

## II VEGETATION OF BUNTINE AND NUGADONG RESERVES

B.G. MUIR

### GENERAL

The Buntine and Nugadong Reserves lie almost at the junction of the Irwin and Avon districts of the South-Western Botanical Province and the Austin and Coolgardie district of the Eremaean Botanical Province (cf. Grieve and Blackall's (1975) modification of Gardner and Bennetts (1956) map).

Beard (1976) has mapped Buntine Reserve, the majority being called 'mixed *Acacia* thicket on sand plain'. A narrow belt along the central road from about loc. 2.12 to loc. 4.13 (see vegetation map this report) and the south-west corner around loc. 3.28 Beard calls '*Eucalyptus loxophleba* sclerophyll woodland'. Climate, geology, physiography, soils and vegetation of the area immediately to the north of Buntine Reserve is discussed briefly in Beard (1976).

Vegetation descriptions are presented in **Appendices 1, 3, 5 and 7** and shown on **Figs 3 to 6**. Species lists for selected locations are given in **Appendices 2, 4, 6 and 8**.

### METHODOLOGY

The vegetation of Buntine and the Nugadong Reserves was mapped at Level 1 of the reliability scale set out in Muir (1977). Each vegetation formation discernible on the air photographs was examined on the ground, and numerous transects made throughout the Reserves; at least one location was described in detail within each association type using the classification shown in **Table 2** and discussed in detail in Muir (1977a), and a list of perennial species made for that location; a soil examination was made in each association type.

Uncleared land contiguous to the Reserves but not included within them was mapped at formation level directly from the photographs (Level 3).

Level 1 locations shown on the accompanying vegetation maps represent 'sample areas' where the vegetation was described. The following prefix numbers of the locations represent basic formation types found on the Reserves.

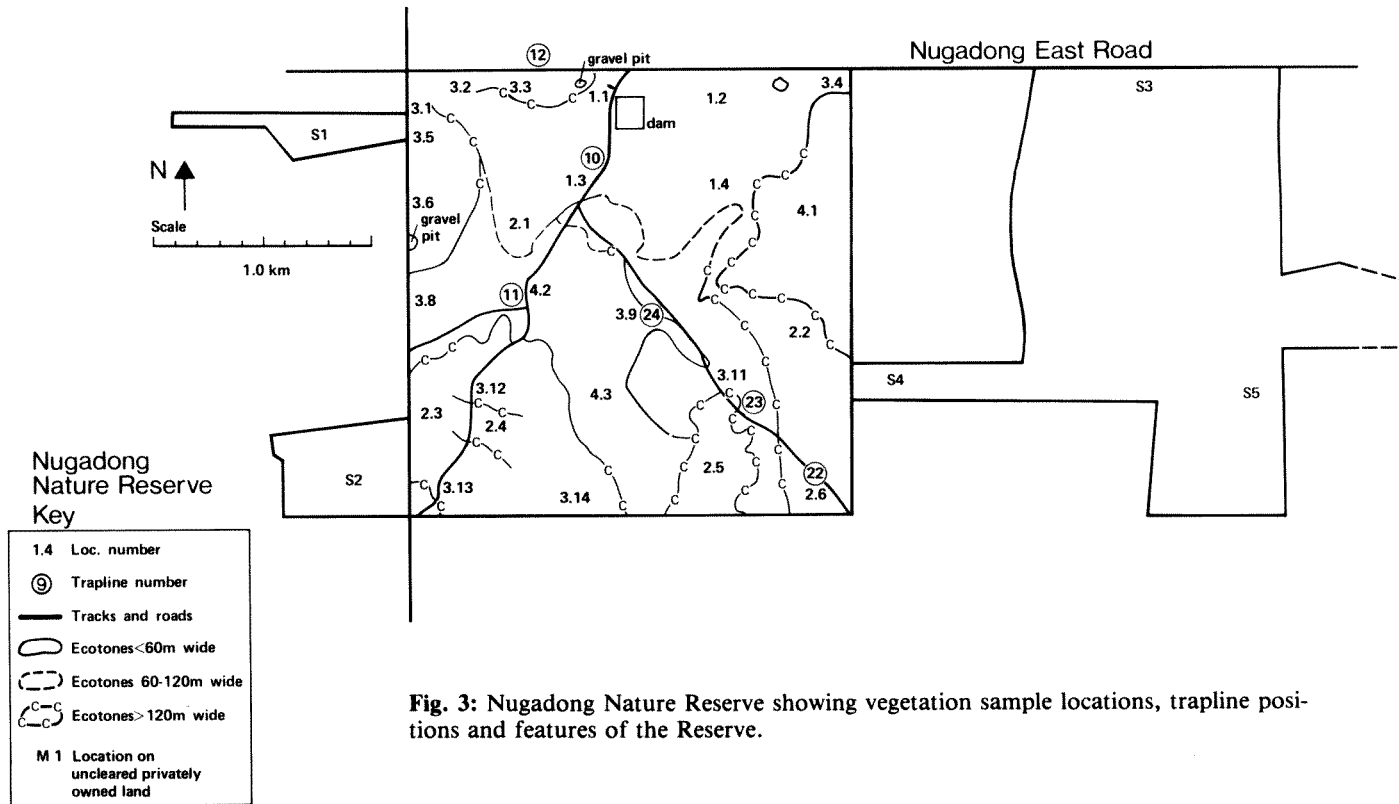
1. = Woodland formations
2. = Mallee formations
3. = Shrubland formations
4. = Heath formations
5. = Lithic complexes

Level 3 locations show on maps are prefixed by: W = Woodland

M = Mallee

S = Shrubland

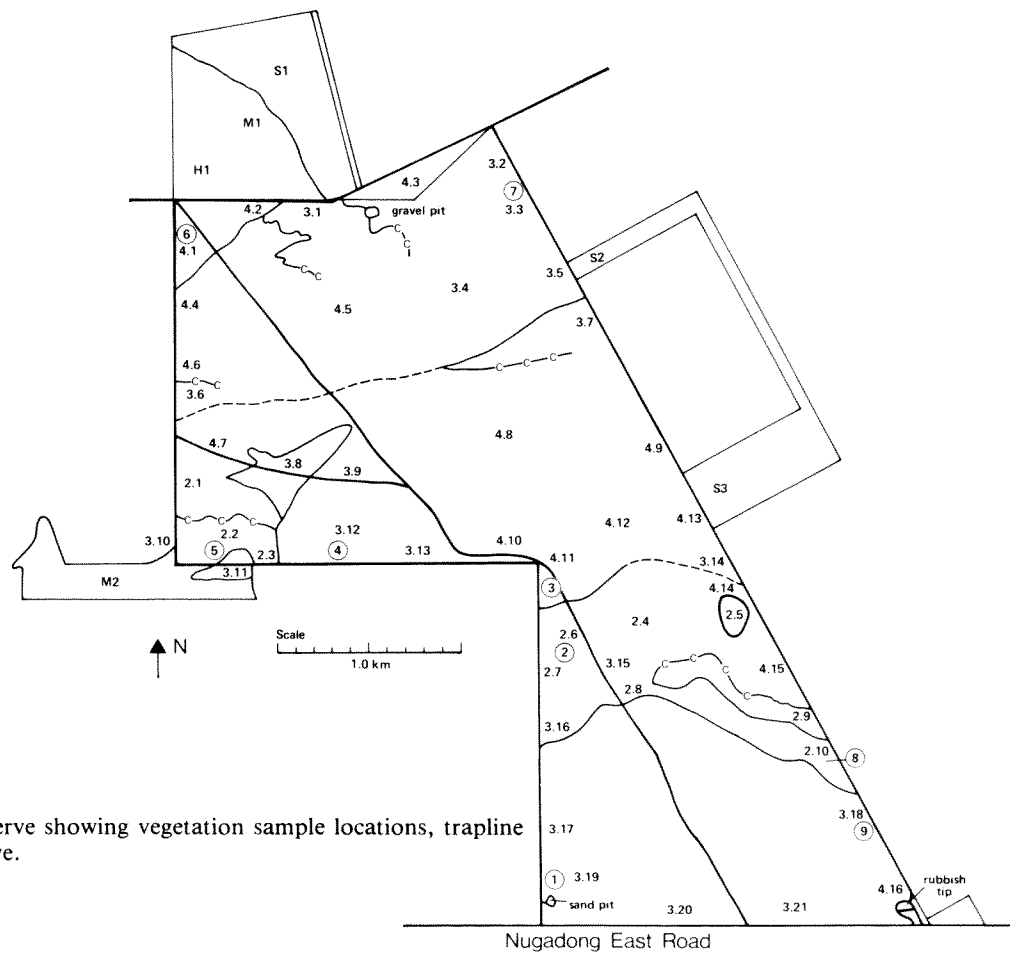
H = Heath



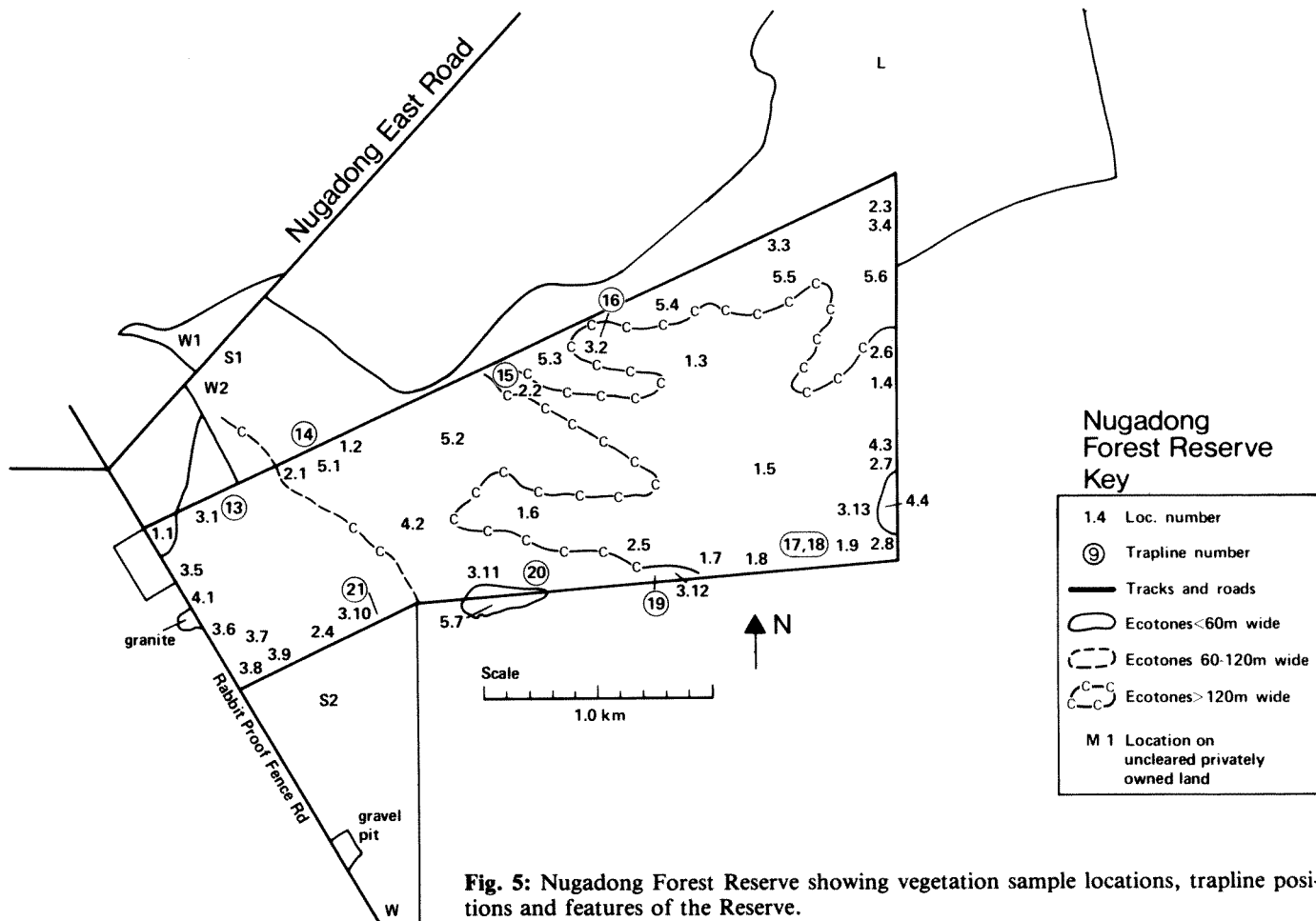
**Fig. 3:** Nugadong Nature Reserve showing vegetation sample locations, trapline positions and features of the Reserve.

### East Nugadong Nature Reserve Key

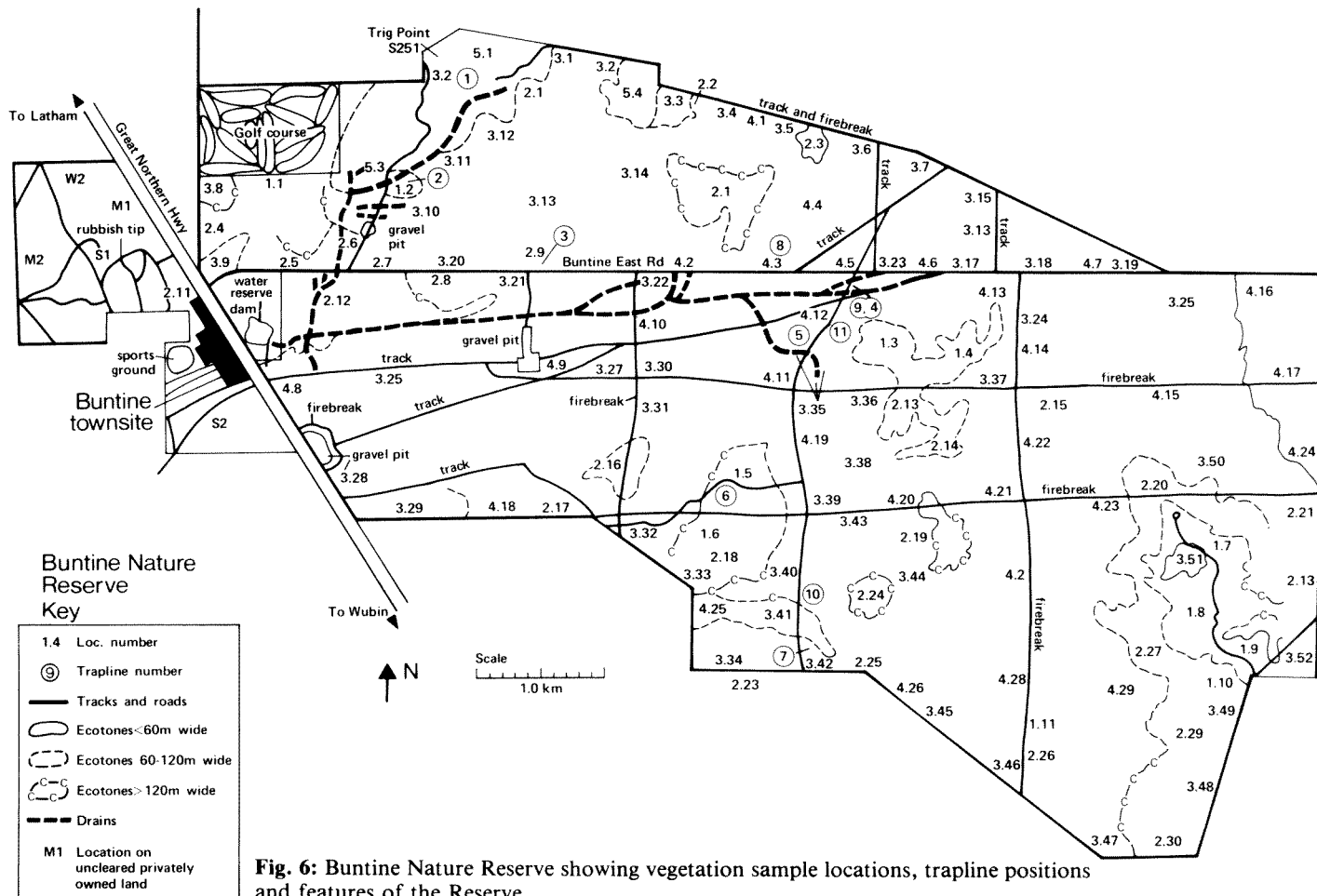
1.4	Loc. number
⊙	Trapline number
—	Tracks and roads
	Ecotones <60m wide
	Ecotones 60-120m wide
	Ecotones >120m wide
M1	Location on uncleared privately owned land



**Fig. 4:** East Nugadong Nature Reserve showing vegetation sample locations, trapline positions and features of the Reserve.



**Fig. 5:** Nugadong Forest Reserve showing vegetation sample locations, trapline positions and features of the Reserve.



**Fig. 6: Buntine Nature Reserve showing vegetation sample locations, trapline positions and features of the Reserve.**

**Table 2: Vegetation classification, from Muir 1977a**

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

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 on Buntine and the Nugadong Reserves. Samples were prepared by mixing 20 gms of sieved soil (less than 2 mm) with 50 cc of deionised water and shaking periodically for 30 mins. 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.

## DISCUSSION

### FORMATIONS AND DISTRIBUTION

Woodland, mallee, shrubland, heath and lithic complex are all represented on Buntine Reserve (**BUR**) and Nugadong Forest Reserve (**NFR**). Lithic complex is absent from Nugadong Reserve (**NR**) and East Nugadong Reserve (**ENR**) and woodland from **ENR** but all other formations found on **BUR** are present. Breakaway and salt complexes are entirely absent.

Where sandy soils are present (sometimes underlain by laterite) heaths and shrublands are developed, the shrublands being more commonly where the laterite content of the soil is greater. Clayey soils tend to be grey and situated on decayed granite, or red and of colluvial origin or formed on granite at a much greater depth than under the grey soils. A dolerite dyke exposed on **NFR** has *Eucalyptus loxophleba* woodland.

Formation area and proportion of the Reserves are set out in the table below.

