

II VEGETATION OF YORKRAKINE ROCK, EAST YORKRAKINE AND NORTH BUNGULLA NATURE RESERVES

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General

Yorkrakine Rock (YRR), East Yorkrakine (YER), and North Bungulla (NBR) Reserves all fall within the Avon Botanical District of the South-Western Botanical Province of Gardner & Bennetts (1956), and the vegetation largely conforms to that generally found throughout this region.

No documented plant collections have been made prior to this survey, which was carried out on 30-31 August (NBR), 1-2 September (YRR), and 4-5 September (YER) 1977.

Vegetation descriptions are presented in **Appendices 1** (YRR), **3** (YER), and **5** (NBR). Species lists for selected locations are given in **Appendices 2, 4, and 6** respectively. Positions of sample locations, tracks and disturbed areas are shown in **Figs 2, 3 and 4** respectively.

Methodology

The vegetation of YRR, YER and NBR 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 **Figs 2, 3 and 4** represent 'sample areas' where the vegetation was examined in detail. The following prefix numbers of the locations represent basic formation types:

- 1 = Woodland formations
- 2 = Mallee formations
- 3 = Shrubland formations
- 4 = Heath formations
- 5 = Lithic complex

The methods used in classifying formations, coding vegetation, preparing plant lists, classifying litter and describing soils are those of Muir (1977a). In addition to the soil characteristics dealt with on other reserves, total soluble salts were also measured. Samples were prepared by mixing 20 g of

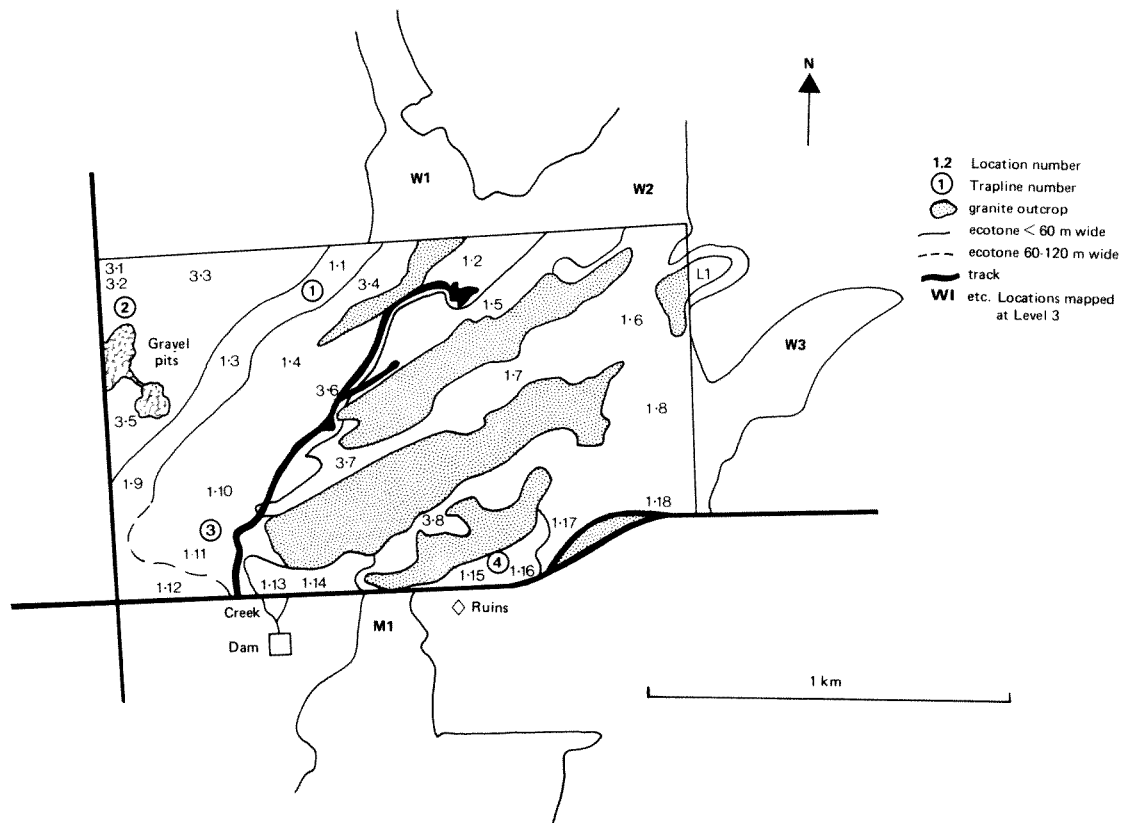


Fig. 2: Map of Yorkkrakine Rock Nature Reserve showing vegetation areas, sample locations, trapline positions and major roads and tracks.

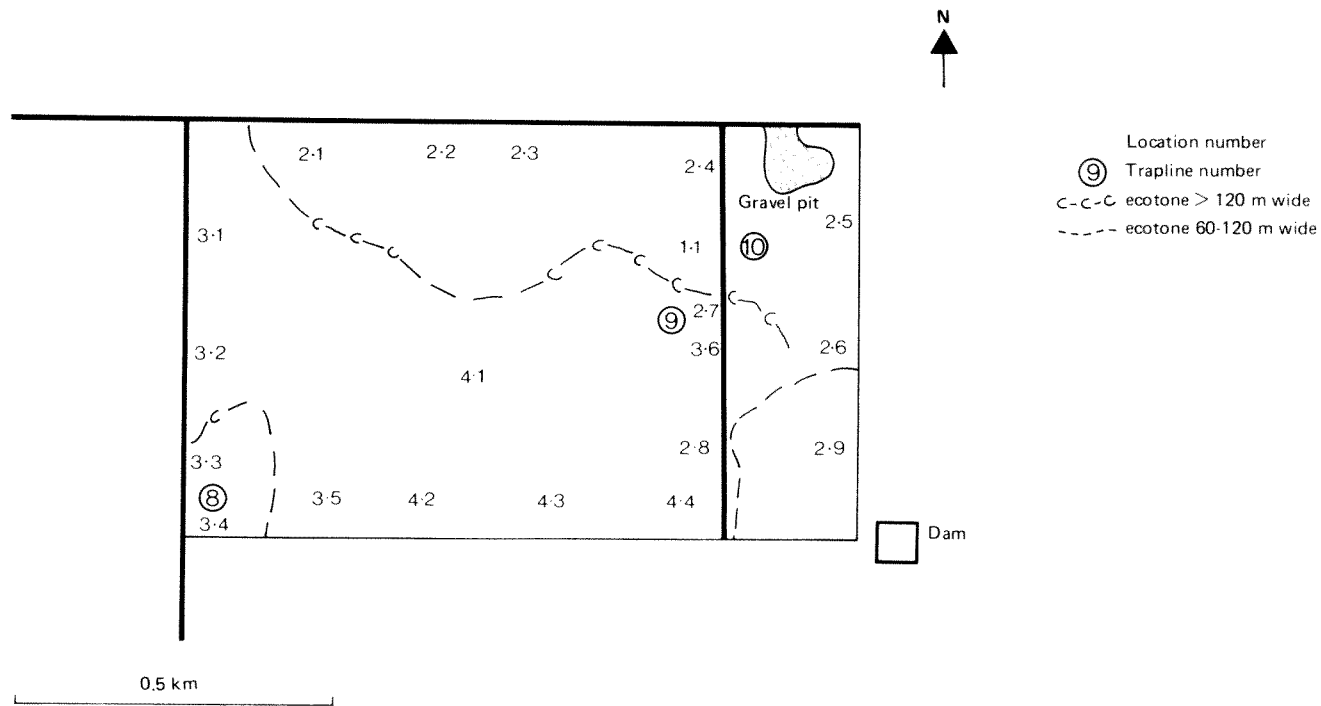


Fig. 3: Map of East Yorkkrakine Nature Reserve showing vegetation areas, sample locations, trapline positions and major roads and tracks.

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 Mosses, liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

sieved soil (less than 2 mm) with 50 cc deionised water and shaking periodically for 30 minutes. Conductivity readings were taken on a Philips PW9504 Conductivity Meter fitted with a PW9510 electrode. Readings were then converted to total soluble salts by comparison to a standard seawater curve.

Formations and Distribution

Yorkrakine Rock Reserve (YRR) has mostly lithic complex as a large portion of the Reserve is bare granite outcrop. Woodlands are of two types: firstly those dominated by *Casuarina huegeliana* or *Acacia acuminata* and occurring on arkosic sands deposited close to the base of the granite outcrop, or as a thin sheet directly on the granite; secondly *Eucalyptus* spp. dominated woodlands which form on clayey soils further from the outcrop.

East Yorkrakine Reserve (YER) has woodland, mallee, shrubland and heaths. The woodland is on clayey soils of some depth, the mallee on shallow clays which probably overlie granite. Shrublands are generally on gravelly areas which tend to retain soil moisture better than heathy soils which are deeper and perhaps better drained.

North Bungulla Reserve (NBR) has only mallee, shrubland and heath represented; the mallee being on clayey pockets where granite approaches the surface, the shrublands where soil is gravelly, and the heaths probably being the result of slightly better drainage on sandy soils or the result of fire.

