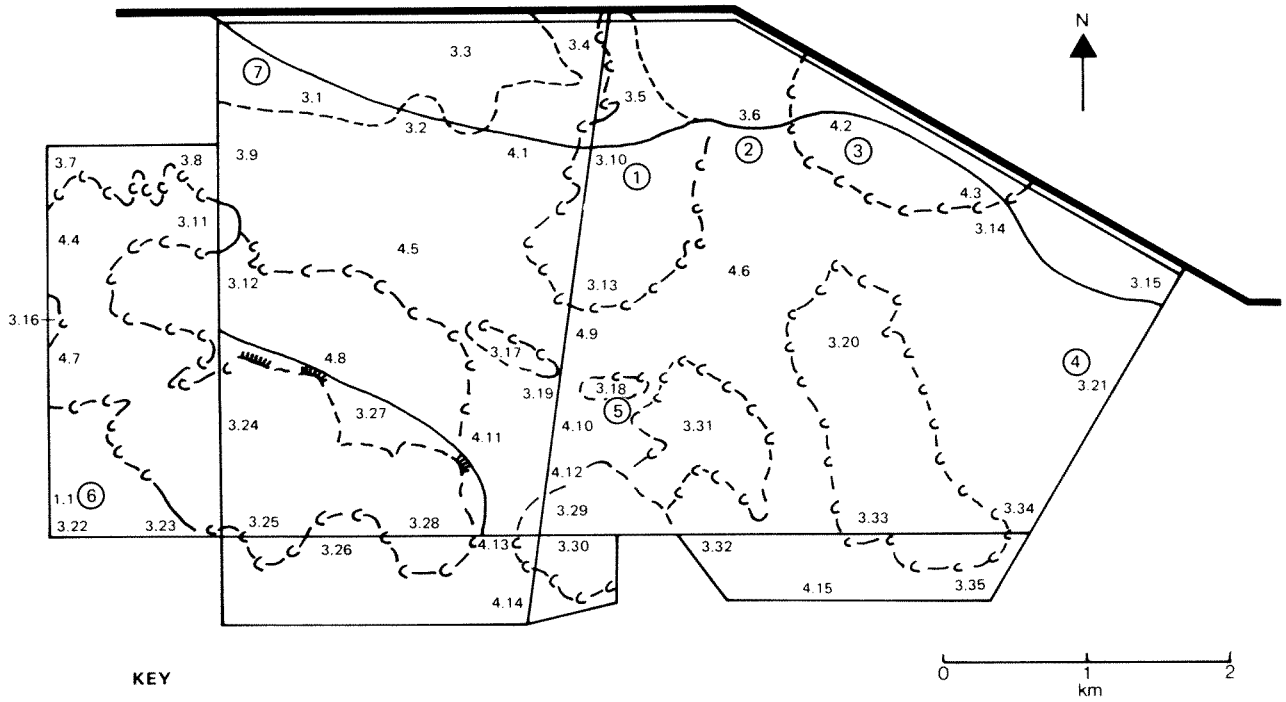

Fig. 5: Map of Bindoo Hill Nature Reserve showing vegetation location numbers, ecotones, and location of traplines.

TABLE 1

Vegetation Classification to be used in Wheatbelt Survey

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 > 30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M	Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA	Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB	Trees < 5m	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 > 2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA	Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB	Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC	Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD	Shrubs 0.0-0.5m	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 > 0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL	Bunch grass < 0.5m	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 > 0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL	Sedges < 0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X	Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
	Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

DISCUSSION

Vegetation Formations

East Yuna Nature Reserve (EYR) has mallee, shrubland, heath and breakaway complex formations, and if the water reserve (A265) is included, a small area of woodland along Noondamurra Pool. Bindoo Hill Nature Reserve (BHR) has only shrublands and heaths, and if its adjacent Water Reserve is included, a small area of woodland. Breakaways are also present on Bindoo Hill Water Reserve but carry vegetation more or less identical to that of the platform and outwash zones. Any difference in vegetation or vertebrate habitat provided by these breakaways is attributable to the geomorphology rather than the vegetation. I consider that inclusion of these areas as 'breakaways' on BHR would be misleading when they are compared to the distinct breakaways of EYR. The total number of vegetation formations on the two reserves are therefore East Yuna 5 (excluding the watercourse and cleared land), Bindoo Hill 3.

Adjacent to EYR is an area of privately owned, uncleared land carrying a woodland (referred to by the owner, and in this paper as Falkirk Forest) and having a fairly long mutual boundary with the reserve. In terms of faunal utilisation this land is effectively part of the reserve and provides the only sizeable area of woodland nearby.

On EYR vegetation types correlate fairly well with topography. The plateau areas carry yellow sands and support *Banksia ashbyi*, *B. sceptrum* and *Actinostrobus arenarius* associations; the 'plateau scarps' are exposures of Tumblagooda Sandstone, on which the whole of EYR is located, and carry dense shrublands, e.g. *Melaleuca uncinata* and several other species according to drainage, soil depth and aspect; and the 'valley floors' or 'plains' below the breakaways carry mallee or dense stands of *Acacia* or *Casuarina* shrubs.

There is a good deal of local variation within these divisions, such as alluvial sand pockets carrying *Actinostrobus*. The moisture and heavy colluvial soils of Noondamurra Pool support woodland, as does the heavier glacial derived soils of the Nangetty Formation found in Falkirk Forest. It would be noted here that the Urella Fault which separates Tumblagooda Sandstone to the east from Nangetty Formation to the west lies parallel to, and virtually on, the western boundary of the southern portion of East Yuna Reserve.

On Bindoo Hill Reserve most of the area is undulating or heavily dissected stony outcrops of Tumblagooda Sandstone with a mosaic of *Melaleuca nematophylla* or *Casuarina campestris* associations. Areas of yellow sand carrying *Banksia* associations and lower lying white sand carrying *Actinostrobus* over heaths are present. Woodland on the Water Reserve is situated on

a watercourse which drains an area of dissected country and it appears the high runoff compensates somewhat for the otherwise light soil and has allowed trees to become established.

Laterite gravel is absent from both reserves although ferruginisation is apparent in both the Tumblagooda Sandstone and Nangetty Formation. The ferruginised areas do not appear to carry plant species different from those found elsewhere on the reserves.

Area and proportion of the reserves occupied by each formation is set out below. The table also indicates the area of each formation as uncleared contiguous with the reserve.

Formation	East Yuna and Water Reserve combined		Adjacent	Bindoo Hill and Water Reserve		Adjacent
	Approx. area ha	% reserve		Approx. area ha	% reserve	
Woodland	5	0.28	200+	—	—	4
Mallee	380	21	—	—	—	—
Shrubland	1100	60.6	30+	310	66	116
Heath	100	5.5	500+	170	34	36
Breakaway	200	11	—	—	—	—
Watercourse	20	1.1	—	—	—	—
Other	10	0.6	—	—	—	—

The table shows that woodland is very poorly represented or absent on both reserves although EYR has a stand adjacent to it. It must be emphasised that this adjacent woodland (Falkirk Forest) is privately owned, and that its significance to the fauna of the region is very great (see Dell and McGauran, this report). There are scattered trees in several parts of EYR, particularly near locs 2.12, 2.13 and 2.14 and in some parts of Wandin Creek, but their canopy cover never exceeds 2% and they do not form a distinct stratum.

Mallee is fairly well represented on EYR but is absent as a formation on BHR although scattered scrub mallee are present (particularly in loc. 3.21).

The majority of both reserves is covered by shrubland and the remainder of BHR by heath. Heath is poorly represented on EYR and is almost exclusively the result of recent burning, as is the *ca* 500 ha of heath adjacent to the reserve. The regrowth of the heaths will climax as shrubland. Breakaway complexes make up *ca* 10% of EYR and are important in that their large area and great variability introduces a high degree of habitat diversity for fauna.

Associations

Associations as used here includes associations, associes and consociations according to the definitions of Beadle and Costin (1952) and Polunin (1960).

Associations found on East Yuna and Bindoo Hill Reserves are listed below.

East Yuna Reserve

WOODLAND — absent

MALLEE
Eucalyptus dongarraensis
E. dongarraensis-Acacia ligulata
E. dongarraensis-E. ebbanoensis
E. jucunda-E. dongarraensis
E. jucunda-E. ebbanoensis
E. leptopoda-E. dongarraensis

SHRUBLAND
Acacia acuminata
A. ligulata
A. neurophylla-Casuarina campestris-Melaleuca uncinata
A. neurophylla-M. eleutherostachya
Actinostrobus arenarius
Banksia ashbyi-Actinostrobus arenarius
C. campestris
C. campestris-A. signata
C. campestris-Eremaea pauciflora
C. campestris-M. uncinata
Grevillea candicans
M. uncinata
Mixed with no dominant

HEATH
Acacia acuminata-Acacia sp. indet. 1
A. neurophylla
Casuarina campestris
C. campestris-Melaleuca uncinata
M. uncinata

OTHER (Noondamurra Pool)
Casuarina obesa-Eucalyptus camaldulensis

Bindoo Hill Reserve

WOODLAND
Eucalyptus loxophleba

MALLEE — absent

SHRUBLAND
Acacia affin. *blakelyi*
A. signata-Melaleuca nematophylla
Actinostrobus arenarius (occurs mostly as emergents over a heath, but exceeds 2% in limited areas)

Banksia ashbyi-B. sceptrum
B. sceptrum
Casuarina campestris
C. campestris-Acacia stereophylla
M. nematophylla
M. uncinata — mixed (numerous species of about equivalent dominance)

HEATH
Casuarina campestris-Thryptomene racemulosa-Calothamnus blepharospermus
Conospermum distichum — mixed

Number of Associations

	East Yuna	Bindoo Hill
Woodland	—	1
Mallee	6	—
Shrubland	13	9
Heath	5	2
Other	1	—
Total	25	12

Shrublands have the greatest number of associations on both reserves, all other formations having very few associations or being entirely absent. EYR has about twice as many associations, largely due to the plateau-breakaway-valley floor structure of the reserve. In contrast BHR has only undulating rocky hills and areas of sand.

In terms of number of associations per area of 'reserve' (which includes the water reserves at each place), Bindoo Hill has *ca* 2.5 associations per km^2 as compared to East Yuna with *ca* 1.4 associations per km^2. Bindoo Hill is thus relatively more diverse at association level.

Abundance of Senescent Trees

Using Muir's (1977b) index of relative abundance of senescent trees the East Yuna Reserve, Water Reserve and adjacent uncleared woodland (Falkirk Forest) can be evaluated.