Formation	BUR	NR	ENR	NFR
Woodland	179ha 6%	80ha 20%	—	123ha 33%
Mallee	382 12	71 18	86ha 11%	22 6
Shrubland	1504 47	156 39	396 51	101 28
Heath	960 31	93 23	290 38	25 7
Lithic Complex	122 4	—	—	93 26

It can be seen from the table that shrublands cover a considerable proportion of all the Reserves and that heaths are prominent except on **NFR**. Woodlands are well represented on **NR** and **NFR** but poorly represented on **BUR**.

### ASSOCIATIONS

'Associations' as used here include associations, assocsies and consociations according to the definitions of Beadle and Costin (1952) and Polunin (1960). The numbers in the columns code the formations represented in each association, e.g. *Casuarina campestris* dominated associations are represented in both shrublands (3) and heaths (4) on all the Reserves except **NR**.

ASSOCIATION	NR	ENR	NFR	BUR
<i>Acacia acuminata</i>				5
<i>A. assimilis</i>	3	3		
<i>A. heteroneura</i>	3	3	3	
<i>A. heteroneura</i> — <i>Casuarina acutivalvis</i>	3			
<i>A. heteroneura</i> — <i>C. corniculata</i>	3			
<i>A. resinomarginea</i>			3	
<i>A. signata</i>			3	3
<i>A. stereophylla</i>		3		3
<i>A. stereophylla</i> — <i>Calothamnus gilesii</i>				3
<i>A. stereophylla</i> — <i>Casuarina acutivalvis</i>				3
<i>A. stereophylla</i> — <i>Melaleuca uncinata</i>				3
<i>C. acutivalvis</i>	3		3	
<i>C. acutivalvis</i> — <i>Acacia neurophylla</i>				3
<i>C. acutivalvis</i> — <i>M. nematophylla</i>				3
<i>C. campestris</i>		3,4	3,4	3,4
<i>C. campestris</i> — <i>A. filifolia</i>				3
<i>C. campestris</i> — <i>A. heteroneura</i>		3		
<i>C. campestris</i> — <i>A. resinomarginea</i> — <i>A. heteroneura</i>				3
<i>C. campestris</i> — <i>Grevillea filifolia</i>		3		
<i>C. campestris</i> — <i>Hakea falcata</i> — <i>A. desertorum</i>				3
<i>C. campestris</i> — <i>H. scoparia</i>			3	
<i>C. campestris</i> — <i>M. uncinata</i>			3	
<i>C. corniculata</i>		3		
<i>C. corniculata</i> — <i>A. stereophylla</i> — <i>M. cordata</i>			3	
<i>Eucalyptus erythronema</i>				2,3
<i>E. foecunda</i>	2	2		
<i>E. foecunda</i> — <i>E. redunca</i>			2	
<i>E. loxophleba</i>	1	2	1,2	1,2
<i>E. redunca</i>			2	2
<i>E. redunca</i> — <i>E. transcontinentalis</i>		2		2
<i>E. rigidula</i> — <i>E. drummondii</i>				2
<i>E. rigidula</i> — <i>E. foecunda</i>				2
<i>E. rigidula</i> — <i>E. kochii</i>				2
<i>E. salubris</i>			1	1
<i>E. salubris</i> — <i>E. gracilis</i>	1			
<i>E. salubris</i> — <i>E. loxophleba</i>			1	
<i>E. stowardii</i>				2
<i>E. transcontinentalis</i>		2		
<i>E. transcontinentalis</i> — <i>E. redunca</i>		2		



<i>Grevillea excelsior</i> — <i>C. acutivalvis</i>				3
<i>G. fififolia</i>		4		
<i>Hakea coriacea</i> — <i>C. acutivalvis</i>				3
<i>H. falcata</i> — <i>C. corniculata</i>				4
<i>H. subsulcata</i>				4
<i>H. subsulcata</i> — <i>M. uncinata</i>				3
<i>Melaleuca acuminata</i> — <i>M. lateriflora</i>		3		
<i>M. eleutherostachya</i>		3		
<i>M. eleutherostachya</i> — <i>A. acuminata</i>		3		
<i>M. nematophylla</i>				3,4
<i>M. uncinata</i>				3
<i>M. uncinata</i> — <i>A. assimilis</i>				4
<i>M. uncinata</i> — <i>A. heteroneura</i>	3			
<i>M. uncinata</i> — <i>M. eleutherostachya</i>				
— <i>M. acuminata</i>				3
Mixed (no particular dominant)	4			3,4
<i>Thryptomene</i> affin. <i>kochii</i>			3,5	

No. of associations	NR	NER	NFR	BUR
Woodland	2	—	3	2
Mallee	1	5	3	8
Shrubland	6	10	9	19
Heath	1	2	1	6
Lithic complex	—	—	1	1
TOTAL	10	17	17	36

Compared with other reserves in the wheatbelt these four reserves have about an average number of associations for their respective sizes. In terms of number of associations per area of reserve, **NR** and **ENR** are about average compared to the other wheatbelt reserves examined to date. In contrast **NFR** is richer, having 4.7 associations/km<sup>2</sup> and **BUR** is poorer, having 1.14 associations/km<sup>2</sup>. The average for the wheatbelt reserves examined so far is 2.79/km<sup>2</sup>.

#### SENESCENT TREES

The artificially contrived index of abundance of senescent trees discussed in Muir (1977b) can be calculated for Buntine and the Nugadong Reserves.

Reserve	Area of woodland	Average % senescence	Average canopy cover	Senescence index
BUR	179ha	7.5%	9.7%	1.3
NR	80	2	5.3	0.2
NFR	123	15	16	3

Although the senescence index of **BUR** is slightly higher than that of the other two Reserves, all have very low indices compared with many other wheatbelt reserves eg. a senescence index of *ca* 13 at Yornaning and Dongolocking Reserves.

#### FLORISTICS

It is probable that most of the perennials on **NR** and **ENR** were recorded during this survey as these reserves are fairly uniform and access is good. The collection from **NFR** is probably less complete due to its complexity and poor access. From previous experience it is estimated that there is probably about 100 perennials and large ephemerals on **NR**, about 140 on **ENR**, about 160 on **NFR** and about 250 on **BUR**.

A total of 241 plant species was recorded on the 4 Reserves. Number of species recorded in each formation and on each Reserve, and the number in relation to area of formation or Reserve is set out below.

FORMATION	NR		ENR		NFR		BUR	
	No. spp	spp/ha	No. spp	spp/ha	No. spp	spp/ha	No. spp	spp/ha
Woodland	31	0.39	—	—	21	0.17	46	0.26
Mallee	25	0.35	38	0.44	25	1.14	60	0.16
Shrubland	35	0.22	67	0.17	34	0.34	114	0.08
Heath	13	0.14	56	0.19	22	0.88	79	0.08
Lithic complex	—	—	—	—	40	0.43	21	0.17
Total No. spp	71		101		94		183	
spp/sq km for								
Reserve	17.8		13.1		25.8		5.8	

The highest number of plant species in common between any two reserves (**NR** & **ENR**) is 39.5%, and the lowest (**NR** & **BUR**) is 28.3%. This could be seen as evidence to support the need for numerous scattered reserves rather than a single large reserve. The argument that a single large reserve like **BUR** carries many of the species is offset by the fact that only about 15% of the species found amongst the 4 Reserves were found on all of them.

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

FORMATION	NR		ENR		NFR		BUR	
	No. spp	spp/ha	No. spp	spp/ha	No. spp	spp/ha	No. spp	spp/ha
Woodland	23	0.29	—	—	11	0.09	19	0.11
Mallee	13	0.18	8	0.09	8	0.36	12	0.03
Shrubland	13	0.08	27	0.07	13	0.13	32	0.02
Heath	1	0.01	20	0.07	8	0.32	32	0.02
Lithic complex	—	—	—	—	25	0.27	—	—

On **NR** and **BUR** the most restricted species per area occur in woodlands. **ENR** and **NFR** in contrast, have the most per area in mallee associations. The fewest restricted species per area were found in shrublands and heath on all the Reserves except **NFR** where the woodlands had fewest.

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—NUGADONG RESERVE

*NB:* All vegetation is 20-25 years old.

### WOODLAND

#### Loc. 1.1

##### Key Description

Open low Woodland A *over* Open Scrub *on* light medium clay.

Code eLAr.xSr/LMC

##### Loc. Details

Stratum 1. *Eucalyptus loxophleba* trees and some tree mallees, mature, stratum 5-12 m tall, 2-10% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature, variable from 0.5 to 3 m tall, *ca* 2% canopy cover (less in many areas).

##### Comments

All species with seedlings although *E. loxophleba* seedlings uncommon. Numerous small weeds in disturbed area, mostly *Arctotheca calendula*, *Hypochaeris glabra*, and *Ursinia anthemoides*. Scattered *Amphipogon debilis* grasses present. Timber removed from area. Soil disturbed by dam, tracks and campsites. Some rubbish in area, mostly bottles and rusty steel drums. No evidence of fire.

##### Litter

Moderately abundant beneath trees, rest sparse. Mostly broad leaves, bark, twigs and large debris. Clumps beneath trees to 5 cm deep, clumps up to 30 m apart.

##### Soil

Friable soil 30-40 cm deep over degraded granite and clays to 1 m then into decayed granite. 20 cm sample highly pedal, sandy, coherent, unbleached, highly calcareous, pH7.4, yellowish red, 5YR5/6, light medium clay. Soluble salts 150 ppm.

#### Loc. 1.2

As for loc. 1.1 and 1.3 mosaics. There are scattered areas of *Eucalyptus loxophleba* in this loc. that were dying at the time of survey. These areas often had abundant *Cheilanthes tenuifolia* ferns and may indicate areas where the underlying granite is closer to the surface. the consequent shallow rooting put these trees at a disadvantage after the previous years exceptionally dry conditions.

**Loc. 1.3 (TRAPLINE 10)**

As for loc. 1.1 with several open areas up to 100 m across. Canopy cover in this region falls below 2% but retains the character of woodland. The area has probably been partly cleared and gives the impression of perhaps having been a stock holding area at some time.

**Loc. 1.4**

Mostly as for loc. 1.1.

**Loc. 1.5**

**Key Description**

Open Low Woodland A over Open Dwarf Scrub D on light clay

**Code** eLAR.xSDr/LC

**Loc. Details**

Stratum 1. *Eucalyptus salubris* trees and scattered *E. gracilis* trees, mature, stratum 6-8 m tall, 2-3% canopy cover.

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

**Comments**

Some areas with clumps of shrubs 1.5-2.5 m tall, 2-10% canopy cover within clumps. Seedlings of all prominent species present. No emergents but canopy top is uneven in stratum 1. No evidence of fire.

**Litter**

Moderately abundant, mostly twigs, large debris and broad leaves. Some clumps of loosely packed twigs to 10 cm deep, clumps 0-4 m apart.

**Soil**

Friable soil ca 0.5 m deep overlaying clays and decayed granite. 5-10 cm sample highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH5.7, yellowish red, 5YR5/6, light clay. Soluble salts 1000 ppm.

**MALLEE**

**Loc. 2.1**

As for loc. 2.6.

**Loc. 2.2**

As for loc. 2.6 with many patches of shrubland similar to locs. 3.5, 3.8, 3.9, 3.11, and 3.12.

**Loc. 2.3**

**Key Description**

Very Open Shrub Mallee over Dwarf Scrub C on light sandy clay loam.

**Code** eKSr.xSCi/LSCL

**Loc. Details**

Stratum 1. *Eucalyptus foecunda* shrub mallee and scattered *Casuarina acutivalvis*, mature, stratum 6-8 m tall, 2-10% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature, stratum 0.5-1.0 m tall, 10-30% canopy cover.

## Comments

Evidence of old fire scars.

## Litter

Abundant, mostly bark, broad leaves and twigs, clumped to 8 cm deep, clumps 0-2 m apart.

## Soil

20 cm sample moderately pedal, sandy, poorly coherent, unbleached, non-calcareous, pH5.1, yellow, 10YR7/6, light sandy clay loam. soluble salts 55 ppm. Well drained.

## Loc. 2.4

As for loc. 2.3 but 6-7 m tall, 10-30% canopy cover over *Acacia graffiana* and mixed shrubs 0.5-1.0 m tall, 2-10% canopy cover.

Soil is highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH4.9, reddish yellow, 5YR6/6, sandy clay loam. Deeper soil was as above but light brown 7.5YR6/4 with ca 1% rock fragments. Soluble salts 180 ppm. Drainage poor.

## Loc. 2.5

As for loc. 2.6.

## Loc. 2.6 (TRAPLINE 22)

### Key Description

Very Open Shrub Mallee on fine sandy loam

Code eKSr/FSL

### Loc. Details

*Eucalyptus redunca* shrub mallee, mature, stratum 4-6 m tall, 2-10% canopy cover.

## Comments

No understory, but occasional shrubs, particularly *Acacia graffiana* present. No evidence of fire.

## Litter

Moderately abundant. Mostly twigs and large debris with some bark and broad leaves, clumps 0-4 m apart.

## Soil

30 cm sample is moderately pedal, sandy, strongly coherent, unbleached, non-calcareous, pH4.7, reddish yellow, 7.5YR6/6, fine sandy loam. Drainage poor.

## SHRUBLAND

### Loc. 3.1

#### Key Description

Thicket over Open Dwarf Scrub C on sandy clay loam

Code xSc.xSCr/SCL

### Loc. Details

Stratum 1. *Melaleuca uncinata* and *Acacia heteroneura* shrubs, mature to senescent, stratum 2-3 m tall, 30-70% canopy cover.

Stratum 2. *Phebalium tuberosum* and several other species of shrubs, mature, stratum 0.5-1.0 m tall, 2-10% canopy cover (some areas less than 2%).

### Comments

*Grevillea tenuiloba* seedlings present. Weed seedlings common. Scattered piles of rubbish present, mostly broken bottles and rusty steel drums. Scattered *Casuarina acutivalvis* and *Acacia acuminata* emergent to 5 m. Evidence of old fire scars.

### Litter

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

### Soil

Friable soil deeper than 1 m.

0-10 cm soil plus organic dust.

10-30 cm moderately pedal, sandy, poorly coherent, blotchy bleached, non-calcareous, pH4.1, yellow, 10YR7/8, sandy clay loam. Soluble salts 40 ppm.

30 cm onwards slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.7, yellow, 10YR7/6, sandy clay loam with ca 1-2% gravel pebbles. Soluble salts less than 30 ppm. Well to excessively drained.

### Loc. 3.2

As for loc. 3.1. Boundary with loc. 1.3 has abundant *Ecdeiocolea monostachya*.

### Loc. 3.3 (TRAPLINE 12)

#### Key Description

Thicket over Open Dwarf Scrub D on sandy clay loam.

Code aSc.xSDr/SCL

### Loc. Details

Stratum 1. *Acacia assimilis* shrubs, mostly senescent, stratum 3-5 m tall, 30-70% canopy cover.

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

### Comments

Some areas with *Melaleuca cordata* 1 m tall forming clumps. Border of loc. 1.1 associations has *Triodia scariosa* stands. Evidence of very old fire scars.

### Litter

Moderately abundant, mostly terete leaves, continuous or up to 2 m apart.

### Soil

Friable soil ca 30 cm deep.

20 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.4, yellow, 10YR7/6, sandy clay loam with ca 20% gravel pebbles.

### Loc. 3.4

Mosaic of shrublands similar to locs 3.1, 3.5, and 3.8.

### Loc. 3.5

Loc. 3.1 association gives way to *Acacia heteroneura*, *Casuarina corniculata* and mixed shrubs, 1-2.5 m tall, 2-10% canopy cover over *Melaleuca cordata* and *Petrophile incurvata*, 0.1 m tall, 10-30%. Litter as for loc. 3.1 but clumps 0-4 m apart. Soil is similar to loc. 3.1 but with ca 20% laterite pebbles.

### Loc. 3.6

Mosaic of shrublands similar to locs. 3.1 and 3.5 and small areas of *Acacia heteroneura* 2.5-4.0 m tall, 30-70% over *Melaleuca cordata* 1.0 m tall, ca 2% with scattered *Banksia benthamiana*. The southern portions of this loc. may have *Casuarina acutivalvis* in clumps 5-6.5 m tall, 10-30% canopy cover or as scattered shrubs within the other associations.

### Loc. 3.7

As for loc. 3.9

### Loc. 3.8

Mosaic of locs. 3.1 and 3.5 with some patches of loc. 3.6. *Melaleuca conothamnoides* prominent in understory.

### Loc. 3.9 (TRAPLINE 24)

#### Key Description

Open Scrub over Low Sedges on fine sandy loam

Code aSr.n<sub>1</sub>VLC/FSL n<sub>1</sub> = *Ecdeiocola monostachya*

#### Loc. Details

Stratum 1. *Acacia heteroneura* shrubs, mature, stratum 1.5-2.5 m tall, 2-10% canopy cover.

Stratum 2. *Ecdeiocola monostachya*, mature, stratum 0.3 m tall, 30-70% canopy cover.

#### Comments.

Seedlings of all species present. No evidence of fire. Between locs. 3.9 and 3.11 there is some influence of the heath species of loc. 4.3. These areas are mostly *Melaleuca uncinata* 3.4 m tall, 10-30% canopy cover over mixed shrubs, particularly *Baeckea* sp. 7. Soil is generally less gravelly than the shrubland. Scattered *Eucalyptus redunca* may be present.

#### Litter

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

#### Soil

Friable soil ca 0.5 m deep.

30 cm sample highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH4.3, light yellowish brown, 10YR6/4, fine sandy loam with ca 5% laterite pebbles (upper 10 cm has ca 50% gravel pebbles). Well drained with local pooling.

### Loc. 3.10

Mosaic of *Casuarina acutivalvis* shrubs, 2-4 m tall, 70-100% canopy cover with no understory and areas of the above with *Melaleuca uncinata*, *M. eleutherostachya*, *Acacia heteroneura* or *Thryptomene* affin. *kochii* prominent.

### Loc. 3.11 (TRAPLINE 23)

**Key Description**

Dense Thicket *on* fine sandy loam

**Code** xSD/FSL

**Loc. Details**

*Acacia heteroneura* and *Casuarina acutivalvis* shrubs, mature to senescent, stratum 1.5-3 m tall, 70-100% canopy cover.