Formation area and proportion of the reserve are set out in the table below:

Formation	YRR		YER		NBR	
Woodland	87 ha	55%	1 ha	1%	—	—
Mallee	—	—	33	41	7 ha	7%
Shrubland	28	18	16	20	78	75
Heath	—	—	31	38	14	14
Lithic complex	43	27	—	—	—	—
Cleared areas	—	—	—	—	5	5

YRR is predominantly woodland, both in area of formation and percentage of reserve. This figure is, however, biased by the inclusion of the large area of *Acacia acuminata* woodland which is formed on the deeper soil pockets of the granite. If these woodlands are considered as part of the lithic complex, the area of granite-affected formation is increased to ca 140 ha or ca 78% of the reserve. Locs 3.4, 3.6, 3.7 and 3.8 are also very closely influenced by the granite, and thus well over 80% of the reserve owes its structure and much of its floristics to the granite outcrop.

YER, in contrast, has its largest area as mallee or heath, with shrubland of lesser area. Woodland is almost absent.

NBR has mostly shrubland, with only small patches, widely separated, of heath and mallee. The gravel pit and cleared areas have removed the vegetation of ca 5% of the reserve.

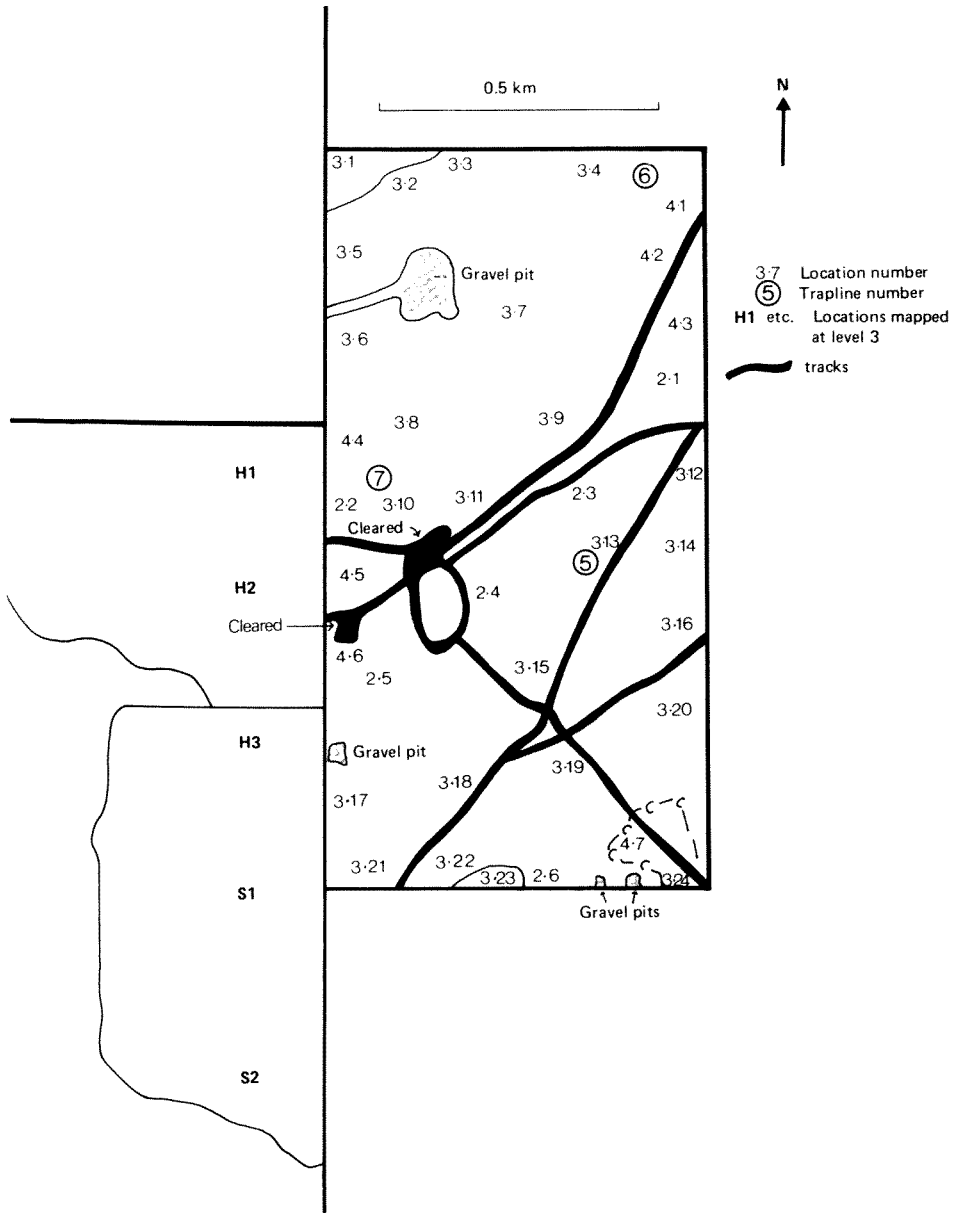


Fig. 4: Map of North Bungulla Nature Reserve showing vegetation areas, sample locations, trapline positions and major roads and tracks.

Associations

'Associations' as used here include associations, associates and consociations according to the definitions of Beadle & Costin (1952) and Polunin (1960). Associations on YRR, YER and NBR are listed below:

ASSOCIATIONS WITHIN EACH FORMATION

	Reserve where recorded		
	YRR	YER	NBR
WOODLAND			
<i>Acacia acuminata</i>	x		
<i>A. acuminata-A. lasiocalyx-A. saligna</i>	x		
<i>Casuarina huegeliana</i>	x		
<i>Eucalyptus salmonophloia</i>	x	x	
<i>E. salmonophloia-E. wandoo</i>	x		
<i>E. wandoo</i>	x		
MALLEE			
<i>Eucalyptus cylindriflora-E. redunca</i>		x	
<i>E. erythronema</i>			x
<i>E. redunca</i>		x	x
<i>E. sheathiana-E. cylindriflora</i>		x	
<i>E. transcontinentalis</i>			x
<i>E. transcontinentalis-E. cylindriflora</i>		x	
<i>E. transcontinentalis-E. redunca</i>		x	x
SHRUBLAND			
<i>Acacia stereophylla</i>	x	x	x
<i>A. stereophylla-Casuarina acutivalvis</i>		x	x
<i>A. stereophylla-C. campestris</i>	x		
<i>Casuarina acutivalvis</i>		x	x
<i>C. campestris</i>	x	x	x
<i>Grevillea excelsior</i>	x		
<i>Hakea coriacea-C. acutivalvis</i>			x
<i>Leptospermum erubescens</i>	x		
<i>Melaleuca uncinata</i>		x	x
HEATH			
<i>Casuarina campestris</i>	x		x
<i>Melaleuca seriata-mixed</i>			x
<i>M. uncinata</i>			x
<i>M. uncinata-C. campestris</i>			x
<i>M. uncinata-C. campestris-Hakea subsulcata</i>			x
<i>M. uncinata-C. campestris-M. seriata</i>			x
LITHIC COMPLEX			
Mixed (variable dominance)	x		

Formation	Number of Associations		
	YRR	YER	NBR
Woodland	6	1	—
Mallee	—	5	4
Shrubland	5	5	6
Heath	1	—	6
Lithic complex	1	—	—
Total	13	11	16

Expressed as number of associations per square km of reserve, YRR has 8.2, YER 13.6 and NBR 15.4 associations, all high compared to the average of *ca* 4 associations per square km for the reserves examined to date in the survey of the wheatbelt.

Senescent Trees

A senescence index for trees can be determined for YER and YRR in the manner described in Muir (1977b). Trees are absent from NBR and very scarce on YER, being only present as a few immature to mature *Eucalyptus salmonophloia* in loc. 1.1. There are however scattered trees in mallee locs 2.3, 2.5, 2.6 and 2.9. Average canopy cover for the trees is *ca* 2% and they are about 1% senescent. A senescence index for the reserve would thus be 0.0004 (virtually absent).

YRR, in contrast, has *ca* 87 ha of woodland of which about 78 ha is *Acacia acuminata* or *Casuarina huegeliana* dominated, neither of which generally forms hollow limbs or trunks. The trees which commonly form hollows are largely restricted to *ca* 9 ha of *Eucalyptus* spp. in locs 1.1, 1.3, 1.9 and 1.12. The average canopy cover for these locs is 13%, thus there is *ca* 1.2 ha of actual canopy. Average senescence is about 5% and the senescence index for YRR is 0.06.

Floristics

Collections of perennial plant species are probably fairly complete on YER due to the uniform nature of the vegetation. YRR and NBR are less well examined for although access is good the vegetation is highly mosaic and variable.

A total of 330 species was recorded, 119 on YRR, 88 on YER and 150 on NBR. Only 27 species (8.2%) were common to all three reserves. Based on previous experience, the total number of common perennials *and* large annuals on each reserve is probably about 170, 120 and 220 respectively.

The relative species abundance for the reserves is 0.75 spp./ha on YRR, 1.09 spp./ha on YER and 1.44 on NBR, indicating that the most species per area of reserve is on NBR, and the least on YRR.

