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Report on the limestone vegetation of Wabling Hill area, Reserves 39411 and 39412, and the Ridges extension to Yanchep National Park.

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ABSTRACT

An assessment was undertaken of the vegetation of the massive limestone ridges north of Perth. Massive tops were occupied by *Melaleuca huegelii - M. acerosa* shrublands (floristic community type 26a - Gibson *et al.* 1994). Only 111 ha of this community type was located in the study area. Nineteen hectares of this community type are reserved in Yanchep National Park. On the deeper soils off the massive tops two other community types (26b and 27) were found. These types are much more widespread than community type 26a with extensive areas in Yanchep National Park and further south in Yalgorup National Park.

It is recommended that community type 26a be recognised as a critically threatened community type rather than susceptible as has been suggested earlier (Gibson *et al.* 1994). It is further recommended that the Ridges extension of Yanchep National Park be declared as has been recommended previously (CALM 1989, 1992) and that the Wabling Hill area also be reserved in order to protect the largest two remaining occurrences of this community type.

INTRODUCTION

Three floristic community types (types 26a, 26b and 27) are known to occur on the massive limestone ridges north and south of Perth (Gibson *et al.* 1994). The massive limestone ridge tops are generally occupied by *Melaleuca huegelii - M. acerosa* shrublands (type 26a), which give way to tall heaths, thickets, woodlands and mallees (type 26b) on ridges or slopes with more soil development. Where shrublands and mallee become very dense the species poor community type 27 occurs. This is a much more restricted community type than the previous types.

In the 1994 report floristic community type 26a was reported as not occurring in any secure conservation reserve. Community type 26b was recorded from Yalgorup National Park and Mealup Nature Reserve, while type 27 was found at Yalgorup National Park over some 25 km. None of these three floristic community types was know from any secure conservation reserve north of Perth, but types 26a and 26b were known to occur in the proposed Ridges extension of Yanchep National Park (CALM 1989), and Wabling Hill area. Type 26a was also known from Shire View Hill area, which was placed on DEP interim protected list in 1994 (DEP 1994). No area figures were available on the extent of these floristic community types.

Given the strong mining interest in the limestone ridges north of Perth, this study was commissioned to determine the occurrence and extent of these floristic community types in the Ridges - Wabling Hill area and to determine regional reservation status.

METHODS

Fifteen 10m x 10m quadrats were established in four areas where major limestone ridges were known to occur (Reserves 39411 and 39412, the Wabling Hill area, and in the Ridges extension of Yanchep

National Park in an area west of Banjo Rd and the Haddrill Rd area - Figure 1). All these areas and the Parrot Ridge area (which was surveyed in the 1994 study) are subject to current mining interest.

Each plot was visited on two occasions in spring of 1996. Sampling was concentrated on the limestone uplands. Care was taken to locate sites in the least disturbed vegetation available in the area. Within each plot all vascular plants were recorded. Data on topographical position, slope, aspect, percentage litter, percentage bare ground, percentage exposed rock, vegetation structure and condition were collected from each site. Vegetation structure was recorded using Muir's (1977) classification. All sites were permanently marked with four steel fence droppers and their positions fixed using a GPS unit.

These fifteen sites were compared to the 1994 classification by the use of the ALOC routine in PATN numerical analysis package (Belbin 1993). The existing classification was used to generate group centroids with which the new sites were compared. There was some minor reclassification of the 1994 groupings using this method, but these did not influence the limestone community types under discussion.

Nomenclature follows Green (1985) and current usage at the Western Australian Herbarium (PERTH). Selected voucher specimens will be lodged in PERTH.

After the floristic grouping of the new quadrats had been determined, these and the existing plots from Parrot Ridge and Wilbinga Hill were used to map the extent of the limestone community from available 1:12500 and 1:20000 colour air photographs. Type 26a could be distinguished with a high level of confidence. Types 26b and 27 could also be distinguished from the surrounding *Banksia* woodlands (type 28) but could not be distinguished from each other. The area figures derived from this mapping should be considered indicative since uncorrected photos were used and generally stereo pairs were not available. Mapping of community type 26a was carried out across the study area, but types 26b/27 was only mapped in the Wabling Hill area and reserve 39411.