Area	Area of actual canopy	% senescent	Index
East Yuna Reserve	est. 0.005 ha	2	0.0001
Water Reserve	2.5 ha	5	0.13
Falkirk Forest	*ca* 12 ha	90	10.8

The index indicates that EYR and associated Water Reserve are very low in numbers of available hollow tree limbs and trunks but that Falkirk

Forest is very rich in both. Dell and McGauran (this report) support the supposition that the number of birds which nest in hollow limbs or trunks is very high in Falkirk Forest and that breeding of these species is virtually absent on the reserve.

An index of senescent trees on Bindoo Hill Nature Reserve and adjacent Water Reserve is:

Area	Area of actual canopy	% senescent	Index
Bindoo Hill Reserve	0	0	0
Water Reserve	0.16 ha	95	0.5

This low index reflects the small area of woodland available and not the degree of utilisation by birds, which is exceptionally high. In this instance the percentage senescence is the important factor, and the area is of great importance to the breeding birds of the region (Dell and McGauran, this report).

Floristics

The vegetation of both East Yuna and Bindoo Hill Nature Reserves is both complex and highly mosaic in distribution, making adequate collection difficult. Compounding this problem was the dry season previous to the survey (in October 1976) which caused very few plants to flower, thus making differentiation of similar species almost impossible. As a result only 164 plant species on EYR and 83 plant species on BHR were recognized, the majority of these identified on leaf and stem characters. From experience elsewhere in the wheatbelt I estimate there may be *ca* 350 species of larger plants on EYR and *ca* 200 species on BHR.

Beard and Burns (1976) list 247 plant species for EYR including 159 species not recorded by me, and I record 71 species not listed by them. If one adds the 164 species I found to the 159 recorded by Beard and Burns and not found by me one arrives at a figure of about 323 species of larger plants for the reserve. This approximates my estimate of *ca* 350. EYR is thus abundant in plant species in comparison to other reserves in the wheatbelt, the highest previous estimates being North Tarin Rock (Muir 1976), Bendering (Muir 1977a) and Dongolocking (Muir 1978a) Reserves, all with estimates of *ca* 300 species.

No previously published list of plant species is available for BHR and so the estimate is based entirely on my collection. The estimated 200 species is comparable to that of some of the smaller reserves, e.g. Durokoppin and Kodj Kodjin (Muir 1978b) and Yornaning Reserves (Muir 1979) surveyed in the wheatbelt.

In terms of number of species estimated per area of reserve, EYR has 20 spp./km^2 and BHR 41 spp./km^2. Compared to the estimated average number (*ca* 28) of species per square kilometre for the rest of the wheatbelt, EYR is poor in species and BHR relatively high.

When Beard and Burns (1976) and my own species list is combined, 49 families are recorded on EYR dominated by Myrtaceae, Proteaceae and Mimosaceae amongst the dicotyledons and Liliaceae amongst the monocotyledons. On BHR I recorded 24 families, the dicotyledons again dominated by Myrtaceae, Proteaceae and Mimosaceae but with the monocotyledons dominated by Restionaceae.

Species number and number of species per area of each formation as determined from my species lists of EYR and BHR are as follows (Beard and Burns [1976] list cannot be related to formations):

Formation	EYR		BHR	
	number	spp./ha	number	spp./ha
Mallee	87	0.2	—	—
Shrubland	60	0.05	82	0.17
Heath	57	0.6	—	—
Breakaway	16	0.08	—	—

In addition, woodland at Noondamurra Pool had 13 species (2.6 spp./ha) and on Bindoo Hill Water Reserve had 16 species (4.0 spp./ha). On EYR each of the formations (apart from the breakaways) has similar numbers of species, but heath (fire regeneration) is the most diverse in relation to area. This indicates that shrubland regrowing after fire has *ca* 12 times the number of species per area as does shrubland that is unburnt. In relation to shrublands elsewhere in the wheatbelt, those of EYR are poor in species but number of species in other formations is comparable to reserves elsewhere.

The distribution of 'restricted species', those found only in a single formation type, is set out below for EYR:

Formation	Number species	Spp./ha
Mallee	36	0.09
Shrubland	30	0.03
Heath	12	0.12
Breakaway	7	0.04

The number of restricted species per hectare of formation is particularly high in mallee, low in shrublands and similar to wheatbelt reserves elsewhere in both heath and breakaways. Total number of restricted species recorded on EYR by me was 85 and thus *ca* 52% of the total species recorded were of

restricted distribution. On BHR the only species *in common* between woodland on the Water Reserve and the shrublands was *Acacia acuminata*, the remaining species being restricted to either woodland or shrubland.

It is of interest that of the total of 184 plant species recorded on the two reserves only 63 (34%) were common to both.

A synthesis of all ecological and floristic data for the reserves will be included in the final wheatbelt study to be presented later.

APPENDIX 1

VEGETATION DESCRIPTIONS
EAST YUNA RESERVE

MALLEE FORMATIONS

- **Loc. 2.1**

Basically as loc. 2.7 with patches of shrubland similar to loc. 3.19. *Casuarina acutivalvis* prominent in stratum 1 in some areas.

- **Loc. 2.2**

Area of *Eucalyptus dongarraensis*, *E. leptophylla* and *E. redunca* shrub mallee, stratum 4-6 m tall, 10-30% canopy cover.

- **Loc. 2.3**

Eucalyptus dongarraensis and scattered *E. ebbanoensis* shrub mallee, stratum 4-6 m tall, 10-30% canopy cover over *Plectrachne danthonioides* hummock grass, 0.3 m tall, 2-10% canopy cover. Soil is very stony.

- **Loc. 2.4**

Mosaic of associations similar to locs 2.3 and 3.19. *Eucalyptus drummondii* scattered throughout.

- **Loc. 2.5 (Trapline 8)**

Key Description

Open Shrub Mallee *over* Hummock Grass *on* fine sandy loam.

Code eKSi.tHi/FSL

Loc. Details

Stratum 1. *Eucalyptus leptopoda* and *E. dongarraensis* shrub mallee mature, stratum 0-10 m tall, 10-30% canopy cover.

Stratum 2. *Plectrachne danthonioides* hummock grass, mature, 0.5 m tall, 2-10% canopy cover.

Comments

Some young plants present, mostly less than 1.5 m tall. *Plectrachne* clumps burnt by the Museum Survey Team in 1973 show no signs of seedling growth in the burnt areas apart from two *Casuarina acutivalvis* shrubs 0.7 m tall. *Ricinocarpus velutinus* abundant on firebreak adjacent to paddock. No evidence of fire and area probably not burnt for *ca* 55 years.

Litter

Moderately abundant, mostly terete leaves, bark and twigs, clumped to 2 cm deep beneath shrubs, clumps 1-10 m apart.

Soil

Friable soil greater than 1 m deep. 15 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 5.8, reddish-yellow, 7.5 YR 6/6, fine sandy loam.

40 cm sample moderately pedal, earthy, very coherent, unbleached, non-calcareous, pH 6.5, reddish-yellow, 7.5 YR 7/6, clay loam.

Comments

Soil reaction trend — neutral, drainage excessive, situated in low area between breakaways.

- Loc. 2.6

Mosaic of mallee similar to loc. 2.5 with some shrubland similar to loc. 3.19 and scattered *Actinostrobus arenarius* shrubs. Some clumps of *Casuarina acutivalvis* 4-6 m tall, 70-100% canopy cover. Some *Eucalyptus foecunda* present.

- Loc. 2.7 (Trapline 6)

Key Description

Open Shrub Mallee *over* Open Dwarf Scrub C *over* Open Hummock Grass *on* sandy clay loam.

Code eKSi.xSCr.tHr/SCL

Loc. Details

Stratum 1. *Eucalyptus jucunda* shrub mallee, *E. dongarraensis* shrub and tree mallee and several species of shrubs, immature, stratum 3-5 m tall, 10-30% canopy cover.

Stratum 2. *Acacia coolgardiensis* and several species of shrubs, senescent, stratum 0.5-1 m tall, 2-10% canopy cover.

Stratum 3. *Plectrachne danthonioides* hummock grass, senescent, stratum 0.5 m tall, 2-10% canopy cover.

Comments

Several young plants of *Plectrachne* present. Some *E. dongarraensis* emergent to 6 m. No evidence of fire. Area is probably *ca* 50 years old. Some *E. ebbanoensis* between locs 2.7 and 3.10 and a small patch of *Casuarina campestris, Melaleuca uncinata* and *Acacia signata* 1.5-3 m tall, 30-70% canopy cover near corner of reserve.

Litter

Moderately abundant, mostly broad leaves, terete leaves and dead *Plectrachne* clumps. Mostly clumped beneath shrubs to 2 cm deep, clumps continuous or up to 2 m apart.

Soil

Friable soil deeper than 1 m. 0-10 cm slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 5.7, reddish-yellow, 7.5 YR 6/8, sandy clay loam.

10-20 cm as above, but shows patches of blotchy bleached areas up to 2 cm across.

20 cm onwards moderately pedal, sandy, coherent, unbleached, non-calcareous, pH 5.6, reddish-yellow, 10 YR 7/8, sandy clay loam. Contains *ca* 2% rock fragments.

Comments

Soil reaction trend — acid, excessively drained, situated on top of breakaway platform.

- **Loc. 2.8 (Trapline 7)**

Key Description

Open Shrub Mallee *over* Hummock Grass *on* sandy clay loam.

Code eKSi.tHi/SCL

Loc. Details

Stratum 1. *Eucalyptus dongarraensis* shrub mallee and *Acacia ligulata* shrubs, mature, stratum 1-13 m tall, 2-10% canopy cover.

Stratum 2. *Plectrachne danthonioides* hummock grass and *Labichea lanceolata* var. *teretifolia* shrubs, mature, stratum 0-0.5 m tall, 10-30% canopy cover.

Comments

Ecotone between locs 3.15 and 2.8 has abundant *Ecdeiocolea monostachya* 30-70% canopy cover. Area was chained in 1962 and again in 1966; regrowth is *ca* 10 years old.

Litter

Moderately abundant, mostly broad leaves, terete leaves and dead *Plectrachne* clumps. Mostly clumped beneath shrubs to 1 cm deep, clumps *ca* 6 m apart.

Soil

Horizon A soil is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.2, pink, 7.5 YR 7/4, sandy clay loam.

Comments

Well drained. Situated in area of runoff from breakaways, prone to flooding after rain.

- **Loc. 2.9**

Key Description

Very Open Shrub Mallee *over* Open Dwarf Scrub C *over* Open Hummock Grass *on* sandy clay loam.