**Comments**

No understory present. No evidence of fire. Also see loc. 3.9.

**Litter**

Abundant, mostly terete leaves, twigs, clumped to 5 cm deep, continuous.

**Soil**

Friable soil *ca* 30 cm deep over laterite.

20 cm sample is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.3, yellow, 10YR7/8, fine sandy loam with *ca* 10-20% laterite pebbles.

**Loc. 3.12**

Mosaic of shrublands similar to loc. 3.10 and 3.11.

**Loc. 3.13**

Mosaic of shrublands similar to locs. 3.10 and 3.11 but with prominent *Casuarina campestris* and *Thryptomene* affin. *kochii*, the latter 1.5 m tall. The area gives the impression of being regrowth although there is no fire evidence. The soil is poorly drained. *Eucalyptus redunca* mallees common close to woodland at loc. 1.5.

**Loc. 3.14**

Mosaic of locs. 3.6, 3.9, 3.10 and 3.11

**HEATH****Loc. 4.1**

As for loc. 4.2 with *Melaleuca conothamnoides* prominent.

**Loc. 4.2 (TRAPLINE 11)****Key Description**

Low Scrub D *on* light clay loam

**Code** xSDi/LSCL

**Loc. Details**

Mixed shrubs with no particular dominant, mature to senescent, stratum 0-0.5 m tall, 10-30% canopy cover.

**Comments**

Some area with *Ecdeiocolea monostachya* or *Melaleuca canothamnoides* prominent. Scattered



*Casuarina corniculata* and *Acacia heteroneura* 2.5 m tall ca 1% canopy cover present. Seedlings of all major species present. Evidence of very old fire scars.

**Litter**

Sparse, terete, leaves, not clumped. Spacing between shrubs is 0.5-1.0 m.

**Soil**

Friable soil deeper than 1m.

0.1 cm soil plus organic dust.

1-25 cm moderately pedal, sandy, extremely coherent, unbleached, non-calcareous, pH4.8, yellow, 10YR7/8, light sandy clay loam.

26 cm onwards as above but strongly coherent, blotchy bleached, pH4.5, very pale brown, 10YR8/4 with ca 5% laterite pebbles. Excessively drained.

**Loc. 4.3**

As for loc 4.2 with patches of shrubland similar to loc. 3.9 and 3.11 and areas with abundant *Melaleuca conothamnoides*, *Gahnia* affin. *polyphylla* or *Ecdeiocolea monostachya*.

**UNCLEARED LAND CONTIGUOUS WITH NUGADONG RESERVE**

**S1**

As for locs 3.1, 3.5.

**S2**

As for locs. 1.5, 2.3, 3.13 mosaic.

**S3**

Mosaic of shrublands with loc. 3.3, 3.10 and 3.11 types most prominent.

**S4**

*Casuarina acutivalvis* 4-6 m tall, 10-30% canopy cover. No understory.

**S5**

Not examined but airphoto indicates probably similar to S3 or S4 with some mallee.

**APPENDIX 2**  
**PLANT SPECIES RECORDED AT SELECTED LOCATIONS**  
**NUGADONG RESERVE**

(SC) denotes specimens lodged in Western Australian Museum Survey Collection

**Loc. 1.3**

*Acacia acuminata*

*A. colletioides*

*A. erinacea*

*A. microbotrya*

*A. signata*

*Alyxia buxifolia*

*Amphipogon debilis*  
*Arctotheca calendula*  
*Atriplex semibaccatum*  
*Dianella revoluta*  
*Enchylaena tomentosa*  
*Eremophila clarkii*  
*Eucalyptus loxophleba*

*Hypochaeris glabra*  
*Lomandra effusa*  
*Santalum acuminatum*  
*S. spicatum*  
*Templetonia sulcata*  
*Ursinia anthemoides*

**Loc. 1.5**

*Acacia acuminata*  
*A. colletoides*  
*A. desertorum*  
*A. graffiana*  
*A. mackayana*  
*A. merrallii*  
*Enchylaena tomentosa*  
*Eremophila* affin. *alternifolia*

*E. drummondii*  
*E. oppositifolia*  
*Eucalyptus salubris*  
*Olearia muelleri*  
*Rhagodia* affin. *preissii*  
*Santalum acuminatum*  
*Thryptomene* affin. *kochii*

**Loc. 2.6**

*Acacia graffiana*  
*Amphipogon debilis*  
*Baeckea* sp. 7 (SC)  
*Borya nitida*

*Casuarina acutivalvis*  
*Dianella revoluta*  
*Melaleuca eleutherostachya*  
*Phebalium filifolium*

**Loc. 3.3**

*Acacia dielsii*  
*A. heteroneura*  
*A. stereophylla*  
*Baeckea muricata*  
*B. sp. 7 (SC)*  
*Calytrix angulata*  
*Cassytha glabella*  
*Casuarina acutivalvis*

*C. corniculata*  
*Eucalyptus drummondii*  
*Grevillea paradoxa*  
*Hakea scoparia*  
*Melaleuca cordata*  
*Petrophile incurvata*  
*Thryptomene* affin. *kochii*

**Loc. 3.9**

*Acacia dielsii*  
*A. heteroneura*  
*Borya nitida*  
*Calytrix angulata*  
*Ecdiceola monostachya*

*Gahnia* affin. *polyphylla*  
*Grevillea tenuiloba*  
*Lepidosperma gracile*  
*Petrophile incurvata*  
*Platysace effusa*

**Loc. 3.11**

*Acacia heteroneura*  
*Amphipogon debilis*  
*Borya nitida*  
*Casuarina acutivalvis*  
*Dianella revoluta*

*Hakea scoparia*  
*Melaleuca cordata*  
*M. uncinata*  
*Phebalium* affin. *filifolium*  
*Thryptomene* affin. *kochii*

**Loc. 4.2**

*Acacia dielsii*  
*A. heteroneura*  
*Baeckea* sp. 7(SC)  
*Calytrix angulata*  
*Casuarina corniculata*  
*Ecdeiocolea monostachya*  
*Gahnia* affin. *polyphylla*

*Grevillea paradoxa*  
*Leucopogon hamulosus*  
*Melaleuca conothamnoides*  
*M. uncinata*  
*Petrophile incurvata*  
*Platysace effusa*

**APPENDIX 3**  
**VEGETATION DESCRIPTIONS—**  
**EAST NUGADONG RESERVE**

*NB:* All vegetation *ca* 26 years old unless otherwise stated.

**MALLEE**

**Loc. 2.1**

As for loc. 2.2

**Loc. 2.2 (TRAPLINE 5)**

**Key Description**

Very Open Tree Mallee *on* sandy clay loam

**Code** eKTr/SCL

**Loc. Details**

*Eucalyptus loxophleba* tree mallee stratum 8-10 m tall, 2-10% canopy cover.

## Comments

Area of tree mallee is about 100 m in diameter and surrounded by shrubland. The *E. loxophleba* has scattered *Melaleuca eleutherostachya* 3-4 m tall beneath it (less than 1% canopy cover) and this becomes more abundant as it passes into loc. 3.10 and loc. 2.3 (see descriptions). Clumps nearest the trapline are mostly 3-4 m tall and reach 30-70% canopy cover.

## Litter

Sparse, mostly bark, twigs and broadleaves. Layer continuous.

## Soil

30 cm sample is moderately pedal, sandy, poorly coherent, pH6.2, yellowish red, 5YR5/8, sandy clay loam. Well drained.

## Loc. 2.3

Transition between locs. 2.2, and 3.12 which has structure and floristics similar to loc. 2.7.

## Loc. 2.4

As for loc. 2.7 with patches of shrubland similar to loc. 3.15.

## Loc. 2.5

Area of *Eucalyptus foecunda*, mature, stratum 4-5 m tall, 2-10% canopy cover over *Melaleuca uncinata* and *Casuarina campestris*, stratum 1-2 m tall, ca 5% canopy cover (may be as low as 2%) over *Ecdiocollea monostachya* and scattered shrubs 0.5 m tall, 10-30% canopy cover. Soil is slightly pedal, sandy, poorly coherent, pH4.8, very pale brown, 10YR7/4, sandy loam. Drainage fairly good.

## Loc. 2.6

As for loc. 2.7 but with stratum 1 5-6 m tall and understory 0.5-1.0 m tall, 30-70% canopy cover. Soil as for loc. 2.7.

## Loc. 2.7 (TRAPLINE 2)

### Key Description

Very Open Shrub Mallee over Dwarf Scrub C on sandy clay loam

Code xKSr.xSci/SCL

### Loc. Details

Stratum 1. *Eucalyptus foecunda* shrub mallee, immature, stratum 4-6 m tall, 2-10% canopy cover.

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

## Comments

No evidence of fire.

## Litter

Moderate to abundant, mostly broad leaves and twigs but terete leaves and large debris also abundant. Clumped to 2 cm deep, clumps 2 m apart.

## Soil

Friable soil deeper than 1 m.

30 cm sample highly pedal, sandy, poorly coherent, pH6.0, brownish yellow, 10YR6/6, sandy clay loam.

60 cm sample as above but yellow, 10YR7/6. Drainage excessive.

## Loc. 2.8

As for loc. 2.6 and 2.7 but with scattered *Eucalyptus loxophleba* tree mallees and some *Melaleuca eleutherostachya* shrubs and scattered *Amphipogon debilis* grasses.

## Loc. 2.9

*Eucalyptus transcontinentalis* shrub mallee 5-6 m tall 1-3% canopy cover over *Acacia heteroneura* shrubs 3-4 m tall, 10-30% canopy cover. Litter is mostly terete leaves, broad leaves, bark and twigs. Soil as for loc. 3.16. Some areas have understoreys similar to loc. 2.5 but *Melaleuca uncinata* is generally more common than *Casuarina campestris* and canopy cover of stratum 2 is usually 60-80%.

## Loc. 2.10 (TRAPLINE 8)

### Key Description

Very Open Shrub Mallee over Scrub on sandy clay loam

Code eKSr.mSi/SCL

### Loc. Details

Stratum 1. *Eucalyptus transcontinentalis* and *E. redunca* shrub mallee, mature, 5-7 m tall, 2-10% canopy cover.

Stratum 2. *Melaleuca uncinata* or *M. eleutherostachya*, mature, 1-2.5 m tall, 10-30% (sometimes up to 70%).

### Comments

Area has patches of *Eucalyptus loxophleba* mature, stratum 6-10 m tall, 2-10% canopy cover over *Olearia revoluta*, 1.0 m tall, 2-10% canopy cover. Soil here is highly pedal, sandy, strongly coherent, pH5.3, yellowish red, 5YR5/6, sandy clay. Soluble salts 1700ppm. No evidence of fire.

### Litter

Abundant, broad leaves, twigs, terete leaves, continuous or spaced up to 3 m.

## Soil

30 cm sample is moderately pedal, sandy, poorly coherent, pH6.0, yellowish red, 5YR5/8, sandy clay loam. Poorly drained.

## SHRUBLAND

### Loc. 3.1

#### Key Description

Thicket *on* gravelly fine sandy loam

Code xSc/K-FSL

#### Loc. Details

*Casuarina acutivalvis* and *Acacia neurophylla* shrubs, mature to senescent, stratum 1-3 m tall, 30-70% canopy cover.

#### Comments

No understory present. Has stands of *Casuarina acutivalvis* emergent to 6 m tall and clumps of *Eucalyptus oldfieldii*, the latter becoming more abundant to the west and south of this loc. The vegetation is very variable due to changes in floristic dominance rather than change in height or density. No evidence of fire.

#### Litter

Abundant, mostly broad leaves, terete leaves and twigs, continuous to 5 cm deep.

## Soil

30 cm sample moderately pedal, earthy, poorly coherent, pH4.2, yellow, 10YR7/6, fine sandy loam with *ca* 90% gravel. Well drained.

### Loc. 3.2

Mosaic of shrublands similar to locs. 3.3, 3.5, and 3.19 with scattered mallees. Stand is *ca* 22 years old.

### Loc. 3.3 (TRAPLINE 7)

#### Key Description

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

Code xSr.xSDr.xSDr/LSCL

### Loc. Details

Stratum 1. *Casuarina campestris* and *Acacia heteroneura* shrubs with some *Acacia stereophylla* and *Grevillea excelsior* shrubs, mature, stratum 2-4 m tall, 2-10% canopy cover.

Stratum 2. *Grevillea filifolia*, *Melaleuca cordata* and several other species of shrubs, mature, stratum 0.5-1.5 m tall, 2-10% canopy cover.

Stratum 3. *Baeckea muricata* and numerous other species of shrub, mature to senescent, stratum 0-0.5 m tall, 2-10% canopy cover.

### Comments

Scattered *Eucalyptus drummondii* and *Hakea minyma* present. Seedlings of all species found. No evidence of fire.

### Litter

Abundant, mostly terete leaves and twigs, clumped 2 cm deep, continuous or up to 2 m apart.

### Soil

Friable soil deeper than 1 m.

40 cm sample is slightly pedal, sandy, poorly coherent, pH4.5, yellow, 10YR7/6, light sandy clay loam. Excessively drained.

### Loc. 3.4

As for loc. 3.3 with areas similar to locs. 3.1 and 3.7.

### Loc. 3.5

As for loc. 3.3 with *Eucalyptus drummondii* conspicuous.

### Loc. 3.6

As for loc. 3.12

### Loc. 3.7

*Acacia stereophylla* shrubs, 2-3 m tall, 2-10% canopy cover over *Melaleuca cordata*, *M. conothamnoides* and several other species of shrubs, 0.5 m tall, 10-30% canopy cover.

### Loc. 3.8

*Casuarina campestris* shrubs, mature, 3-4 m tall, 2-10% canopy cover over *Thryptomene* affin. *kochii*, *Melaleuca conothamnoides*, *Hakea falcata* and several other species of shrubs, mature, stratum 0.5-1.5 m tall, 30-70% canopy cover.

### Loc. 3.9

Mostly *Casuarina campestris* shrubs 1.5-3.0 m tall, 70-100% canopy cover with some *Baeckea muricata*, 0.3 m tall, 2-10% canopy cover.

### Loc. 3.10

Open, disturbed area with clumps of *Melaleuca eleutherostachya* shrubs (some with tree life-form) 5-6 m tall, 2-10% canopy cover over the area but 70-100% canopy cover within clumps. Clumps may be up to 20 m in diameter and 10-30 m apart. There are occasional *Eucalyptus loxophleba* present. Ground surface in the open areas is sandy, uneven, often with shallow elongate grooves, and has abundant weeds (particularly *Ursinia anthemoides*) and some grass. These areas may be due to natural pooling of water but in comparison with loc. 3.11 indicate some disturbance, possibly partial clearing or heavy stock trampling.

### Loc. 3.11

#### Key Description

Thicket *on* sandy clay loam

Code mSc/SCL

#### Loc. Details

*Melaleuca acuminata* and *M. lateriflora* shrubs, immature, stratum 1-2.5 m tall, 30-70% canopy cover.

#### Comments

No understory present. Patchy distribution of plants is due to waterlogging of soil in localised areas. The ground surface in the open areas is silty, very even, basin shaped and has very few weeds or grasses (cf. loc. 3.10). No evidence of fire.

#### Litter

Sparse, terete leaves and twigs clumped to 1 cm deep, clumps *ca* 3 m apart.

#### Soil

30 cm sample moderately pedal, sandy, poorly coherent, pH6.4, yellowish red, 5YR4/8, sandy clay loam. Poorly drained.

### Loc. 3.12 (TRAPLINE 4)

#### Key Description

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

Code xSc.xSDr/FSL

#### Loc. Details

Stratum 1. *Casuarina campestris* and numerous other species of shrubs, mature, stratum 1-2.5 m tall, 30-70% canopy cover.

Stratum 2. *Baeckea* sp. 7 and numerous other species of shrubs, mature to senescent, stratum 0.4 m tall, 2-10% canopy cover.



## Comments

*Acacia resinomarginea* emergent to 5 m tall. Evidence of very old fire scars.

## Litter

Sparse to moderately abundant, mostly terete leaves and twigs clumped to 2 cm deep, clumps ca 3 m apart. Abundant standing dead shrubs or stumps.

## Soil

Friable soil ca 1-m deep.

30 cm sample slightly pedal, sandy, poorly coherent, pH5.3, reddish yellow, 7.5YR7/8, fine sandy loam. Excessively drained.

## Loc. 3.13

Mosaic of associations similar to locs. 3.12 with areas of *Acacia resinomarginea*, 3-4 m tall, 30-70% canopy cover over *Phebalium tuberculosum*, *Beyeria lechenaultii* and several other species of shrubs ca 1.0 m tall, 2-10% canopy cover. There are also patches of *Casuarina campestris*, *Eucalyptus drummondii*, *Banksia benthamiana* and *Actinostrobos arenarius*.

## Loc. 3.14

Mosaic of associations similar to locs. 3.3, 3.7, and 4.13.

## Loc. 3.15

Small area of *Acacia heteroneura* shrubs 1.0-2.5 m tall, 10-30% canopy cover over *Baeckea muricata* and *Amphipogon debilis* 0.2-0.3 m tall, 2-10% canopy cover. Area is surrounded by mallee similar to loc. 2.6 and 2.7.

## Loc. 3.16

### Key Description

Scrub on fine sandy loam

Code xSi/FSL

### Loc. Details

*Melaleuca eleutherostachya* and *Acacia acuminata* shrubs, mature to senescent, 3-5 m tall, 10-30% canopy cover.

## Comments

*Eucalyptus loxophleba* tree mallees, 7-9m tall, ca 1% canopy cover present. Seedlings and young plants of all species observed. Abundant clumps of *Amphipogon debilis* grass. Evidence of very old fire scars.

### Litter

Moderately abundant, twigs, broad leaves and large debris. Numerous standing dead shrubs. Clumped to 3 cm deep, clumps 0-3 m apart.

### Soil

Friable soil *ca* 38 cm deep.

