A biological survey of the agricultural zone : vegetation and vascular flora of Drummond Nature Reserve

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ABSTRACT

A survey of the flora and vegetation communities of Drummond Nature Reserve was undertaken. The reserve contains ten vegetation communities, mainly woodlands of wandoo and jarrah / marri. One community is caused by secondary salination and two (wandoo woodland over sedges and *Melaleuca lateritia* dominated claypans) have been rarely recorded during the Biological Survey of the Agricultural Zone. A total of 439 taxa of vascular plants were recorded for the reserve, including two rare and seven priority taxa. The vegetation and flora of the reserve are typical of the northern jarrah forest.

INTRODUCTION

This study of the flora and vegetation communities of Drummond Nature Reserve (42805) was undertaken as part of the Biological Survey of the Agricultural Zone undertaken for the Salinity Action Plan and the State Salinity Strategy (Government of Western Australia 2000).

The valley floors of the reserve are under threat by secondary salination due to rising groundwater and saline water flows from surrounding cleared areas. This reserve has very high conservation values in the valley floors and has been proposed as a natural diversity recovery catchment. This paper details the vegetation and flora of the reserve as part of the nomination background and as a benchmark for this recovery process.

Several other areas reported on in detail include the Lake Muir-Unicup Recovery Catchment (Gibson and Keighery 2000) and the Quairading Nature Reserve (Keighery *et al*. 2001). These detailed reports will continue as the need arises.

Drummond Nature Reserve is approximately 10 km west of Bolgart and seven kilometres north-east of Julimar Conservation Park on the northern margin of the Swan Region in the Mundaring District of the Department of Conservation and Land Management. The reserve is an 'A' class nature reserve of 439 ha purchased and gazetted in 1993. Previously it was freehold land used for stock grazing.

The reserve lies near the north-east boundary of the Jarrah Forest IBRA Region (Thackaway and Creswell 1995). Bolgart (10 km to the east) has an annual rainfall of 469 mm (Bureau of Meteorology, Western Australia 1999). The climate is warm Mediterranean with five to six dry months per year.

Beard (1979) described the major structural vegetation formations in the area at a scale of 1:250,000 and maps the reserve as marri / wandoo woodland. Surveys from nearby areas include a site-based floristic survey of the Bindoon to Moora area (Griffin, 1992), although no sites were established in the reserve.

Apart from the broad scale vegetation mapping referred to above, there appear to be no published biological data on Drummond Nature Reserve.

MATERIALS AND METHODS

Prior to the intensive study reported here, as part of the Biological Survey of the Agricultural Zone one biodiversity site (sampling plants, ground dwelling vertebrates and invertebrates) and four floristic sites (10 x 10 m quadrats) were established in the reserve in 1998. These sites will be used in a biogeographic analysis of the entire Agricultural Zone during 2001. Plant data from these sites was incorporated into this study.

To compile the species list for the reserve, these sites were supplemented by four visits to the reserve in autumn, early and late spring and summer using extensive foot traverses during 1999 and 2000. The vegetation map was compiled using colour stereo photographs at 1:50,000 scale with extensive ground truthing. The reserve has not been burnt for over 10 years.

VEGETATION

Drummond Nature Reserve consists of a series of lateritic hills and spurs interspersed with valleys and spillway deposits and a small area of outcropping bedrock. Ten vegetation units were recognised within the reserve (Fig. 1). As expected these appear to relate to soil type, topography and drainage; that is, wandoo woodlands

dominate the ridges, gravelly slopes and clay soils of the valleys, while marri woodlands dominate the duplex soils of the valleys and banksia woodlands are found on the deep sands. Some vegetation units had sharp distinct boundaries while others formed broad ecotones between units. The units are shown on Figure 1 as a numeric code and are described below.

Vegetation Types

There are six woodland types in the study area (vegetation units 2, 3, 4, 5, 6 and 9), one mallee type (vegetation unit 10), two granite heaths (vegetation unit 7) and a wetland (vegetation unit 8).