Code eKSr.xSCr.tHr/SCL

Loc. Details

Stratum 1. *Eucalyptus dongarraensis* and *E. ebbanoensis* shrub mallee, immature, stratum 2-3 m tall, 2-10% canopy cover.

Stratum 2. *Casuarina campestris, Acacia* sp. 1 and several other species of shrubs, mature, stratum 0.5-1 m tall, 2-10% canopy cover.

Stratum 3. *Plectrachne danthonioides* hummock grass and some shrubs, mature, stratum 0.5 m tall, 2-10% canopy cover.

Comments

Seedlings of *C. campestris* and *Acacia* sp. 1 present. Some mallees emergent to 4 m. No evidence of fire. Area may have been disturbed at some time — age uncertain.

Litter

Sparse, terete leaves and clumps of large debris. Litter is *ca* 0.5 cm deep and in patches up to 1.5 m apart — piles of large debris are generally 5-15 m apart.

Soil

Friable soil deeper than 1 m. 0-20 cm non-pedal, sandy, very poorly coherent, unbleached, non-calcareous, pH 6.1, reddish-yellow, 7.5 YR 6/6, sandy clay loam.

20-28 cm slightly pedal, sandy, coherent, evenly bleached, non-calcareous, pH 6.2, reddish-yellow, 7.5 YR 7/6, sandy clay loam.

31 cm onwards highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH 6.3, reddish-yellow, 7.5 YR 6/8, sandy clay loam.

Comments

Soil reaction trend — acid, excessively drained. Situated on lowest point of depression between two low hills.

- **Loc. 2.10**

  As for loc. 2.6.

- **Loc. 2.11 (Trapline 1)**

Key Description

Very Open Shrub Mallee *over* Open Dwarf Scrub C *over* Open Hummock Grass and Very Open Low Sedges *on* fine sandy loam.

Code eKSr.m_1SCr.tHn_1VLr/FSL

m_1 = *Melaleuca subtrigona*
n_1 = *Mesomelaena* sp. 1

Loc. Details

Stratum 1. *Eucalyptus dongarraensis* and *E. foecunda* shrub mallee, immature, stratum 4-7 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca* affin. *subtrigona* shrubs, mature, stratum 0.5-1 m tall, 2-10% canopy cover.

Stratum 3. *Plectrachne danthonioides* hummock grass and *Mesomelaena* sp. 1 sedge, mature, stratum 0-0.5 m tall, 2-10% canopy cover.

Comments

In very small areas strata 2 and 3 may reach canopy cover levels of 30-70%. No evidence of fire. Area was rolled in 1929 and chained in 1966. The vegetation is thus *ca* 10 years old.

Litter

Sparse, mostly terete leaves and twigs, clumped, beneath shrubs to 0.5 cm deep, clumps 2-4 m apart.

Soil

Horizon A sample is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 6.1, yellowish-red, 5 YR 5/8, fine sandy loam. Drainage is poor. Situated on raised banks beside Wandin Creek.

- **Loc. 2.12**

Mosaic of areas similar to loc. 2.11 with patches of vegetation similar to loc. 3.16 and 3.19 and areas of *Eucalyptus loxophleba* tree mallee and *Acacia signata* and some *A. acuminata*. Some *E. loxophleba* reach 10 m in height and are senescent.

- **Loc. 2.13**

Mosaic of areas similar to locs 2.5, 2.7, 2.11 and 3.16.

- **Loc. 2.14**

Eucalyptus ebbanoensis, *E. dongarraensis* and *E. loxophleba* shrub and tree mallees 2-10 m tall. Some areas clumped, others scattered, and with varying percentages of each species. Understory of mixed shrubs and/or *Plectrachne danthonioides* up to 0.5 m tall. Patches similar to loc. 2.8 are present.

- **Loc. 2.15**

Mostly as for loc. 2.12 with mosaic of areas similar to locs 2.5, 2.7, 2.11 and 3.16.

- **Loc. 2.16**

As for loc. 2.14 with pockets of *Acacia coolgardiensis* 4-7 m tall, 10-30% cover over shrubs, mostly *Thryptomene* sp. 3 1-2 m tall and 2-10% canopy cover over *Scholtzia parviflora* 0.5 m tall, 2-10% canopy cover. *Eucalyptus leptopoda* is common on the creek banks.

- **Loc. 2.17**

Key Description

Open Shrub Mallee *over* Dwarf Scrub C *over* Open Hummock Grass *on* sandy clay loam.

Code eKSi.xSCi.tHr/SCL

Loc. Details

Stratum 1. *Eucalyptus jucunda* and *E. ebbanoensis* shrub mallee, immature, stratum 2-7 m tall, 10-30% canopy cover.

Stratum 2. *Melaleuca* affin. *subtrigona* and *Calothamnus blepharospermus* shrubs, immature, stratum 0.5-1 m tall, 10-30% canopy cover.

Stratum 3. *Plectrachne danthonioides* hummock grass, mature, stratum 0-0.5 m tall, 2-10% canopy cover.

Comments

Seedlings and young plants of all species found. Trace of very old fire scars visible. Area has not been burnt for *ca* 55 years.

Litter

Moderately abundant, broad leaves, terete leaves and twigs, clumped beneath shrubs to 2 cm deep, clumps *ca* 2 m apart.

Soil

Friable soil greater than 1 m deep. 30 cm sample non-pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.1, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

50 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.6, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Soil reaction trend — neutral. Drainage excessive, situated on fairly flat slope of low sandy hill.

- Loc. 2.18

Mostly similar to loc. 2.7 with mosaic of areas similar to locs 2.5, 2.11, and 2.12 with belts of mallee following shallow watercourses.

SHRUBLANDS

- Loc. 3.1

Narrow belt of *Accacia* affin. *acuminata*, stratum 4-5 m tall, 10-30% canopy cover over *Melaleuca uncinata* stratum 2-2.5 m tall, 2-10% canopy cover. Soil is non-pedal, earthy, non-coherent, unbleached, non-calcareous, pH 4.9, pinkish-grey, 7.5 YR 7/2, fine sandy loam containing *ca* 10% rock fragments. Soil gives way to sandstone at *ca* 30 cm. Well drained.

- Loc. 3.2

Mosaic of associations similar to locs 3.19 and 2.7. Scattered *Casuarina acutivalvis* present.

- Loc. 3.3

Basically similar to loc. 3.16 with a canopy cover of 70-100%. Scattered *Melaleuca eleutherostachya* present.

- Loc. 3.4

Similar to loc. 3.16 with patches of mallee similar to loc. 2.7 and patches of loc. 2.5.

- Loc. 3.5

Casuarina campestris, Melaleuca uncinata, M. conothamnoides and *Acacia* sp. 1 shrubs, stratum 1.5-3 m tall, 70-100% canopy cover.

- Loc. 3.6

Similar to loc. 3.16 with scattered *Melaleuca eleutherostachya* and patches of *M. uncinata* and *Acacia neurophylla* 3-4 m tall, 30-70% canopy cover.

- Loc. 3.7

As for loc. 3.19 with abundant *Melaleuca uncinata*.

- Loc. 3.8

Acacia neurophylla, Melaleuca eleutherostachya shrubs and scattered *Eucalyptus dongarraensis* and *E. jucunda* shrub mallees, stratum 2-5 m tall, varying from 10-70% canopy cover over *Plectrachne danthonioides* hummock grass and *Baeckea* sp. 4 0.5 m tall, 10-30% canopy cover. Soil is non-pedal, sandy, non-coherent, unbleached, non-calcareous, pH 4.9, very pale brown, 10 YR 7/3, fine sandy loam. Well drained. Some patches of *Acacia neurophylla* and some *A. signata* shrubs 2-5 m tall, *ca* 30% canopy cover. No understory but scattered *Baeckea* sp. 4. Litter here is moderately abundant, mostly terete leaves, continuous to 1 cm deep. Soil is rocky and is part of a very degraded breakaway.

- Loc. 3.9

As for loc. 3.8 with varying proportions of *Casuarina campestris* and *C. acutivalvis.* In some parts a second stratum of *Melaleuca acuminata* 2-3 m tall, 10-30% canopy cover is present where the upper stratum thins out. Some *Acacia signata* and *Melaleuca nematophylla* present up to 1-1.5 m tall. Ground very stony.

- Loc. 3.10

Key Description

Thicket *over* Open Dwarf Scrub C *on* sandy clay loam.

Code xSc.n_1SCr/SCL n_1 = *Baeckea* sp. 4

Loc. Details

Stratum 1. Mixed shrubs with no particular dominants although *Casuarina campestris, Melaleuca uncinata* and *Eucalyptus* affin. *ewartiana* are prominent. All species senescent, stratum 2-2.5 m tall, 30-70% canopy cover.

Stratum 2. *Baeckea* sp. 4 shrubs, senescent, stratum 0.5-1 m tall, 2-10% canopy cover.

Comments

All species regrowing. Scattered *Actinostrobus arenarius* present. No evidence of fire. Vegetation is probably *ca* 50 years old. Some parts with abundant *Santalum acuminatum.*

Litter

Moderately abundant, mostly terete leaves, broad leaves and twigs, clumped beneath shrubs to 2 cm deep, clumps *ca* 0-2 m apart.

Soil

Friable soil deeper than 1 m. 15 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 5.3, yellow, 10 YR 7/6, sandy clay loam.

40 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 5.2, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Soil reaction trend — acid, drainage excessive, situated on top of low rise.

- Loc. 3.11

Acacia neurophylla, Acacia sp. 1 and *Melaleuca nematophylla* commonest with *A. neurophylla* sometimes absent when shrubs are taller. Canopy cover varies between 2-50%. Ground still very stony. Scattered clumps of mallee present and some *Plectrachne.* Occasional *Casuarina acutivalvis.* Mostly 4-6 m tall, 10-30% canopy cover with the mallees 2-10% cover.

- Loc. 3.12

Area missed by 1920 fire and much older than 55 years at time of survey. Vegetation is unstratified, up to 9 m tall and of variable canopy cover (mostly 10-70%). Most common species are *Acacia acuminata, Casuarina acutivalvis, Melaleuca acuminata* and *M. uncinata.* Seedlings and young plants of all species are present but few in number.

- Loc. 3.13

As for loc. 3.17 with patches similar to loc. 2.9.

- Loc. 3.14

As for loc. 3.16 in patches, the rest open or with patches of shrubs similar to loc. 3.17.