RESULTS

FLORA

A total of 225 taxa (species, subspecies and varieties) were recorded from study area. The flora list was compiled from taxa found within the 15 plots or the adjacent area (Appendix 1). Of these 225 taxa, 193 were native and 33 were weeds. The best represented families were the Proteaceae (17 native taxa), Asteraceae (16 native taxa and 4 weeds), Orchidaceae (15 native taxa), Apiaceae (10 native taxa), and Poaceae (9 native taxa and 8 weeds) The Papilionaceae (9 native taxa, 2 weeds). Myrtaceae (9 taxa) and Cyperaceae (7 taxa) were less well represented than reported for the coastal plain as a whole (Gibson *et al.* 1996). The most significant components of the weed flora were the annual grasses (7 taxa) and the Caryophyllaceae (5 taxa).

Four priority taxa were found in the current survey (Table 1, CALM 1996). In addition *Lepidium lyratogynum* was found at Wabling Hill, a range extension from Jurien Bay. The annual grass *Rostraria pumila* was also recorded for the first time from the Coastal Plain. This weed is generally found in the Carnarvon Basin, the wheatbelt and out near Eyre. Keighery (1992) lists 33 significant species of the Quindalup and Spearwood systems which are endemic to the Swan Coastal Plain; 17 of these taxa were recorded in the present survey.

Table 1 Priority taxa found in current survey

Taxa	**Priority**
Carpobrotus sp. Hepburn (GJ Keighery 11518)	1
Conostylis pauciflora subsp. *euryrhipis*	3
Olax scalariformis	3
Stylidium maritima ms	3

VEGETATION

The plots were placed primarily to sample the upland limestone vegetation. Species richness varied from 38 to 83 taxa / plot (average 56.9 taxa / plot). Floristic community type 26a was recorded as being present on all the limestone ridges sampled. In addition types 26b and 27 were also sampled at some sites. The area near Haddrill Rd had been burnt recently, and it was difficult to find undisturbed sites to sample. Community type 26a was recorded from an upland site while the two lowland sites were the typical spearwood *Banksia* woodland of the area (type 28)(Table 2).

Table 2. Classification of 15 new plots into the 1994 classification.

Area	Type 26a	Type 26b	Type 27	Type 28	Source
Reserve 39411 area	+	+			Present study
Wabling Hill area	+	+			Present study
Reserve 39412 area	+		+		Present study
Ridges extension					
Parrot Ridge area	+	+			1994 study
area west Banjo Rd	+				Present study
Haddrill Rd area	+			+	Present study
Yanchep National Park					
E of Wanneroo Rd	+				Present study
W of Wanneroo Rd	+				CALM unpub

The 1994 study had previously established that floristic community type 26a also occurred along Parrot Ridge and at Wilbinga Hill (1 km NE Wabling Hill). This study also indicated that floristic community type 26b was widespread in the Ridges extension.

The floristic community type 26a was mapped across the study area and in Yanchep National Park to allow for reservation assessment (Table 3). Community type 26b was mapped in the north of the study area. In the central and southern part of the Ridges extension this community forms extensive stands in a complex mosaic with community type 28. It is also common in Yanchep National Park, part of which has been previously mapped (Figure 2, Arnold 1990). Arnold's hZc unit appears to correspond to type 26b/27.

Table 3. Estimates of areas of different floristic community types. Estimates derived from uncorrected airphotos and limited ground truthing.