20 cm sample is moderately pedal, sandy, coherent, pH5.2, yellowish red, 5YR5/8, fine sandy loam. Soluble salts 50 ppm.

50 cm sample highly pedal, sandy, strongly coherent, pH5.8, pink, 5YR7/4, sandy clay loam. Soluble salts 150 ppm.

Horizon A well drained but waterlogs after heavy rain.

### Loc. 3.17

As for loc. 3.19 but with patches of *Acacia signata* 0.5-2.0 m tall, 10.30% canopy cover and with understorey and clumps of *Casuarina acutivalvis* absent.

### Loc. 3.18

#### Key Description

Dense Thicket *over* Open Dwarf Scrub D *on* sandy clay loam

Code aSd.n<sub>1</sub>SDr/SCL                      n<sub>1</sub> = *Baeckea* sp. 7

#### Loc. Details

Stratum 1. *Acacia heteroneura* shrubs, mature, stratum 2-3.5 m tall, 70-100% canopy cover.

Stratum 2. *Baeckea* sp. 7 shrubs 0.5 m tall, *ca* 5% canopy cover but absent in some small areas.

### Litter

Moderate to abundant, terete leaves and twigs, clumped to 2 cm deep, 0-2 m apart.

### Soil

Friable soil *ca* 0.5 m deep.

20 cm sample moderately pedal, sandy, coherent, pH4.7, light yellowish brown, 10YR6/4, sandy clay loam with *ca* 5% gravel. Soluble salts 80 ppm.

50 cm sample slightly pedal, sandy, poorly coherent, pH5.0 yellow, 10YR7/6, clay loam with *ca* 80% gravel. Soluble salts less than 30 ppm.

Well drained.

### Loc. 3.19 (TRAPLINE 1)

#### Key Description

Mosaic of Scrub *over* Open Dwarf Scrub C—Heath A *over* Open Dwarf Scrub D—Open Low Scrub B/all *on* sandy clay loam.

Code Mosaic aSi.xSCr-aSAc.xSDr-xSBr/SCL

#### Loc. Details

Mosaic area of two associations with strips of a third.

Assocn. 1. *Acacia* affin. *assimilis* shrubs, mature to senescent, 2-2.5 m tall, 10-30% canopy cover over *Thryptomene australis* and *Baeckea muricata* senescent, 1.0 m tall, 2-10% canopy cover.

Assocn. 2. *Acacia stereophylla*, mature to senescent, stratum 1-2 m tall, 30-70% canopy cover over mixed shrubs 0.5m tall, 2-10%.

Assocn. 3. No dominant, shrubs 1-5 m tall, 2-10% canopy cover. This area is regeneration after fire. The original vegetation was as assocn. 2.

#### Comments

Emergent *Casuarina acutivalvis* to 5m tall. Evidence of very old fire scars in associations 1 and 2 and recent scars in assocn. 3.

#### Litter

Assocns. 1 and 2 sparse to moderate, terete leaves, clumped to 0.5 cm deep, clumps 4 m apart. Absent in assocn. 3.

#### Soil

Soil the same in all associations. Friable soil *ca* 50 cm deep and as described for loc. 3.18.

#### Loc. 3.20

Mosaic of shrublands similar to locs. 3.12, 3.17, 3.18 and 3.19 (associations 1 and 2).

#### Loc. 3.21

Mostly as for loc. 3.12 with patches of shrubland similar to loc. 3.19.

### HEATH

#### Loc. 4.1 (TRAPLINE 6)

Unstratified, 0.5 m tall, 10-30% canopy cover. Some areas with shrubs dominant, in other area *Eccleiocolea monostachya* is most conspicuous. Original vegetation as for locs. 4.4 and 4.6. Soil moderately pedal, sandy, poorly coherent, pH5.5, yellow, 10YR7/8, sandy loam. Association is *ca* 9 years old.

#### Loc. 4.2

As for loc. 4.1 but *Casuarina campestris* and some *Eucalyptus* sp. mallees regrown to 1.5 m tall. This is probably regrowth of loc. 3.1 association. Area burnt *ca* 18 years ago, scrub rolled *ca* 9 years ago.

**Loc. 4.3**

*Grevillea filifolia* and several other species of shrubs, immature, stratum 0.5-1.5 m tall, 10-30% canopy cover and mixed shrubs 0.5 m tall, 2-10% canopy cover. Scattered mallees present. Litter is sparse, terete leaves, twigs, clumped to 1 cm deep, clumps 3 m apart. No evidence of fire but area is regrowth following scrub rolling. Soil is moderately pedal, sandy, poorly coherent, pH5.2, yellow, 10YR7/8, sandy loam. Excessively drained.

**Loc. 4.4**

*Casuarina campestris* over heath species similar to loc. 4.11.

**Loc. 4.5**

Mosaic of heaths similar to locs. 4.10 and 4.11 with patches of shrubland similar to loc. 3.3

**Loc. 4.6**

*Casuarina campestris* over *Ecdeiocolea monostachya* similar to loc. 4.11. Soil is moderately pedal, sandy, poorly coherent, pH5.1, yellow, 10YR7/8, sandy loam.

**Loc. 4.7**

*Casuarina campestris* over *Ecdeiocolea monostachya* similar to loc. 4.11.

**Loc. 4.8**

Mosaic of heaths similar to locs. 4.9, 4.13, 4.10, and 4.11.

**Loc. 4.9**

Mosaic of *Casuarina* heaths with *C. campestris*, *Grevillea filifolia* 1-1.5 m tall, 10-30% over *Baeckea muricata*, *Melaleuca cordata* and *M. conothamnoides* 0-5 m tall, 10-30% canopy cover as a prominent association. Soil is moderately pedal, sandy, poorly coherent, pH5.2, yellow, 10YR7/8, sandy loam.

**Loc. 4.10**

Association similar to loc. 4.11 heathy areas but without the *Casuarina* overstory. Comprises mixed shrubs, 1.0 m tall, 30-70% canopy cover. There is no other strata except in small areas where clumps of shrubs 1.5 m tall may reach 6% canopy cover. Soil at 25 cm is moderately pedal, sandy, poorly coherent, pH5.3, brownish yellow, 10YR6/8, fine sandy loam. 50 cm sample is slightly pedal, pH5.6, reddish yellow, 7.5YR7/8, otherwise as above.

**Loc. 4.11 (TRAPLINE 3)**

**Key Description**

Low Scrub B over Low Heath D on gravelly clay loam

**Code** cSBI.xSDc/K-CL

### Loc. Details

Area comprises repeated mosaic of one basic association with either a heath or sedge understory. The basic structure is *Casuarina corniculata* or *C. campestris* with some *Melaleuca uncinata* shrubs, 0.5-1.5 m tall, 10-30% canopy cover.

The second stratum is either *Ecdeiocolea monostachya*, *Baeckea muricata*, and *Mesomelaena* sp. 1 sedges and shrubs or mixed shrubs with no dominant. Both associations are 0.5 m tall, but the density is 30-70% in the sedge areas and only 10-30% in the heathy. There is evidence of old fire scars in both types.

### Litter

Sparse to absent.

### Soil

Sedge areas are in shallow depressions that are well drained but probably remain damp longer after rain. The soil is mostly slightly pedal, sandy, poorly coherent, pH5.2, yellow, 10YR7/6, clay loam with up to 80% laterite pebbles.

Heath areas are on slight rises that are excessively drained. Soil here as above but very pale brown, 10YR7/4, fine sandy loam with a maximum of 5 or 10% gravel.

### Loc. 4.12

Mostly mosaic of types found in loc. 4.11 and 4.13.

### Loc. 4.13

As for loc. 4.9 with patches similar to loc. 4.11.

### Loc. 4.14

As for loc. 4.10 with patches similar to loc. 4.11.

### Loc. 4.15

As for loc. 4.11 but mostly *Casuarina campestris* in upper story and ca 2 m tall. Small areas may reach 2.5 m tall. Canopy cover is mostly ca 50% regardless of what species are dominant in the understory.

### Loc. 4.16

As for loc. 4.10 with occasional patches of shrubland similar to loc. 3.18. Rubbish tip is 7-11 years old.

## UNCLEARED LAND ADJACENT TO NUGADONG EAST RESERVE

### M1

As for H1 but to 3 m tall and with abundant regrowing mallees, particularly *Eucalyptus oldfieldii* and *E. drummondii*. Canopy cover of area about 30% may reach 50% in some areas.

## M2

Mostly *Eucalyptus loxophleba* tree mallees 4-8 m tall, 10-30% canopy cover with no understory and with clumps similar to loc. 3.10. Area heavily grazed.

## S1

Mostly as for loc. 4.3 but 2-2.5 m tall in many areas. Mallees common in clumps. Area scrub rolled.

## S2

As for loc. 3.3

## S3

Originally similar to loc. 3.3. Now comprises *Casuarina campestris*, *Acacia heteroneura*, *Acacia stereophylla*, *Grevillea excelsior* and *Grevillea apiculoba* shrubs 1.5-5 m tall, 2-10% canopy cover over *Amphipogon debilis* and some *Schoenus* affin. *compressus* grasses and sedges to 20 cm tall, ca 20% canopy cover. All other understory species absent. All of the upper stratum has been browsed by sheep to about 1.5 m above the ground.

## H1

Mixed shrubs, no particular dominant, 0-1.5 m tall, 10-30% canopy cover over *Baeckea muricata* 0.5 m tall, 2-10% canopy cover. Several species are emergent to 2.5 m, the most obvious being *Actinostrobos arenarius*, *Acacia* affin. *coolgardiensis*, *Melaleuca concreta*, *Acacia neurophylla*, *Thryptomene* affin. *kochii*, *Acacia heteroneura*, *Santalum acuminatum* and *Eucalyptus drummondii*.

Litter is moderately abundant, clumped to 5 cm deep, clumps 3 m apart. The litter is almost entirely twigs. The area has been scrub rolled and burnt.

## APPENDIX 4 PLANT SPECIES RECORDED AT SELECTED LOCATIONS— EAST NUGADONG RESERVE

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

### Loc. 2.2

*Dianella revoluta*  
*Eucalyptus loxophleba*  
*Lomandra efusa*

*Melaleuca eleutherostachya*  
*Olearia muelleri*

**Loc. 2.7**

*Acacia assimilis*  
*A. graffiana*  
*A. heteroneura*  
*Beyeria lechenaultii*  
*Eucalyptus foecunda*  
*Hakea falcata*  
*Leptospermum erubescens*

*Melaleuca conothamnoides*  
*M. affin. pentagona*  
*M. subtrigona*  
*Olearia revoluta*  
*Phebalium tuberculosum*  
*Platysace maxwellii*  
*Santalum acuminatum*

**Loc. 2.10**

*Acacia graffiana*  
*A. mackayana*  
*Amphipogon debilis*  
*Atriplex semibaccata*  
*Cassytha glabella*  
*Eremophila* affin. *decipiens*  
*E. drummondii*

*Eucalyptus loxophleba*  
*E. redunca*  
*Melaleuca eleutherostachya*  
*M. uncinata*  
*Olearia revoluta*  
*Santalum acuminatum*

**Loc. 3.3**

*Acacia heteroneura*  
*A. resinomarginea*  
*A. signata*  
*A. stereophylla*  
*Astroloma serratifolium*  
*Baeckea muricata*  
*B. sp. 7 (SC)*  
*Casuarina campestris*  
*Choretrum pritzellii*  
*Eriostemon thryptomenoides*  
*Eucalyptus drummondii*  
*Grevillea excelsior*

*G. filifolia*  
*G. paradoxa*  
*Hakea falcata*  
*H. minyma*  
*Isopogon divergens*  
*Melaleuca cordata*  
*M. subtrigona*  
*Persoonia striata*  
*Petrophile ericifolia*  
*P. shuttleworthiana*  
*Philotheca drummondita*  
*Schoenus* affin. *compressus*

**Loc. 3.12**

*Acacia assimilis*  
*A. heteroneura*  
*A. resinomarginea*  
*A. stereophylla*  
*Baeckea muricata*  
*B. sp. 7 (SC)*  
*Banksia benthamiana*  
*Byeria lechenaultii*  
*Calytrix angulata*

*Casuarina campestris*  
*Eriostemon deserti*  
*Gahnia* affin. *polyphylla*  
*Grevillea filifolia*  
*G. paradoxa*  
*Melaleuca cordata*  
*Micromyrtus imbricata*  
*Petrophile incurvata*  
*Thryptomene* sp. 4 (SC)

**Loc. 3.18**

*Acacia heteroneura*  
*Baeckea muricata*

*B. sp. 7 (SC)*  
*Hakea scoparia*

**Loc. 3.19**

*Acacia assimilis* (burnt)  
*A. stereophylla* (both)  
*Baeckea muricata* (both)  
*Baeckea sp. 7 (SC)* (both)  
*Calytrix angulata* (both)  
*Casuarina acutivalvis* (burnt)  
*C. campestris* (burnt)  
*C. corniculata* (unburnt)

*Grevillea paradoxa* (burnt)  
*Hakea scoparia* (unburnt)  
*Melaleuca cordata* (both)  
*M. uncinata* (unburnt)  
*Petrophile incurvata* (unburnt)  
*Schoenus affin. compressus* (burnt)  
*Thryptomene australis* (both)  
*Verticordia chrysantha* (burnt)

**Loc. 4.1**

*Acacia dielsii*  
*Baeckea muricata*  
*B. sp. 7 (SC)*  
*Casuarina campestris*  
*Choretrum pritzellii*  
*Ecdeiolelea monostachya*  
*Hakea circumalata*  
*H. falcata*

*Harperia lateriflora*  
*Melaleuca cordata*  
*M. subtrigona*  
*Petrophile ericifolia*  
*P. seminuda*  
*Platysace effusa*  
*Schoenus sp. 1 (SC)*

**Loc. 4.11**

*Acacia dielsii*  
*Baeckea muricata*  
*B. sp. 7 (SC)*  
*Calytrix angulata*  
*Cassytha glabella*  
*Casuarina campestris*  
*C. corniculata*  
*Choretrum pritzellii*  
*Ecdeiolelea monostachya*  
*Eriostemon thryptomenoides*

*Lepidosperma tenue*  
*Melaleuca cordata*  
*M. uncinata*  
*Mesomelaena sp. 1 (SC)*  
*Philothea hassellii*  
*Schoenus sp. 1 (SC)*  
*S. affin. subbulbosus*  
*Verticordia brownii*  
*V. drummondii*



**APPENDIX 5**  
**VEGETATION DESCRIPTION—**  
**NUGADONG FOREST RESERVE**

WOODLAND

*NB:* All vegetation older than 30 years unless otherwise stated.

**Loc. 1.1**

**Key Description**

Open Low Woodland A *over* Very Open Shrub Mallee *over* Open Low Woodland B *on* sandy clay

**Code** eLAr.xKSr.mLBr/SC

**Loc. Details**

Stratum 1. *Eucalyptus salubris* trees immature, and some *E. transcontinentalis* tree mallee mature, stratum 11-13 m tall, 1-3% canopy cover.

Stratum 2. *E. transcontinentalis* and *E. redunca* shrub mallee and tree mallee, mature, stratum 4-9 m tall, 2-10% canopy cover.

Stratum 3. *Melaleuca corymbosa* trees, senescent, stratum 4-5 m tall, 2-10% canopy cover.

**Comments**

Scattered shrubs to 0.5m tall present. No evidence of fire. Scattered rubbish present, mostly tin cans.

**Litter**

Abundant, broad leaves, twigs and large debris, continuous or clumped, 1 m apart.

**Soil**

Friable soil 25 cm deep over light clay.

20 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH6.5, yellowish red, SYR4/6, sandy clay. Soluble salts 640 ppm.

**Loc. 1.2**

**Key Description**

Open Low Woodland A *on* sandy clay

**Code** eLAr/SC

**Loc. Details**

Single stratum of *Eucalyptus loxophleba* trees, mature to senescent, stratum 10-12 m tall, 2-10% canopy cover.

## Comments

Shrubs to 2 m tall, scattered beneath trees, have total canopy cover of about 1-2%. *Dodonaea inequifolia* is commonest. No evidence of fire.

## Litter

Abundant, mostly large debris and twigs, bark and broad leaves. Continuous, beneath shrubs or slightly water piled, clumps up to 2m apart.

## Soil

Friable soil depth variable 10-80 cm.

30 cm sample highly pedal, earthy, strongly coherent, unbleached, non-calcareous, pH8.3, yellowish red, 5YR4/6, sandy clay. Contains 80% rock fragments. Soluble salts 170 ppm.

## Loc. 1.3

As for loc. 1.5

## Loc. 1.4

*Eucalyptus salubris* stand similar to loc. 1.7.

## Loc. 1.5

As for loc. 1.8 with stands of, or scattered, *Eucalyptus salubris*. *Alyxia buxifolia* common.

## Loc. 1.6

As loc. 1.8 with abundant *Eucalyptus redunca* mallees.

## Loc. 1.7

## Key Description

Low Woodland A over Open Dwarf Scrub C on sandy clay loam

Code eLAI.xSCr/SCL

## Loc. Details

Stratum 1. *Eucalyptus salubris* and *E. loxophleba* trees and scattered *E. redunca* trees all mature, stratum 10-13 m, 10-30% canopy cover.

Stratum 2. *Acacia acuarua*, *Olearia muelleri* and several other species shrubs, mature, stratum 0-1 m tall, 1-5% canopy cover.

## Comments

Some small areas dominated by *E. salubris* trees and *E. loxophleba* tree mallees or *E. redunca* trees, tree mallee or shrub mallees. Where *E. redunca* is tree mallees the stratum is 4-6 m tall, where it is trees the stratum is 8-10 m tall. No evidence of fire.

### Litter

Abundant, large debris, broad leaves, twigs, clumped to 2 cm deep, clumps 0-4 m apart.

### Soil

Friable soil ca 40 cm deep over clays

0-35 cm sample highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH6.7, yellowish red, 5YR4/8, sandy clay loam. Soluble salts less than 30 ppm.

40-45 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH6.5, reddish yellow, 5YR6/6, sandy loam. Soluble salts 45 ppm.