- Loc. 3.15

Key Description

Open Scrub *over* Open Dwarf Scrub C *on* light sandy clay loam.

Code xSr.xSCr/LSCL

Loc. Details

Stratum 1. *Grevillea candicans* and numerous other species of shrubs, stratum 2-3.5 m tall, 2-10% canopy cover.

Stratum 2. *Casuarina campestris* shrubs, *Ecdeiocolea monostachya* sedge, *Plectrachne danthonioides* and several species of shrubs, stratum 0.5-1 m tall, 2-10% canopy cover.

Comments

This area is only *ca* 200 m wide and passes into heath to the north and mallee to the south. It possibly represents a transition between the heath and mallee soil types.

Litter

Moderately abundant, mostly broad leaves, terete leaves and dead *Plectrachne* clumps. Mostly clumped beneath shrubs to 1 cm deep, clumps *ca* 6 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample was slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.1, reddish-yellow, 7.5 YR 7/8, light sandy clay loam.

Comments

Well drained.

- Loc. 3.16

Key Description

Open Scrub *on* loam.

Code m_1Sr/L m_1 = *Melaleuca uncinata*

Loc. Details

Unstratified — *Melaleuca uncinata* shrubs and scattered *Eucalyptus dongarraensis* and *E. foecunda* shrub mallee. All species mature, stratum 4-6 m tall, *ca* 10% canopy cover.

Comments

No understory and no evidence of fire. The *M. uncinata* stands are spaced widely apart and there is no litter or understory between. The vegetation is likely to be very old. Canopy cover within stands is *ca* 8%.

Litter

Outside the *M. uncinata* stands litter is sparse to absent with small clumps of terete leaves deposited by water runoff from the breakaway slopes.

Inside stands litter is moderately abundant, all terete leaves, to 0.5 cm deep. Distance between litter piles inside stands is 0-1 m and outside stands is up to 5 m.

Soil

Friable depth variable from a few centimetres to probably several metres. 30 cm sample is highly pedal, earthy, very coherent, unbleached, non-calcareous, pH 6.3, light brown, 7.5 YR 6/4, loam.

Comments

Poorly drained, situated at base of breakaway slope. Some areas with abundant sandstone pebbles.

- Loc. 3.17

Key Description

Open Scrub *over* Thicket *on* clay loam.

Code a_1Sr.m_1Sc/CL

a_1 = *Acacia ligulata*
m_1 = *Melaleuca uncinata*

Loc. Details

Stratum 1. *Acacia ligulata* shrubs, senescent, stratum 4-5.5 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca uncinata* shrubs, mature, stratum 1.5-2.5 m tall, 30-70% canopy cover.

Comments

Many seedlings and young plants of *Melaleuca uncinata*. No evidence of fire. Area has been scrub rolled and is probably 10-20 years old.

Litter

Moderately abundant, mostly terete leaves and clumps and scattered large debris. Leaves 1 cm deep and clumped *ca* 0.5 m apart. Large debris piled to *ca* 20 cm deep and piles *ca* 5 m apart.

Soil

Friable soil deeper than 1 m. 15 cm sample moderately pedal, earthy, coherent, unbleached, non-calcareous, pH 4.2, reddish-yellow, 5 YR 6/6, clay loam.

35 cm sample moderately pedal, sandy, coherent, unbleached, non-calcareous, pH 4.2, pink, 5 YR 7/4, clay loam.

Comments

Soil reaction trend — acid, well drained but may waterlog after heavy rain.

- Loc. 3.18

Open area with dense clumps of mature *Melaleuca* spp. shrubs. The clumps are 2.5-3.5 m tall and average 8 m in diameter. Most are *Melaleuca uncinata* but there are occasional *M. eleutherostachya* clumps. The area averages 2-10% canopy cover but the clumps are 70-100% cover.

There are scattered senescent *Eucalyptus loxophleba* trees 14-15 m tall and occasional *Acacia andrewsii* and *A. tetragonophylla* shrubs.

North of this loc. the *E. loxophleba* is replaced by *E. dongarraensis* and some *E. ebbanoensis* shrub and tree mallees 6-9 m tall over *Plectrachne danthonioides* and several species of shrubs 0.5-1.5 m tall, 30-70% canopy cover. This association merges into loc. 2.8.

- Loc. 3.19

Key Description

Scrub *over* Dwarf Scrub D *on* fine sandy loam.

Code xSi.n_1SDi/FSL n_1 = *Baeckea* sp. 4

Loc. Details

Stratum 1. *Acacia neurophylla, Casuarina campestris, Melaleuca uncinata* and *Hakea pycnoneura* shrubs, mature, stratum 1.5-2.5 m tall, 10-30% canopy cover.

Stratum 2. *Baeckea* sp. 4 shrubs, senescent, stratum 0.5 m tall, 10-30% canopy cover.

Comments

All species found as seedlings or young plants. Occasional *Acacia neurophylla* shrubs emergent to 3.5 m tall and scattered *Eucalyptus dongarraensis.*

Litter

Sparse mostly terete leaves, clumped to 0.5 cm deep, clumps 2 m apart.

Soil

Friable soil less than 30 cm deep. 20 cm sample is slightly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 4.9, very pale brown, 10 YR 7/4, fine sandy loam. Contains *ca* 10% rock fragments up to 5 cm diameter. These rocks increase to *ca* 20 cm diameter at about 30 cm then pass into solid rock. Area is well drained.

- Loc. 3.20 (Trapline 3)

Key Description

Thicket *over* Open Dwarf Scrub C *on* sandy clay loam.

Code xSc.xSCr/SCL

Loc. Details

Stratum 1. *Banksia ashbyi, Actinostrobus arenarius* and several other species of shrubs, mature, stratum 2-4 m tall, 30-70% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature to senescent, stratum 0-1 m tall, 2-10% canopy cover.

Comments

Seedlings and young plants of all species present. Some *B. ashbyi* and *A. arenarius* emergent to 7 m tall. Some parts of stratum 1 thin out to 10-30% cover. No evidence of fire. Area is *ca* 55 years old.

Litter

Abundant, comprising terete leaves, broad leaves, twigs and large debris, clumps 2-4 cm deep (in places up to 10 cm deep) clumps 0-1 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.6, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Soil reaction trend — acid, excessively drained, situated on flat area on top of breakaway plateau.

- Loc. 3.21 (Trapline 9)

Key Description

Scrub *over* Dwarf Scrub C *on* fine sandy loam.

Code xSi.xSCi/FSL

Loc. Details

Stratum 1. *Casuarina campestris* and several other species of shrubs, stratum 2-3.5 m tall, 10-30% canopy cover.

Stratum 2. *Baeckea* sp. 3 and 4 and several other species of shrubs, stratum 0.5-1.0 m tall, 10-30% canopy cover.

Comments

Species list, litter and soil as described for loc. 3.19.

- Loc. 3.22 (Trapline 4)

Key Description

Scrub *over* Open Dwarf Scrub C *on* sandy clay loam.

Code xSi.xSCr/SCL

Loc. Details

Stratum 1. *Casuarina campestris* and *Eremaea pauciflora* shrubs, mature, stratum 0.5-1.0 m tall, 2-10% canopy cover.

Comments

Seedlings and young plants of all species present. Scattered *Banksia ashbyi* and *B. sceptrum* to 7 m tall. Proportion of these species increases on passing down the slope. No evidence of fire. Area is *ca* 55 years old.

Litter

Sparse, mostly terete leaves, clumped beneath shrubs to 1-2 cm deep, clumps continuous for patches up to 2 m across, 2-5 m between clumps.

Soil

Friable soil deeper than 1 m. 30 cm sample slightly pedal, sandy, coherent, unbleached, non-calcareous, pH 6.3, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Soil reaction trend — acid, drainage excessive, situated on top of breakaway platform.

- Loc. 3.23

  As for loc. 3.22 with patches of mallee.

- Loc. 3.24

  As for loc. 3.22.

- Loc. 3.26

  As for loc. 3.22 with abundant *B. sceptrum* and some *B. ashbyi.*

- Loc. 3.26

  As for loc. 3.27 with patches of mallee.

- Loc. 3.27 (Trapline 5)

Key Description

Open Scrub *over* Low Heath C *on* clayey sand.

Code gSr.xSCc/CLS

Loc. Details

Stratum 1. *Actinostrobus arenarius* shrubs, mature, stratum 4 m tall, variable but just dense enough to constitute a stratum. Overall cover probably 2-3%.

Stratum 2. Mixed shrubs, no particular dominant, mature, stratum 0.5-1.0 m tall, 30-70% canopy cover.

Comments

All species present as seedlings or young plants. No evidence of fire. Area probably *ca* 55 years old.

Litter

Moderately abundant, mostly broad leaves, terete leaves and twigs, clumped beneath shrubs to 2 cm deep, clumps 1 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample non-pedal, sandy, non-coherent, unbleached, non-calcareous, pH 5.5, very pale brown, 10 YR 8/3, clayey sand.

Comments

Soil reaction trend — acid. Drainage excessive. Situated on hill slope close to bottom of very degraded breakaway.

- Loc. 3.28

  Area of *Casuarina campestris* and *Acacia signata* 2-4 m tall, 2-10% canopy cover. No understory present. Scattered shrubs of *Dodonaea inequifolia* and *Ricinocarpus velutinus, Ptilotus obovatus* and *Eucalyptus foecunda* shrub mallee along the breakaway edge. Soil is compact lateritised sandstone with small soil pockets.

- Loc. 3.29

  As for loc. 3.19 with scattered patches of loc. 2.17 mallee.

- Loc. 3.30

  As for loc. 3.19 with patches of loc. 3.22.

- Loc. 3.31

  As for loc. 3.19 with areas of 2.17 and abundant *Melaleuca uncinata.*

- Loc. 3.32

Area comprises complex of degraded breakaways and eroded gullies running into the Greenough River. The area may have been cleared or heavily grazed at some time. Vegetation is shrubs and mallees, 2-3 m tall and 2-3% cover over bare ground or scattered grasses. *Acacia ligulata*, *A. andrewsii* and *A. tetragonophylla*.

HEATH FORMATIONS

- Loc. 4.1

Small area of *Acacia acuminata* and *Acacia* sp. 1 shrubs, 1-1.5 m tall, 30-70% canopy cover. No understory. Between locs 4.1 and 2.2 is a small belt of *Plectrachne danthonioides* and *Baeckea* sp. 4. 10-30% canopy cover.