The table below compares floristic diversity between formations, indicating number of species in each formation and the number of species per ha of each formation:

Formation	YRR		YER		NBR	
	No. spp.	spp./ha	No. spp.	spp./ha	No. spp.	spp./ha
Woodland	69	0.79	5	5	—	—
Mallee	—	—	52	1.58	35	5.00
Shrubland	58	2.07	40	2.50	104	1.33
Heath	—	—	11	0.35	68	4.86
Lithic complex	17	0.40	—	—	—	—

Most species were recorded in woodland on YRR, although in terms of area shrubland had by far the most. Similar results were obtained on YER; except for woodland, the small area of which inflated the species per area figure.

The figures for NBR are of interest as none of the formations was of particularly small area and the number of species in one formation (shrubland) was fairly high. The floristic diversity figures are thus high, although comparatively lower in shrubland compared to mallee or heath.

The number of species found *only* in a single formation (restricted species) are shown below:

Formation	YRR		YER		NBR	
	No. spp.	spp./ha	No. spp.	spp./ha	No. spp.	spp./ha
Woodland	42	0.48	1	1	—	—
Mallee	—	—	39	1.18	20	2.86
Shrubland	42	1.50	31	1.94	54	0.69
Heath	—	—	3	0.10	21	1.50
Lithic complex	5	0.12	—	—	—	—

Although the greatest number of restricted species on the reserves is found in woodlands and shrubland (YRR), mallee and shrubland (YER) and shrubland (NBR), the most per area of formation were in shrubland on YRR and YER and in mallee on NBR.

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 —
YORKRAKINE ROCK NATURE RESERVE

N.B. All vegetation is older than 25 years.

WOODLAND FORMATIONS

● Loc. 1.1 (Trapline 1)

Key Description

Woodland over Open Scrub on clay loam.

Code eMi.xSr/CL

Loc. Details

Stratum 1. *Eucalyptus salmonophloia* trees, immature, stratum 16-24 m tall, 10-30% canopy cover.

Stratum 2. *Acacia graffiana* and *Melaleuca uncinata* shrubs, mature, stratum 1-2.5 m tall, 2-10% canopy cover.

Comments

Some areas of stratum 1 down to 5% canopy cover. Scattered *E. loxophleba* present on edge of association. No evidence of fire. Some timber removed.

Litter

Abundant, broad leaves, bark and some large debris. Layer continuous, to 2 cm deep.

Soil

30 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 4.9, brown 7.5 YR 5/2, clay loam with abundant quartz grit. Salts 150 ppm. Poorly drained.

● Loc. 1.2

As for loc. 1.11 with small areas of granite exposed.

● Loc. 1.3

As for loc. 1.1 with some areas of *Eucalyptus wandoo* and scattered *E. loxophleba*.

● Loc. 1.4

As for loc. 1.11 with scattered *Eucalyptus loxophleba* and *Santalum spicatum* trees and *Dodonaea inequifolia*, *Alyxia buxifolia* and *Grevillea paniculata* shrubs.

● Loc. 1.5

Casuarina huegeliana trees, immature to senescent, 6-11 m tall, 70-100% canopy cover over *Leptospermum erubescens* shrubs, mature, 1.5-4 m tall, 2-10% canopy cover. Small open areas with granite outcropping have *Stylobasium australe*, *Acacia lasiocalyx*, *Dianella revoluta*, *Stypanandra imbricata* and *Melaleuca elliptica*.

- **Loc. 1.6**

As for loc. 1.11.

- **Loc. 1.7**

As for loc. 1.11 with numerous small granite exposures and boulders.

- **Loc. 1.8**

As for loc. 1.11.

- **Loc. 1.9**

Key Description

Open Woodland on clay loam.

Code eMr/CL

Loc. Details

Unstratified *Eucalyptus wandoo* trees, mature, 12-19 m tall, 2-10% canopy cover.

Comments

No understory but scattered grasses and shrubs present. Northern edge of loc. passes into *E. salmonophloia* association. Scattered granite boulders present. Some timber removed. No evidence of fire. Also ref. loc. 1.12.

Litter

Abundant, mostly broad leaves, bark and some large debris, continuous, to 2 cm deep.

Soil

30 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, brown, 7.5 YR 5/2, clay loam with coarse quartz grit. Soluble salts 150 ppm. Poorly drained.

- **Loc. 1.10**

As for loc. 1.11 with abundant *Santalum spicatum* trees and scattered *Glischrocaryon flavescens*.

- **Loc. 1.11 (Trapline 3)**

Key Description

Open Low Woodland A over Herbs on sandy clay loam.

Code aLAr.n₁Jc/SCL

n₁ = *Borya nitida*

Loc. Details

Stratum 1. *Acacia acuminata* trees, immature to mature, 4-5.5 m tall, 2-10% canopy cover.

Stratum 2. *Borya nitida* herbs, mature, 5-10 cm tall, 30-70% canopy cover.

Comments

Scattered *Eucalyptus loxophleba* trees to 9 m tall. Scattered grasses present. Seedlings of all species present. No evidence of fire.

Litter

Sparse, twigs and some large debris. Virtually no clumping but about 10 m between logs or large branches.

Soil

Variable depth due to numerous outcrops of granite either as single large exposures or clusters of boulders. 20 cm sample was highly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.8, reddish brown, 5 YR 4/4, sandy clay loam. Well drained but some areas of pooling and runoff from boulders or granite pavement.

● Loc. 1.12

Key Description

Open Woodland over Open Low Scrub B on sandy clay loam.

Code eMr.xSBr/SCL

Loc. Details

Stratum 1. *Eucalyptus salmonophloia* and *E. wandoo* trees, mature, 10-23 m tall, 2-10% canopy cover.

Stratum 2. *Pittosporum phillyraeoides* and *Scaevola spinescens* shrubs, the former immature, the latter mature to senescent, 0-1.5 m tall canopy cover ca 2% overall but locally clumped up to 70%.

Comments

Scattered *E. salubris* trees, mature, 8-11 m tall, and *E. loxophleba* tree mallee and trees, 6-11 m tall with scattered emergents to 28 m. No evidence of fire. Between loc. 1.12 and loc. 1.9, where ecotone of loc. 1.11 penetrates, the *E. loxophleba* becomes entirely tree mallee, 4-10 m tall, 2-10% canopy cover over *Casuarina campestris* shrubs 1.5-4 m tall, 10-30% canopy cover.

Litter

Moderately abundant, mostly broad leaves and bark with some large debris, continuous, to 2 cm deep.

Soil

30 cm sample is highly pedal, sandy, coherent, unbleached, non-calcareous, pH 5.5, brown, 7.5 YR 5/4, sandy clay loam. Soluble salts 250 ppm. Poorly drained.

● Loc. 1.13

Casuarina huegeliana trees to 12 m tall. 70-100% canopy cover. Understory of grasses and scattered sedges. This is a small pocket in the runoff zone of the granite outcrop.

● Loc. 1.14

Acacia acuminata, *A. lasiocalyx* and *A. saligna* trees 4-6 m tall, 70-100% canopy cover over *Leptospermum erubescens* 1-3 m tall, 2-10% canopy cover over *Lepidosperma* affin. *costale* 0.4 m tall, 10-30% canopy cover. Small pocket in runoff zone of granite outcrop.

● Loc. 1.15 (Trapline 4)

Key Description

Dense Low Forest A on clayey sand.

Code cLAd/CLS

Loc. Details

Unstratified *Casuarina huegeliana* and scattered *Acacia lasiocalyx* trees, mature to senescent, 6-11 m tall, 70-100% canopy cover.

Comments

No understory but abundant *Hordeum marinum* and *Ehrharta longiflora* grass. Several rabbit warrens and dung hills. No evidence of fire.

Litter

Abundant, terete leaves, layer continuous, to 3 cm deep.

Soil

30 cm sample non-pedal, sandy, non-coherent, unbleached, non-calcareous, pH 5.6, pink, 7.5 YR 7/4, clayey sand with abundant quartz grit. Soluble salts 86 ppm. Well drained.

- Loc. 1.16

As for locs 1.14 and 1.15 mosaic with exposures of granite.

- Loc. 1.17

As for loc. 1.11 with scattered or clumped *Casuarina huegeliana* trees.

- Loc. 1.18

As for loc. 1.11 with areas of *Casuarina huegeliana* and exposures of granite.

SHRUBLAND FORMATIONS

- Loc. 3.1

Very small area of *Grevillea excelsior* shrubs 3-5 m tall, 2-10% canopy cover over *Casuarina campestris* and *Hakea falcata* shrubs 1.5-3 m tall, 2-10% canopy cover over *Baeckea muricata* and *Melaleuca conothamnoides* shrubs and *Ecdeiocola monostachya* sedge 0.5 m tall, 10-30% canopy cover. Litter moderate to abundant. Soil as for loc. 3.2 but pH 3.8 and with soluble salts 40 ppm. Excessively drained. This association probably represents a remnant of a larger area north and west of the reserve and now cleared.