Area	Area type 26a	Area 26b & 27	Airphoto interpretation	Field checking
Reserve 39411 area	10.7 ha (9 patches)	41.0 ha (4 patches)	AW	Yes
Wabling Hill area	47.1 ha (22 patches)	89.5 ha (9 patches)	AW	Yes
Reserve 39412 area	1.6 ha (2 patches)	7.36 ha (1 patch)	NG	No
Ridges extension				
Parrot Ridge area	22.1 ha (3 patches)	not mapped	NG	No
area west Banjo Rd	9.6 ha (4 patches)	not mapped but extensive	AW/NG	No
Haddrill Rd area	2.4 ha (2 patches)	not mapped but extensive	AW/NG	No
Yanchep National Park				
E of Wanneroo Rd	5.7 ha (3 patches)	not mapped but extensive	AW	No
W of Wanneroo Rd	13.0 ha (3 patches)	not mapped but extensive	NG	No
TOTAL	111.1 ha			

The data clearly indicate that floristic community type 26a has very restricted distribution. Only 111 ha were located during the present survey and only 19 ha occurs in a secure conservation reserve. This

community is also know from small patches in the Shire View Hill area (Gibson *et al.* 1994, DEP, unpublished data). Other small occurrences could be expected to occur in State Forest 65 and adjacent lands. However, no other large occurrences are known. Given the extensive work undertaken in this area over the last five years, it is considered unlikely that large areas (patches > 10 ha) will be located.

Floristic community type 26b/27 appears to be widespread in both Yanchep National Park and the surrounding areas.

DISCUSSION

Data on both the flora and vegetation highlight the conservation significance of the massive limestone ridges north of Perth. More than half the endemic taxa of the Quindalup and Spearwood systems (Keighery 1992) were recorded in or adjacent to the 15 plots established in this study. That two significant range extensions were recorded indicates how poor our knowledge of the flora within 100 km of Perth still remains.

Regionally community type 26a is largely restricted to the massive limestone ridges north of Perth, while one outlying occurrence of this community type has been recorded south of Perth on a limestone ridge in Lake Clifton townsite (Figure 3, Gibson *et al.* 1994). The present vegetation mapping clearly shows the restricted local nature of this floristic community. Given the continued pressure for limestone, this community type should be regarded as a "critically endangered" community type and not just "susceptible" as proposed in the earlier report (Gibson *et al.* 1994). All remaining areas are of high conservation significance. The present reservation of 19 ha in six small patches in Yanchep National Park cannot be considered adequate reservation.

The largest occurrences in the Wabling Hill - Wilbinga Hill and Parrot Ridge areas are the best remaining examples of this community type. Quarries already occur in both these areas. This community type is presently also being mined near Shire View Hill (some 20 km south of Parrot Ridge) with further proposals for mining presently being considered. While other small occurrences of this community type probably occur in State Forest 65 and surrounding lands no other large patches have been identified by either CALM or DEP in surveys of the coastal plain over the last five years. To the south of Perth this community type is only known from the Lake Clifton townsite.

In contrast, community type 26b/27 is much more widespread, and significant areas of this community type are represented in Yanchep National Park. and further south in Yalgorup National Park.

It is recommended that:

1. Community type 26a be considered a critically threatened community.

2. Ridges extension to Yanchep National Park should proceed in line with the earlier recommendations (CALM 1989, CALM 1992) to protect one of the best remaining examples of this community type.

3. That priority be given for reservation of the Wabling Hill - Wilbinga Hill area to reserve the largest remaining example of this community type.

4. That the purpose and vesting of reserves 39411 and 39412 be changed to A class Nature Reserve vested in the NPNCA.

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Appendix 1. List of taxa recorded in or adjacent to the 15 plots established in spring 1996

Family: Aizoaceae (110)
* Carpobrotus edulis
Carpobrotus sp.Hepburn (G.J.Keighery 11518) PN
Carpobrotus virescens

Family: Anthericaceae (054F)
Corynotheca micrantha
Sowerbaea laxiflora
Thysanotus arenarius
Thysanotus manglesianus
Thysanotus patersonii
Thysanotus thyrsoideus
Thysanotus triandrus
Tricoryne elatior

