Gnangara Sustainability Strategy

An across-government initiative

Groundwater – Biodiversity – Land use

PATTERNS OF FLORISTIC DIVERSITY IN THE GNANGARA SUSTAINABILITY STRATEGY STUDY AREA

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Patterns of Floristic diversity in the Gnangara Sustainability Strategy study area

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Report for the Gnangara Sustainability Strategy and the Department of Environment and Conservation

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Introduction

The GSS study area is located on the western coast of south-west Western Australia and is internationally renowned for its high floristic diversity and endemism (Beard *et al.* 2000; Hopper and Gioia 2004). South-west Western Australia has been identified as one of the world's biodiversity hotspots, defined as regions containing outstanding biodiversity values that have undergone or are experiencing exceptional loss of habitat (Mittermeier *et al.* 2004). Known as the South West Botanical Province (Beard *et al.* 2000), or the South Western Australian Floristic Region (Hopper and Gioia in prep.; Hopper and Gioia 2004), the south-west of Western Australia has > 7000 vascular plant taxa, of which approximately 50 % are endemic (Coates and Atkins 2001; Hopper and Gioia 2004).

Assessing the conservation status of all components in diverse areas such as south-west Western Australia is often difficult (Keighery *et al.* 2007; Reyers *et al.* 2000). For conservation planning purposes, regions are often separated into different vegetation groups and land-system maps (Bowker 2000; Reyers *et al.* 2001) on which units are methods to represent surrogates of biodiversity typical of that area. In south-west Western Australia there are a number of vegetation classification systems, most of which represent a combination of soil type, floristics and climate (e.g. vegetation complexes; Heddle *et al.* 1980). In addition to species richness and vegetation units, the condition (or quality) of vegetation units is now widely used as a surrogate for biodiversity (Saunders *et al.* 1998), and may be assessed in a number of ways, including the use of remote sensing techniques.

Western Australia is covered by Beard's vegetation mapping (Beard 1990). The GSS study area is located in the IBRA Perth Coastal Plain subregion (SWA2), hereafter referred to as the Swan Coastal Plain (SCP). The SCP is a narrow strip of land that runs parallel to the coast and is bordered by the Darling Scarp and Gingin Scarp to the east. The area surrounding Perth is highly populated, and clearing of native habitat for

agriculture and urbanisation has been extensive. However, in the centre of the GSS study area there remains the largest continuous area of remnant vegetation on the SCP, being south of the Moore River and covering over 60 000 ha (Sonneman and Brown 2008). Remnant vegetation has significant State biodiversity values, as it contains a number of Bush Forever sites, threatened species and ecological communities, and a suite of some 600 wetlands (Government of Western Australia 2000a).

There have been a number of major studies on the flora of the SCP (Gibson *et al.* 1994; Keighery 1999; Marchant *et al.* 1987). Within the Perth Metropolitan Region alone, > 1 200 native taxa have been identified (DEP 1996). Species richness in the Swan Coastal Plain is high and floristic quadrat (10 x 10 m) estimates range from 9 to 66 taxa (Government of Western Australia 2000b). The highest diversity has been recorded in woodlands of the Bassendean Dunes and on the eastern side of the SCP (Government of Western Australia 2000b). Woody native species from the Myrtaceae and Proteaceae families tend to dominate the flora of the GSS and the SCP (Barrett and Pin Tay 2005). Prominent overstorey species in the GSS include tuart (*Eucalyptus gomphocephala*), jarrah (*E. marginata*), marri (*Corymbia calophylla*), the coastal blackbutt (*E. todtiana*), *Melaleuca* spp., as well as several *Banksia* species, including the slender banksia (*B. attenuata*), firewood banksia (*B. menziesii*), holly-leaved banksia (*B. ilicifolia*) and the swamp banksia (*B. littoralis*). Indeed, the *Banksia* woodlands typical of the GSS study area are floristically rich, taxonomically diverse, and exhibit a high degree of variability in the understorey (Dodd and Griffin 1989). In addition, there are a number of wetland associated plant species and vegetation communities.

The species richness in the GSS study area was examined using herbarium records on species location datasets to determine total species richness and dominant plant taxa . Within the GSS study area, the total number of plant taxa (species and infraspecies) that have been recorded is 1 901, including *1 337 native taxa and 564 introduced taxa.* A total of 157 plant families were recorded from the GSS study area, comprising 649 genera, of which 316 genera include alien taxa. The ten dominant families include ~ 53 % of the total native vascular taxa recorded in the GSS study area and include: Myrtaceae, Proteaceae, Cyperaceae, Orchidaceae, Asteraceae, Papilionaceae, Stylidiaceae, Poaceae, Haemodoraceae and Mimosaceae. The twelve dominant genera within the GSS study area contribute ~ 22 % of the total native vascular taxa recorded,

and include: *Melaleuca, Verticordia, Banksia* (including *Dryandra* taxa), *Hakea, Schoenus, Caladenia, Stylidium, Conostylis, Acacia, Leucopogon, Drosera* and *Hibbertia*. There are 17 *Banksia* species known from the GSS study area, including 9 species formerly considered in the genus *Dryandra* (Mast and Thiele 2007).