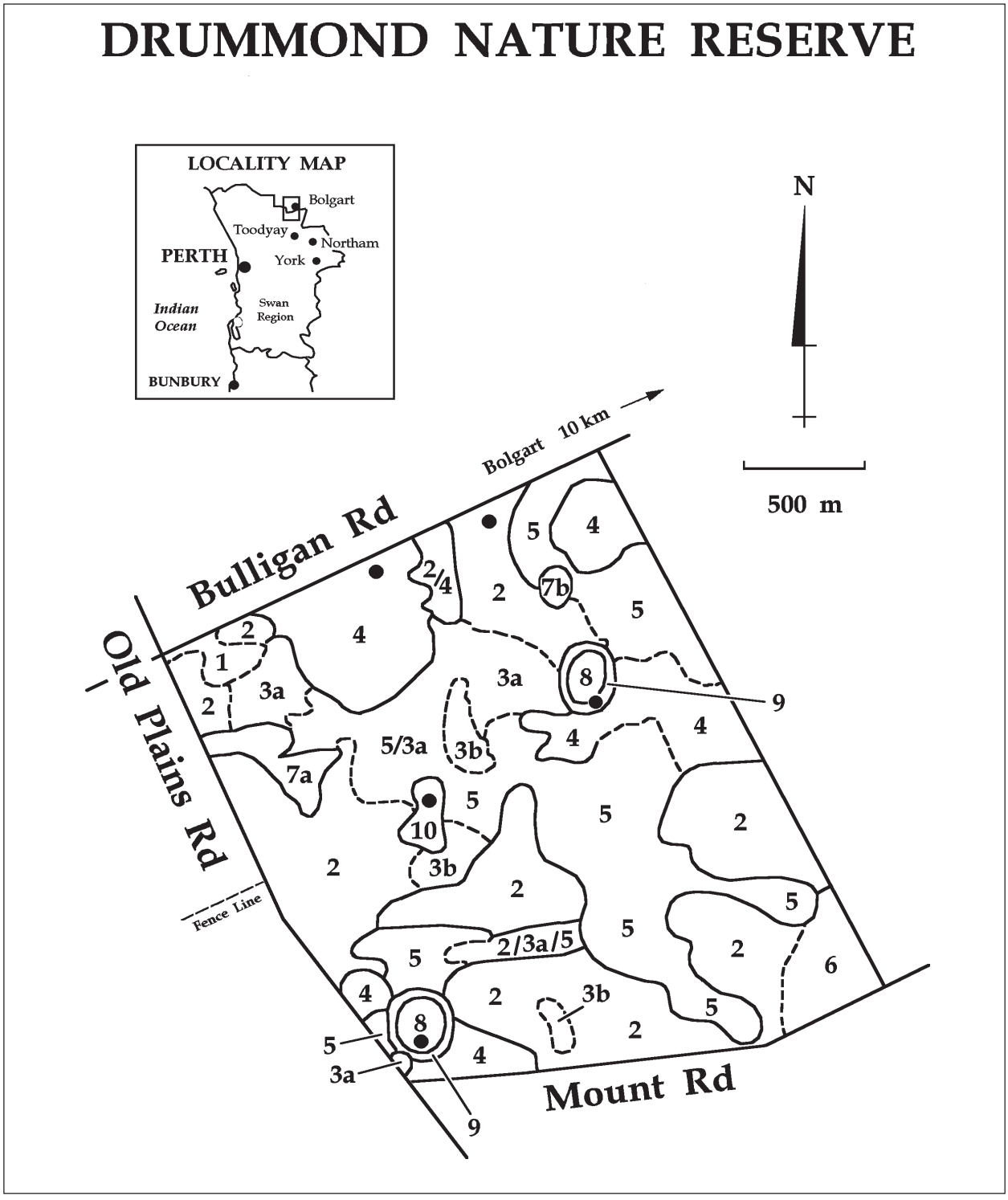

Figure 1. Vegetation map of Drummond Nature Reserve. The broken lines on the map indicate ecotomes (broad change over areas) between the vegetation types rather than sharp boundaries.

Figure 2. Eucalyptus wandoo over sedges (vegetation type 3b).

1. *Salt affected wandoo woodland*
   Trees are dead or suffering from dieback and understorey is dead and / or replaced by annual weeds. This area corresponds to the largest saline water intrusion mapped by Western Australia Department of Agriculture hydrologists.

2. *Wandoo (Eucalyptus wandoo) open woodland over low open shrubland*
   This is found on lateritic hills, spurs and slopes.

3. *Wandoo woodland on clay flats in the valleys*
   This can be segregated into:
   3a) Wandoo woodland usually with scattered marri (*Eucalyptus calophylla*) over *Xanthorrhoea preissii* over low shrubs over herbs and grasses.
   3b) Wandoo woodland over dense low sedges of *Mesomelaena preissii* (Fig. 2).

4. *Banksia low woodland on deep sands*
   Banksia woodland of variable composition. On the northern and eastern margins of the reserve almost pure stands of *Banksia attenuata* and *B. menziesii* occur; elsewhere scattered marri is often an emergent, especially on the dunes above the lakes. Along Mount Road and south-east of the northern claypan, *Banksia prionotes* is also a common component.

5. *Marri woodland on clay or duplex soils in the valleys*
   This is a very open woodland over tall scattered shrubs of *Jacksonia sternbergiana* over very open low heath of *Allocasuarina humilis* and *Gastrolobium calycinum* over herbs and sedges.

6. *York gum (Eucalyptus loxophleba)/ Jam (Acacia acuminata) over herbs*
   Occurring on brown loams with some evidence of granite. This vegetation type has scattered wandoo throughout. This community merges into wandoo woodland up slope as wandoo becomes dominant on the lateritic ridges. This community occurs on brown loams, probably derived from granite.

7. *Granite heath*
   There are two types:
   7a) Tall dense shrubland of *Melaleuca steedmanii*, *Calothamnus* and *Dodonaea pinifolia* that opens out to a small outcrop dominated by a herbfield of *Borya sphaerocephala*.
   7b) Tall very open shrubland of *Xanthorrhoea preissii* over mid dense heath of *Gastrolobium calycinum* and *Hakea incrassata* over sedges and *Borya* herbfield.

8. *Claypan*
   Melaleuca lateritia mid dense shrubland over herbs.

9. *Flooded gum (Eucalyptus rudis) open woodland over low sedges of Baumea rubiginosa*
   This community occurs on the slopes of the claypans.

10. *Eucalyptus drummondii mid dense low mallee over low heath of Allocasuarina humilis, Calothamnus sanguineus and Hakea incrassata over low sedges of Mesomelaena preissii*
    This occurs on yellow sandy clays on valley slopes.