### Loc. 1.8 (TRAPLINE 17, 18)

#### Key Description

Low Woodland A over Low Scrub B on sandy clay loam

Code eLAI.xSBI/SCL

#### Loc. Details

Stratum 1. *Eucalyptus loxophleba* trees, mature, stratum, 7-9 m tall, 10-30% canopy cover.

Stratum 2. *Acacia acuarina*, *Olearia muelleri*, *Alyxia buxifolia*, and several other species of shrubs, mature stratum 0.5-1.5 m tall, ca 12% canopy cover.

#### Comments

No evidence of fire.

### Litter

Abundant, large debris, broad leaves, twigs, clumped to 2 cm deep, clumps 0-4 m apart.

### Soil

As for loc. 1.7.

### Loc. 1.9

As for loc. 1.7.

### MALLEE

#### Loc. 2.1

As for loc. 2.4 with scattered *Eucalyptus transcidentalis* and *E. loxophleba* with patches similar to loc. 3.1

#### Loc. 2.2

As for loc. 2.8 (TRAPLINE 15).

### Loc. 2.3

#### Key Description

Very Open Shrub Mallee over Open Herbs on sandy clay loam

Code eKsr.n<sub>1</sub>Ji/SCL                      n<sub>1</sub> = *Borya nitida*

#### Loc. Details

Stratum 1. *Eucalyptus foecunda* shrub mallee and *E. redunca* shrub and tree mallee mature, stratum 2-7 m tall, 2-10% canopy cover.

Stratum 2. *Borya nitida* herbs, mature, stratum 0.1 m tall, 10-30% canopy cover.

#### Comments

In some areas the *Borya nitida* is replaced by *Gahnia* affin. *polyphylla*, 0.3 m tall, 2-10% canopy cover. No evidence of fire.

#### Litter

Abundant, broad leaves, bark, twigs and large debris, clumped to 3 cm deep, clumps 0-1 m apart.

#### Soil

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH6.4, reddish yellow, 7.5YR7/8, sandy clay loam.

### Loc. 2.4

Small belt of *Eucalyptus redunca* shrub mallee mature 5-6 m tall, 2-10% canopy cover over a patchy understory of shrubs to 1 m tall.

### Loc. 2.5

Partly as for *Eucalyptus redunca* mallee belts described in loc. 1.7 (comments) with small areas resembling loc. 2.3.

### Loc. 2.6

Small stand of *Eucalyptus transcontinentalis* and *E. loxophleba* tree mallees.

### Loc. 2.7

Small band of *Eucalyptus loxophleba* tree mallee stratum 6-7 m tall, 2-10% canopy cover over *Melaleuca acuminata* and *Acacia acuminata* stratum 4-5m tall, 2-10% canopy cover.

### Loc. 2.8

Clumps of *Eucalyptus redunca* shrub mallee and patches of *Melaleuca eleutherostachya* shrubs as a narrow band on the edge of loc. 1.9 *E. salubris* stand. Soil is slightly pedal, sandy, coherent, pH6.2, yellow, 10YR7/6, sandy clay loam, ca 70% laterite pebbles.

## SHRUBLAND

### Loc. 3.1 (TRAPLINE 13)

#### Key Description

Dense Thicket *over* Dwarf Scrub C *on* clay loam

Code aSd.n<sub>1</sub>SCI/CL

#### Loc. Details

Stratum 1. *Acacia heteroneura* shrubs, mature, stratum 2-4 m tall, 70-100% canopy cover.

Stratum 2. *Baeckea* sp. 7 shrubs, mature to senescent, stratum 1.0 m tall, 10-30% canopy cover.

#### Comments

No evidence of fire. Vegetation is 25-30 years old.

#### Litter

Abundant, terete leaves and twigs, evenly distributed to 2 cm deep.

#### Soil

Friable soil deeper than 1 m.

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH6.6, reddish yellow, 7.5YR6/6, clay loam.

80 cm sample as above but pH6.4, 7.5YR7/8, sandy clay loam.

### Loc. 3.2 (TRAPLINE 16)

Mosaic of shrublands similar to locs. 3.5, 3.7, 3.13 becoming lower and more heathy near the granite outcrop. Scattered *Santalum acuminatum*, *Acacia saligna* and *Eucalyptus loxophleba* present.

### Loc. 3.3

Mosaic similar to locs. 3.6 and 3.9

### Loc. 3.4

Mosaic of *Casuarina campestris* or *Melaleuca uncinata* heath and shrubland.

### Loc. 3.5

#### Key Description

Open Scrub *over* Thicket *on* clay loam

Code xSr.xSc/CL

### Loc. Details

Stratum 1. *Acacia heteroneura*, *Casuarina acutivalvis* shrubs, stratum 4-6 m 2-10% canopy cover.

Stratum 2. *Thryptomene* affin. *kochii* and several other species of shrubs, stratum 2-2.5 m tall, 30-70% canopy cover.

### Comments

Some areas with stratum 2 absent or replaced by *Melaleuca uncinata* 5-6 m tall, 30-70% canopy cover or mixed shrubs with no dominants.

### Litter

Moderately abundant, terete leaves and twigs, continuous or clumped, 2 cm deep, clumps 0-1 m apart.

### Soil

30 cm sample is highly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.7, brownish yellow, 10YR6/6, clay loam. Soluble salts 50 ppm.

### Loc. 3.6

Loc. 3.6 and 3.7 are pure stands of different associations which occur as a mosaic in area between the locs. rather than merging into each other. Loc. 3.6 association is *Casuarina campestris* mature, stratum 2-3.5 m tall, 70-100% canopy cover. A lower stratum of *Gahnia* affin. *polyphylla* sedge and shrubs, stratum 0.5 m tall, ca 2% canopy cover. Soil is highly pedal, sandy, coherent, pH6.0, strong brown, 7.5YR5/8, light sandy clay loam. Soluble salts less than 30 ppm.

### Loc. 3.7

*Casuarina campestris*, *Hakea scoparia* shrubs, mature, stratum 2-3.5 m tall, 30-70% canopy cover. A lower stratum of shrubs with no particular dominants to 0.5 m tall, 10-30% canopy cover, Soil is moderately pedal, sandy, coherent, pH6.3, brown, 7.5YR4/4, fine sandy loam. Soluble salts 40 ppm.

### Loc. 3.8

*Acacia signata* shrubs, stratum 2-3 m tall, 30-70% canopy cover over *Baeckea muricata* shrubs, stratum 0.5 m tall, 2-10% canopy cover. Scattered *Eucalyptus redunca* shrub mallee to 5 m tall present.

### Loc. 3.9

*Casuarina campestris* shrubs, stratum 2-3 m tall, 10-30% canopy cover over mixed shrubs, stratum 0.5 m tall, 10-30% canopy cover. Eastern edge of loc. has sparser upper stratum and scattered *Grevillea filifolia* shrubs.

### Loc. 3.10 (TRAPLINE 21)

*Melaleuca uncinata* shrubs, 3-4 m tall, 70-100% canopy cover with no understory but scattered *Casuarina acutivalvis* shrubs to 6 m tall. Small areas are more open (30-70%) and have heathy understory.

### Loc. 3.11 (TRAPLINE 20)

Mosaic of variable species dominance and density. Associations are mostly: *Melaleuca uncinata* shrubs 2-3 m tall, 70-100% canopy cover with no understory; *Casuarina campestris* as described in loc. 3.6; *Casuarina campestris* shrubs, stratum 1.5-3.0 m tall, 70-100% canopy cover over *Ecdeiocolea monostachya* sedge 0.5 m tall, 10-30% canopy cover.

### Loc. 3.12 (TRAPLINE 19)

*Melaleuca uncinata* shrubs, stratum 5-6 m tall, 30-70% canopy cover. Scattered *Melaleuca acuminata* present. Scattered *Eucalyptus salubris* and *E. redunca* shrub mallee penetrate this association from loc. 2.5 and 1.7.

### Loc. 3.13

*Acacia resinomarginea* shrubs 2-3 m tall, 30-70% canopy cover over *Ecdeiocolea monostachya* sedge 0.3 m tall, 2-10% canopy cover over *Borya nitida* 0.1 m tall, 10-30% canopy cover.

## HEATH

### Loc. 4.1

Small area of *Thryptomene* aff. *kochii* shrubs 1.5-2.0 m tall, 30-70% canopy cover.

### Loc. 4.2

*Casuarina campestris* and *Melaleuca uncinata* shrubs, stratum 1-1.5 m tall, 30-70% canopy cover over mixed shrubs, stratum 1.0 m tall, 2-10% canopy cover. Scattered *Eucalyptus foecunda* and *E. redunca* mallee present. Soil is highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH5.5, very pale brown, 10YR7/4, sandy clay loam. Soluble salts 100 ppm.

### Loc. 4.3

*Casuarina campestris* shrubs 0.5-1.5 m tall, 10-30% canopy cover over *Ecdeiocolea monostachya* sedge and scattered *Baeckea* sp. 7 shrubs, 0.5 m tall, 10-30% canopy cover.

### Loc. 4.4

Mixed shrubs with no particular dominant, stratum 1-2 m tall, 30-70% canopy cover over *Ecdeiocolea monostachya* sedge and several species of shrubs 0.5 m tall, 2-10% canopy cover.

## LITHIC COMPLEX

### Loc. 5.1 (TRAPLINE 14)

Mosaic of granite with *Rhizocarpon* sp. or *Parmelia* spp. lichens and *Grimmia* sp. moss with *Borya nitida* where pockets of soil have developed. The areas of *Borya nitida* are usually 0.1 m tall, 70-100% canopy cover and commonly have *Cheilanthes tenuifolia* ferns around the edges. Deeper soil pockets may have *Grevillea paniculata* shrubs present.

Where soil becomes much deeper there is commonly a band of *Thryptomene* aff. *kochii* 2-2.5 m tall, 10-30% canopy cover with no understory on the edge of the *Borya* patches. This passes into a shrubland

of *Acacia heteroneura* shrubs 3-4 m tall, 70-100% canopy cover over *Gahnia* affin. *polyphylla* sedge and *Amphipogon debilis* grasses 0.2 m tall, 2-10% canopy cover.

**Loc. 5.2**

As for loc. 5.1

**Loc. 5.3**

As for loc. 5.1. Soil is slightly pedal, sandy, strongly coherent, pH6.3, brown, 7.5YR5/4, fine sandy loam.

**Loc. 5.4**

Mostly *Casuarina campestris* shrubland with patches similar to loc. 5.1.

**Loc. 5.5**

Mosaic of associations similar to locs. 5.1 and 5.6.

**Loc. 5.6**

Mosaic of *Casuarina campestris* and *Thryptomene* affin. *kochii* shrubs 1-2.5 m tall, 30-70% canopy cover and patches of *Borya nitida* 0.1 m tall, 30-70% canopy cover and patches of *Borya nitida* 0.1 m tall, 70-100% canopy cover and open areas of granite. Refer also to area L1. Soil is slightly pedal, sandy, poorly coherent, pH6.4, brown, 7.5YR4/4, fine sandy loam. Soluble salts 40 ppm.

**Loc. 5.7**

Area of bare granite and scattered shrubs situated in uncleared part of adjacent farm. The area in the farm is mostly *Dodonaea attenuata*, *Glischrocaryon flavescens* and *Spartochloa scirpoidea* grass. Where the granite passes into the Reserve the association becomes *Casuarina campestris* and *Calothamnus chrysanthus* shrubs 2 m tall, 30-70% canopy cover with scattered *Spartochloa scirpoidea*. On deeper soils the association becomes like loc. 5.1 *Acacia heteroneura* band. Shallow soils are moderately pedal, sandy, poorly coherent, pH5.6, yellowish red, 5YR5/6, sandy clay loam.

## UNCLEARED LAND CONTIGUOUS WITH RESERVE

**W1**

*Eucalyptus loxophleba*

**W2**

*Eucalyptus salubris* similar to loc. 1.7.

**W3**

Small stand of *Eucalyptus cylindriflora* trees 3-5 m tall, 10-30% canopy cover over *Melaleuca undulata* and *Phebalium tuberculosum*. Soil here is highly pedal, sandy, coherent pH6.5, light brown, 7.5YR6/4, fine sandy loam. Soluble salts 640 ppm.



S1

Similar to locs. 4.1 and 4.3 but to 2.5 m tall.

S2

Mosaic of associations similar to locs. 3,8, 3.9, 3.10. Some large areas of *Melaleuca uncinata* 4-6m tall, 70-100% canopy cover present.

L1

Mosaic of areas similar to locs. 5.1, 5.6, and 5.7. Area L1 near loc. 5.6 contains *Acacia*.

**APPENDIX 6**  
**PLANT SPECIES RECORDED AT SELECTED LOCATIONS**  
**NUGADONG FOREST RESERVE**

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

**Loc. 1.1**

*Acacia graffiana*

*A. mackayana*

*A. merrallii*

*Eucalyptus redunca*

*E. salubris*

*E. transcontinentalis*

*Melaleuca corymbosa*

*Olearia muelleri*

*Rhagodia spinescens*

**Loc. 1.8**

*Acacia acuaria*

*A. acuminata*

*Alyxia buxifolia*

*Cassia nemophylla*

*Dodonaea inequifolia*

*Eucalyptus loxophleba*

*Hakea recurva*

*Olearia muelleri*

*Ptilotus obovatus*

*Rhagodia preissii*

**Loc. 2.3**

*Acacia* affin. *flabellifolia*

*A. graffiana*

*Baeckea* sp. 7 (SC)

*Borya nitida*

*Eucalyptus foecunda*

*E. redunca*

*E. transcontinentalis*

*Gahnia* affin. *polyphylla*

*Monotaxis occidentalis*

*Olearia revoluta*

**Loc. 3.1**

*Acacia signata*  
*Baeckea heteranthera*  
*Cassytha* sp. B (SC)  
*Casuarina acutivalvis*  
*Grevillea excelsior*

*G. filifolia*  
*G. paradoxa*  
*Hakea coriacea*  
*Melaleuca cordata*  
*Thryptomene* sp. 4 (SC)

**Loc. 3.5**

*Acacia* affin. *filifolia*  
*A. heteroneura*  
*A. signata*  
*Cassia nemophylla*  
*Casuarina acutivalvis*  
*C. campestris*  
*Dianella revoluta*

*Grevillea paradoxa*  
*Melaleuca cordata*  
*M. uncinata*  
*Petrophile incurvata*  
*Thryptomene* affin. *australis*  
*T.* affin. *kochii*  
*T.* sp. 4 (SC)

**Loc. 3.7**

*Acacia dielsii*  
*Casuarina campestris*  
*Gahnia* affin. *polyphylla*  
*Hakea subsulcata*  
*Melaleuca platycalyx*

*Petrophile divaricata*  
*P. shuttleworthiana*  
*Platysace effusa*  
*Santalum acuminatum*  
*Verticordia brownii*



**Loc. 3.13**

*Acacia heteroneura*  
*A. resinomarginea*

*Borya nitida*  
*Ecdeiocola monostachya*

**Loc. 4.2**

*Acacia assimilis*  
*A. stereophylla*  
*Baeckea* sp. 7 (SC)  
*Casuarina campestris*  
*Choretrum pritzellii*  
*Dodonaea caespitosa*  
*Eucalyptus foecunda*  
*E. redunca*  
*Gahnia* affin. *polyphylla*  
*Grevillea filifolia*  
*G. paradoxa*

*Hakea subsulcata*  
*Melaleuca conothamnoides*  
*M.* affin. *glaberrima*  
*M. platycalyx*  
*M. uncinata*  
*M. undulata*  
*Petrophile incurvata*  
*P. shuttleworthiana*  
*Platysace effusa*  
*Stipa elegantissima*  
*Verticordia chrysantha*

**Loc. 5.1**

*Acacia heteroneura*  
*Amphipogon debilis*  
*Borya nitida*  
*Cheilanthes tenuifolia*

*Gahnia* affin. *polyphylla*  
*Grevillea paniculata*  
*Thryptomene* affin. *kochii*

**APPENDIX 7**  
**VEGETATION DESCRIPTIONS—BUNTINE RESERVE**

*NB:* All vegetation is 18-20 years old unless otherwise stated.

**WOODLAND**

**Loc. 1.1**

As for loc. 1.8

**Loc. 1.2 (TRAPLINE 2)**

**Key Description**

Low Woodland A *over* Open Low Woodland A *over* Open Dwarf Scrub C *on* sandy clay

**Code** eLAI.aLAr.xSCr/SC

**Loc. Details**

Stratum 1. *Eucalyptus loxophleba* trees and tree mallees, mature, stratum 8-11 m tall, 10-30% canopy cover.

Stratum 2. *Acacia acuminata* trees, mature to senescent, stratum 6-8 m tall, *ca* 3% canopy cover.

Stratum 3. *Acacia acuarria* and several other species of shrubs, mature to senescent, stratum 0-1 m tall, 2-10% canopy cover.

**Comments**

Probably partly disturbed, areas nearby have been grazed. No evidence of fire.

**Litter**

Abundant, broad leaves, twigs and abundant logs, fallen dead branches and stumps. Litter clumped to 3 cm deep, clumps 0-1 m apart.

## Soil

Friable soil *ca* 50 cm deep.

20 cm sample highly pedal, sandy, very coherent, unbleached, non-calcareous, pH6.2, reddish brown, SYR4/3, sandy clay. Soluble salts 60 ppm.

Drainage poor.

## Loc. 1.3

*Eucalyptus salubris* trees with scattered *E. salmonophloia* present. Mature, stratum 8-18 m tall, 2-10% canopy cover. Some *E. salmonophloia* emergent to 22 m. Understory mostly *Acacia mackayana* 0.5-1.0 m tall (some up to 2 m tall), 2-10% canopy cover although there are scattered clumps up to 40% canopy cover. Patches of *Rhagodia spinescens* and *Olearia muelleri* shrubs 0.5 tall, 10-30% canopy cover. Scattered *E. loxophleba* and *E. transcontinentalis* tree mallee present on borders of association. Where *E. loxophleba* forms a distinct association the stratum is 4-8 m tall, 10-30% canopy cover over *Baeckea* sp. 7 0.5-1.3 m tall, 2-10% canopy cover. The mallee belt is surrounded on the outer edge by a narrow band of *Acacia resinomarginea* where it passes into the surrounding vegetation. No evidence of fire.