- Loc. 3.2 (Trapline 2)

Key Description

Thicket over Open Low Sedges on fine sandy loam.

Code acSc.n₁ VLi/FSL

n₁ = *Ecdeiocola monostachya*

Loc. Details

Stratum 1. *Acacia stereophylla* and *Casuarina campestris* shrubs, mature, 2-2.5 m tall, 30-70% canopy cover.

Stratum 2. *Ecdeiocola monostachya* sedge, mature, 0.5 m tall, 10-30% canopy cover.

Comments

Rabbit warrens present. Evidence of very old fire scars. Becomes pure *C. campestris* 1.5-2.0 m tall, 70-100% canopy cover near gravel pit.

Litter

Sparse to moderate, mostly terete leaves, clumped to 1 cm deep, clumps 2 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample moderately pedal, sandy, coherent, unbleached, non-calcareous, pH 4.1, yellow, 10 YR 7/6, fine sandy loam. Soluble salts less than 30 ppm, well drained.

● Loc. 3.3

As for loc. 3.2 but *Casuarina campestris* not a codominant in stratum 1. Additionally stratum 1 is 3-5 m tall and only 2-10% canopy cover. Scattered *Eucalyptus drummondii* are present as are dead stems of *Grevillea excelsior*. Soil as for loc. 3.2 but pH 3.9 and well drained. Closer to loc. 1.1 loc 3.3 becomes more like loc. 3.2.

● Loc. 3.4

Casuarina campestris shrubs 2-3 m tall, 30-70% canopy cover. Scattered *Acacia acuminata*, *Eucalyptus loxophleba* and *Melaleuca radula* present. Understory as for loc. 1.11.

● Loc. 3.5

Key Description

Scrub over Open Low Sedges on fine sandy loam.

Code cSi.n₁VLi/FSL

n₁ = *Ecdeiocolea monostachya*

Loc. Details

Stratum 1. *Casuarina campestris* shrubs, mature to senescent, 2-3 m tall, ca 30% canopy cover.

Stratum 2. *Ecdeiocolea monostachya* sedge, 0.5 m tall, 10-30% canopy cover.

Comments

Scattered *Eucalyptus drummondii* shrub mallee to 6 m tall, may reach 1% canopy cover in parts. Seedlings of all species noted. No evidence of fire. Gravel pit near this loc. is older than 15 years.

Litter

Moderate, terete leaves, twigs and bark, clumped to 2 cm deep, clumps continuous or up to 2 m apart. Abundant standing dead shrubs.

Soil

Soil greater than 1 m deep. 30 cm sample slightly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.3, yellow, 10 YR 7/8, fine sandy loam. Well drained.

● Loc. 3.6

Casuarina campestris shrubs 2-3 m tall, 70-100% canopy cover over *Lepidosperma* affin. *costale* and grasses to 30 cm tall. Scattered *Dodonaea inequifolia* on northern margins of this loc.

- Loc. 3.7

Dominated by shrubs, mostly *Leptospermum erubescens* with numerous other species present including *Hakea petiolaris*, *Dodonaea attenuata*, *Nuytsia floribunda*, *Stypandra imbricata* and *Lepidosperma costale*. Area collects an enormous amount of runoff, the majority of the water falling on the granite north and south of this loc. and east to about halfway between locs 3.7 and 1.7 draining into loc. 3.7.

- Loc. 3.8

Similar to loc. 3.7. Most of the area is *Leptospermum erubescens* shrubs 2-3 m tall, 70-100% canopy cover. There are also areas of *Acacia lasiocalyx* 4-6 m tall or *Nuytsia floribunda* 2-7 m tall. These areas are all surrounded by bands of *L. erubescens*.

LITHIC COMPLEX

The granite areas are not differentiated by loc. numbers but consist of a mosaic of bare granite slopes with shallow or deep soil pockets. Bare areas tend to be on steeper slopes and have only blue-green algal stains or occasional lichens, particularly *Rhizocarpon* sp. or *Caloplaca irrubescens*. Flatter areas have *Grimmea* sp. moss or *Parmelia conspersa* lichen. Shallow soil pockets have *Kunzea pulchella*, *Dodonaea attenuata* or *Diplolaena drummondii* shrubs.

Deeper pockets have *Melaleuca elliptica*, *Kunzea pulchella*, *Scaevola spinescens*, *Dodonaea attenuata*, *Stypandra imbricata* or *Lepidosperma costale* with occasional *Acacia lasiocalyx* trees. Very deep pockets are represented by locs 3.7 and 3.8.

UNCLEARED LAND ADJACENT TO RESERVE

- W1

As for loc. 1.11 with patches similar to loc. 3.4.

- W2

As for W1.

- W3

As for loc. 1.18.

- M1

Eucalyptus loxophleba tree mallee and trees, 10-14 m tall, 10-30% canopy cover.

- L1

As for lithic complex.

APPENDIX 2
 PLANT SPECIES LISTS FOR SELECTED LOCATIONS
 YORKRAKINE ROCK NATURE RESERVE

Loc. 1.1

Acacia graffiana
Eucalyptus loxophleba
E. salmonophloia
Maireana enchylaenoides
M. georgei

Melaleuca uncinata
Olearia muelleri
O. revoluta
Santalum acuminatum

Loc. 1.11

Acacia acuminata
Arctotheca calendula
Borya nitida
Cheilanthes tenuifolia
Dianella revoluta
Erodium cygnorum
Eucalyptus loxophleba
Hakea recurva

Helichrysum cassinianum
Lepidosperma costale
Melaleuca adnata
Podotheca gnaphalioides
Thysanotus tenellus
Ursinia anthemoides
Waitzia acuminata

Loc. 1.15

Acacia lasiocalyx
Asparagus asparagoides
Casuarina huegeliana

Ehrharta longiflora
Hordeum marinum
Muhlenbeckia adpressa

Loc. 3.2

Acacia heteroneura
A. stereophylla
Baeckea floribunda
B. muricata
Borya nitida
Calothamnus gilesii

Casuarina campestris
Ecdeiocolea monostachya
Grevillea paradoxa
G. pritzellii
Hakea falcata
Melaleuca conothamnoides

Loc. 3.5

Acacia stereophylla
Borya nitida
Casuarina campestris
Chamaexeros fimbriata
Conospermum stoechadis
Ecdeiocolea monostachya
Eriostemon tomentellus var. *grandis*
Eucalyptus drummondii

Gahnia polyphylla
Hakea falcata
Halgania lavendulacea
Harperia lateriflora
Melaleuca conothamnoides
Santalum spicatum
Xylomelum angustifolium

LITHIC COMPLEX

Shallow Pockets

Calandrinia polyandra
Diplolaena drummondii
Dodonaea attenuata
Hibbertia affin. *glomerosa*

Keraudrenia integrifolia
Kunzea pulchella
Mirbelia ramulosa
Podotheca gnaphalioides

Deep Pockets

Acacia extensa
A. lasiocalyx
Dianella revoluta
Dodonaea attenuata
Helipterum hyalospermum
Kunzea pulchella

Lepidosperma costale
Melaleuca elliptica
Myriocephalus gracilis
Scaevola spinescens
Stypandra imbricata

APPENDIX 3 VEGETATION DESCRIPTIONS — EAST YORKRAKINE NATURE RESERVE

N.B. All vegetation 20-25 years old unless otherwise specified.

● Loc. 1.1 (Trapline 10)

Key Description

Open Woodland *over* Open Scrub *on* sandy clay.

Code eMr.xSr/SC

Loc. Details

Stratum 1. *Eucalyptus salmonophloia* trees, mature, 16-20 m tall, 2-10% canopy cover.
Stratum 2. *Acacia acuminata*, *Melaleuca lateriflora*, *M. adnata* shrubs, mature to senescent, 1.5-3 m tall, 2-10% canopy cover but distribution very patchy.

Comments

Occasional thickets of *M. acuminata* and *M. adnata*. No evidence of fire.

Litter

Moderate, broad leaves, large debris, clumped to 1.5 cm deep, clumps 2-8 m apart. Abundant rubbish including bottles, sheets of rusty iron and timber.

Soil

As for loc. 2.5 but pH 5.6, light reddish brown, 5 YR 6/4, sandy clay.

MALLEE FORMATIONS

● Loc. 2.1

Key Description

Open Shrub Mallee *over* Thicket *over* Very Open Low Grass *on* light sandy clay loam.

Code eKSi.mSc.n₁ GLr/LSCL

n₁ = *Spartochloa scirpoidea*

Loc. Details

Stratum 1. *Eucalyptus transcontinentalis* and *E. redunca* shrub mallee, immature to mature, stratum 4-5.5 m tall, 10-30% canopy cover.

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

Stratum 3. *Spartochloa scirpoidea* bunch grass, mature, 0.3 m tall, 2-10% canopy cover.

Comments

Borya nitida and *Loxocarya pubescens* may reach 2% canopy cover over small areas. No evidence of fire.

Litter

Moderate, broad leaves, bark and twigs, clumped to 1 cm deep, clumps 2-5 m apart.