Purpose of the study

This project aimed to assess the current occurrence and distribution of plant taxa across the GSS fauna study site locations, and examined patterns in species richness with landscape features. Specifically, we were interested in examining plant species composition between the two main landforms (Bassendean and Spearwood dunes), among a number of dominant vegetation types, and between sites with different years since last fire. The surveys were conducted in parallel to a concurrent survey of ground-welling vertebrates (Valentine *et al.* 2009). In addition, we were interested in the plant species composition at wetland sites within the GSS known for their location records of two priority fauna species, rakali (water rats, *Hydromys chrysogaster*) and quenda (southern brown bandicoot, *Isoodon obesulus*).

Methods

Study Area

The GSS study area is situated on the Swan Coastal Plain and extends from the Swan River in the south, to the Moore River and Gingin Brook in the north, and from the Ellen Brook in the east to the Indian Ocean in the west (DOW 2008). The Swan Coastal Plain is built up from foothill, aeolian, lake, river and estuarine deposits laid down to the west of the scarp (Davidson 1995). Three main dune systems underlie most of the groundwater system – the younger Quindalup Dunes close to the coast, the Spearwood Dunes associated with Tamala Limestone ridges within about ten kilometres of the coast and the inland Bassendean Dunes which are older and flatter, and contain leached and slightly acidic sands (Figure 1).