Family: Apiaceae (281)
Daucus glochidiatus
Homalosciadium homalocarpum
Hydrocotyle blepharocarpa
Hydrocotyle callicarpa
Hydrocotyle capillaris
Hydrocotyle diantha
Hydrocotyle hispidula
Hydrocotyle pilifera var. glabrata
Trachymene pilosa
Xanthosia huegelii

Family: Asteraceae (345)
Asteridea athrixioides
Brachyscome iberidifolia
Gnaphalium sphaericum
Hyalosperma cotula
* Hypochaeris glabra
Lagenifera huegelii
Millotia tenuifolia
Podolepis lessonii
Podotheca angustifolia
Podotheca chrysantha
Podotheca gnaphalioides
Quinetia urvillei
Rhodanthe corymbosa
Senecio lautus
Siloxerus humifusus
* Sonchus oleraceus
* Urospermum picroides
* Ursinia anthemoides
Waitzia citrina
Waitzia suaveolens

Family: Brassicaceae (138)
* Heliophila pusilla
Lepidium lyratogynum
Lepidium rotundum
* Sisymbrium orientale
Stenopetalum robustum

Family: Campanulaceae (339)
* Wahlenbergia capensis
Wahlenbergia preissii

Family: Caryophyllaceae (113)
* Cerastium glomeratum
* Minuartia hybrida
* Petrorhagia velutina
* Sagina apetala
* Stellaria media

Family: Casuarinaceae (070)
Allocasuarina humilis

Family: Centrolepidaceae (040)
Centrolepis drummondiana

Family: Chenopodiaceae (105)
Rhagodia baccata

Family: Colchicaceae (054J)
Burchardia umbellata
Wurmbea monantha

Family: Crassulaceae (149)
Crassula colorata
Crassula exserta
* Crassula glomerata

Family: Cyperaceae (032)
Isolepis marginata
Lepidosperma sp. (BJK&NG 231)
Lepidosperma angustatum
Mesomelaena pseudostygia
Schoenus clandestinus
Schoenus latitans
Schoenus subflavus

Family: Dasypogonaceae (054C)
Acanthocarpus preissii
Lomandra caespitosa

Family: Dilleniaceae (226)
Hibbertia huegelii
Hibbertia hypericoides
Hibbertia racemosa

Family: Droseraceae (143)
Drosera erythrorhiza subsp. erythrorhiza
Drosera glanduligera
Drosera macrantha
Drosera menziesii
Drosera pallida

Family: Epacridaceae (288)

Conostephium pendulum
Leucopogon parviflorus
Leucopogon polymorphus
Leucopogon propinquus

Family: Euphorbiaceae (185)
Beyeria cinerea
Phyllanthus calycinus
Poranthera microphylla

Family: Geraniaceae (167)
* Erodium cicutarium
* Pelargonium capitatum
Pelargonium littorale

Family: Goodeniaceae (341)
Lechenaultia linarioides
Scaevola globulifera
Scaevola thesioides

Family: Gyrostemonaceae (108)
Tersonia cyathiflora

Family: Haemodoraceae (055)
Anigozanthos humilis
Anigozanthos manglesii
Conostylis candicans
Conostylis pauciflora subsp. euryrhipis
Conostylis setigera
Haemodorum laxum
Haemodorum paniculatum
Haemodorum spicatum

Family: Iridaceae (060)
* Gladiolus caryophyllaceus
Patersonia occidentalis
* Romulea rosea

Family: Juncaginaceae (026)
Triglochin calcitrapum
Triglochin centrocarpum
Triglochin trichophorum

Family: Lamiaceae (313)
Hemiandra pungens
Hemigenia barbata

Family: Lauraceae (131)
Cassytha flava
Cassytha racemosa

Family: Lobeliaceae (340)
Isotoma hypocrateriformis
Lobelia heterophylla
Lobelia tenuior

Family: Loganiaceae (302)
Mitrasacme paradoxa

Family: Loranthaceae (097)
Nuytsia floribunda

Family: Mimosaceae (163)
Acacia lasiocarpa
Acacia pulchella var. glaberrima
Acacia rostellifera