TABLE 1
Vascular flora of Drummond Nature Reserve. With the wandoo, (l) indicates that the species only occurs on lateritic soils (vegetation type 2) and (cl) indicates species only occurring on clay valley soils (vegetation type 3).

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Ferns/Gymnosperms	*Cheilanthes*	*austrotenuifolia*		X		X			X	
	Isoetes	*drummondii*	X							
	Ophioglossum	*lusitanicum*	X	X		X	X		X	
	Macrozamia	*riedlei*		X (l)	X	X	X			
	Selaginella	*gracillima*		X (cl)			X			
Anthericaceae	*Arthropodium*	*capillipes*		X		X	X		X	X
	Arthropodium	*preissii*	X							
	Borya	*laciniata*					X			
	Borya	*scirpoidea*					X			
	Borya	*sphaerocephala*		X			X		X	
	Caesia	*alfordii*	X	X						
	Chaemascilla	*corymbosa*		X			X		X	X
	Chaemascilla	*spiralis*		X			X			X
	Corynotheca	*micrantha*		X	X		X			
	Dichopogon	*fimbriatus*		X						
	Laxmannia	*grandiflora*		X						X
	Laxmannia	*omnifertilis*		X (cl)						
	Laxmannia	*ramosa*			X		X			
	Laxmannia	*sessiliflora*		X			X			
	Laxmannia	*squarrosa*					*X*			
	Sowerbaea	*laxiflora*		X	X		X			
	Thysanotus	*patersonii*		X	X				X	
	Thysanotus	*thyrsoideus*	X		X		X			
	Tricoryne	*arenicola*								X
	Tricoryne	*elatior*				X				
	Tricoryne	*tenella*		X	X					
Centrolepidaceae	*Aphelia*	*cyperoides*	X	X	X					
	Aphelia	*brizula*	X		X					
	Aphelia	*drummondii*				X				
	Centrolepis	*alepyroides*	X							
	Centrolepis	*aristata*	X				X			
	Centrolepis	*drummondiana*			X		X			
	Centrolepis	*glabra*	X							
	Centrolepis	*pilosa*					X			
	Centrolepis	*polygyna*					X			
Colchicaceae	*Burchardia*	*congesta*		X	X		X			X
	Wurmbea	*dioica*		X					X	
Cyperaceae	*Baumea*	*juncea*	X							
	Baumea	*rubiginosa*	X							
	Caustis	*dioica*			X		X			
	Chorizandra	*enodis*	X							
	Cyathochaeta	*avenacea*		X			X			
	Cyathochaeta	*equitans*			X					
	**Cyperus*	*tenellus*	X				X		X	

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Cyperaceae (cont)	*Eliocharis*	*keigheryi*	X							
	Isolepis	*cernua*	X							
	Isolepis	*marginata*					X			
	Isolepis	*stellata*					X			
	Lepidosperma	*pubisquameum*					X			
	Lepidosperma	*tenue*		X(l)						
	Lepidosperma	*viscidum*							X	X
	Mesomelaena	*preissii*		X						
	Mesemolaena	*pseudostygia*		X						
	Mesemolaena	*tetragona*		X						
	Schoenus	*clandestinus*		X(cl)			X			X
	Schoenus	*curvifolius*			X		X			
	Schoenus	*elegans*	X							
	Schoenus	*?loliaceus GJK15488*	X							
	Schoenus	*nanus*		X						
	Schoenus	*natans*	X							
	Schoenus	*odontocarpus*					X			
	Schoenus	*rigens*					X			
	Schoenus	*subbulbosus*			X					
	Schoenus	*tenellus*	X							
	Schoenus	*variicellae*			X					
	Tetraria	*octandra*		X(cl)			X			
Dasypogonaceae	*Calectasia*	*cyanea*			X					
	Lomandra	*caespitosa*		X			X			
	Lomandra	*effusa*		X						
	Lomandra	*micrantha*		X						
	Lomandra	*sericea*		X(cl)						
	Lomandra	*suaveolens*					X			
Haemodoraceae	*Anigozanthos*	*bicolor*		X						
	Anigozanthos	*humilis*			X		X			
	Conostylis	*androstemma*		X						
	Conostylis	*aurea*			X					
	Conostylis	*candicans*					X			
	Conostylis	*setigera*			X		X			
	Conostylis	*stylidioides*					X			
	Haemodorum	*brevisepalum*					X			
	Haemodorum	*discolor*		X			X			
	Haemodorum	*panniculatum*				X	X		X	X
	Haemodorum	*simplex*					X			
	Haemodorum	*spicatum*		X			X			
	Tribonanthes	*uniflora*	X							
	Tribonanthes	*violacea*	X							
	Tribonanthes	*longipetala*	X				X			
Hydatellaceae	*Hydatella*	*leptogyne*	X							
	Trithuria	*bibracteata*	X							
	Trithuria	*submersa*	X							