## Loc. 1.4

As for loc. 1.3 with some small areas of immature *Eucalyptus salmonophloia* trees 8-15 m tall. Tongue near loc. 4.13 is *E. transcontinentalis* tree mallee 6-11 m tall *ca* 3% canopy cover over *Phebalium tuberosum* and *Melaleuca undulata* shrub 1.0 m tall, 10-30% cover.

## Loc. 1.5 (TRAPLINE 6)

### Key Description

Open Low Woodland A over Open Dwarf Scrub C on light clay

Code eLAR.aScR/LC

### Loc. Details

Stratum 1. *Eucalyptus salubris* trees, immature to mature, stratum 8-11 m tall, 2-10% canopy cover.

Stratum 2. *Acacia mackayana* shrubs, mature to senescent, stratum 0.5-1.0 m tall, 2-10% canopy cover (patches up to 15%).

### Comments

Thickets of *Melaleuca lateriflora* or *M. adnata* shrubs, mature, stratum 2-3.5 m tall, 70-100% canopy cover. *Eucalyptus redunca* and *E. transcontinentalis* tree and shrub mallee form a band around the edge of the *E. salubris* association.

### Litter

Moderate, broad leaves, bark, twigs and large debris, scattered to 2 cm deep, small clumps up to 6 m apart.

## Soil

Friable soil *ca* 20 cm deep.

10-20 cm sample highly pedal, earthy, very coherent, unbleached, non-calcareous, pH4.6, yellowish red, 5YR4/8, light clay. Soluble salts 205 ppm. Drainage poor.

**Loc. 1.6**

As for loc. 1.5 with *Eucalyptus salmonophloia* present.

**Loc. 1.7**

As for loc 1.8

**Loc. 1.8**

**Key Description**

Open Woodland over Open Dwarf Scrub C on light clay

**Code** eMr.xSCr/LC

**Loc. Details**

Stratum 1. *Eucalyptus salubris* trees, mature to senescent, stratum 12-17 m tall, 2-10% canopy cover.  
Stratum 2. *Acacia mackayana*, *A. merrallii* and *Templetonia sulcata* shrubs, mature, stratum 1.0 m tall, 2-10% canopy cover with areas up to 20%.

**Comments**

Scattered *Eucalyptus salmonophloia* trees present. Scattered thickets of *Melaleuca acuminata* shrubs, mature, stratum 2-3.5 m tall (some up to 5 m) 30-70% canopy cover. These thickets are mostly 10-20 m diameter. Trees up to 180 cm circumference at breast height have been removed from the area. No evidence of fire.

**Litter**

Moderate, variable from very sparse to abundant in clumps beneath shrubs. Mostly broad leaves and twigs. Some large debris, logs and standing dead trees present.

**Soil**

Friable soil 30 cm deep over clays.  
20 cm sample highly pedal, earthy, very coherent, unbleached, non-calcareous, pH4.8, yellowish red, 5YR4/8, light clay. soluble salts 215 ppm.  
Drainage poor.

**Loc. 1.9**

As for loc. 1.8 but mostly *Eucalyptus salubris* and *E. salmonophloia* as codominants. Stratum 12-17 m tall, ca 8% canopy cover. Understorey very patchy, mostly *Melaleuca adnata* shrubs, stratum 2-4 m tall, mostly less than 2% canopy cover. Some areas of woodland less than 2% canopy cover due to timber cutting. In these areas *Rhagodia spinescens* and *Atriplex paludosa* shrubs and herbs are to 20 cm tall, 2-10% canopy cover.

#### Loc. 1.10

Small stand of *Eucalyptus erythronema* trees, mature, stratum 4-10 m tall, 10-30% canopy cover. Understory is mixed species of shrubs, 0.5 m tall, ca 1% canopy cover. Soil is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH5.5, brown, 7.5YR5/4, sandy clay loam. Soluble salts 410 ppm.

#### Loc. 1.11

Stand of *Eucalyptus salubris* and scattered *E. salmonophloia* trees over *Acacia mackayana* and *A. merrallii* shrubs. *E. salubris* stand is surrounded by a belt of *E. cylindriflora* trees (immature) 4-5.5 m tall, 10-30% canopy cover with scattered emergent *E. salmonophloia* trees 9-11 m tall. Understory is *Grevillea huegelii* and *A. mackayana* 0.5-1.5 m tall, 10-30% canopy cover.

This belt is in turn surrounded by a narrow band of *E. redunca* shrub mallees over *Melaleuca undulata*.

### MALLEE

#### Loc. 2.1

*Eucalyptus* affin. *rigidula* and *E. foecunda* shrub mallee mature, stratum 4-8 m tall, 2-10% canopy cover over mixed shrubs, no particular dominant, stratum 0.5-2 m tall, 2-10% canopy cover. Scattered *E. salubris* trees 3-14 m tall, ca 1% canopy cover present. Soil is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH6.3, brown, 7.5YR5/2, sandy clay. Poorly drained.

#### Loc. 2.2

As for loc. 2.3.

#### Loc. 2.3

#### Key Description

Very Open Tree Mallee over Open Low Scrub B on clayey sand

Code eKTr.xSBr/CLS

#### Loc. Details

Stratum 1. *Eucalyptus rigidula* and *E. kochii* tree mallee and trees, mature to senescent, stratum 5-9 m tall, 2-10% canopy cover.

Stratum 2. *Acacia merrallii* and several other species of shrubs, mature to senescent, stratum 0-1.5 m tall, 2-10% canopy cover.

#### Comments

Some *E. redunca* and *E. rigidula* emergent to 14 m tall. Scattered *Casuarina acutivalvis* or *Melaleuca lateriflora* 4-5 m tall present. Seedlings of most species apparent. Scattered weeds present near boundary adjacent to farm. Timber removed from the area. No evidence of fire.

## Litter

Sparse, broad leaves, twigs and large debris, clumped to 0.5 cm deep, clumps 3 m apart.

## Soil

Friable soil 20-30 cm deep.

15 cm sample highly pedal, earthy, extremely coherent, unbleached, non-calcareous, pH5.6, brown, 7.5YR5/4, clayey sand. Soluble salts 1200 ppm. Drainage poor.

## Loc. 2.4

*Eucalyptus redunca* shrub mallee association similar to loc. 2.7. Patches of shrubland similar to loc. 3.8 and *E. salubris* woodland similar to loc. 1.5 are present.

## Loc. 2.5

*Eucalyptus redunca* shrub mallees, 4.7 m tall, 10-30% canopy cover over *Borya nitida* 0-0.1 m tall, 10-30%. There are clumps of *Acacia acuminata* and *Melaleuca uncinata* and *M. lateriflora* to 2 m tall 10-30% canopy cover within clumps ca 2% overall canopy cover. The area south of this loc. on the eastern boundary of the Water reserve is described under loc. 2.12.

## Loc. 2.6

As for loc. 2.7. Some patches without the *Ecdeiocolea monostachya* understory but with small clumps of *Melaleuca uncinata*, *M. lateriflora* or *Acacia acuminata*. Gravel pit is 10-18 years old.

## Loc. 2.7

### Key Description

Very Open Shrub Mallee over Scrub over Low Sedges over Very Open Herbs on clay loam

Code eKSr.xSi.n<sub>1</sub>VLc.n<sub>2</sub>Jr/CL

n<sub>1</sub> = *Ecdeiocolea monostachya*

n<sub>2</sub> = *Borya nitida*

### Loc. Details

Stratum 1. *Eucalyptus stowardii* shrub mallee, tree mallee and trees, mature, stratum 5-10 m tall, 2-10% canopy cover.

Stratum 2. *Casuarina campestris* or *Acacia desertorum* or *Acacia heteroneura* shrubs, mature to senescent, stratum 2-2.5 m tall, 10-30% (up to 70% in places) canopy cover.

Stratum 3. *Ecdeiocolea monostachya* sedge, mature, stratum 0.5 m tall, 30-70% canopy cover.

Stratum 4. *Borya nitida* herbs, stratum 0.2 m tall, 2-10% canopy cover.

### Comments

Seedlings of most species present. No evidence of fire.

## Litter

Sparse, broad leaves, twigs and standing dead shrubs. Clumps to 5 cm deep, 5-8 m apart.

## Soil

Friable soil 50 cm deep over laterite.

20 cm sample slightly pedal, earthy, poorly coherent, unbleached, non-calcareous, pH5.1, brownish yellow, 10YR6/8, clay loam, ca 25% gravel pebbles, drainage moderate to poor.

## Loc. 2.8

Mosaic of *E. redunca* shrub mallee 5-7 m tall, 2-10% canopy cover over *Acacia heteroneura* 2-2.5 m tall, 30-70% canopy cover over *Ecdeiocolea monostachya* 0.5 m tall, 10-30% canopy cover and areas where *A. heteroneura* reaches 3-5 m tall and becomes dominant (see loc. 3.20).

## Loc. 2.9 (TRAPLINE 3)

Mosaic of mallee similar to locs. 2.7 and 2.8 and a few small areas similar to loc. 2.3 together with patches of *Melaleuca* spp. or *Acacia heteroneura* shrubland.

## Loc. 2.10

*Eucalyptus redunca* shrub mallees, stratum 6-8 m tall, 2-10% canopy cover over *Melaleuca undulata* 0.5-2.0 m tall, 30-70% canopy cover. Scattered *Acacia mackayana*, *Borya nitida* and *Melaleuca adnata* present. Borders of mallee association has *Casuarina campestris* and *C. corniculata* shrubs 1.0-1.5 m tall, 70-100% canopy cover.

## Loc. 2.11

Mosaic of *Eucalyptus loxophleba* as for loc. 2.12 with areas of *E. transcontinentalis* either with a second stratum of shrubs or completely bare, the understorey having been removed.

## Loc. 2.12

### Key Description

Open Tree Mallee over Open Scrub on sandy clay

Code eKTi.xSr/SC

### Loc. Details

Stratum 1. *Eucalyptus loxophleba* tree mallee and trees, mature, stratum 5-8 m tall, 10-30% canopy cover.

Stratum 2. Mixed shrubs with no particular dominant, stratum 1-2.5 m tall, 2-10% canopy cover.

### Comments

In some areas *E. redunca* is dominant and here the association is 3-5 m tall. There are scattered thickets of *Acacia acuminata* or *Melaleuca uncinata* shrubs 2-3 m tall present. The northern portion of the Water Reserve is similar to loc. 2.7.



## Litter

Sparse to moderate, broad leaves, twigs, bark and large debris. Clumped to 2 cm deep, clumps 1-3 m apart.

## Soil

Friable soil ca 30 cm deep.

20 cm sample is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH5.9, yellowish red, 5YR4/8, sandy clay. Soluble salts 46 ppm. Drainage poor.

## Loc. 2.13

Mosaic of *Eucalyptus loxophleba* association as described in loc. 1.3 with *E. redunca* associations or scattered *E. transcontinentalis*.

## Loc. 2.14

Clumps of *Eucalyptus redunca* or *E. transcontinentalis* shrub mallee as for locs. 2.5 and 2.7.

## Loc. 2.15

Small area of *Eucalyptus redunca* mallee.

## Loc. 2.16

Small area of *Eucalyptus redunca*, *E. transcontinentalis* shrub mallee with scattered *E. salubris* trees.

## Loc. 2.17

Small area of *Eucalyptus redunca* shrub mallee together with *Melaleuca uncinata*, *M. eleutherostachya* and *Acacia acuminata* shrubs 3-4 m tall, 10-30% canopy cover. Abundant *Amphipogon debilis* grass present. Litter abundant, mostly broad leaves, twigs and large debris. Moderately well drained. Eastern edge of loc. 2.17 is mixed shrubs, 2-2.5 m tall, 2-10% canopy cover over mixed shrubs 0.5 m tall, 10-30% canopy cover.

## Loc. 2.18

*Eucalyptus redunca* shrub mallee association with scattered *E. erythronema*

## Loc. 2.19

Small area of *Eucalyptus redunca* shrub mallee.

## Loc. 2.20

Scattered *Eucalyptus redunca* shrub mallee over *Acacia stereophylla* or *Casuarina campestris* heath or shrubland passing into pure stands of mallee closer to the woodland. Pure stands are *E. redunca* shrub mallee stratum 4-5 m tall, 2-10% canopy cover over *Melaleuca adnata*, *M. undulata* and *Acacia* sp. shrubs stratum 0.5-1.0 m tall, 30-70% canopy cover.

**Loc. 2.21**

*Eucalyptus rigidula* and *E. drummondii* shrub mallee, mature, stratum 3-3.5 m tall, 2-10% canopy cover over *Casuarina campestris* and mixed shrubs with no particular dominant mature to senescent, stratum 1-2.5 m tall, 2-10% canopy cover over mixed shrubs, no particular dominant, 0.5 tall, 10-30% canopy cover. Litter moderately abundant, terete leaves, broad leaves and twigs, clumped to 2 cm deep, clumps 2 m apart. Soil is slightly pedal, sandy, coherent, unbleached, non-calcareous, pH5.2, brownish yellow, 10YR6/6, sandy clay loam. Well drained. Refer loc. 4.24.

**Loc. 2.22**

Mosaic of *Eucalyptus redunca* shrub mallee and *Melaleuca nematophylla* shrubland. Small patches of *Casuarina acutivalvis* shrubland present. Mallees are mostly 4-6 m tall, 2-10% canopy cover. Some *Thryptomene* affin. *kochii*.

**Loc. 2.23**

Small stand *Eucalyptus erythronema* together with *E. redunca* association in a mosaic with *Acacia stereophylla* shrubland and *Melaleuca nematophylla* heath.

**Loc. 2.24**

Small stand of *Eucalyptus redunca* shrub mallee.

**Loc. 2.25**

Annular associations of mallee surrounding a small stand of *Eucalyptus erythronema* trees 6-10 m tall (*E. salubris* emergent to 14 m tall) with scattered understory of *Melaleuca adnata* and other shrubs. Soil here is moderately pedal, sandy, poorly coherent, unbleached, non-calcareous, pH6.5, reddish yellow, 5YR6/8, sandy clay loam. This passes abruptly to 20 cm into highly pedal, sandy, extremely coherent, unbleached, non-calcareous, pH5.8, pink, 7.5YR7/4, sandy clay loam with soluble salts 220 ppm.

Surrounding this woodland association is *Eucalyptus redunca* shrub mallees, mature, stratum 4-7 m tall, 30-70% canopy cover over *Olearia revoluta* and *Melaleuca adnata* 0-1 m tall, ca 3% canopy cover. The outer annulus is *E. redunca* mature, stratum 4-7 m tall, 2-10% canopy cover over *Melaleuca undulata* shrubs 0-1.0 m tall, 30-70% canopy cover. This outer band has moderately pedal, sandy, coherent, unbleached, non-calcareous, pH5.4, pink, 7.5YR7/4, clayey sand with 165 ppm soluble salts.

**Loc. 2.26**

Small belt of *Eucalyptus redunca* shrub mallee which is ecotone of loc. 1.10.

**Loc. 2.27**

As for loc. 2.20.

**Loc. 2.28**

As for loc. 2.21 but with less influences of adjacent shrubland.

**Loc. 2.29**

As for loc. 2.20

**Loc. 2.30**

Mosaic of *Eucalyptus redunca* shrub mallee over *Melaleuca undulata* as described in loc. 2.25 or *E. redunca* and *E. transcontinentalis* over *Melaleuca undulata* as described in loc. 2.25 or *E. redunca* and *E. transcontinentalis* over *Melaleuca adnata* and *Acacia mackayana* shrubs.

**SHRUBLAND**

**Loc. 3.1**

**Key Description**

Scrub over Open Low Scrub B on fine sandy loam

**Code** cSi.xSBr/FSL

**Loc. Details**

Stratum 1. *Casuarina acutivalvis* shrubs, mature, stratum 4-5 m tall, 10-30% canopy cover.

Stratum 2. *Phebalium tuberculosum* and *Grevillea paradoxa* shrubs, mature, stratum 0.5-1.5 m tall, 2-10% canopy cover.

**Comments**

Evidence of very old fire scars.

**Litter**

Abundant, terete leaves and twigs evenly distributed to 2 cm deep.

**Soil**

Friable soil ca 30 cm deep.

20 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.6, brownish yellow, 10YR6/6, fine sandy loam, ca 50% laterite pebbles. Soluble salts 39 ppm. Well drained.

**Loc. 3.2**

Mosaic of *Casuarina campestris* or *Melaleuca nematophylla* shrublands and heath.

**Loc. 3.3**

*Casuarina acutivalvis* and *Melaleuca nematophylla* shrubs similar to loc. 3.51.

**Loc. 3.4**

*Casuarina acutivalvis* association similar to loc. 3.17.

### Loc. 3.5

*Casuarina acutivalvis* shrubs with scattered *Hakea coriacea* and *Acacia neurophylla* shrubs. Some *Eucalyptus drummondii* and *Thryptomene* affin. *kochii* present. Southern portion of this loc. as for loc. 3.6.

### Loc. 3.6

*Melaleuca uncinata* and some *Acacia heteroneura* shrubs 2-3 m tall, 70-100% canopy cover. No understory but many weeds. Patchy areas of *Acacia heteroneura* shrubs 2-3.5 m tall, 30-70% canopy cover over *Calothamnus gilesii* and *Melaleuca radula* shrubs 1.0-1.5 m 2-10% canopy cover.

Soil in *M. uncinata* areas is highly pedal, sandy, coherent, unbleached, non-calcareous, pH5.7, yellowish red, 5YR5/8, clay loam. Soluble salts 36 ppm. Poorly drained.

*Acacia heteroneura* areas have highly pedal, sandy, coherent, unbleached, non-calcareous, pH5.9, strong brown, 7.5YR7/6, sandy clay with ca 5% gravel pebbles. Soluble salts less than 30 ppm. Poorly drained.