Soil

Friable soil 20 cm deep over compact clayey B horizon. 15 cm sample slightly pedal, sandy, coherent, unbleached, non-calcareous, pH 5.9, light brown, 7.5 YR 6/4, light sandy clay loam. Soluble salts 40 ppm.

50 cm sample highly pedal, sandy, extremely coherent, unbleached, non-calcareous, pH 6.1, pinkish grey, 7.5 YR 7/2, sandy clay. Soluble salts 220 ppm. Poorly drained.

• Loc. 2.2

Eucalyptus redunca shrub mallee 4-5 m tall, 10-30% canopy cover over *Borya nitida* 0.2 m tall, 10-30% canopy cover. Area is ecotone around loc. 2.3 association.

• Loc. 2.3

Key Description

Open Shrub Mallee over Open Dwarf Scrub C on sandy clay.

Code eKSi.xSCr/SC

Loc. Details

Stratum 1. *Eucalyptus cylindriflora* and *E. redunca* shrub mallee, mature, 10-12 m tall, 10-30% canopy cover.

Stratum 2. *Melaleuca undulata* and several other species of shrubs, mature, 1.0 m tall, 2-10% canopy cover.

Comments

Scattered *E. salmonophloia* and *E. wandoo* trees 16-22 m tall. No evidence of fire.

Litter

Moderate, mostly large debris and stumps, some broad leaves and twigs, scattered evenly, very little clumping.

Soil

30 cm sample moderately pedal, sandy, coherent, unbleached, non-calcareous, pH 4.8, brown, 7.5 YR 5/4, sandy clay. Soluble salts 620 ppm. Poorly drained.

● Loc. 2.4

Key Description

Open Shrub Mallee over Open Dwarf Scrub C over Very Open Herbs (or Low Grass) on heavy clay.

Code eKSi.xSCr.n₁J(GL)r/HC n₁ = *Borya nitida* or *Amphipogon debilis*

Loc. Details

Stratum 1. *Eucalyptus redunca*, *E. transcontinentalis* and occasional *E. cylindriflora* shrub mallees, mature to senescent, stratum 5-6 m tall, 10-30% canopy cover.

Stratum 2. Mixed shrubs; no particular dominant, mature, 1.0 m tall (variable) 2-10% canopy cover.

Stratum 3. *Borya nitida* or *Amphipogon debilis* 0.2 m tall, 2-10% canopy cover.

Comments

Scattered *E. salubris* trees to 15 m tall and *E. cylindriflora* tree mallee to 8 m tall. No evidence of fire. Rubbish abundant and includes bottles, sheets of iron and drums.

Litter

Moderate, broad leaves, bark and twigs, clumped to 2 cm deep, clumps continuous or up to 2 m apart.

Soil

30 cm sample highly pedal, sandy, poorly coherent to coherent, unbleached, non-calcareous, pH 5.1, yellowish red, 5 YR 5/6, heavy clay. Soluble salts 46 ppm. Poorly drained.

● Loc. 2.5

Key Description

Open Shrub Mallee on sandy clay.

Code eKSi/SC

Loc. Details

Unstratified. *Eucalyptus sheathiana* and *E. cylindriflora* shrub mallee and scattered *E. transcontinentalis* tree mallee, mature to senescent, stratum 6-8 m tall, 10-30% canopy cover.

Comments

Scattered emergent *E. wandoo*, *E. salmonophloia* and *E. salubris* trees, 12-20 m tall. Some of the *E. transcontinentalis* are of tree life form. No understory present but scattered clumps of *Melaleuca acuminata* or *M. adnata* present, the latter senescent. Remains of old charcoal pits present, and some rubbish, mainly rusty sheets of galvanised iron. Evidence of very old fire scars. Gravel pit ca 3 ha in area is located in this loc.

Litter

Abundant, broad leaves and some twigs, sparse large debris. Leaf litter almost continuous, 2 cm deep.

Soil

30 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 5.7, reddish brown, 5 YR 5/3, sandy clay. Soluble salts 460 ppm. Drainage poor.

- **Loc. 2.6**

As for loc. 2.5 but is *Eucalyptus transcontinentalis* and *E. cylindriflora* shrub mallee.

- **Loc. 2.7 (Trapline 9)**

Key Description

Shrub Mallee on sandy clay to fine sandy loam (ecotone).

Code eKSc/SC to FSL (ecotone)

Loc. Details

Unstratified. *Eucalyptus redunca* and some *E. cylindriflora* and *E. transcontinentalis* shrub mallee, mature, stratum 5-7 m tall, 30-70% canopy cover.

Comments

No understory but scattered trees from loc. 1.1. This loc. is broadest part of ecotone between locs 1.1 and 3.6.

Litter

Abundant, broad leaves, bark, twigs and some large debris, 2 cm deep, continuous or in clumps up to 3 m apart. Abundant rubbish including bottles, sheets of rusty galvanised iron, drums and timber.

Soil

Varies from similar to loc. 1.1 soil on northern edge to similar to loc. 3.5 on southern limits.

- **Loc. 2.8**

As for loc. 2.9.

- **Loc. 2.9**

Key Description

Open Shrub Mallee over Open Low Scrub B over Dwarf Scrub C on heavy clay.

Code eKSi.mSBr.mSCi/HC

Loc. Details

Stratum 1. *Eucalyptus transcontinentalis* and scattered *E. redunca* and *E. cylindriflora* shrub mallee, mature, 6-11 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca adnata* shrubs, mature, 1-1.5 m tall, 2-10% canopy cover.

Stratum 3. *M. undulata* shrubs, mature to senescent, 1.0 m tall, 10-30% canopy cover.

Comments

Scattered *E. wandoo* emergent to 20 m tall. Patches of *M. uncinata* 2-2.5 m tall, 10-30% cover (within clumps) replaces stratum 2 in some areas.

Litter

Moderate, mostly twigs, evenly distributed.

Soil

20 cm sample highly pedal, sandy, extremely coherent, unbleached, non-calcareous, pH 5.5, brown 7.5 YR 4/2, heavy clay with ca 40% rock fragments. Soluble salts 210 ppm. Poorly drained.

SHRUBLAND FORMATIONS

● Loc. 3.1

Casuarina campestris shrubs, mature, 1-2.5 m tall, 10-30% canopy cover over *Ecdeio-colea monostachya* sedge, 0.5 m tall, 30-70% canopy cover. Scattered *C. acutivalvis* present on northern portions.

● Loc. 3.2

Key Description

Open Scrub over Dwarf Scrub D on fine sandy loam.

Code aSr.xSDi/FSL

Loc. Details

Stratum 1. *Acacia stereophylla* shrubs, mature, stratum 3-3.5 m tall, 2-10% canopy cover.

Stratum 2. *Ecdeio-colea monostachya* sedge and mixed shrubs, 0.5 m tall, 10-30% canopy cover.

Comments

No evidence of fire.

Litter

Sparse, mostly narrow leaves.

Soil

30 cm sample highly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.6, yellow, 10 YR 7/6, fine sandy loam with ca 15% laterite pebbles. Soluble salts 30 ppm. Well drained.

● Loc. 3.3

As for loc. 3.4 but *Acacia stereophylla* codominant with *Casuarina acutivalvis*.

● Loc. 3.4 (Trapline 8)

Key Description

Thicket on sandy clay.

Code cSc/SC

Loc. Details

Unstratified *Casuarina acutivalvis* shrubs, mature to senescent, stratum 3-4 m tall, ca 65% canopy cover.

Comments

No understory but scattered shrubs or patches of *Acacia stereophylla* and *A. neurophylla* present. No evidence of fire. Vegetation ca 25 years old.

Litter

Abundant, terete leaves, twigs and some large debris, layer continuous to 2 cm deep.

Soil

Friable soil ca 0.5 m deep over gravel. 30 cm sample moderately to highly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.1, light yellowish brown, 10 YR 6/4, sandy clay with ca 30% laterite pebbles. Soluble salts 37 ppm. Well drained.

● Loc. 3.5

Casuarina campestris shrubs, mature to senescent, 1-2.5 m tall, 2-10% canopy cover over *Melaleuca seriata*, *M. conothamnoides* and *Ecdeiocolea monostachya* senescent 0.5 m tall, 30-70% canopy cover. Scattered *Acacia stereophylla* emergent to 3.5 m tall. Soil moderately pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.2, yellow 10 YR 7/6, fine sandy loam. Soluble salts 33 ppm. Well drained.

● Loc. 3.6

Small area of *Melaleuca uncinata* and some *Casuarina campestris* shrubs, 1.5-2.5 m tall, 30-70% canopy cover over *Spartochloa scirpoidea* 0.5 m tall, 2-10% canopy cover. Scattered *Acacia acuminata* to 3.5 m tall. Soil as for loc. 3.5.

HEATH FORMATIONS

● Loc. 4.1

Mosaic of associations similar to locs 4.2 and 4.3.

● Loc. 4.2

As for loc. 4.3 but stratum 2 is *Ecdeiocolea monostachya* 0.5 m tall and 2-10% canopy cover. Stratum 3 is *Borya nitida*, 0.1 m tall, 10-30% canopy cover. Scattered *Eucalyptus drummondii* present.