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Hypoxidaceae	*Hypoxis*	*occidentalis*		X(cl)	X	X				
Iridaceae	**Gladiolius*	*caryophyllaceus*		X	X					
	Orthrosanthus	*laxus*		X(l)		X	X			
	Patersonia	*occidentalis*			X		X			
	Patersonia	*rudis*		X(l)						
	**Hesperantha*	*falcata*	X							
	**Romulea*	*australis*				X		X		
	**Romulea*	*rosea*		X				X		
Juncaceae	*Juncus*	*bufonius*	X	X			X			
	Juncus	*capitatus*	X							
Juncaginaceae	*Triglochin*	*calcitrapum*		X			X			
	Triglochin	*lineare*	X							
	Triglochin	*minutissima*		X(cl)						
	Caladenia	*discoidea*		X(l)		X	X			
Orchidaceae	*Caladenia*	*flava*		X	X	X	X		X	X
	Caladenia	*longicauda*		X, X(l)		X				
	Caladenia	*marginata*				X				
	Cyanicula	*gemmata*		X(l)		X			X	X
	Cyanicula	*sericea*		X(l)			X			
	Diuris	*corymbosa*		X						
	Eriochilus	*dilatatus*		X(cl)	X	X	X			
	Leporella	*fimbriata*			X		X			X
	Microtis	*media*	X				X			
	Microtis	*orbicularis*	X							
	**Monadenia*	*bracteata*					X	X		
	Prasophyllum	*hians*			X					
	Prasophyllum	*macrostachyum*	X							
	Prasophyllum	*ovale*	X	X						
	Pterostylis	*nana*				X				
	Pterostylis	*recurva*		X(cl)						
	Pterostylis	*sanguinea*		X(cl)						
	Pyrorchis	*nigricans*			X					
	Thelymitra	*antennifera*							X	
	Thelymitra	*benthamiana*	X				X		X	
	Thelymitra	*crinita*		X(cl)						
	Thelymitra	*flexuosa*					X			
	Thelymitra	*pauciflora*					X			
Philydraceae	*Philydrella*	*pygmaea*	X						X	
Phormiaceae	*Agrostocrinum*	*scabrum*		X(cl)		X	X		X	
	Dianella	*revoluta*		X(l)						
	Stypandra	*glauca*		X		X				
Poaceae	*Agrostis*	*avenacea*	X							
	**Aira*	*caryophyllea*		X			X	X	X	
	Amphibromus	*nervosus*	X	X						
	Amphipogon	*strictus*		X			X			X
	Amphipogon	*turbinatus*		X	X	X	X			X

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Poaceae (cont)	*Aristida*	*contorta*		.		X	X			
	Austrodanthonia	*?setacea*		X		X				
	Austrostipa	*compressa*			X					
	Austrostipa	*elegantisima*		X,X(l)			X			X
	Austrostipa	*pycnostachya*					X			
	Austrostipa	*trichophylla*		X			X			
	**Avena*	*barbata*		X			X	X		
	**Brachypodium*	*distachyon*					X	X		
	**Briza*	*maxima*	X	X			X			
	**Briza*	*minor*					X	X		
	**Bromus*	*diandrus*		X(l)				X		
	**Ehrharta*	*longiflora*			X			X		
	Microlaena	*stipoides*				X				
	Neurachne	*alopecuroidea*		X,X(l)					X	X
	**Parapholis*	*incurva*		X				*X*		
	Poa	*drummondii*		X(l)	*X*					
	Polypogon	*tenellus*	X							
	**Triticum*	*aestivum*		X						
	**Vulpia*	*myuros*		X	X		X			
Restionaceae	*Alexgeorgea*	*nitens*			X		X			
	Desmocladus	*asper*		X			X			*X*
	Harperia	*lateriflora*		X			X			
	Hypolaena	*exsulca*			X					
	Lepidobolus	*preissianus*								*X*
	Meeboldinia	*congustata*	X							
	Lepyrodia	*muirii*	X							
	Lolium	*rigidum*		X				X		
	Lyginia	*barbata*			X		*X*			
Xanthorrhoeaceae	*Xanthorrhoea*	*preissii*		X	X		X		X	
Amaranthaceae	*Ptilotus*	*declinatus*					X			
	Ptilotus	*manglesii*		X			X			
	Ptilotus	*polystachyus*		X	X					X
	Ptilotus	*stirlingii*		X			*X*			
Apiaceae	*Daucus*	*glochidiatus*		X(l)			X		X	X
	Homaloscadium	*homalocarpum*	X	X		X	X		X	
	Hydrocotyle	*alata*	X						X	
	Hydrocotyle	*lemnoides*	X							
	Hydrocotyle	*medicaginoides*		X						
	Hydrocotyle	*pilifera*		X	X	X	X			X
	Platysace	*maxwellii*		X						
	Platysace	*ramosissima*		X			X			
	Platysace	*teres*		X(h)						
	Trachymene	*cyanopetala*				X			X	
	Trachymene	*ornata*				*X*				
	Trachymene	*pilosa*		X	X		X		X	X
	Xanthosia	*candida*		X(h)						
	Xanthosia	*huegelii*		X(l)	X	X				