Family: Myoporaceae (326)
Eremophila glabra

Family: Myrtaceae (273)
Baeckea robusta
Calothamnus quadrifidus
Calytrix strigosa
Eremaea pauciflora
Eucalyptus decipiens
Eucalyptus foecunda
Hypocalymma angustifolium
Melaleuca acerosa
Melaleuca huegelii

Family: Olacaceae (095)
Olax scalariformis

Family: Orchidaceae (066)
Burnettia nigricans MS
Caladenia bicalliata
Caladenia flava
Caladenia latifolia
Caladenia longicauda subsp. calcigena MS
Caladenia reptans
Cyrtostylis huegelii
Elythranthera brunonis
Eriochilus dilatatus
Microtis media
Prasophyllum elatum
Pterostylis aff. nana
Pterostylis aspera
Pterostylis brevisepala MS
Pterostylis vittata

Family: Papilionaceae (165)
Bossiaea eriocarpa
Daviesia divaricata
Gompholobium tomentosum
Hardenbergia comptoniana
Isotropis cuneifolia
Jacksonia stricta
Kennedia prostrata
Mirbelia trichocalyx
Templetonia retusa
* Trifolium campestre
* Trifolium dubium

Family: Phormiaceae (054E)
Dianella revoluta

Family: Pittosporaceae (152)
Sollya heterophylla

Family: Poaceae (031)
* Aira caryophyllea
* Avellinia michelii
Bromus arenarius
* Bromus diandrus
Danthonia occidentalis
* Ehrharta brevifolia
* Ehrharta calycina
* Ehrharta longiflora
Microlaena stipoides
Poa drummondiana
Poa poiformis
* Rostraria pumila
Stipa compressa
Stipa flavescens
Stipa pycnostachya
Stipa tenuifolia
* Vulpia myuros

Family: Polygalaceae (183)
Comesperma integerrimum

Family: Polygonaceae (103)
Muehlenbeckia polybotrya

Family: Portulacaceae (111)
Calandrinia brevipedata
Calandrinia corrigioloides
Calandrinia granulifera
Calandrinia liniflora

Family: Primulaceae (293)
* Anagallis arvensis

Family: Proteaceae (090)
Banksia attenuata
Conospermum stoechadis
Conospermum triplinervium
Dryandra nivea
Dryandra sessilis
Grevillea preissii
Hakea costata
Hakea lissocarpha
Hakea prostrata
Hakea ruscifolia
Hakea trifurcata
Petrophile brevifolia
Petrophile linearis
Petrophile macrostachya
Petrophile serruriae
Stirlingia latifolia
Synaphea spinulosa

Family: Ranunculaceae (119)
Ranunculus pumilio

Family: Restionaceae (039)
Lepidobolus preissianus
Loxocarya aspera MS
Loxocarya flexuosa

Family: Rhamnaceae (215)
Trymalium ledifolium

Family: Rubiaceae (331)
* Galium murale
Opercularia vaginata

Family: Rutaceae (175)
Boronia ramosa subsp. anethifolia

Family: Sapindaceae (207)
Diplopeltis huegelii
Dodonaea aptera

Family: Scrophulariaceae (316)
* Dischisma arenarium
* Parentucellia latifolia

Family: Solanaceae (315)
* Solanum nigrum

Family: Stackhousiaceae (202)
Stackhousia monogyna

Family: Stylidiaceae (343)
Levenhookia stipitata
Stylidium brunonianum
Stylidium bulbiferum
Stylidium calcaratum
Stylidium junceum
Stylidium macrocarpum
Stylidium maritima MS
Stylidium repens

Family: Thymelaeaceae (263)
Pimelea calcicola

Family: Urticaceae (088)
Parietaria debilis

Family: Violaceae (243)
Hybanthus calycinus

Family: Xanthorrhoeaceae (054D)
Xanthorrhoea preissii

Family: Zamiaceae (016A)
Macrozamia riedlei