- Loc. 4.2

Area of regrowth dominated by *Acacia neurophylla*. Several other species of shrubs present, all 0.5-1 m tall, with occasional shrubs to 2 m. Dead *Actinostrobus arenarius* shrubs to 2 m. Regrowth canopy cover *ca* 10%. Original vegetation probably similar to loc. 3.10. Burnt *ca* 7 years before survey.

- Loc. 4.3

Similar to loc. 4.2 but *Actinostrobus* absent. Original vegetation similar to loc. 3.5.

- Loc. 4.4

Key Description

Open Dwarf Scrub C *over* Very Open Low Sedges *on* sandy clay loam.

Code cSCr.n_1VLr/SCL n_1 = *Harperia lateriflora*

Loc. Details

Stratum 1. *Casuarina campestris* shrubs, immature, stratum 0.5-1 m tall, 2-10% canopy cover.

Stratum 2. *Harperia lateriflora* sedge, mature, stratum 0-30 cm tall, 2-10% canopy cover.

Comments

All species present as seedlings or young plants. Occasional *E. dongarraensis* or *E. ebbanoensis* shrub mallee emergent to 3 m. Scattered *C. campestris* emergent to 2 m. Scattered *Actinostrobus arenarius* present. No evidence of fire. Area was chained in 1962 and rechained in 1966. A small area to the east of this loc. was chained only in 1966. The regrowth is the same in both locations but is a little denser in the eastern portion.

Litter

Moderately abundant, comprising mostly terete leaves and twigs, clumped 2 cm deep beneath shrubs, clumps *ca* 3 cm apart.

Soil

Friable soil deeper than 1 m. 15 cm sample slightly pedal, sandy, poorly coherent, slightly blotched, bleached, non-calcareous, pH 5.0, yellow, 10 YR 7/6, sandy clay loam.

40 cm sample slightly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 5.3, yellow, 10 YR 7/6, sandy clay loam.

Comments

Soil reaction trend — acid, drainage excessive, located on upper slopes of gently sloping hillside.

- Loc. 4.5

As for loc. 4.6.

- Loc. 4.6

Key Description

Heath B *over* Open Low Sedges *on* fine sandy loam.

Code xSBc.n_1VLi/FSL n_1 = *Mesomelaena* sp. 1

Loc. Details

Stratum 1. *Casuarina campestris* and *Melaleuca uncinata* shrubs, immature, stratum 0.5-1.5 m tall, 30-70% canopy cover.

Stratum 2. *Mesomelaena* sp. 1 sedge, mature, stratum 0.5 m tall, 10-30% canopy cover.

Comments

Casuarina regrowth abundant. Some species have regrown by suckering from old root-stocks. Scattered *Eucalyptus ebbanoensis* present. Area has been scrubrolled, but no evidence of fire. Regrowth is 10 years old.

Litter

Sparse but with clumps of large debris. Main litter is terete leaves, piled 0.5 cm deep, with spaces up to 1 m between piles. Large debris heaped to 30 cm deep, heaps 10-15 m apart.

Soil

Friable soil deeper than 1 m. 0-0.5 cm soil plus organic dust. 1.0-15 cm slightly pedal, sandy, poorly coherent, unbleached except for vague blotches at *ca* 10 cm depth, non-calcareous, pH 5.0, yellow, 10 YR 7/6, fine sandy loam.

50 cm sample slightly pedal, sandy, very coherent, unbleached non-calcareous, pH 5.0, yellow, 10 YR 8/8, sandy clay loam.

Comments

Soil reaction trend — acid, drainage excessive, situated on flat ground but slightly (1-2 m) lower than area 3.19.

- Loc. 4.7

Melaleuca uncinata 0.5-1.0 m tall, 30-70% canopy cover with scattered *Xylomelum angustifolium*, *Actinostrobus arenarius* shrubs and *Eucalyptus leptopoda* shrub mallee. Between loc. 4.7 and the breakaway, *Melaleuca nematophylla* is prominent.

- Loc. 4.8

Casuarina campestris and numerous other species of shrubs, stratum 1-2 m tall, 30-70% canopy cover. Also contains *Melaleuca subtrigona*, *Eucalyptus ebbanoensis*, *Ecdeiocolea monostachya*, *Acacia acuminata* and *Harperia* affin. *lateriflora*.

BREAKAWAY COMPLEX

- **Loc. 6.1**

Platform as for loc. 2.7 where the soil veneer is deeper. Where the soil is very shallow *Borya nitida* stands occur and scattered shrubs have established in cracks in the rock. There are areas of several square metres with only bare rock exposed. This may have small pockets of moss or patches of lichen.

Visor: 2-3 m thick, comprising very hard sandstone and/or conglomerate variably ferruginised so that its gross appearance is lateritic. Few plants occur on this zone except mosses or lichens.

Notch: absent in some places, or well developed into caves, some up to 3 m deep, 8 m long and 1.5 m high. An interesting feature of the geology of the notch is the frequent exudation of salt deposits on to the surface of the rock or as fillings in cracks. The notch area is generally devoid of plants except the occasional blue-green or green alga. The dripline of the visor on the scree below the notch occasionally has *Ptilotus obovatus, Chenopodium murale* or *Ursinia anthemoides.*

Scree and outwash: upper slopes tumbled boulders of sandstone. *Eucalyptus loxophleba* tree mallees and trees, scattered, mostly less than 2% canopy cover. Lower slopes and flats with vegetation as for loc. 3.16.

- **Loc. 6.2 (Trapline 2)**

Platform: *Casuarina campestris* thickets, mostly 2-4 m and 70-100% canopy cover interspersed with open areas of *Baeckea* sp. 3 (SC), *Verticordia penicillaris* or other shrubs.

Visor: 1-4 m thick, mostly very weathered and containing rockholes which collect water after rain.

Upper slopes: *Melaleuca radula, M. uncinata* shrubs 2-3 m tall, 70-100% canopy cover with scattered *Ptilotus obovatus* shrubs 0.5 m tall, giving way to *Acacia signata, M. uncinata* association 2-3.5 m tall, 70-100% canopy cover slightly lower down the slope.

Mid-slope: as above, but *M. uncinata* more abundant than *A. signata* and increases to 3-5 m tall, but drops to 30-70% canopy cover.

Lower slope: *M. uncinata* only, 2.5-3.5 m tall, 30-70% canopy cover passing into clumped *M. uncinata* as described for loc. 3.16.

Flats: *Micromyrtus* affin. *racemosa* and *Melaleuca uncinata* 2-2.5 m tall, 2-10% canopy cover with scattered emergent *Melaleuca eleutherostachya* to 6 m tall.

- **Loc. 6.3**

Slopes of degraded breakaway where road passes from flat lowlands up the edge of the breakaway on to the platform. Mallee of loc. 2.8 thins out and becomes shrubby mosaic of *Casuarina campestris* 2-4 m tall, 70-100% canopy cover with patches of *Melaleuca uncinata* similar to loc. 3.16. There are also scattered mallee and *Plectrachne danthonioides* clumps. Dense clumps of *Ricinocarpus velutinus* are common on the roadside.

OTHER FORMATIONS

- **Loc. 8.1**

Area rolled 1929 and cropped 1934-38 then regrown until 1966 when it was rechained. Area is now bare ground with annual grasses and other herbaceous plants and scattered shrubs to 2-3 m tall, *ca* 0.5-1% canopy cover.

- **Loc. 8.2**

Riverbanks at Noondamurra Pool. Pool and flowing water leading from it contain abundant *Potamogeton* affin. *obtusifolius.* Banks of pool and shallower areas of creek

have dense stands of *Scirpus littoralis* and *Juncus maritimus* sedges 0.5-1 m tall, 70-100% canopy cover and small patches of *Cotula coronopifolia*. Higher ground has *Casuarina obesa* trees, to 7 m tall, and *Eucalyptus camaldulensis* to 10 m tall. The *C. obesa* have abundant *Cassytha* sp. forming dense tangled mats 1-3 m above the ground.

UNCLEARED LAND ADJACENT TO
EAST YUNA RESERVE

- **Falkirk Forest *ca* 1 km west of loc. 8.1**

Key Description

Open Low Woodland A *on* fine sandy clay loam.

Code eLAr/FSCL

Loc. Details

Unstratified. *Eucalyptus loxophleba* trees and scattered *E. leptopoda* tree mallee; the former very senescent, the latter mature to senescent. Canopy height 8-12 m, 2-10% canopy cover. Average foliage density is 30-40%.

Comments

Some *E. loxophleba* emergent to 14 m tall. Occasional *E. transcontinentalis* present. No understory although scattered shrubs of *Acacia tetragonophylla, Eremophila clarkii, Exocarpus sparteus, Monotaxis lurida* and *Ptilotus obovata* are present. There are also scattered *Stipa elegantissima* bunch grasses and clumps of *Melaleuca uncinata* similar to loc. 3.16 on the reserve. Seedlings or young plants of all species were found although most had been damaged by sheep as the area is used for grazing.

The area was aerial top-dressed with superphosphate (*ca* 110 kg/ha or 1 cwt/acre) in 1962 and gave rise to dense stands of *Erodium cygnorum*. Since then the production of this species has declined steadily each year and the owner now considers that top-dressing is again necessary.

The eastern border of Falkirk Forest was burnt in 1922, and some timber removed in 1930-35. The remainder has not been burnt since before 1920.

Litter

Sparse, mostly twigs, large debris and some broad leaves. Clumped to 3 cm deep, mostly beneath shrubs, with some clumps of twigs and logs to 20 cm deep. Clumps 2-10 m apart. Numerous hollow or solid fallen logs present throughout area and many standing hollow trees either completely or partially dead.

Soil

Horizon A sample highly pedal, earthy, very coherent, unbleached, non-calcareous, pH 5.5, red, 2.5 YR 4/6, fine sandy clay loam.

Comments

Drainage poor, situated on flat area slightly above surrounding country.

APPENDIX 2

LIST OF PLANT SPECIES RECORDED AT VARIOUS LOCATIONS EAST YUNA RESERVE (INCLUDING WATER RESERVE)

Due to the time of survey (October) and the extremely dry year, flowering material was available for only a few species. Virtually all identifications are based on vegetation material compared to Western Australian Museum survey collections, State Herbarium collections, and by reference to Herbarium experts and to the list in Beard and Burns (1976).

Symbols: SC = specimen lodged in Museum survey collection
D = found on disturbed ground only
+D = found on both disturbed and undisturbed ground

A firebreak, road verge or adjacent paddock is considered a disturbance. It does not refer to natural regrowth from fire or scrubrolling.