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Asclepiadaceae	*Rhyncharrhena*	*linearis*				X				
Asteraceae	*Angianthus*	*tomentosus*	X							
	**Arctotheca*	*calendula*			X		X	X		
	Blennospora	*drummondii*	X	X						
	Brachyscome	*glandulosa*		X(l)						
	Brachyscome	*iberiidifolia*		X	X	X	X			
	Calotis	*hispidula*		X						
	**Carduus*	*pycnocephalus*				X		X	X	
	Cotula	*cotuloides*		X(cl)						
	Euchiton	*sphaericus*	X	X						
	Gnephosis	*tenuissima*		X						
	Helichrysum	*leucopsideum*		X			X		X	
	Hyalospermum	*cotula*	X	X(l)						
	Hyalospermum	*pyrethrum*	X							
	**Hypochaeris*	*glabra*		X(l)	X		X	X	X	X
	Lagenophora	*huegelii*		X(l), X(cl)	X	X	X			
	Lawrencella	*rosea*		X(cl)						
	Millotia	*myosotidifolia*		X	X					
	Myriocephalus	*occidentalis*	X							
	Olearia	*rudis*		X(l)						
	Podolepis	*canescens*		X			X			X
	Podolepis	*gracilis*	X							
	Podolepis	*lessonii*		X						
	Podotheca	*angustifolia*		X	X		X			X
	Podotheca	*gnaphalioides*			X	X				
	Pterochaeta	*panniculata*		X	X		X			
	Quinetia	*urvillei*		X	X		X		X	X
	Rhodanthe	*laevis*		X(l)						
	Rhodanthe	*manglesii*				X				
	Siloxerus	*multiflorus*							X	
	Senecio	*lautus*			X					
	Siloxerus	*humifusus*			X		X			
	Trichocline	*spathulata*		X(l)						
	**Ursinia*	*anthemoides*	X	X	X		X	X		
	Waitzia	*acuminata*				X	X			X
	Waitzia	*nitida*		X	X					
	Waitzia	*suaveolens*		X			X			X
Brassicaceae	*Lepidium*	*rotundum*		X		X	X			
Boraginaceae	**Echium*	*plantagineum*					X	X		
	Halgania	*preissiana*				X				
Campanulaceae	*Wahlenbergia*	*preissii*		X	X	X	X	X		X
Casuarinaceae	*Allocasuarina*	*campestris*		X		X				
	Allocasuarina	*huegeliana*		*X(cl)*		X			X	
	Allocasuarina	*humilis*			X		X			X
	Allocasuarina	*microstachya*					X			
	Allocasuarina	*thuyoides*					X			

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Crassulaceae	*Crassula*	*colorata*		X						
	Crassula	*exserta*	X	X						
	**Crassula*	*natans*							X	
	Crassula	*pedicellosa*		X						
Dilleniaceae	*Hibbertia*	*acerosa*	X							
	Hibbertia	*commutata*		X						
	Hibbertia	*huegelii*			X		X			
	Hibbertia	*hypericoides*		X	X		X			X
	Hibbertia	*racemosa*					X			
	Hibbertia	*spicata*		X						
	Hibbertia	*subvaginata*			X					
Droseraceae	*Drosera*	*bulbosa*							X	
	Drosera	*erythrorhiza*		X						
	Drosera	*gigantea*					X			
	Drosera	*glanduligera*	X				X			
	Drosera	*heterophylla*		X(cl)						
	Drosera	*macrophylla*				X				
	Drosera	*menziesii*					X			
	Drosera	*pallida*		X		X	X			
	Drosera	*pycnoblasta*			X					X
	Drosera	*stolonifera*		X			X			
	Drosera	*zonaria*			X					
Epacridaceae	*Astroloma*	*macrocalyx*					X			
	Astroloma	*pallidum*		X(l)	X		X			X
	Astroloma	*prostratum*		X(l)						
	Astroloma	*serratifolium*		X(l)						
	Leucopogon	*tamminensis*								X
	Lysinema	*ciliatum*		X(h)			X			
	Styphelia	*tenuiflora*	X(l)							
Euphorbiaceae	*Phyllanthus*	*calycinus*		X(l)						
	Poranthera	*microphylla*				X	X			
	Ricinocarpus	*glaucus*			X					
Gentianaceae	**Centaurium*	*erythraea*			X				X	
	**Cicendia*	*filiformis*	X							
	**Erodium*	*crinitum*			X					
	Erodium	*cygnorum*		*X*	*X*		X			
Goodeniaceae	*Damperia*	*alata*		X						
	Damperia	*lavandulacea*		X						X
	Goodenia	*berardiana*		X						
	Goodenia	*glaericola*		X(l)						
	Goodenia	*micrantha*	X							
	Goodenia	*cf mimuloides*		X						
	Lechenaultia	*biloba*		X(l)						
	Lechenaultia	*expansa*			X					
	Scaevola	*repens*			X					
	Verreauxia	*reinwardtii*			X	X	X			