### Loc. 3.7

*Acacia stereophylla*, *Melaleuca uncinata* and *M. nematophylla* shrubs, mature, stratum 1-2.5 m tall, 70-100% canopy cover as a mosaic with associations similar to loc. 3.15. Between this loc. and loc. 3.15 is a small patch of *M. undulata*, *M. eleutherostachya* and *Acacia merralli* 1.0 m tall, 30-70% cover.

### Loc. 3.8

Mixed shrubs, no particular dominants, mature, stratum 2-2.5m tall, 30-70% canopy cover over mixed shrubs, 1.0 m tall, ca 2% canopy cover. Prominent species in stratum 1 are *Casuarina acutivalvis*, *Melaleuca nematophylla*, *Thryptomene* affin *kochii* and several other species. Scattered *Acacia heteroneura*, *Casuarina acutivalvis* and *Eucalyptus redunca* emergent to 5 m tall. Soil is moderately pedal, earthy, coherent, unbleached, non-calcareous, pH4.5, strong brown, 7.5YR5/8, sandy clay loam, ca 10% laterite pebbles.

### Loc. 3.9

*Hakea subsulcata* and *Melaleuca uncinata* shrubs, mature, stratum 2-3 m tall, 10-30% canopy cover over *Eccleioleuca monostachya* sedge 0.5 m tall, 30-70% canopy cover. Soil is slightly pedal, sandy, poorly coherent, unbleached, pH4.6, reddish yellow, 7.5YR6/8, light sandy clay loam.

### Loc. 3.10

*Casuarina campestris* and *Acacia stereophylla* shrubs, stratum 1.5-2.0 m tall, 70-100% canopy cover.

### Loc. 3.11

Originally dense thickets of *Casuarina campestris*, *Acacia resinomarginea* and *A. heteroneura* shrubs 2-4 m tall, 10-30% canopy cover. Area has been recently burnt out and shows no signs of regeneration other than scattered regrowth to 10 cm tall.

### Loc. 3.12

As for loc. 3.11 with scattered *Santalum spicatum* and some *Acacia longiphylloidea*.

**Loc. 3.13**

Mosaic of shrublands similar to locs. 3.6, 3.15.

**Loc. 3.14**

Mosaic of shrublands similar to locs. 3.7, 3.15.

**Loc. 3.15**

Mosaic of two distinct associations, firstly, *Casuarina acutivalvis* shrubs, mature, stratum 2-5 m tall, 2-10% canopy cover over *Hakea subsulcata* and *Petrophile shuttleworthiana* shrubs, mature, stratum 0.5-1.5 m tall, 2-10% canopy cover.

The second association is *Acacia stereopyhlla* and several other species of shrubs, mature, stratum 1.5-2.5 m tall, 2-10% canopy cover over *Melaleuca conothamnoides*, *Hakea subsulcata* and *Patersonia occidentalis* shrubs and herbs, stratum 0.5 m tall, 30-70% canopy cover. Association is 20 to 25 years old.

Soil in both associations is highly pedal, sandy, very coherent, unbleached, non-calcareous, pH5.2, yellow, 10YR7/6, sandy clay loam. Contains ca 10% laterite pebbles. Fine plant roots very abundant. Poorly drained.

**Loc. 3.16**

Mosaic of *Casuarina acutivalvis* shrubland similar to loc. 3.18 and *Casuarina campestris* heath similar to loc. 4.7. Association is older than 25 years.

**Loc. 3.17**

*Casuarina acutivalvis* shrubs, stratum 1.5-3 m tall, 30-70% canopy cover over *C. campestris*, *Hakea subsulcata* and several other species of shrubs, stratum 0.5-1.0 m tall, 2-10% canopy cover. Soil is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH5.7, yellow, 10YR7/6, fine sandy loam, ca 20% laterite pebbles. Association is older than 25 years.

**Loc. 3.18**

*Acacia stereophylla* and *Casuarina acutivalvis* shrubs, stratum 2-3.5 m 10-30% canopy cover. Stratum 2 of mixed shrubs (sometimes *Casuarina campestris* prominent) 1.0 m tall, 2-10% canopy cover. Soil is highly pedal, earthy, coherent, unbleached, non-calcareous, pH4.8, light yellowish brown, 10YR6/4, sandy clay, ca 15% laterite pebbles.

**Loc. 3.19**

*Grevillea excelsior*, *Casuarina acutivalvis* shrubs and scattered *Eucalyptus drummondii* shrub mallee, stratum 2-3.5 m tall, 2-10% canopy cover over *Melaleuca subtrigona*, *M. conothamnoides* shrubs, stratum 0.5-1.0 m tall, 30-70% canopy cover. The extreme south eastern corner of this loc. is regrowth following clearing and is predominantly *M. conothamnoides* shrubs. Soil is moderately pedal, sandy, coherent, pH4.6, brownish yellow, 10YR6/6, sandy clay with ca 20% laterite pebbles. Well drained with localised poor drainage.

**Loc. 3.20**

Small areas of *Acacia heteroneura* or *Casuarina acutivalvis* shrubs where *Eucalyptus redunca* shrub mallee canopy drops below 2%.

**Loc. 3.21**

As for loc. 3.20 but *Ecdeiocolea monostachya* prominent in understory and shrubs are to 1.5 m tall.

**Loc. 3.22**

**Key Description**

Thicket on clayey sand

Code aSc/CLS

**Loc. Details**

Unstratified; *Acacia signata* shrubs, mature, stratum 3-4.5 m tall, 30-70% canopy cover.

**Comments**

Scattered *Melaleuca lateriflora* or *Acacia colletioides* present, mostly less than 1.5 m tall. Some *Borya nitida* clumps present. No evidence of fire.

**Litter**

Continuous, *A. signata* leaves, 1 cm deep.

**Soil**

Friable soil ca 0.5 m deep.

30 cm sample, highly pedal, earthy, coherent, unbleached, non-calcareous, pH4.6, reddish yellow, 5YR6/6, clayey sand. Soluble salts 1200 ppm.

**Loc. 3.23 (TRAPLINE 4, 9)**

**Key Description**

Open Scrub over Open Low Sedges on sandy clay loam

Code xSr.n<sub>1</sub>VLi/SCL                      n<sub>1</sub> = *Ecdeiocolea monostachya*

**Loc. Details**

Stratum 1. *Casuarina campestris*, *Hakea falcata*, *Acacia desertorum*, mature, stratum 1-2.5 m tall, 2-10% canopy cover.

Stratum 2. *Ecdeiocolea monostachya* sedge and several species of shrubs, mature, stratum 0.5 m tall, 10-30% canopy cover.

**Comments**

Numerous emergents of *Grevillea excelsior*, *Eucalyptus drummondii*, *Casuarina acutivalvis* and *Acacia signata* 2-4 m tall, ca 1-2% canopy cover. No evidence of fire.

## Litter

Moderately abundant, terete leaves, twigs and some large debris, clumped to 2 cm deep, clumps 1-3 m apart.

## Soil

Friable soil deeper than 1 m.

30 cm sample is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.8, reddish yellow, 7.5YR7/8, sandy clay loam.

### Loc. 3.24

As for loc. 3.17

### Loc. 3.25

As for loc. 3.19

### Loc. 3.26

Mosaic of associations similar to loc. 3.15 and 3.17 with scattered patches of *Banksia benthamiana* association.

### Loc. 3.27

As for loc. 3.1 and 3.17 mosaic becoming more like 3.18 adjacent to loc. 4.9.

### Loc. 3.28

As for loc. 3.18 *Casuarina acutivalvis* with scattered *Banksia benthamiana* 3-4 m tall, 30-70% cover. The gravel pit near this loc. is 3.5 m deep and shows some regrowth in parts of gravel pit which have not been disturbed for some time. Soil profile in gravel pit as below:

0-150 cm brownish yellow, 10YR6/6, sandy clay loam  
150-200 cm gritty quartz grains and sandy clay loam  
200-250 cm increasing proportion of laterite pebbles 5-10 mm diameter  
250-270 cm red laterite pebbles 5-50 mm diameter  
270-290 cm laterite pebbles 5-10 mm diameter  
290-300 cm red laterite pebbles 5-50 mm diameter  
300-320 cm laterite pebbles 5-10 mm diameter  
320-350 cm red laterite pebbles 5-50 mm diameter

Profile indicates series of periods of lateritisation with overlain soil.

### Loc. 3.29

#### Key Description

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

Code cSc.xSDr/FSL

### Loc. Details

Stratum 1. *Casuarina campestris* shrubs, mature, stratum 3-3.5 m tall, 30-70% canopy cover.  
Stratum 2. Mixed shrubs, no particular dominant, 0.5 m tall, ca 3-4% canopy cover.

### Comments

Eastern edge of this loc. with *Melaleuca eleutherostachya* and *M. uncinata* shrubs 2-3 m tall. Scattered *Eucalyptus redunca* present. This area with scattered granite boulders.

### Litter

Abundant, large debris and twigs, some terete leaves, clumped to 1 cm deep, clumps continuous or up to 2 m apart.

### Soil

Friable soil ca 0.5 m deep over gravel.

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.6, strong brown, 7.5YR5/6, fine sandy loam, ca 10% laterite pebbles. Soluble salts 40 ppm.

### Loc. 3.30

Patchy areas of *Casuarina acutivalvis*, *Acacia stereophylla*, *A. heteroneura* or *Casuarina campestris* shrubland. Numerous *Eucalyptus redunca*, *E. transcontinentalis* shrub mallee, 1-2% canopy cover (may exceed 2% in small areas). Where the mallee is densest the understory is *Melaleuca fulgens*, *M. lateriflora* or *Acacia dielsii*.

### Loc. 3.31

As for loc. 3.17 or 3.18.

### Loc. 3.32

#### Key Description

Thicket on sandy clay loam

Code xSc/SCL

### Loc. Details

Unstratified *Casuarina corniculata*, *Acacia stereophylla* and *Melaleuca cordata*, shrubs, mature, 2-2.5 m tall, 30-70% canopy cover (sometimes up to 80%).

### Comments

No understory but scattered shrubs present. Some *Casuarina acutivalvis* to 5 m. No evidence of fire. Vegetation may be slightly older than 20 years.



**Litter**

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

**Soil**

Friable soil deeper than 0.5 m.

30 cm sample, slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.4, brownish yellow, 10YR6/6. Sandy clay loam, ca 10% gravel pebbles. Well drained.

**Loc. 3.33**

Mosaic of shrublands similar to loc. 3.24 and 3.37.

**Loc. 3.34**

Mostly *Melaleuca nematophylla* shrubs with some areas of *Casuarina acutivalvis*.

**Loc. 3.35 (TRAPLINE 5)****Key Description**

Thicket on sandy clay loam

Code mSc/SCL

**Loc. Details**

Unstratified, *Melaleuca uncinata*, *M. eleutherostachya*, *M. acuminata* and some *M. lateriflora* shrubs, mature, stratum 2-5 m tall, 30-70% canopy cover.

**Comments**

No understory. Scattered *Acacia acuminata* present. Association follows watercourse and forms a belt ca 30 m wide either side of it. No evidence of fire.

**Litter**

Moderately abundant, mostly terete leaves and twigs, clumped to 1 cm deep, continuous or clumps up to 2 m apart.

**Soil**

Friable soil ca 70 cm deep over decayed granite.

30 cm sample is highly pedal, sandy, extremely coherent, unbleached, non-calcareous, pH5.3, brown, 7.5YR5/4, sandy clay loam.

**Loc. 3.36**

Mosaic of associations similar to loc. 3.6 or 3.35 with *Casuarina acutivalvis* prominent near loc. 1.3.

**Loc. 3.37**

*Casuarina acutivalvis* shrubs similar to loc. 3.17.

**Loc. 3.38**

Mosaic of associations similar to loc. 3.36 and 3.39.

**Loc. 3.39****Key Description**

Dense Thicket *over* Open Dwarf Scrub C *on* fine sandy loam

**Code** aSd.xSCr/FSL

**Loc. Details**

Stratum 1. *Acacia stereophylla* shrubs, mature, stratum 2-2.5 m tall, 70-100% canopy cover.

Stratum 2. Mixed shrubs, no particular dominants, 0.5-1.0 m tall, *ca* 2-3% canopy cover.

**Comments**

Scattered patches of *Casuarina campestris* 1.5-2.0 m tall, 70-100% within the *A. stereophylla* association.

**Litter**

Variable, sparse to abundant, up to 1 cm deep clumps up to 2 m apart, mostly terete leaves or narrow flat leaves.

**Soil**

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.6, brownish yellow, 10YR6/6, fine sandy loam, *ca* 40% canopy cover. Soluble salts 80 ppm. Well to poorly drained.

**Loc. 3.40 (TRAPLINE 10)****Key Description**

Open Scrub *over* Low Scrub B *over* Dwarf Scrub D *on* sandy clay loam

**Code** xSr.xSBI.xSDi/SCL

**Loc. Details**

Stratum 1. *Hakea coriacea* and *Casuarina acutivalvis* shrubs, mature, stratum 2.5-4 m tall, 2-10% canopy cover.

Stratum 2. *Hakea falcata*, *C. campestris* and several other species of shrubs, mature, stratum 1-1.5 m tall, 10-30% canopy cover.

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

#### Comments

No evidence of fire.

#### Litter

Sparse, terete leaves and twigs, clumped to 1 cm deep, clumps 1.5-3 m apart.

#### Soil

Identical to loc. 3.42.

#### Loc. 3.41

-*Acacia stereophylla* shrubs, mature, 2-5 m tall, less than 2% canopy cover together with scattered *Eucalyptus drummondii* shrub mallee 2-5 m tall. There is an understory of *Melaleuca cordata*, *Grevillea filifolia* and other shrubs 0.5 m tall. The physiognomy of the association is that of a shrubland although canopy cover in the upper stratum is low. Soil is highly pedal, earthy, strongly coherent, unbleached, non-calcareous, pH5.5, yellowish red, 5YR5/6, clayey sand with soluble salts 1350 ppm.

#### Loc. 3.42 (TRAPLINE 7)

##### Key Description

Open Scrub over Heath B over Open Dwarf Scrub D on sandy clay loam

Code cSr.xSBc.xSDr/SCL

##### Loc. Details

Stratum 1. *Casuarina acutivalvis* shrubs, mature, stratum 3-3.5 m tall, ca 4% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature, stratum 1-1.5 m tall, 30-70% canopy cover.

Stratum 3. Mixed shrubs, no particular dominant, mature to senescent, stratum 0.5 m tall, ca 8% canopy cover.

##### Comments

Northern parts of this loc., approaching loc. 2.24 over *Casuarina acutivalvis*, *Acacia desertorum* 2-2.5 m tall, ca 15% canopy cover over *Melaleuca cordata*, *Petrophile divergens* and mixed shrubs, 0.5-1.5 m tall, ca 15% canopy cover. Scattered *Eucalyptus drummondii* to 4 m tall are present. No evidence of fire.

##### Litter

Sparse to moderately abundant, terete leaves and twigs, clumped to 2 cm deep, clumps 1-2 m apart.

##### Soil

Friable soil deeper than 1.5 m.

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH5.3, brownish yellow, 10YR6/6, sandy clay loam. Well to excessively drained.

**Loc. 3.43**

Mosaic of *Acacia stereophylla* or *Casuarina acutivalvis*. Shrublands with areas of heath and associations similar to loc. 4.11.

**Loc. 3.44**

As for loc. 3.43 with patches similar to loc. 3.42.

**Loc. 3.45**

*Acacia stereophylla*, *Calothamnus gilesii* shrubs 2-2.5 m tall. Scattered *Eucalyptus oldfieldii* present.

**Loc. 3.46**

Mosaic of *Acacia stereophylla*, *Casuarina acutivalvis* shrublands with scattered *Eucalyptus oldfieldii* and *E. ebbanoensis*.

**Loc. 3.47**

Between here and loc. 3.46 is mostly *Melaleuca nematophylla* and *Acacia stereophylla* shrubs with some *Eucalyptus ebbanoensis*. This gives way to areas with patches of *Casuarina campestris* and *M. nematophylla* heath and then into *Acacia neurophylla* shrubs 2-3.5 m tall, 70-100% canopy cover near the boundary with loc. 2.30. A small area within this loc., on the Reserve boundary, has not been burnt for a very long time. The association here is *A. neurophylla* and *C. campestris* 3-3.5 m tall, 90-100% canopy cover. No understory is present. Litter very abundant, terete leaves and twigs, continuous to 5-8 cm deep. Soil is moderately pedal, sandy, poorly coherent, unbleached, non-calcareous, pH5.0, yellow, 10YR7/6, clayey sand. Soluble salts 45 ppm. Well drained.

**Loc. 3.48**

**Key Description**

Open Scrub over Dwarf Scrub C on sandy clay loam

**Code** xSr.xSci/SCL

**Loc. Details**

Stratum 1. *Casuarina campestris* and *Acacia filifolia* shrubs, mature to senescent, stratum 2-3 m tall, 2-10% canopy cover (areas up to 30%).

Stratum 2. Mixed shrubs, no particular dominant, mature to senescent, stratum 0-1.0 m tall, 10-30% canopy cover.

**Comments**

Scattered *Casuarina acutivalvis* and *Eucalyptus drummondii* emergent to 4 m. No evidence of fire.

## Litter

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

## Soil

Friable soil *ca* 1 m deep.

30 cm sample slightly pedal, sandy, extremely coherent, unbleached, non-calcareous, pH5.4, brownish yellow, 10YR6/6, sandy clay loam.

### Loc. 3.49

Mostly *Casuarina acutivalvis* shrubland with scattered *Eucalyptus redunca* shrub mallee. Adjacent to loc. 1.10 *Melaleuca eleutherostachya* or *M. lateriflora* with *M. undulata* in the understory. Vegetation is older than 25 years.

### Loc. 3.50

Mosaic of *Acacia stereophylla* and *Casuarina acutivalvis* shrublands with patches of *Melaleuca undulata* heath near the woodland.

### Loc. 3.51

Area of *Casuarina acutivalvis* shrubs, mature, stratum 2-5 m tall, 30-70% canopy cover over *Grevillea paradoxa* shrubs, stratum 1-1.5 m tall *ca* 2-3% canopy cover. Soil is highly pedal, sandy, coherent, pH4.5, strong brown, 7.5YR5/8, sandy clay. Well Drained.