● Loc. 4.3

Key Description

Dense Heath B over Open Herbs on sandy clay loam.

Code cSBd.n₁Ji/SCL

n₁ = *Borya nitida*

Loc. Details

Stratum 1. *Casuarina campestris* shrubs, mature, 1-1.5 m tall, 70-100% canopy cover.
Stratum 2. *Borya nitida* herbs, mature, 0.1 m tall, 10-30% canopy cover.

Comments

Scattered *Ecdeiocolea monostachya* present. Evidence of very old fire scars on *C. campestris* trunks.

Litter

Moderate, mostly terete leaves, layer continuous to 2 cm deep.

Soil

30 cm sample highly pedal, sandy, coherent, unbleached, non-calcareous, pH 5.1, pale brown, 10 YR 6/3, sandy clay loam. Well drained.

• Loc. 4.4

Casuarina campestris shrubs, mature, 1-2 m tall, 30-70% canopy cover over *Borya nitida* herbs, senescent, 0.1 m tall, 10-30% canopy cover. Scattered *Ecdeiocolea monostachya* and *Eucalyptus loxophleba* present. Litter sparse, mostly terete leaves, clumped to 2 cm deep, clumps 2 m apart. Soil highly pedal, sandy, poorly coherent, pH 5.3, yellow, 10 YR 7/8, sandy clay. In small areas *C. campestris* reaches 3.5 m tall and has scattered *Acacia assimilis* and *Eucalyptus redunca* emergent to 5 m tall. These areas are slightly less well drained than the major part of the association.

APPENDIX 4

PLANT SPECIES LISTS FROM SELECTED LOCATIONS EAST YORKKRAKINE NATURE RESERVE

(SC) denotes specimen lodged in Western Australian Museum Survey Collection.

Loc. 1.1

Acacia acuminata
Eucalyptus salmonophloia
Melaleuca acuminata

M. adnata
M. lateriflora

Loc. 2.3

Acacia acuarria
A. erinacea
A. graffiana
A. merrallii
Bassia affin. *diacantha*
Borya nitida
Eucalyptus cylindriflora
E. redunca
E. salmonophloia

E. transcontinentalis
E. wandoo
Grevillea huegellii
Lepidosperma gracile
Melaleuca acuminata
M. undulata
Olearia muelleri
Phebalium tuberculatum
Santalum acuminatum
Stipa elegantissima

Loc. 2.7

Acacia merrallii
Eucalyptus cylindriflora

E. redunca
E. transcontinentalis

Loc. 2.9

Acacia acuminata
Borya nitida
Cryptandra myriantha
Eremophila woolsiana
Eucalyptus cylindriflora
E. redunca
E. transcontinentalis
E. wandoo

Lepidosperma pruinatum
Melaleuca acuminata
M. adnata
M. uncinata
M. undulata
Spartochloa scirpoidea
Stipa affin. *compressa*

Loc. 3.2

Acacia heteroneura
A. stereophylla
Baeckea muricata
Beaufortia micrantha
Boronia caeruleascens
Borya nitida
Casuarina campestris
Chamelaucium drummondii
Cryptandra myriantha
Cyperacea sp. 1 (SC)
Ecdeiocolea monostachya
Hakea circumalata

Halgania lavendulacea
Harperia lateriflora
Hibbertia glomerosa
H. uncinata
Lepidosperma drummondii
Melaleuca conothamnoides
M. platycalyx
Pimelea brevifolia
Santalum acuminatum
Verticordia chrysantha
Xanthorrhoea nana

Loc. 3.4

Acacia neurophylla
A. stereophylla
Baeckea crispiflora
Calothamnus gilesii
Cassyltha pubescens
Casuarina acutivalvis

Ecdeiocolea monostachya
Gastrolobium hookeri
Grevillea paradoxa
G. petrophiloides
Hakea scoparia
Pimelea brevifolia

Loc. 4.3

Borya nitida
Casuarina campestris
Ecdeiocolea monostachya

APPENDIX 5

VEGETATION DESCRIPTIONS — NORTH BUNGULLA NATURE RESERVE

N.B. All vegetation more than 25 years old unless otherwise specified.

MALLEE FORMATIONS

● Loc. 2.1

Eucalyptus erythronema shrub mallee, mature, stratum 4-5 m tall, 2-10% canopy cover, over *Melaleuca undulata* shrubs, mature, stratum 0.5 m tall, 70-100% canopy cover. Soil is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 5.8, brown, 7.5 YR 5/4, sandy clay. Soluble salts 690 ppm. Poorly drained.

● Loc. 2.2 (Trapline 7)

Key Description

Very Open Shrub Mallee over Open Low Scrub B on heavy clay.

Code eKSr.mSBr/HC

Loc. Details

Stratum 1. *Eucalyptus redunca* shrub mallee, mature, stratum 6-12 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca undulata* and *M. uncinata* shrubs, mature to senescent, stratum 0.5-1.5 m tall, 2-10% canopy cover.

Comments

Scattered clumps of *Callitris canescens* shrubs to 3 m tall. Ecotone into loc. 3.10 has abundant *Dodonaea caespitosa*. Northern edge of association has *E. erythronema* 6-12 m tall, 2-10% cover over *M. undulata* 1.0 m tall, 30-70%. *Callitris canescens* clumps abundant.

Litter

Abundant, broad leaves, twigs and abundant large debris including standing stumps. Layer ca 2 cm deep, continuous or up to 2 m apart.

Soil

30 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 5.8, dark greyish brown, 10 YR 4/2, heavy clay. Soluble salts 350 ppm. Poorly drained.

● Loc. 2.3

As for loc. 2.1.

● Loc. 2.4

Eucalyptus erythronema shrub mallee, mature, stratum 4-6 m tall, 2-10% canopy cover with scattered *E. transcontinentalis*. Scattered shrubs in understory, particularly *Melaleuca undulata*. Edge of association has a narrow band of *E. redunca* shrub mallee. Soil is highly pedal, sandy, strongly coherent, pH 5.6, brown, 7.5 YR 5/4, heavy clay with some quartz grit. Soluble salts 1250 ppm. Poorly drained.

● Loc. 2.5

Key Description

Very Open Shrub Mallee over Low Heath D on sandy clay.

Code eKSr.mSDc/SC

Loc. Details

Stratum 1. *Eucalyptus transcontinentalis* and *E. redunca* shrub and some tree mallee, mature, stratum 6-8 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca undulata* shrubs, mature, 0.5 m tall, 30-70% canopy cover.

Comments

Scattered *E. erythronema* shrub mallee 2-4 m tall on edges of association. Occasional *M. adnata* shrubs to 1 m.

Litter

Sparsely, broad leaves and twigs, clumped to 1 cm deep, clumps 2-6 m apart.

Soil

20 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH 6.2, brown, 7.5 YR 5/4, sandy clay. Soluble salts 1500 ppm. Poorly drained.

● Loc. 2.6

Small stand of *Eucalyptus transcontinentalis* shrub mallee, 4.5-6 m tall, 2-10% canopy cover, over *Melaleuca uncinata* and *Scholtzia drummondii* shrubs, 0.5-1.5 m tall, 10-30% canopy cover. Scattered *E. gardneri* shrub mallee present.

SHRUBLAND FORMATIONS

● Loc. 3.1

Disturbed area, cleared and regrown, originally as for loc. 3.2. Regrowth is *Melaleuca uncinata* and some *Casuarina campestris* shrubs, immature, 2-4 m tall, 30-70% cover over *Avena barbata*, *Ehrharta longiflora*, *Arctotheca calendula* and several other species of herbs, 0.5 m tall, 70-100% cover.

Litter abundant, piles of timber and branches to 1 m tall. Soil as for loc. 3.2 but poorly drained.

● Loc. 3.2

Key Description

Scrub over Open Low Scrub B over Low Sedges or Low Heath D on fine sandy loam.

Code xSi.xSBr.n₁VL(SD)c/FSL

n₁ = *Ecdeiocolea monostachya*

Loc. Details

Stratum 1. *Casuarina campestris* shrubs and some *Melaleuca uncinata*, *C. acutivalvis* shrubs or *Eucalyptus stowardii* tree mallee. All species mature to senescent, stratum 1.5-5 m tall, 10-30% canopy cover.

Stratum 2. Mixed shrubs, no dominant, mature, stratum 0.5-1.5 m tall, 2-10% canopy cover.

Stratum 3. *Ecdeiocolea monostachya* sedges or mixed shrubs (no dominant), mature, 0.5 m tall, 30-70% canopy cover.

Comments

C. acutivalvis shrubs emergent to 6 m tall. Scattered seedlings present. Occasional *Ehrharta longiflora* grass present. In some areas stratum 1 reaches 30-70% canopy cover and stratum 3 is dominated by *Melaleuca platycalyx* or *Chamelaucium drummondii*. No evidence of fire.

Litter

Moderate to abundant, terete leaves, twigs and large debris, clumped to 2-5 cm deep, clumps 2-6 m apart.

Soil

Friable soil ca 1 m deep. 30 cm sample highly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.6, yellow, 10 YR 7/6, fine sandy loam with ca 20% laterite pebbles. Well drained.