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Halorhagaceae	*Glissrocharyon*	*aureum*		X						
	Gonocarpus	*cordiger*		X(l)						
	Gonocarpus	*nodulosus*	X	X			X			
	Myriophyllum	*echinatum*	X							
Hyperiaceae	*Hypericum*	*japonicum*					X			
Lamiaceae	*Hemigena*	*sericea*		X						
Lauraceae	*Cassytha*	*flava*			X		X		X	
Lobeliaceae	*Isotoma*	*hypocratiiformis*		X						
	Lobelia	*gibbosa*		X						
	Lobelia	*heterophylla*				X	X		X	X
	**Monopsis*	*debilis*	X				X			
Lentibulariaceae	*Utricularia*	*inaequalis*	X							
Linaceae	*Linum*	*marginale*		X						
Loganiaceae	*Logania*	*flaviflora*		X						
	Phyllangium	*paradoxum*	X			X	X		X	X
Loranthaceae	*Amyema*	*miquelii*		X			X			
	Amyema	*preissii*				X				
	Nuytsia	*floribunda*			X					
Lythraceae	*Lythrum*	*hyssopifolium*					X			
Menyanthaceae	*Villarsia*	*capitata*	X							
Myrtaceae	*Baeckea*	*camphorosmae*		X(l)						
	Baeckea	*crispiflora*		X			X			
	Baeckea	*?grandiflora*		X(l)						
	Calothamnus	*sanguineus*		X						X
	Calothamnus	*quadrifidus*		X					X	
	Calytrix	*fraseri*		X	X					
	Calytrix	*flavescens*		X						
	Calytrix	*strigosa*		X						
	Eucalyptus	*calophylla*					X			
	Eucalyptus	*drummondii*								X
	Eucalyptus	*marginata*					X			
	Eucalyptus	*rudis*	X				X			
	Eucalyptus	*wandoo*		X						
	Hypocalymma	*angustifolium*			X	X	X			
	Leptospermum	*erubescens*			X		X			
	Melaleuca	*lateritia*	X							
	Melaleuca	*leptospermoides*								X
	Melaleuca	*scabra*		X	X					
	Melaleuca	*steedmanii*		X(cl)					X	
	Melaleuca	*viminea*					X			
	Scholtzia	*involucrata*			X					
	Verticordia	*densiflora*	X				X			
	Verticordia	*huegelii tridens*		X			X			
	Verticordia	*pennigera*		X						
	Verticordia	*roei*		X						
	Verticordia	*serrata*			X					

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Mimosaceae	*Acacia*	*acuminata*		X(cl)		X			X	
	Acacia	*applanata*			X					
	Acacia	*chapmanii*		X						
	Acacia	*drummondii*		X(l)						
	Acacia	*incrassata*		X						
	Acacia	*lasiocarpha*		X						X
	Acacia	*latipes*					X			
	Acacia	*microbotrya*				X				
	Acacia	*pulchella*		X	X		X		X	X
	Acacia	*saligna*					X			
	Acacia	*shuttleworthii*		X						
	Acacia	*stenoptera*		X	X					X
Olacaceae	*Olax*	*benthamiana*					X			
Orobanchaceae	**Orobanche*	*minor*					X	X		
Oxalidaceae	*Oxalis*	*perennans*		X(cl)						
Papillionaceae	*Aotus*	*procumbens*			X					
	Bossiaea	*eriocarpa*		X(cl)					X	
	Bossiaea	*spinescens*				X				
	Daviesia	*angulata*					X			
	Daviesia	*cardiophylla*		X			X			
	Daviesia	*decurrens*		X			X			
	Daviesia	*preissii*		X						
	Daviesia	*hakeoides*					X			X
	Gastrolobium	*calycinum*		X(l)						
	Gastrolobium	*spinosum*		X						
	Gompholobium	*marginatum*		X			X			
	Gompholobium	*tomentosum*			X					
	Hovea	*pungens*		X						X
	Hovea	*trisperma*					X			
	Isotropis	*cuenifolia*			X					
	Jacksonia	*furcellata*			X					
	Jacksonia	*restoides*		*X*						
	Jacksonia	*sternbergiana*			X					
	Kennedia	*prostrata*				X	X			
	Mirbelia	*trichocalyx*								X
	Nemcia	*capitata*			X		X			
	**Trifolium*	*arvense*					X			
	**Trifolium*	*campestre*	X							
Pittosporaceae	*Billardiera*	*bicolor*		X						
	Billardiera	*sericea*		X						
	Cheiranthera	*preissiana var preissiana*							X	
	Sollya	*heterophylla*		X(flat)			X			

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Polygalaceae	*Comesperma*	*calymega*		X	X					
	Comesperma	*ciliatum*							X	
	Comesperma	*integerrimum*				X				
	Comesperma	*rhadinocarpa*					X			
	Comesperma	*volubile*		X						
Polygonaceae	*Muehlenbeckia*	*adpressa*				X	X			
Portulaccaceae	*Calandrinia*	*composita*	X							
	Calandrinia	*corrigioloides*			X					
	Calandrinia	*granulifera*			X					
	Calandrinia	*linifolia*			X					
Primulaceae	**Anagallis*	*arvensis*	X	X			X		X	X
Proteaceae	*Adenanthos*	*cygnorum*			X					
	Adenanthos	*drummondii*					X			
	Banksia	*attenuata*			X					
	Banksia	*grandis*			X					
	Banksia	*menziesii*			X					
	Banksia	*prionotes*			X		X			
	Conospermum	*glumaceum*		X						
	Conospermum	*stoechadis*			X		X			
	Dryandra	*bipinnatifida*		X(l)						
	Dryandra	*fraseri*		X						X
	Dryandra	*lindleyana*		X						
	Dryandra	*sessilis*		X			X			
	Dryandra	*squarrosa*		X(l)						
	Grevillea	*bipinnatifida*		X						
	Grevillea	*scabra*		X						
	Grevillea	*synaphea*		X						
	Grevillea	*vestita*				X	X			
	Hakea	*incrassata*		X						X
	Hakea	*lissocarpha*		X						
	Hakea	*preissii*					X			
	Hakea	*prostrata*			X		X			
	Hakea	*ruscifolia*			X		X			
	Hakea	*stenocarpa*		X(cl)						
	Hakea	*trifurcata*			X		X			
	Hakea	*undulata*		X(l)						
	Hakea	*varia*					X			
	Isopogon	*divergens*								X
	Isopogon	*dubius*		X(l)						
	Persoonia	*angustiflora*								X
	Persoonia	*striata*		X						
	Persoonia	*sulcata*		X						
	Petrophile	*brevifolia*			X		X			
	Petrophile	*striata*		X(l)						