This association is surrounded by a band of *C. acutivalvis*, *Melaleuca eleutherostachya* and *M. lateriflora* shrubs, mature, stratum 2-4 m tall, 10-30% canopy cover over *Acacia mackayana*, *M. undulata* and *M. adnata* shrubs, mature to senescent, stratum 0.5-1.0 m tall, 30-70% canopy cover. Vegetation is older than 25 years. Soil here is as above but with earthy fabric, pH5.8, yellowish red, 5YR5/6, clayey sand. Poorly drained.

### Loc. 3.52

Mosaic similar to locs. 3.48, 3.49.

## HEATH

### Loc. 4.1

*Casuarina campestris* heath as for loc. 4.7 with patches of *Melaleuca undulata* shrubs 1.0 m tall.

### Loc. 4.2

#### Key Description

Low Scrub B over Open Low Sedges on sandy clay loam

Code mSbi.n<sub>1</sub>VLi/SCL

n<sub>1</sub> = *Lepidosperma gracile*

**Loc. Details**

Stratum 1. *Melaleuca uncinata* shrubs, immature, stratum 1.0-1.5 m tall, 10-30% canopy cover.

Stratum 2. *Lepidosperma gracile* sedge and several species of shrubs, mature, 0.5 m tall, 10-30% canopy cover.

**Comments**

Southern parts of this loc. have no understory. North side of road has the upperstory 2-10% canopy cover and *Ecdeiocolea monostachya* replacing the *L. gracile* and with a canopy cover of 30-70%.

**Litter**

Sparse, mostly terete leaves, twigs and flattened sedge clumps, 0.5 cm deep, 1-2 m between clumps.

**Soil**

Friable soil deeper than 1 m.

30 cm sample moderately pedal, sandy, coherent, unbleached, non-calcareous, pH4.5, brownish yellow 10YR6/6, sandy clay loam. Well drained.

**Loc. 4.3 (TRAPLINE 8)**

As for loc. 4.2 with scattered mallees on north side of road.

**Loc. 4.4**

As for loc. 4.2 and 4.7 becoming taller to the eastern side of this loc.

**Loc. 4.5**

As for loc. 3.23 but 1-2.0 m tall and with fewer emergents. Some parts similar to loc. 4.11.

**Loc. 4.6**

As for loc. 4.13.

**Loc. 4.7****Key Description**

Dense Heath B over Open Dwarf Scrub D on light sandy clay loam

**Code** cSBd.mSDr/LSCL

**Loc. Details**

Stratum 1. *Casuarina campestris* shrubs, immature, stratum 1-1.5 m tall, 70-100% canopy cover.

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

## Comments

*Grevillea excelsior* to 3 m tall. Western edge of loc. has *Acacia* and *C. campestris* dominant, canopy cover 30-70%. Evidence of old fire scars.

## Litter

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

## Soil

Friable soil deeper than 1m.

30 cm sample slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH4.9, yellow, 10YR7/8, light sandy clay loam. Excessively drained perhaps with localised areas which are only well drained.

## Loc. 4.8

Northern portion of this loc. is *Hakea subsulcata* shrubs 0.5-1.0 m tall, 2-10% canopy cover over *Melaleuca conothamnoides*, *Ecdeiocolea monostachya*, and several species of shrubs, 0.4 m tall, 30-70% canopy cover. Has patches of *Casuarina acutivalvis* 4-5 m tall, and scattered *Banksia benthamiana*. Litter sparse, no evidence of fire, well drained.

Closer to gravel pit the association has prominent *Acacia stereophylla* 1.0-1.5 m tall, 10-30% canopy cover.

## Loc. 4.9

*Hakea subsulcata* and some *Acacia stereophylla* shrubs 1-1.5 m tall, 10-30% canopy cover over *Melaleuca conothamnoides* and mixed shrubs 0.5 m tall, 2-10% canopy cover. Clumps of *Casuarina acutivalvis* shrubland present. Soil well drained, gravelly. Gravel pit is 10-18 years old.

## Loc. 4.10

*Melaleuca uncinata* heaths as for loc. 4.2.

## Loc. 4.11

### Key Description

Open Low Scrub A over Dwarf Scrub C on sandy clay loam

Code xSAE.xSci/SCL

## Loc. Details

Stratum 1. *Melaleuca uncinata* and *Acacia stereophylla* shrubs, mature, stratum 1.5-2.0 m tall, 2-10% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, mature to senescent, stratum 0.7 m tall, 10-30% canopy cover.

## Comments

*Acacia stereophylla* shrubs emergent to 2-5 m tall. Closer to loc. 3.30 association becomes *Casuarina campestris* similar to loc. 4.7 where upper stratum may drop to 2-10% and the understory reach 30-70% canopy cover. Evidence of very old fire scars in both associations.

## Litter

Sparse to moderate, terete leaves and twigs clumped to 1 cm deep, clumps 1-5 m apart.

## Soil

Friable soil deeper than 1 m.

30 cm sample is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, pH5.5, brownish yellow, 10YR6/6, sandy clay loam. Well to excessively drained.

## Loc. 4.12 (TRAPLINE 11 and comment on TRAPLINE 5)

### Key Description

Low Scrub B over Open Dwarf Scrub D on sandy clay loam

Code mSbi.xSDr/SCL

### Loc. Details

Stratum 1. *Melaleuca uncinata* shrubs, immature, stratum 1.0-1.3 m tall, 10-30% canopy cover.

Stratum 2. Mixed shrubs, no particular dominant, 0.4 m tall, 2-10% canopy cover.

## Comments

Western parts of this loc. have *Acacia dielsii* and *M. uncinata* 2-3.5 m tall, 10-30% over *Eriostemon deserti* and *Leucopogon hamulosus* 1.0 m tall, 10-30%. Evidence of very old fire scars.

## Litter

Sparse, terete leaves and twigs, clumped to 0.5 cm deep, clumps 1 m apart.

## Soil

Friable soil deeper than 0.5 m.

30 cm sample is highly pedal, sandy, strongly coherent, unbleached, non-calcareous, pH4.4, yellow, 10YR7/6, sandy clay loam. Soluble salts 50 ppm. Trapline 5 is as above but soil is pH5.3, brown, 7.5YR5/4, sandy clay loam, soluble salts less than 30 ppm.

## Loc. 4.13

*Casuarina acutivalvis* and *C. campestris* shrubs, stratum 1-1.5 m tall, 10-30% canopy cover over mixed shrubs, no particular dominant, 0.5 m tall, 2-10% canopy cover. This area is regrowth from an old fire. Original vegetation as described for loc. 3.17.



**Loc. 4.14**

*Melaleuca nematophylla* and/or *Casuarina campestris* heath with patches of *C. acutivalvis* or *Acacia stereophylla* shrubland.

**Loc. 4.15**

*Casuarina campestris* heath similar to loc. 4.7.

**Loc. 4.16**

Mixed shrubs, no particular dominant, 0.5 m tall, 10-30% canopy cover with scattered *Eucalyptus rigidula* and *E. pyriformis* shrub mallees 1.5-2.5 m tall. Vegetation is 10-15 years old. Gravel pit is 10-18 years old. Soil is 1-1.5 m deep over compact laterite. Moderately pedal, earthy, coherent, pH5.0, brownish yellow, 10YR6/6, fine sandy loam.

**Loc. 4.17**

As for loc. 4.16 (also refer loc. 4.24).

**Loc. 4.18**

As for loc. 4.7 sometimes becoming taller (up to 2.5 m) and with areas where *Acacia stereophylla* is prominent. *Melaleuca cordata* and *M. conothamnoides* are common in the understory. This loc. is regrowth of loc. 3.29 vegetation.

**Loc. 4.19**

*Casuarina campestris* or *Melaleuca uncinata* associations similar to loc. 4.7, 4.11 and 4.12.

**Loc. 4.20**

As for loc. 4.7 and 4.2 with patches of *Acacia stereophylla* or *Casuarina acutivalvis* shrubland.

**Loc. 4.21**

*Casuarina campestris* heath similar to loc. 4.7 with patches of *C. acutivalvis* shrubland.

**Loc. 4.22**

As for loc. 4.21.

**Loc. 4.23**

Patchy *Casuarina campestris* heath with stands of *Hakea coriacea*.

**Loc. 4.24**

Burnt area is *Hakea falcata*, *Casuarina corniculata* and several other species of shrubs, 0.7 m tall, 30-70% canopy cover. Unburnt adjacent is part of loc. 2.21 extreme northern edge. The association here

is *H. falcata* and scattered *C. corniculata* 0.5-1.5 m tall, 10-30% canopy cover over *Melaleuca subtrigona*, *M. cordata* and several other shrubs, 1.0 m tall, 10-30% canopy cover, scattered *Eucalyptus drummondii* emergent to 3-3.5 m tall. Soil in both locations is slightly pedal, sandy, poorly coherent, unbleached, non-calcareous, brownish yellow, 10YR6/6, sandy clay loam. The burnt area was pH5.4, the unburnt pH4.5

**Loc. 4.25**

*Melaleuca nematophylla* shrubs 1.0-1.5 m tall, 30-70% canopy cover over mixed shrubs 0.5 m tall, 2-10% canopy cover.

**Loc. 4.26**

Mosaic of *Casuarina campestris* heath as for loc. 4.7 or *Melaleuca uncinata* as for loc. 4.11 and 4.12 or *Melaleuca nematophylla* as for loc. 4.25 with scattered *E. stowardii*, *E. redunca* or *E. transcontinentalis*.

**Loc. 4.27**

*Casuarina campestris* as for loc. 4.7, but 30-70% canopy cover.

**Loc. 4.28**

*Melaleuca uncinata* shrubs 2-2.5 m tall, 30-70% canopy cover over mixed shrubs, no particular dominant, 1.0 m tall, 2-10% canopy cover. This association is an ecotone between loc. 4.27 association and the mallee belt surrounding loc. 1.10.

**Loc. 4.29**

As for loc. 4.23.

**LITHIC COMPLEX**

**Loc 5.1**

Mosaic of areas of bare granite with *Parmelia* spp. and *Rhizocarpon* sp. lichens and *Grimmea* sp. moss. Where soil has accumulated *Borya nitida* forms a patchy cover to 10 cm tall. Deeper soils have *Thryptomene* affin. *kochii* or stands of heath 0.5-1.5 m tall, 70-100% canopy cover. The dominant species in these heaths may be *Melaleuca uncinata*, *Casuarina campestris*, *Calothamnus gilesii*, *M. fulgens*, or *Acacia desertorum*. Understory where it is present is *Borya nitida* or *Gahnia* affin. *polyphylla*. In some areas *M. uncinata* reaches 4-5 m tall, 2-10% canopy cover.

**Loc. 5.2 (TRAPLINE 1)**

As for loc. 5.1 with the majority of the vegetation on deeper soils being *Casuarina campestris*, *Acacia resinomarginea* or *A. heteroneura* shrubs 2-4 m tall, 10-30% canopy cover. Area is now burnt and regrowth to 10 cm tall. Vegetation was 18-20 years old at time of survey, regrowth is ca 6-12 months old.

**Loc. 5.3**

As for loc. 5.1 on north-western and north-eastern parts of this loc.; the southern part is now *Acacia acuminata* scattered over a park-like area with no understory but a dense cover of weeds to 10 cm tall.

The area has been cleared and is now used as a picnic area. There are occasional clumps of *Acacia microrobotrya* in artificial depressions near the park's eastern edge.

**Loc. 5.4**

As for loc. 5.1. Small pockets of soil in the bare granite areas have *Melaleuca fulgens*. Shrubs on deeper soils are commonly *Acacia heteroneura*.

**APPENDIX 8**  
**PLANT SPECIES RECORDED AT SELECTED LOCATIONS—**  
**BUNTINE RESERVE**

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

**Loc. 1.2**

<i>Acacia acuaria</i>	<i>Eucalyptus loxophleba</i>
<i>A. acuminata</i>	<i>Grevillea paniculata</i>
<i>A. erinacea</i>	<i>Hakea recurva</i>
<i>Bassia diacantha</i>	<i>Helichrysum lindleyi</i>
<i>Borya nitida</i>	<i>Helipterum hyalospermum</i>
<i>Brachycome pusilla</i>	<i>Lepidosperma gracile</i>
<i>Caladenia hirta</i>	<i>Lomandra effusa</i>
<i>Cephalopterum drummondii</i>	<i>Ptilotus obovatus</i>
<i>Cheiranthra parviflora</i>	<i>Rhagodia nutans</i>
<i>Dianella revoluta</i>	<i>R. preissii</i>
<i>Drosera macrantha</i>	<i>Santalum spicatum</i>
<i>Eremophila clarkii</i>	<i>Solanum nummularium</i>
<i>E. affin. decipens</i>	<i>Waitzia acuminatum</i>
<i>Erodium cygnorum</i>	

**Loc. 1.5**

<i>Acacia acuminata</i>	<i>Exocarpus aphyllus</i>
<i>A. graffiana</i>	<i>Melaleuca adnata</i>
<i>A. mackayana</i>	<i>M. lateriflora</i>
<i>A. multispicata</i>	<i>M. undulata</i>
<i>Eremophila oppositifolia</i>	<i>Rhagodia spinescens</i>
<i>Eucalyptus salmonophloia</i>	<i>Santalum acuminatum</i>
<i>E. salubris</i>	

**Loc. 2.9**

*Acacia graffiana*  
*A. heteroneura*  
*Alyxia buxifolia*  
*Amphipogon debilis*  
*Casuarina acutivalvis*  
*Dianella revoluta*  
*Ecdeiocolea monostachya*  
*Enchylaena tomentosa*  
*Eremophila oppositifolia*  
*Eucalyptus redunca*  
*E. stowardii*  
*Gahnia* affin. *polyphylla*

*Grevillea huegelii*  
*G. paniculata*  
*G. petrophiloides*  
*Meleuca eleutherostachya*  
*M. lateriflora*  
*M. uncinata*  
*Olearia muelleri*  
*Phebalium tuberculosum*  
*Platysace effusa*  
*Rhagodia spinescens*  
*Santalum acuminatum*

**Loc. 3.23**

*Acacia desertorum*  
*A. dielsii*  
*A. multispicata*  
*A. signata*  
*Baeckea heteranthera*  
*B. sp. 7 (SC)*  
*Brachyloma concolor*  
*Casuarina acutivalvis*  
*C. campestris*  
*Cryptandra leucophracta*  
Cyperaceae sp. 1 (SC)  
*Daviesia nudiflora*  
*Ecdeiocolea monostachya*  
*Eucalyptus drummondii*

*E. ebbanoensis*  
*Grevillea excelsior*  
*Hakea falcata*  
*Jacksonia* affin. *racemosa*  
*Isopogon scabriusculus*  
*Leucopogon hamulosus*  
*Melaleuca cordata*  
*M. pentagona*  
*Micromyrtus imbricata*  
*Persoonia* affin. *saundersiana*  
*Santalum acuminatum*  
*Schoenus* affin. *compressus*  
*S. sp. 1 (SC)*

**Loc. 3.35**

*Acacia acuminata*  
*Melaleuca acuminata*  
*M. eleutherostachya*

*M. lateriflora*  
*M. uncinata*

**Loc. 3.40**

*Acacia assimilis*  
*A. desertorum*  
*A. stereophylla*  
*Baeckea heteranthera*  
*B. sp. 7 (SC)*  
*Casuarina acutivalvis*  
*C. campestris*  
*Darwinia purpurea*

*Drosera macrantha*  
*Eucalyptus drummondii*  
*Hakea coriacea*  
*H. subsulcata*  
*Hibbertia uncinata*  
*Melaleuca conothamnoides*  
*M. cordata*  
*Micromyrtus imbricata*

*Patersonia occidentalis*  
*Petrophile incurvata*  
*Platysace maxwellii*

*Santalum acuminatum*  
*Schoenus* sp. 1 (SC)  
*S.* affin. *subbulbosus*

**Loc. 3.42**

*Acacia desertorum*  
*A. stereophylla*  
*Baeckea heteranthera*  
*B.* sp. 7 (SC)  
*Casuarina acutivalvis*  
*C. campestris*  
*Choretrum glomeratum*  
*Cryptandra leucophracta*  
*Darwinia purpurea*  
*Drosera macrantha*  
*Ecdeiocolea monostachya*  
*Hakea falcata*

*Hibbertia uncinata*  
*Isopogon scabriusculus*  
*Leucopogon hamulosus*  
*Melaleuca conothamnoides*  
*M. cordata*  
*M. pentagona*  
*Micromyrtus imbricata*  
*Patersonia occidentalis*  
*Petrophile incurvata*  
*Philotheca drummondita*  
*Schoenus compressus*  
*Scholtzia drummondii*

**Loc. 4.2**

*Acacia assimilis*  
*A. dielsii*  
*A. multispicata*  
*Baeckea heteranthera*  
*Boronia caerulea*  
*Borya nitida*  
*Cryptandra myriantha*  
Cyperaceae sp. 1 (SC)  
*Darwinia purpurea*  
*Hakea falcata*

*Lepidosperma gracile*  
*L.* sp. 4 (SC)  
*Leucopogon hamulosus*  
*Melaleuca conothamnoides*  
*M. seriata*  
*Petrophile divaricata*  
*Platysace effusa*  
*Santalum acuminatum*  
*Verticordia brownii*

**Loc. 4.12**

*Acacia dielsii*  
*Baeckea heteranthera*  
*Borya nitida*  
*Ecdeiocolea monostachya*  
*Eriostemon deserti*  
*Gahnia* affin. *polyphylla*

*Lepidosperma gracile*  
*Leucopogon hamulosus*  
*Melaleuca platycalyx*  
*M. uncinata*  
*Platysace effusa*

**Loc. 5.2**

List based on regrowth 10 cm tall  
*Acacia* affin. *coolgardiensis*  
*A. heteroneura*  
*A. resinomarginea*  
*Borya nitida*

*Casuarina campestris*  
*Grevillea paniculata*  
*Hakea recurva*  
*Helichrysum lindleyi*  
*Melaleuca fulgens*