Loc. 2.5

Cassia clarkii
Casuarina acutivalvis
Dianella revoluta
Eremophila affin. *clarkii*
Eucalyptus dongarraensis
E. leptopoda
Hakea bucculenta
H. minyma
H. subsulcata
Olearia revoluta
Plectrachne danthonioides
Ptilotus obovatus
Rhagodia sp. 2 (SC)
Rhagodia sp. 3 (SC)
Ricinocarpus velutinus (+D)
Solanum lasiophyllum

Loc. 2.7

Acacia blakelyi
A. affin. *coolgardiensis*
A. graffiana
A. signata
Actinostrobus arenarius
Baeckea sp. 4 (SC)
Casuarina campestris
Comesperma scoparia
Eucalyptus dongarraensis
E. ebbanoensis
E. jucunda
Grevillea excelsior
Hakea bucculenta
Lepidosperma gracile
Melaleuca uncinata
Plectrachne danthonioides
Ricinocarpus velutinus
Scaevola spinescens
Waitzia acuminata

Loc. 2.8

Acacia ligulata
A. leptospermoides psammophila
Ecdeiocolea monostachya
Eucalyptus dongarraensis
Harperia lateriflora
Labichea lanceolata var. *teretifolia*
Melaleuca affin. *scabra*
Mesomelaena sp. 1 (SC)
Plectrachne danthonioides
Santalum sp. 1 (SC)
Scaevola spinescens
Thryptomene or *Micromyrtus* sp. 5 (SC)

Loc. 2.9

Acacia acuaria
A. acuminata
A. ligulata
A. signata

Actinostrobus arenarius sp. 2 (SC)
Baeckea sp. 3 (SC)
Baeckea sp. 4 (SC)
Brachysema daviesioides (D)
Cassytha sp. B (SC)
Casuarina campestris
Comesperma scoparia (+D)
C. spinosum
Dampiera tomentosa
Dicrastylis fulva (D)
Epacridaceae sp. 2 (SC)
Eucalyptus dongarraensis
E. ebbanoensis
Glischrocaryon roei (D)
Grevillea eriostachya
G. excelsior
Hakea pycnoneura
H. scoparia
Lepidosperma scabrum
Melaleuca cordata
M. subtrigona
Plectrachne danthonioides (+D)
Ricinocarpus velutinus (D)
Santalum affin. *murrayanum*
Scaevola spinescens
Schoenus asperocarpus (D)

Loc. 2.11

Acacia acuaria
A. signata
Baeckea sp. 6 (SC)
Chamelaucium sp. 1 (SC)
Corynotheca micrantha
Dianella revoluta
Eucalyptus dongarraensis
E. foecunda
Harperia lateriflora
Melaleuca eleutherostachya
M. seriata
M. affin. *subtrigona*
Mesomelaena sp. 1 (SC)
Plectrachne danthonioides
Scholtzia parviflora
Thryptomene or *Micromyrtus* sp. 3 (SC)

Loc. 2.17

Baeckea sp. 4 (SC)
Calothamnus blepharespermus
Casuarina campestris
Ecdeiocolea monostachya
Eucalyptus ebbanoensis
E. jucunda
Grevillea affin. *integrifolia*
Hakea bucculenta
Isopogon semifurcata
?Lhotzkya harvestiana
Melaleuca cordata
M. scabra
M. affin. *subtrigona*
Platysace affin. *effusa*
Plectrachne danthonioides
Santalum sp. 1 (SC)
Wehlia aurea

Loc. 3.7

Acacia affin. *coolgardiensis*
A. neurophylla
Baeckea sp. 4 (SC)
Casuarina campestris
Dodonaea caespitosa
Hakea scoparia
Melaleuca cordata
M. nematophylla
M. uncinata
Thryptomene affin. *tuberculata*
T. sp. 4 (SC)

Loc. 3.10

Acacia acuminata
A. affin. *ligulata*
A. neurophylla
A. signata
Actinostrobus arenarius
Baeckea sp. 4 (SC)
Beaufortia elegans
B. squarrosa
Casuarina campestris
Comesperma scoparia
Conostephium drummondii
C. preissii

Dodonaea caespitosa
Eucalyptus affin. *ewartiana*
E. oldfieldii
Hakea bucculenta
H. minyma
H. scoparia
H. subsulcata
Leptomeria preissii
Melaleuca cordata
M. affin. *scabra*
M. uncinata
Mesomelaena sp. 1 (SC)
Myrtaceae sp. 3 (SC)
Santalum acuminatum
Thryptomene racemulosa
Verticordia polytricha

Loc. 3.15

Acacia blakelyi
A. signata
A. sp. 2 (SC)
Baeckea sp. 4 (SC)
B. sp. 6 (SC)
Beaufortia elegans
Casuarina campestris
Comesperma scoparia
Conostephium drummondii
C. preissii
Ecdeiocolea monostachya
Eucalyptus jucunda
Grevillea candicans
G. excelsior
Malaleuca cordata
?Thryptomene sp. 3 (SC)
Plectrachne danthonioides
Santalum sp. 1 (SC)
Schoenus subbulbosus
Thryptomene sp. 4 (SC)

Loc. 3.16

Dianella revoluta
Eucalyptus dongarraensis
E. foecunda
E. leptopoda
Hakea preissii
Melaleuca eleutherostachya
M. uncinata
Santalum acuminatum

Loc. 3.17

Acacia ligulata
A. signata
Amphipogon debilis
Casuarina campestris
Glischrocaryon flavescens (D)
Keraudrenia hermanniaefolia (D)
Lepidosperma affin. *gracile*
Melaleuca uncinata
Waitzia acuminata (D)

Loc. 3.19

Acacia acuminata (D)
A. neurophylla (+D)
Baeckea sp. 4 (SC)
B. sp. 5 (D, SC)
Brachysema daviesioides (D)
Casuarina campestris
Comesperma scoparia (D)
Dampiera tomentosa (D)
Dicrastylis fulva (D)
Dodonaea caespitosa (+D)
Eucalyptus dongarraensis
E. ebbanoensis
E. eudesmoides
Glischrocaryon roei
Hakea pycnoneura
H. subsulcata
Keraudrenia hermanniaefolia (D)
Lhotzkya harvestiana
Melaleuca cordata
M. nematophylla
M. uncinata
Myrtaceae sp. 3 (SC)
Platysace maxwellii (D)
Scaevola spinescens (D)
Schoenus asperocarpus (D)
Thryptomene sp. 4 (SC)

Loc. 3.20

Acacia neurophylla
Actinostrobus arenarius
Banksia ashbyi
Beaufortia elegans
Casuarina campestris
Conostephium preissii
Eremaea pauciflora
Eucalyptus jucunda
E. oldfieldii
Hakea bucculenta
Keraudrenia hermanniaefolia
Lhotzkya harvestiana
Melaleuca cordata
Persoonia sp. 1 (SC)
Thryptomene sp. 1 (SC)

Loc. 3.22

Acacia ligulata
A. neurophylla
Baeckea sp. 4 (SC)
B. sp. 6 (SC)
Banksia ashbyi
B. sceptrum
Beaufortia squarrosa
Casuarina campestris
Comesperma scoparia
Eremaea pauciflora
Eucalyptus jucunda
Grevillea gordoniana
Melaleuca cordata
Santalum sp. 1 (SC)

Loc. 3.27

Actinostrobus arenarius
Baeckea sp. 4 (SC)
Casuarina campestris
Comesperma scoparia
Dryandra fraseri
Ecdeiocolea monostachya
Eucalyptus jucunda
Hakea bucculenta
H. circumalata
H. pycnoneura
Harperia lateriflora
Isopogon scabruiscula
Labichea lanceolata var. *teretifolia*
Melaleuca affin. *scabra*
M. subtrigona
Thryptomene racemulosa
Verticordia polytricha

Loc. 4.3

Acacia affin. *coolgardiensis*
A. neurophylla
A. sp. 2 (SC)
Codonocarpus cotinifolius
Melaleuca nematophylla
Myrtaceae sp. 3 (SC)
Ricinocarpus velutinus
Thryptomene affin. *racemulosa*
T. tuberculata

Loc. 4.4

Acacia blakelyi
A. graffiana
A. stereophylla
Actinostrobus arenarius
Amphipogon debilis
Baeckea sp. 4 (SC)
Beaufortia elegans
Calothamnus oldfieldii
Cassytha sp. B (SC)
Casuarina campestris
Conospermum distichum
Dryandra fraseri
D. hewardiana
Eucalyptus dongarraensis
E. ebbanoensis
Glischrocaryon flavescens
Grevillea candicans
Hakea orthorrhyncha
H. pycnoneura
Harperia lateriflora
Laxmannia sp. 2 (SC)
Melaleuca nematophylla

M. scabra
M. subtrigona
Petrophile conifera
Schoenus subbulbosus
Verticordia chrysantha

Loc. 4.6

Acacia acuminata (+D)
A. blakelyi
A. neurophylla (D)
A. sp. 2 (SC)
A. stereophylla
Amphipogon debilis
Baeckea sp. 5 (SC)
Brachysema daviesioides (D)
Casuarina campestris
C. humilis
Comesperma scoparia
C. spinosum
Dampiera affin. *tomentosa* (D)
Dicrastylis fulva (D)
Dodonaea caespitosa (D)
Eucalyptus ebbanoensis
Glischrocaryon roei (D)
Keraudrenia hermanniaefolia (D)
Melaleuca cordata
Melaleuca nematophylla
M. affin. *subtrigona*
M. uncinata
Mesomelaena sp. 1 (SC)
Myrtaceae sp. 3 (SC)
Platysace maxwellii (D)
Scaevola spinescens (D)
Schoenus asperocarpus (D)
Scholtzia sp. 1 (SC)
Thryptomene sp. 1 (SC)
Verticordia polytricha
Waitzia acuminata

Loc. 6.1

Avena barbata
Borya nitida
Chenopodium murale
Enchylaena tomentosa
Eucalyptus loxophleba
Ptilotus obovatus
Sida affin. *calyxhymenia*
Solanum lasiophyllum
Ursinia anthemoides

Loc. 6.2

Acacia signata
Baeckea sp. 4 (SC)
Casuarina campestris
Melaleuca eleutherostachya
M. radula
M. uncinata
Micromyrtus affin. *racemosa*
Ptilotus obovatus
Verticordia penicillaris

Loc. 8.2 (Noondamurra Pool)

Acacia saligna
Cassytha affin. sp. B (SC) (on *Casuarina obesa*)
Casuarina obesa
Cotula coronopifolia
Eucalyptus camaldulensis
E. loxophleba
Grevillea affin. *paniculata*
Juncus maritimus
Melaleuca adnata
Monotaxis lurida
Potamogeton obtusifolius
Rhagodia nutans
Scirpus littoralis

APPENDIX 3

VEGETATION DESCRIPTIONS
BINDOO HILL RESERVE

WOODLAND

- **Loc. 1.1 (Trapline 6)**

Key Description

Open Low Woodland A *over* Scrub *over* Low Scrub B *on* light sandy clay loam.