TABLE 1 (continued)

FAMILY	GENUS	SPECIES	CLAYPAN	WANDOO	BANKSIA	YG/JAM	MARRI	DISTURBED	GRANITE HTH	EUC DRUMM
Proteaceae (cont)	*Stirlingia*	*latifolia*			*X*					
	Synaphea	*petiolaris*		X						
Rafflesiaceae	*Pilostyles*	*hamiltonii*					X			
Rhamnaceae	*Stenanthemum*	*tridentatum*		X						
Rubiaceae	*Opercularia*	*vaginata*		X			X			X
Sapindaceae	*Dodonea*	*pinifolia*								X
Santalaceae	*Santalum*	*acuminatum*		X						
Scrophulariaceae	**Bellardia*	*trixago*		X		X				
	Glossostigma	*diandra*	X							
	Grattiola	*peruviana*	X							
	**Parentucellia*	*latifolia*		X			X			
	**Parentucellia*	*viscosa*	X							
Stackhousiaceae	*Stackhousia*	*monogyna*		X(flat)						
	Tripterococcus	*brunonis*		X(l)						
Sterculiaceae	*Keraundrinia*	*integrifolia*					X			
Stylidiaceae	*Levenhookia*	*pusilla*		X	X					
	Levenhookia	*stipitata*					X			
	Stylidium	*affine*		X(l)						
	Stylidium	*brunonianum*		X(l)						
	Stylidium	*calcaratum*			X		X			
	Stylidium	*emarginatum*							X	
	Stylidium	*eriopodium*								X
	Stylidium	*dichotomum*					X			
	Stylidium	*longitubum*	X							
	Stylidium	*mimeticum*					X			
	Stylidium	*miniatum*		X(l)						
	Stylidium	*piliferum*		X	X		X			
	Stylidium	*pycnostachyum*		X(l)						
	Stylidium	*repens*			X					
	Stylidium	*sacculatum*					X			X
Thymeleaceae	*Pimelea*	*argentea*				X	X			
	Pimelea	*suaeveolens*		X			X			

Disturbed areas

Around the margins of the reserve and along the firebreaks are areas of clearing and repeated disturbance where many weeds are recorded and often confined to. These areas are narrow and strictly speaking are not a vegetation unit; however, they are the major site for many weed species. These areas are given as habitat on the flora list but are not mapped.

VASCULAR FLORA

Composition

Drummond Nature Reserve has a vascular plant flora of at least 439 taxa. These taxa are listed in Table 1 as the appropriate species, subspecies or variants occurring in the reserve. In rare cases there is more than one subspecific taxon present and both are listed and counted (Table 1). Of the 439 taxa recorded, 34 are naturalised aliens and 405 natives. The largest families are the Proteaceae (35 species), Asteraceae (36 species, including 4 weeds), Cyperaceae (28, including 1 weed), Myrtaceae (26), Papillionaceae (23, including 2 weeds), Orchidaceae (24, including 1 weed) and Anthericaceae (21 species). The largest genera are *Stylidium* and *Acacia* (both with 12 species).

The flora is listed under the following major vegetation types of the reserve (Table 1): the claypan wetland (incorporating vegetation types 8 and 9), wandoo woodlands (vegetation types 2 and 3, (l) indicates if the species only occurs on lateritic soils (type 2) and (cl) indicates only occurring on clay valley soils (type 3)), banksia woodland (vegetation type 4), york gum woodland (vegetation type 6), marri woodland (vegetation type 5), disturbed (not mapped), granite heath (vegetation type 7) and Eucalyptus drummondii mallee (vegetation type 10).

The wandoo and marri vegetation types contain the largest number of taxa, but they are also the largest in area.

Weeds

Most of the weeds are currently confined to disturbed areas of the reserve (road edges, firebreaks and drainage lines from roads) and are not widespread through the reserve.

Weed species of current and future concern are:

1. *Gladiolus caryophyllaceus*
   This is currently scattered through the reserve largely on sandy soils in low numbers.
2. *Briza maxima* and *B. minor*
   These are very common in areas by both wetlands where stock were watered.
3. *Echium planatgineum*
   This is currently scattered in grazed woodland on the eastern side of the reserve and is abundant at two sites where drainage is entering the reserve (intersection of Old Plains Road and Mount Road and approximately one kilometre along Bulligan Road).

These infestations are currently under active control (B. Huston[1], personal communication).

Condition

Most of the reserve is in excellent to very good condition, despite a history of grazing prior to acquisition in 1993.

There is evidence of grazing impacts mainly in community 4 and 9 to the east of the eastern claypan.

Rare and priority flora

Drummond Nature Reserve has two species of Declared Rare Flora and seven species of Priority taxa (CALM 1999). The reserve contains the only known populations of the aquatic herb *Hydatella leptogyne* (Hydatellaceae). It also contains two large populations of the emergent aquatic herb *Eleocharis keigheryi* (Cyperaceae).