● Loc. 3.3

Acacia stereophylla shrubs, stratum 2-3.5 m tall, 10-30% cover over *Ecdeiocolea monostachya* sedge 0.5 m tall, 30-70% cover. This association is an ecotone between locs 3.2 and 3.4. Litter is moderate, terete leaves and twigs. Soil 1 m deep over laterite, 30 cm sample highly pedal, sandy, poorly coherent, blotchy bleached, non-calcareous, pH 4.2, yellow, 10 YR 7/8, sandy clay. Ferruginised specks at 0.5 m depth. Soluble salts 50 ppm. Well drained.

● **Loc. 3.4 (Trapline 6)**

Trapline is located in a narrow ecotonal band adjacent to loc. 4.1 and described separately to that location.

Key Description

Thicket *over* Low Scrub B *on* sandy clay.

Code xSc.xSBi/SC

Loc. Details

Stratum 1. *Hakea coriacea* and some *Casuarina campestris*, *Grevillea excelsior* shrubs, mature to senescent, 2-6 m tall, 30-70% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature to senescent, 1.5 m tall, 10-30% canopy cover.

Comments

Scattered *Eucalyptus drummondii* and *E. oldfieldii* present. No evidence of fire. Trapline is located in *Casuarina acutivalvis* shrubs and a few trees, mature, 3-6 m tall, 10-30% cover over *Hakea falcata* and *Grevillea paradoxa* shrubs mature to senescent, 1-2 m tall, 2-10% cover over mixed shrubs, senescent, 0.5 m tall, 2-10% cover. Litter and soil as for major part of loc.

Litter

Abundant, twigs, terete leaves and large debris evenly distributed to 1 cm deep but some clumps to 10 cm deep, clumps 0.1-6 m apart.

Soil

Friable soil deeper than 1 m. 30 cm sample slightly pedal, sandy, coherent, blotchy bleached, non-calcareous, pH 4.0, yellow, 10 YR 7/6, (10 YR 7/8 in ecotone), sandy clay. Soluble salts 50 ppm (less than 30 ppm in ecotone). Well drained.

● **Loc. 3.5**

As for loc. 3.4.

● **Loc. 3.6**

As for loc. 3.2.

● **Loc. 3.7**

As for loc. 3.4 with some components of locs 3.3 and 3.9.

● **Loc. 3.8**

As for loc. 3.13 with some loc. 3.9 components.

● **Loc. 3.9**

Key Description

Open Scrub *over* Low Scrub A *over* Dwarf Scrub D *on* sandy clay.

Code cSr.xSAi.xSDi/SC

Loc. Details

Stratum 1. *Casuarina acutivalvis* shrubs, mature, stratum 3-4 m tall, 2-4% canopy cover.

Stratum 2. *Hakea falcata* shrubs, *Eucalyptus oldfieldii* shrub mallee and several other species of shrubs, mature to senescent, 0.5-2 m tall, 10-30% canopy cover.

Stratum 3. Mixed shrubs, no particular dominant, 0.5 m tall, 10-30% canopy cover.

Comments

No evidence of fire.

Litter

Moderate, twigs, clumped to 1 cm deep, clumps 0-3 m apart.

Soil

30 cm sample highly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.0, light yellowish brown, 10 YR 6/4, sandy clay. Well drained.

● Loc. 3.10

Casuarina campestris shrubs, immature to mature, 2-2.5 m tall, 10-30% cover over *Melaleuca* sp., *Verticordia chrysanthera* or *M. conothamnoides* shrubs, mature, 0.5 m tall, 10-30% cover. Soil is similar to loc. 3.9 but ca 50% gravel content at 30 cm depth.

● Loc. 3.11

Casuarina campestris shrubs, 2-2.5 m tall, 30-70% canopy cover. No understory but scattered shrubs. Soil very gravelly.

● Loc. 3.12

As for loc. 3.13 or 3.4.

● Loc. 3.13 (Trapline 5)

Key Description

Thicket on gravelly fine sandy loam.

Code cSc/K-FSL

Loc. Details

Unstratified *Casuarina acutivalvis* shrubs, mature to senescent, stratum 3-5 m tall, 30-70% canopy cover.

Comments

No understory but scattered shrubs, particularly *Phebalium tuberosum* 0.5 m tall ca 1% cover. Seedlings of all species present. No evidence of fire.

Litter

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

Soil

Friable soil ca 25 cm deep over laterite. 20 cm sample moderately pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 4.9, yellowish brown, 10 YR 5/6, fine sandy loam with ca 70% laterite pebbles. Well drained with some localised pooling in shallow depressions.

● **Loc. 3.14**

Structurally as for loc. 3.4 but stratum 1 dominants are *Eucalyptus incrassata* and *Casuarina acutivalvis*, stratum 2 dominants are *Hakea falcata* and mixed shrubs and stratum 3 is dominated by mixed shrubs. Soil is highly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.0, light yellowish brown, 10 YR 6/4, sandy clay. Well drained.

● **Loc. 3.15**

As for loc. 3.13 but 2-3.5 m tall and with some components of *Casuarina campestris* shrubland similar to loc. 3.11.

● **Loc. 3.16**

Hakea coriacea, *Casuarina acutivalvis*, *Eucalyptus oldfieldii* shrubs and shrub mallee, stratum 2-4.5 m tall, 30-70% canopy cover over *Hakea falcata* and mixed shrubs, stratum 1-2.0 m tall, 70-100% canopy cover.

● **Loc. 3.17**

Key Description

Open Scrub over Open Low Scrub A on sandy clay.

Code xSr.xSAr/SC

Loc. Details

Stratum 1. *Acacia stereophylla* and *Casuarina acutivalvis* shrubs, senescent, stratum 5-7 m tall, 10-30% cover.

Stratum 2. Mixed shrubs, no particular dominant, stratum distinct but of variable height from 0.5 to 2 m tall, 2-10% canopy cover.

Comments

Whole area almost unstratified. Scattered *C. campestris* to 6 m tall. Some areas with denser heathy understory and scattered *Eucalyptus oldfieldii*. No evidence of fire.

Litter

Sparse, terete leaves and twigs to 1 cm deep, continuous or clumps up to 2 m apart. Abundant standing dead trees and scattered large debris. Heaps of spoil from clearing of firebreaks reach 1 m deep and 4-6 m across.

Soil

Friable soil deeper than 1 m. 30 cm sample moderately pedal, earthy, poorly coherent, unbleached, non-calcareous, pH 4.4, light yellowish brown, 10 YR 6/4, sandy clay. Well drained.

● **Loc. 3.18**

Mosaic of shrubs similar to locs 3.13, and 3.11 with some slightly more open areas with abundant *Melaleuca conothamnoides*.

● **Loc. 3.19**

As for loc. 3.4 with abundant *Eucalyptus oldfieldii* shrub mallee.

● **Loc. 3.20**

Mosaic of associations similar to locs 3.2 and 3.4.

- Loc. 3.21

As for loc. 3.22 with patches of association similar to loc. 3.4.

- Loc. 3.22

Key Description

Scrub over Dwarf Scrub C on sandy clay.

Code mSi.xSCi/SC

Loc. Details

Stratum 1. *Melaleuca uncinata* shrubs, immature to mature, stratum 2-2.5 m tall, 10-30% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature, stratum 1.0 m tall, 10-30% canopy cover.

Comments

Scattered emergent *Casuarina acutivalvis* shrubs to 4 m tall. No evidence of fire.

Litter

Sparse, terete leaves, clumped to 0.5 cm deep, clumps 3 m apart.

Soil

Friable soil ca 0.5 m deep over laterite. 30 cm sample moderately pedal, earthy, coherent, unbleached, non-calcareous, pH 4.7, brownish yellow, 10 YR 6/8, sandy clay, 10% laterite pebbles. Soluble salts 150 ppm. Well drained.

- Loc. 3.23

Narrow belt of *Melaleuca uncinata* shrubs, immature, stratum 2-2.5 m tall, 30-70% canopy cover. Second stratum of *Leptospermum erubescens* and *M. seriata* shrubs, immature to mature, stratum 0.5-1 m tall, 2-10% canopy cover. Scattered *Casuarina acutivalvis* shrubs to 5 m tall. Soil is slightly pedal, sandy, almost non-coherent, pH 4.6, yellow, 10 YR 7/6, fine sandy loam with ca 70% laterite pebbles. Soluble salts 90 ppm. Poorly drained.

- Loc. 3.24

Small area of *Casuarina campestris* shrubs and scattered *Eucalyptus oldfieldii* mallee 2-2.5 m tall. Abundant *Leptospermum erubescens*.

HEATH FORMATIONS

- Loc. 4.1

Key Description

Dense Heath A on clayey sand.

Code xSAd/CLS

Loc. Details

Unstratified *Melaleuca uncinata*, *Casuarina campestris* and *M. seriata* shrubs, immature to mature, 0.5-2 m tall, 70-100% canopy cover.

Comments

Scattered *Eucalyptus drummondii* shrub mallee to 5 m tall. No evidence of fire.

Litter

Sparse, terete leaves, twigs, clumped to 2 cm deep, clumps 0-2 m apart.