Code eLAr.xSi.xSBi/LSCL

Loc. Details

Scattered *Eucalyptus loxophleba* trees 8-12 m tall, canopy cover *ca* 4% and most of the trees very senescent. The amount of large debris present and the abundance of dead standing trees indicate that the canopy cover was probably greater in the past. The formation is clearly a woodland in character although existing canopy cover is low.

As an understory or as scattered shrubs there are *Acacia tetragonophylla, A. signata* patches 3-5 m tall, 10-50% canopy cover; *Exocarpus aphyllus, A. tetragonophylla, Atriplex* affin. *inflata,* 0.5-1.5 m tall, 10-30% canopy cover and scattered or clumped *Acacia acuminata, Eremophila duttonii, Cassia charlesiana* and *Dodonaea inequifolia.*

Comments

No evidence of fire for very long time. Small creek passes through area.

Litter

Sparse; broad and terete leaves. Abundant large debris and dead, hollow, standing tree trunks. Some leaf litter clumping along creek banks.

Soil

Variable depth. 30 cm sample highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH 5.7, yellowish-red, 5 YR 4/6, light sandy clay loam with *ca* 10% rock fragments.

Comments

Seasonally very wet and soil poorly drained although surface runoff probably removed quickly. Soil is colluvial sediments derived from degraded breakaways to the north and east.

SHRUBLANDS

- **Loc. 3.1 (Trapline 7)**

Key Description

Thicket *over* Open Dwarf Scrub D *on* light sandy clay loam.

Code xSc.xSDr/LSCL

Loc. Details

Stratum 1. Numerous species shrubs, no particular dominant, all senescent, stratum 1.5-2.5 m tall, 30-70% canopy cover.

Stratum 2. Numerous species shrubs, no particular dominant, all mature, stratum 0-0.5 m tall, 2-10% canopy cover.

Comments

Numerous *Banksia ashbyi* and *B. sceptrum* shrubs 2-7 m tall scattered over area but canopy cover mostly less than 1%. Seedlings or young plants of all species present. No evidence of fire.

Litter

Moderately abundant, terete leaves, broad leaves and twigs, clumped beneath shrubs to 2-3 cm deep, clumps continuous or up to 2 m apart.

Soil

Friable soil deeper than 1 m. 15 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.0, reddish-yellow, 7.5 YR 7/8, light sandy clay loam.

75 cm sample moderately pedal, sandy, coherent, unbleached, non-calcareous, pH 6.1, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Soil reaction trend — acid; excessively drained, situated on top of very low rise.

- **Loc. 3.2**

  As for loc. 3.6.

- **Loc. 3.3**

  As for loc. 3.1.

- **Loc. 3.4**

  Mosaic of shrublands similar to locs 3.33, 3.14.

- **Loc. 3.5**

  Mosaic of shrublands similar to locs 3.14, 3.25.

- **Loc. 3.6 (Trapline 2)**

Key Description

Thicket *over* Open Dwarf Scrub D *on* fine sandy loam.

Code m_1SC.n_1SDr/FSL

m_1 = *Melaleuca nematophylla*
n_1 = *Baeckea* sp. 4

Loc. Details

Stratum 1. *Melaleuca nematophylla* shrubs, mature, stratum 0.5-3.0 m tall, 30-70% canopy cover.

Stratum 2. *Baeckea* sp. 4 shrubs, mature, stratum 0-0.5 m tall, 2-10% canopy cover.

Comments

Some areas similar to loc. 3.33. Some emergent *M. nematophylla* to 4 m tall. No evidence of fire.

Litter

Moderately abundant, mostly terete leaves, clumped beneath shrubs to 1 cm deep, clumps continuous or up to 1 m apart.

Soil

Friable soil 30-50 cm deep. 15 cm sample — slighly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 5.9, reddish-yellow, 7.5 YR 6/6, fine sandy loam with *ca* 10% rock fragments.

Comments

Soil very rocky, moderately well drained, some runoff. Situated on stony ridge.

- Loc. 3.7

Area of *Casuarina campestris, Thryptomene* affin. *racemulosa* and *Calothamnus belpharospermus* shrubs, 1-2 m tall, 30-70% canopy cover.

- Loc. 3.8

Mosaic of shrubland similar to locs 3.14, 3.26, 3.33.

- Loc. 3.9

Mosaic of shrubland similar to locs 3.14, 3.26, 3.33.

- Loc. 3.10 (Trapline 1)

Mostly as for loc. 3.33 with patches of loc. 4.2 and some *Acacia neurophylla.*

- Loc. 3.11

As for loc. 3.33.

- Loc. 3.12

As for loc. 3.14 with scattered patches of scrub similar to loc. 3.33.

- Loc. 3.13

As for loc. 3.10 with clumps of *Casuarina campestris* and patches of heath with or without *Actinostrobus.*

- Loc. 3.14

Key Description

Thicket *over* Very Open Low Sedges and Open Dwarf Scrub D *on* sandy clay loam.

Code cSc.n_1VLn$_2$SDr/SCL

n_1 = *Ecdeiocolea monostachya*
n_2 = *Baeckea* sp. 4

Loc. Details

Stratum 1. *Casuarina campestris* shrubs, mature, stratum 1.5-2.5 m tall, 30-70% canopy cover.

Stratum 2. *Ecdeiocolea monostachya* sedge and *Baeckea* sp. 4 shrubs, mature, stratum 0-0.5 m tall, 2-10% canopy cover.

Comments

Some *Acacia stereophylla* shrubs emergent to 3 m. No evidence of fire.

Litter

Sparse, mostly terete leaves, clumped beneath shrubs to 0.5 cm deep, clumps 2-5 m apart.

Soil

Friable soil shallow, probably mostly less than 30 cm. 10 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.6, reddish-yellow, 7.5 YR 7/8, sandy clay loam with *ca* 1% rock fragments.

Comments

Drainage fairly good, surface rock provides some runoff.

- **Loc. 3.15**

  Mosaic of shrubland similar to loc. 3.14 and heath similar to loc. 4.2.

- **Loc. 3.16**

  As for loc. 3.14.

- **Loc. 3.17**

  As for loc. 3.18.

- **Loc. 3.18 (Trapline 5)**

Key Description

Open Scrub, Scrub or Thicket *over* Open Dwarf Scrub C or Dwarf Scrub C *on* loamy sand.

Code xSr-c.xSCr-i/LS

Loc. Details

Stratum 1. *Banksia sceptrum* and scattered *Actinostrobus arenarius* shrubs, 4-5 m tall, varying between 2 and 70% canopy cover.

Stratum 2. Mixed shrubs with no particular dominant, to 1 m tall, very sparse or up to 30% canopy cover.

Comments

Crest of highest part of reserve. Some sand blow-outs present, partly consolidated by shrubs in some parts. Narrowness of the crest means that the trapline is also sampling vegetation of locs 4.9 and 3.19.

Litter

Variable; absent to moderately abundant. Mostly narrow leaves, some twigs. Scattered or clumped to 1 cm deep.

Soil

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 6.0, yellow, 2.5 YR 8/6, loamy sand.

- **Loc. 3.19**

  Heath similar to loc. 4.2 with *Actinostrobus arenarius* shrubs 4-5 m tall, 30-70% canopy cover. Scattered *Eucalyptus jucunda* present.

- **Loc. 3.20**

  Mosaic of shrubland similar to locs 3.21, 3.14 and 3.6.

- **Loc. 3.21 (Trapline 4)**

Key Description

Open Scrub *over* Low Sedges and Low Heath D *on* sandy clay loam.

Code xSr.n_1VLxSDc/SCL n_1 = *Ecdeiocolea monostachya*

Loc. Details

Stratum 1. *Casuarina campestris* and *Acacia stereophylla* shrubs, mature to senescent, stratum 2-2.5 m tall, 2-10% canopy cover.

Stratum 2. *Ecdeiocolea monostachya* sedge and several species of shrubs, mature to senescent stratum 0-0.5 m tall, 30-70% canopy cover.

Comments

Scattered *Eucalyptus foecunda* and *E. ebbanoensis* and *Actinostrobus arenarius* to 6 m tall. Nearly all species present as seedlings or young plants. No evidence of fire.

Litter

Sparse, mostly terete leaves and twigs, clumped beneath shrubs to 1 cm deep, clumps 3 m apart.

Soil

30 cm sample moderately pedal, earthy, coherent, unbleached, non-calcareous, pH 5.9, reddish-yellow, 7.5 YR 7/8, sandy clay loam.

Comments

Drainage excessive, situated on flat area.

- **Loc. 3.22**

  As for loc. 3.1.

- **Loc. 3.23**

  Area of *Ecdeiocolea monostachya* sedge and heathy species on platform of breakaway with clumps of *Casuarina campestris* or *Acacia neurophylla.*

- **Loc. 3.24**

  Complex area of dissected breakaway platforms, cliffs and rocky slopes with watercourses and piles of boulders.

  Mostly a very complex mosaic of shrublands similar to locs. 3.21, 3.22, 3.15, 3.26. Some areas of watercourses are open and grassy. Water drains into loc. 1.1, then westwards onto adjacent land.

- **Loc. 3.25**

  As for loc. 3.26 but dominant is *Acacia neurophylla.*

- **Loc. 3.26**

Key Description

Scrub *on* sandy loam.

Code $a_1 m_1$Si/SL

a_1 = *Acacia signata*
m_1 = *Melaleuca nematophylla*

Loc. Details

Unstratified *Acacia signata* and *Melaleuca nematophylla* shrubs, mature, canopy 3-5 m tall, 10-30% canopy cover.

Comments

No evidence of fire. Understory completely absent.

Litter

Moderately abundant, narrow leaves (wider than terete, but not 'broad') and twigs, clumped beneath shrubs to 1.5 cm deep, clumps 0-2 m apart.

Soil

Friable soil *ca* 50 cm deep. 30 cm sample non-pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.1, yellowish-brown, 10 YR 5/8, sandy loam with *ca* 90% rock fragments.

Comments

Well drained, may waterlog after heavy rain. Situated on top of breakaway platform.