The populations of Priority taxa present in the reserve are:

1. *Hydrocotyle lemnoides* and *Schoenus natans*
   Very large populations of the aquatic herbs, *Hydrocotyle lemnoides* (Apiaceae, Priority Four) and *Schoenus natans.* (Cyperaceae, Priority Four) are found in both clay based wetlands.

2. *Acacia chapmanii* subspecies *australis*
   On the north-west boundary there is a population of *Acacia chapmanii* subspecies *australis* (Mimosaceae), a Priority Three taxon. The subspecies is confined to the Walebing-Bolgart-New Norcia area. Current records indicate that the taxon is only known from a conservation reserve at Drummond Nature Reserve. This population is rapidly declining as it is directly affected by the salt wedge entering the reserve in this area.

3. *Stenanthemum tridentatum* (Rhamnaceae)
   This is a Priority Three species and is widespread but poorly recorded, extending from Wubin to Wagin in the western wheatbelt.

4. *Comesperma rhadinocarpum* (Polygalaceae)
   This is a Priority Two species that is poorly known, extending in scattered occurrences from Mullewa to Perth.

5. *Platysace ramosissima* (Apiaceae)
   This is a Priority Three species also recorded from Boonanarring Reserve. It is here at its north-eastern limit.

6. *Tricoryne arenicola* (Anthericaceae)
   This is a distinctive form of *Tricoryne arenicola* (Priority Two), here at its western limit. Other collections are recorded from Wongan Hills north to Geraldton and inland to Southern Cross. This species is found in the *Eucalyptus drummondii* mallee heath. There are three species of *Tricoryne* present in this reserve.

[1] B.Houston, Department of Conservation and Land Management, Perth Hills District, 51 Mundaring Weir Road, Mundaring

Species of geographical interest include:

1. A hybrid of *Eucalyptus loxophleba* x *wandoo*
This is a rarely recorded plant that has been found in a number of locations in the western wheatbelt where these species co-occur.

2. *Cyathochaeta equitans*
Drummond Nature Reserve contains the most inland population of the sedge *Cyathochaeta equitans*. This species is mainly recorded from Perth southward on the Swan Coastal Plain thence to Albany. There are isolated records from north of Perth.

3. *Schoenus* aff. *loliaceus*
The record of *Schoenus* aff. *loliaceus* (GK 15488, Cyperaceae) from the reserve may represent a new taxon. It keys to this species which is currently only known from the Scott Coastal Plain and the Lake Muir area.

4. *Rhodanthe pyrethrum* (Asteraceae)
This is here at its northern margin. This species was previously recorded from Julimar Conservation Park and on the Swan Coastal Plain.

DISCUSSION

Griffin (1992) recorded 33 vegetation types and variants in the nearby but much larger Julimar Conservation Park. These were six variants of wandoo woodland, four of jarrah woodland, three of powderbark wandoo woodland, three mixed woodlands, 11 heath variants and six wetland vegetation variants, including a claypan dominated by *Melaleuca viminea*. He did not record a *Melaleuca lateritia* dominated claypan or a wandoo woodland over sedges. Interestingly, we did not record powderbark wandoo on the laterite ridges, suggesting that this species reaches its inland limit at Julimar.

Two of the valley communities (3b and 8) have been rarely recorded in the Biological Survey of the Agricultural Zone. The wandoo woodland over dense low sedges (vegetation type 3b, Fig. 2) is a vegetation type we have not recorded elsewhere in the Biological Survey. The Freshwater claypan (8) dominated by *Melaleuca lateritia* has been rarely recorded during our survey, as a community largely confined to the Swan Coastal Plain and parts of the jarrah forest, it is here at its eastern limit. The *Banksia* woodland present in Drummond Nature Reserve is also at its eastern limit.

Drummond Nature Reserve contains a mixture of communities that characterise the eastern jarrah forest, several of which are at or near their inland limits. This is not unexpected since the reserve is near the eastern margin of the IBRA Jarrah Forest Bioregion.

Griffin (1992) recorded 358 species of vascular plants in Julimar Conservation Park (28,317 hectares, c. 15 km south-west). Subsequent surveys, chiefly by the authors, have increased this number to 583; however, the list is still incomplete. A comparison between the two reserves for flora and vegetation shows that Julimar contains over 180 species not listed for Drummond Nature Reserve. A large proportion of this difference can be attributed to the larger size of Julimar, which contains a greater diversity of habitats with, for example, large granite rocks and breakaways. There is also an attenuation of many jarrah forest elements (for example, *Eucalyptus accedens*, *Lepidosperma squamatum*, *Tetraria capillaris*, *Persoonia elliptica* and *Acacia urophylla*) that do not extend to Drummond Nature Reserve. This is probably due to the sharp rainfall gradients between the reserves. Drummond Nature Reserve, in contrast, contains elements of the sandplains of the Avon IBRA region (*Tricoryne arenicola*, *Caesia alfordii*, *Lomandra effusa*, *Platysace teres*, *Leucopogon taminensis* and *Verticordia roei*) that are not found in Julimar.

Drummond Nature Reserve contains a rich and diverse range of vegetation communities and vascular plant species. Many of the significant communities and flora occur low in the landscape and are under threat by saline water inflows.

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