Soil

Friable soil ca 20 cm deep over very compact sand with abundant quartz pebbles. 15 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH 4.3, light grey, 10 YR 7/2, clayey sand with abundant coarse quartz grit.

40 cm sample slightly pedal, sandy, coherent, unbleached, non-calcareous, pH 4.5, white, 10 YR 8/1, very fine sand with ca 5% rock fragments. Sand is *in situ* derivative from granite. Poorly drained, pooling after heavy rain.

● Loc. 4.2

Area of merging of associations similar to locs 4.1 and 4.3 with some components of loc. 3.4. *Xanthorrhoea nana*, *Lysinema ciliatum* and *Eucalyptus foecunda* prominent.

● Loc. 4.3

Key Description

Low Scrub A over Open Dwarf Scrub C over Very Open Herbs on clayey sand.

Code xSAi.mScR.n₁Jr/CLS

n₁ = *Borya nitida*

Loc. Details

Stratum 1. *Melaleuca uncinata*, *Casuarina campestris* and *Hakea subsulcata* shrubs, immature to mature, stratum 1-2 m tall, 10-30% canopy cover.

Stratum 2. *Melaleuca* affin. *subtrigona* shrubs, mature, stratum 0.5-1.0 m tall, 2-10% canopy cover.

Stratum 3. *Borya nitida* herbs, mature, 0.1 m tall, 2-10% canopy cover.

Comments

Northern edges of loc. has *Grevillea paniculata* and *Acacia lasiocalyx*. Southern edge passes through a belt of *C. campestris* and scattered *M. uncinata* 1-2.5 m tall, 30-70% cover and abundant *Borya nitida* with scattered *Casuarina acutivalvis* and *Eucalyptus drummondii*. This latter association is ecotone between loc. 4.3 and loc. 2.1. No evidence of fire.

Litter

Moderate, terete leaves and twigs, clumped to 1 cm deep, layer continuous or spaces up to 2 m.

Soil

Friable soil deeper than 1 m. 50 cm sample highly pedal (crumb structure), sandy, poorly coherent, unbleached, non-calcareous, pH 4.5, pale yellow, 2.5 YR 7/4, clayey sand with abundant quartz grit. Well to excessively drained.

● Loc. 4.4

As for loc. 4.5 with some components of loc. 3.10 and stands of *Callitris canescens* to 1.5 m tall.

● Loc. 4.5

Melaleuca uncinata and *Casuarina campestris* shrubs, immature, 1-1.5 m tall, 10-30% canopy cover over *M. undulata* shrubs, mature, 0.5 m tall, 10-30% canopy cover. Some *Callitris canescens* present. Some granite outcropping in small areas. Poorly drained.

● Loc. 4.6

Melaleuca uncinata shrubs, immature, 1-1.5 m tall, ca 2-3% canopy cover over mixed shrubs, no particular dominant, mature, 0.5 m tall, 70-100% canopy cover. Probably regrowth following clearing.

● Loc. 4.7

Key Description

Dense Low Heath C over Very Open Low Sedges on sandy clay.

Code xSCd.n₁ VLr/SC

n₁ = *Ecdeiocolea monostachya*

Loc. Details

Stratum 1. *Melaleuca seriata* and several other species of shrubs, mature, 1.0 m tall, 70-100% canopy cover.

Stratum 2. *Ecdeiocolea monostachya* sedge, mature, 0.5 m tall, 2-10% canopy cover.

Comments

Scattered *Eucalyptus drummondii* present and remains of dead *Hakea platysperma* and *Grevillea excelsior* shrubs, neither of which were recorded living in this loc. at present. Very old fire scars visible on *E. drummondii* and the *Hakea* and *Grevillea*.

Litter

Sparse, terete leaves, twigs, clumped to 0.5 cm deep, clumps 1.5 m apart.

Soil

Deeper than 1 m. 30 cm sample highly pedal, earthy, coherent, unbleached, non-calcareous, pH 4.7, brownish yellow, 10 YR 6/8, sandy clay. Well drained.

UNCLEARED LAND ADJACENT TO
NORTH BUNGULLA NATURE RESERVE

● S1

Casuarina campestris with emergent *C. acutivalvis* and *Eucalyptus drummondii*.

● S2

Melaleuca uncinata with some *Eucalyptus oldfieldii*.

● H1

Regrowing heath with *Melaleuca uncinata* and stands of *Eucalyptus redunca* and some *E. stowardii*.

● H2

Sparse *Melaleuca uncinata* with patches of *Eucalyptus redunca* shrub mallee.

● H3

Melaleuca uncinata heath with some *Casuarina campestris* and *Eucalyptus drummondii*.

APPENDIX 6
 PLANT SPECIES LISTS FOR SELECTED LOCATIONS
 NORTH BUNGULLA NATURE RESERVE

Loc. 2.2

<i>Acacia graffiana</i>	<i>E. loxophleba</i>
<i>A. mackayana</i>	<i>E. redunca</i>
<i>Baeckea</i> affin. <i>crispiflora</i>	<i>Melaleuca conferta</i>
<i>Callitris canescens</i>	<i>M. radula</i>
<i>Comesperma volubile</i>	<i>M. uncinata</i>
<i>Dodonaea bursariifolia</i>	<i>M. undulata</i>
<i>D. caespitosa</i>	<i>Olearia muelleri</i>
<i>Eremophila drummondii</i>	<i>Santalum acuminatum</i>
<i>Eucalyptus erythronema</i>	<i>Stipa elegantissima</i>

Loc. 3.4

<i>Acacia heteroneura</i>	<i>G. pritzellii</i>
<i>A. stereophylla</i>	<i>Hakea coriacea</i>
<i>A. yorkrakinensis</i>	<i>H. falcata</i>
<i>Beaufortia micrantha</i>	<i>Isopogon scabriusculus</i>
<i>Cassyltha racemosa</i>	<i>Lepidosperma drummondii</i>
<i>Casuarina acutivalvis</i>	<i>L. gracile</i>
<i>C. campestris</i>	<i>Melaleuca conothamnoides</i>
<i>Choretrum pritzellii</i>	<i>M. seriata</i>
<i>Cryptandra leucophracta</i>	<i>Micromyrtus imbricata</i>
<i>Eriostemon thryptomenoides</i>	<i>Phebalium tuberculosum</i>
<i>Eucalyptus drummondii</i>	<i>Pultenaea neurocalyx</i>
<i>E. oldfieldii</i>	<i>Santalum acuminatum</i>
<i>Grevillea excelsior</i>	

Loc. 3.13

<i>Acacia heteroneura</i>	<i>Hakea coriacea</i>
<i>A. neurophylla</i>	<i>H. falcata</i>
<i>A. yorkrakinensis</i>	<i>H. subsulcata</i>
<i>Astroloma serratifolium</i>	<i>Melaleuca conothamnoides</i>
<i>Baeckea floribunda</i>	<i>M. uncinata</i>
<i>Casuarina acutivalvis</i>	<i>Micromyrtus imbricata</i>
<i>Ecdeiocolea monostachya</i>	<i>Persoonia trinervis</i>
<i>Eucalyptus foecunda</i>	<i>Phebalium tuberculosum</i>
<i>E. olfieldii</i>	

Loc. 3.17

<i>Acacia heteroneura</i>	<i>Eriostemon thryptomenoides</i>
<i>A. sterophylla</i>	<i>Eucalyptus oldfieldii</i>
<i>Baeckea muricata</i>	<i>Grevillea paradoxa</i>
<i>Casuarina acutivalvis</i>	<i>G. petrophiloides</i>
<i>C. campestris</i>	<i>Lepidosperma angustatum</i>
<i>Comesperma volubile</i>	<i>Melaleuca conothamnoides</i>
<i>Cryptandra leucophracata</i>	<i>M. seriata</i>
<i>C. myriantha</i>	<i>Micromyrtus imbricata</i>
<i>Drosera macrantha</i>	<i>Schoenus</i> affin. <i>subbulbosus</i>
<i>Ecdeiocolea monostachya</i>	<i>Verticordia chrysantha</i>

Loc. 4.1

Borya nitida
Casuarina campestris
Eucalyptus drummondii

Melaleuca seriata
M. uncinata
Waitzia acuminata

Loc. 4.7

Acacia heteroneura
A. yorkakinensis
Andersonia lehmanniana
Astroloma serratifolium
Baeckea floribunda
Beaufortia micrantha
Boronia caeruleascens
Calothamnus quadrifidus
Cassytha glabella
Choretrum pritzellii
Dampiera spicigera
Darwinia purpurea
Daviesia aphylla
Ecdeiocolea monostachya
Eucalyptus drummondii
E. oldfieldii
Grevillea pritzellii

Hakea circumalata
H. falcata
Hibbertia uncinata
Isopogon scabriusculus
I. villosus
Laxmannia squarrosa
Lepidosperma drummondii
L. tenue
Leucopogon crassifolius
Lysinema ciliatum
Melaleuca conothamnoides
M. seriata
Mirbelia spinosa
Persoonia trinervis
Verticordia chrysantha
Xanthorrhoea nana