- Loc. 3.27

  Mosaic of shrubland similar to locs 3.6 and 3.14.

- Loc. 3.28

  Mosaic of shrubland similar to locs 3.6 and 3.14 with abundant *Melaleuca cordata.*

- Loc. 3.29

  Mosaic of locs 3.6 and 3.14.

- Loc. 3.30

  As for loc. 3.6 on lower slopes of steep rise, giving way to loc. 3.14 association on higher ground.

- Loc. 3.31

  Mosaic of loc. 3.6 and 3.14.

- Loc. 3.32

  As for loc. 3.31.

- Loc. 3.33

Key Description

Dense Thicket *on* fine sandy loam.

Code xSd/FSL

Loc. Details

Unstratified, *Melaleuca nematophylla* and several other species of shrubs, mature, canopy 2-2.5 m tall, 70-100% canopy cover.

Comments

Some emergent *M. nematophylla* to 3 m tall. No evidence of fire.

Litter

Moderately abundant, mostly terete leaves, clumped to 1 cm deep beneath shrubs, clumps continuous or up to 1 m apart.

Soil

Friable soil 30-50 cm deep. 30 cm sample is slightly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 5.9, reddish-yellow, 7.5 YR 6/6, fine sandy loam with *ca* 1% rock fragments.

Comments

Very stony, abundant surface pebbles, drainage moderate to poor. Situated on stony ridge.

- **Loc. 3.34**

Key Description

Thicket *over* Open Dwarf Scrub D *on* fine sandy loam.

Code xSc.xSDr/FSL

Loc. Details

Stratum 1. *Melaleuca uncinata* and numerous other species of shrubs, mature, stratum 2-3 m tall, 30-70% canopy cover.

Stratum 2. Mixed shrubs, no particular dominants, senescent, stratum 0.5 m tall, 2-10% canopy cover.

Comments

Scattered *Eucalyptus foecunda* shrub mallee to 4 m and *Acacia stereophylla* shrubs to 4 m. No evidence of fire.

Litter

Moderately abundant, terete leaves and twigs, clumped to 1 cm deep, clumps 0-1 m apart.

Soil

30 cm sample slightly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 5.0, yellow, 10 YR 7/6, fine sandy loam with *ca* 20% rock fragments.

Comments

Abundant pebbles and rock fragments both on the surface and at depth. Drainage moderate with some pooling. Situated on low rise surrounded by sandy country.

- **Loc. 3.35**

As for loc. 3.24 but *Melaleuca cordata* prominent in stratum 2, and 10-30% canopy cover.

HEATH

- Loc. 4.1

  As for loc. 4.2.

- Loc. 4.2 (Trapline 3)

Key Description

Low Heath C *on* clayey sand.

Code xSCc/CLS

Loc. Details

Unstratified, *Conospermum distichum* and numerous other shrubs and *Ecdeiocolea monostachya* sedge, all mature, canopy 0-1 m tall, 30-70% canopy cover.

Comments

Actinostrobus arenarius shrubs scattered throughout and may reach 3% canopy cover in small areas. Most species found regenerating from seed. No evidence of fire.

Litter

Sparse, mostly terete leaves and twigs, clumped to 0.5 cm deep beneath shrubs. Clumps 1-3 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample non-pedal, sandy, non-coherent, unbleached, non-calcareous, pH 5.5, very pale brown, 10 YR 8/3, clayey sand.

- Loc. 4.3

  As for loc. 4.2.

- Loc. 4.4

  Casuarina campestris, Thryptomene racemosa and *Calothamnus blepharospermus* shrubs, 1-2 m tall, 30-70% canopy cover.

- Loc. 4.5

  As for loc. 4.2

- Loc. 4.6

  As for loc. 4.5 with patches of loc. 3.6 or 3.21.

- Loc. 4.7

  As for loc. 4.4 with patches of *Ecdeiocolea monostachya.*

- Loc. 4.8

  As for loc. 4.2.

- Loc. 4.9

  Mosaic of loc. 4.2 with small patches similar to loc. 3.10. The *Actinostrobus* becomes more abundant, the shrubs lower and the *Casuarina* sparser as the north side of the sandy crest at locs 3.17 and 3.18 is approached.

- **Loc. 4.10**
  As for loc. 4.2.

- **Loc. 4.11**
  As for loc. 4.2 sometimes becoming shrubland (2 m tall) in some areas.

APPENDIX 4

LIST OF PLANT SPECIES RECORDED AT VARIOUS LOCATIONS BINDOO HILL NATURE RESERVE (INCLUDING WATER RESERVE)

SC = specimen lodged in Western Australian Museum Survey Collection.

Loc. 1.1

Acacia acuminata
A. andrewsii
A. tetragonophylla
Atriplex inflata?
Bassia forestiana
Cassia nemophylla
Dodonaea inequifolia
Eremophila clarkii
Eucalyptus loxophleba
Exocarpus aphyllus
Melaleuca acuminata
Ptilotus grandiflorus
P. obovata
Rhagodia sp. 3 (SC)
Santalum acuminatum
Solanum lasiophyllum

Loc. 3.1

Acanthocarpus preissii
Baeckea sp. 3 (SC)
B. affin. *stowardii*
Banksia ashbyi
B. sceptrum
Beaufortia elegans
Calothamnus blepharospermus
Casuarina campestris
Conospermum stoechadis
Cryptandra leucophracta?
C. affin. *myriantha*
Ecdeiocolea monostachya
Eucalyptus jucunda
Glischrocaryon flavescens
Hakea circumalata
Loxocarya affin. *vestita*
Melaleuca subtrigona
Pityrodia oldfieldii
Ricinocarpus muricatus
Verticordia chrysanthera
Wehlia aurea

Loc. 3.6

Acacia affin. *nigripilosa*
Actinostrobus arenarius
Calothamnus blepharospermus
Casuarina campestris
Comesperma scoparia
Conospermum stoechadis
Cryptandra leucophracta?
Ecdeiocolea monostachya
Eucalyptus jucunda
Grevillea affin. *integrifolia*
Harperia lateriflora
Isopogon divergens
Leptomeria preissiana
Melaleuca scabra
M. subtrigona
Pityrodia affin. *verbascina*
Scholtzia parviflora
Wehlia aurea

Loc. 3.14

Acacia dielsii
A. nigripilosa
A. stereophylla
Calothamnus affin. *chrysantherus*
Casuarina campestris
Conospermum stoechadis
Eucalyptus ebbanoensis
Melaleuca cordata
M. scabra
Myrtaceae sp. 3 (SC)
Thryptomene affin. *racemulosa*
Wehlia aurea

Loc. 3.18

Acacia ligulata
A. saligna
Actinostrobus arenarius
Alyxia buxifolia
Baeckea sp. 3 (SC)
B. sp. 4 (SC)
Banksia sceptrum
Beaufortia elegans
Calothamnus blepharospermus
Casuarina campestris
Comesperma scoparia
Conospermum stoechadis
Conostephium preissii
Enchylaena tomentosa
Eucalyptus jucunda
Glischrocaryon flavescens
Grevillea didymobotrya
Isopogon scabriusculus
Jacksonia hakeioides
Lechenaultia floribunda?
Melaleuca scabra
M. affin. *subtrigona*
Thryptomene sp. 1 (SC)
Xylomelum angustifolium

Loc. 3.21

Acacia bayliana
A. nigripilosa
Actinostrobus arenarius
Baeckea sp. 3 (SC)
Calothamnus affin. *asper*
Cassytha affin. *glabella*
Casuarina campestris
Comesperma scoparia
Conospermum stoechadis
Eucalyptus ebbanoensis
E. foecunda
Grevillea didymobotrya
Hakea pycnoneura
Melaleuca affin. *scabra*
M. subtrigona
Persoonia sp. 1 (SC)
Petrophile semifurcata
Santalum sp. 1 (SC)
Thryptomene racemulosa
Thryptomene or *Micromyrtus* sp. 5 (SC)
Verticordia polytricha

Loc. 3.26

Acacia acuminata
A. neurophylla
Baeckea sp. 5 (SC)
Casuarina campestris
Comesperma scoparia
Lhotskya harvestiana
Melaleuca nematophylla

Loc. 3.33

Acacia neurophylla
Cassytha affin. *racemosa*
Casuarina campestris
Ecdeiocolea monostachya
Hakea affin. *subsulcata*
Lhotskya harvestiana?
Melaleuca cordata
M. nematophylla
Myrtaceae sp. 3 (SC)
Riconocarpus muricatus

Loc. 3.34

Acacia acuminata
A. neurophylla
A. stereophylla
Actinostrobus arenarius
Baeckea sp. 3 (SC)
B. sp. 4 (SC)
Ecdeiocolea monostachya
Hakea invaginata
Lhotzkya harvestiana?
Melaleuca cordata
M. uncinata
Petrophile semifurcata
Ricinocarpus muricatus
Thryptomene sp. 4 (SC)

APPENDIX 5

FAMILY AND SPECIES DISTRIBUTION

Family	Number of species recorded		Family	Number of species recorded	
	East Yuna Reserve	Bindoo Hill Reserve		East Yuna Reserve	Bindoo Hill Reserve
Amarantaceae	5	2	Loranthaceae	1	
Apiaceae	2		Malvaceae	3	
Apocynaceae	1	1	Mimosaceae	32	10
Asteraceae	11		Myoporaceae	4	1
Boraginaceae	2		Myrtaceae	87	26
Caesalpiniaceae	7	1	Orchidaceae	4	
Casuarinaceae	3	1	Phytolaccaceae	1	
Chenopodiaceae	9	4	Pittosporaceae	1	
Convolvulaceae	1		Poaceae	3	
Cupressaceae	1	1	Polygalaceae	3	1
Cyperaceae	5		Proteaceae	38	14
Dicrastylidaceae	5	2	Restionaceae	2	3
Dilleniaceae	5		Rhamnaceae	3	2
Dioscoraceae	1		Rutaceae	2	
Epacridaceae	5	1	Santalaceae	7	4
Euphorbiaceae	4	1	Sapindaceae	4	1
Fabaceae	9	1	Solanaceae	4	1
Goodeniaceae	9	1	Stackhousiaceae	3	
Haemodoraceae	4		Sterculiaceae	5	
Haloragaceae	2	1	Stylidiaceae	2	
Iridaceae	2		Stylobasiaceae	1	
Lamiaceae	4		Thymeliaceae	3	
Lauraceae	1	2	Violaceae	1	
Liliaceae	8		Xanthorrhoeaceae	2	1
Lobeliaceae	1				