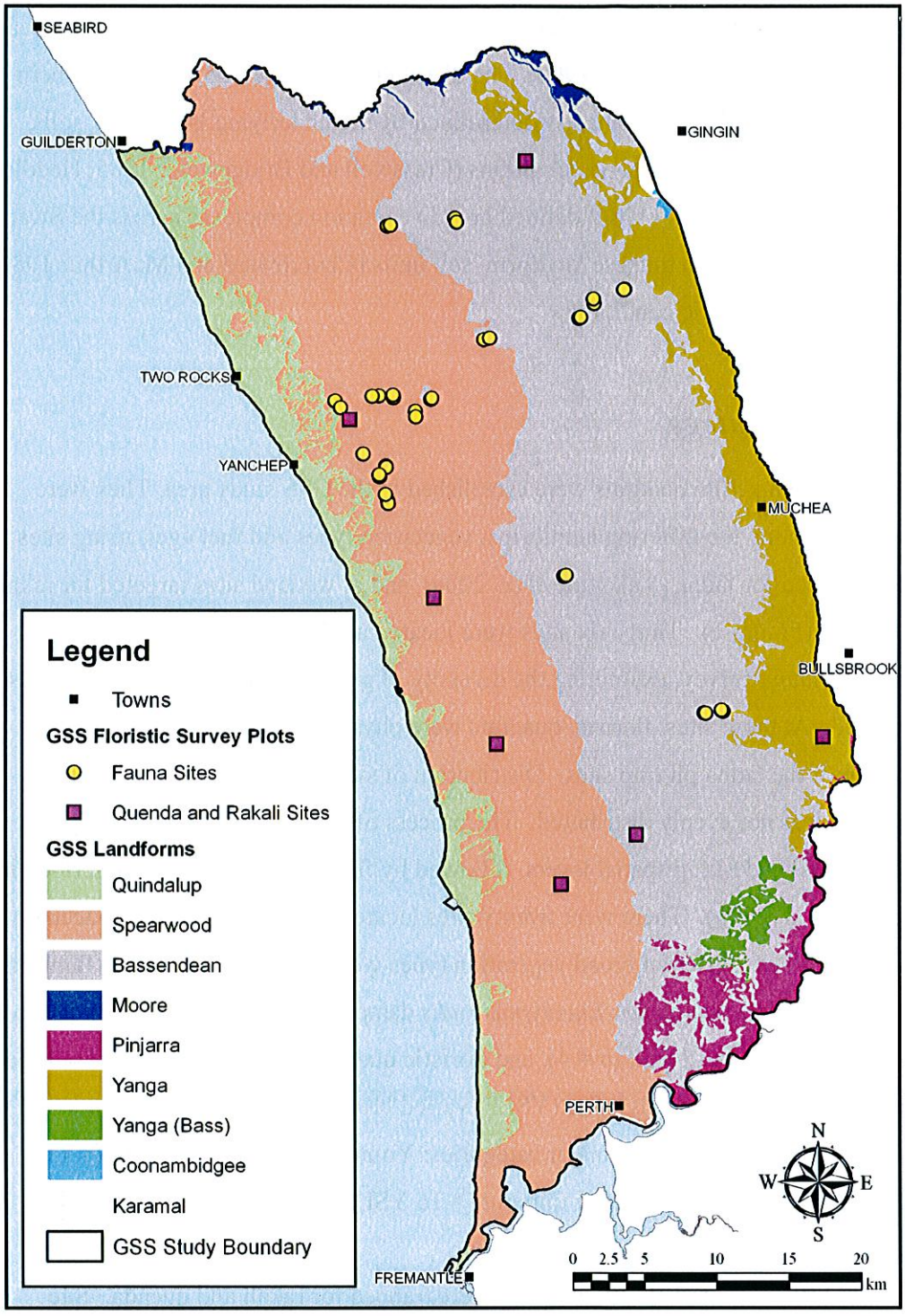

Figure 1. Map of survey site locations across landform

The three main dune systems are dominated by a *Banksia* overstorey with sporadic stands of *Eucalyptus* and *Allocasuarina*, and an understorey consisting mainly of low shrubs from the Myrtaceae, Papilionaceae, and Proteaceae families. There are many

seasonal damplands, swamps and permanent wetlands, fringed by *Banksia littoralis* and *Melaleuca* trees with a variable understorey of species from the Cyperaceae, Juncaceae and Myrtaceae (Semeniuk *et al.* 1990). The distribution of vegetation on the northern Swan Coastal Plain is predominantly determined by the underlying landforms, soils, depth to water table and climatic conditions (Cresswell and Bridgewater 1985; Heddle *et al.* 1980). Heddle *et al.* (1980) defined broad vegetation complexes across the Swan Coastal Plain in relation to these landform–soil units (Churchward and McArthur 1980) and the varying climatic conditions.

Sampling Strategy

Forty three 10m x 10m quadrats were established in the GSS study area. They were distributed among the differing landforms, vegetation types and fuel ages, using sites pit-fall trapped for fauna (Valentine *et al.* 2009), and at wetland sites targeted for rakali and quenda (Figure 1). Thirty six sites were located at pit-fall trap locations where a concurrent fauna survey, examining the diversity of ground-dwelling vertebrates, was conducted. At these sites, floristic quadrats were physically located adjacent to the centre pit of the fauna pit trap sites. Distribution of sites among landscape features varied and was not evenly distributed. The process of site selection was initially conducted using desktop spatial layers, followed by field validation and is described in Valentine et al (2009). There were twenty sites located on Spearwood and sixteen on Bassendean. Four different broad vegetation types were identified, including Banksia woodland (n = 16), *Melaleuca/Eucalyptus rudis* dampland or wetland (n = 12), jarrah forest (n = 4) and tuart forest (n = 4), and floristic quadrats were situated in these broad groupings. The year since last fire (YSLF) varied broadly among sites (3 – 36 YSLF) and we grouped sites into two major categories: Young, those recently burnt (< 11 YSLF; n = 19), or Old, those long unburnt (> 16 YSLF; n = 17).

Seven sites were located at wetlands that were trapped for rakali and quenda. Site selection of wetlands and damplands was based on broad habitat features that may be appropriate for these species, and is described in Valentine et al (2009). At these sites floristic plots were located approximately in the middle of the Rakali/Quenda trapping lines with one edge of the quadrat on the water line where there was free water.

The vascular plant surveys were conducted in spring 2008, during the period September to November. All vascular plant species within each quadrat were recorded, collected and dried in plant presses and were later identified by a botanist. The nomenclature was checked using the Western Australian Herbarium's plant collection database MAX. Species abundance estimates were not calculated.

The quadrat locations were fixed using a GPS, using GDA94 as the datum, at the centre of the quadrat which was physically marked using galvanised fence droppers. A photo was taken across the quadrat facing away from the sun for best lighting. The slope of the site was recorded, its aspect, and the surface and subsurface soil were recorded in basic form. The characteristics of drainage were estimated as well as what time of year it was thought to be wet.

Litter cover and bare ground were estimated within each 10 x 10 m quadrat in percentage, to the nearest 5%. The vegetation structure and cover at each site were recorded using Keighery (2005) which has been modified from Muir (1977) in that the growth forms have different height classes. However this should not affect the results because the NVIS (National Vegetation Information System) requires that the maximum height of the layer be recorded and from this the vegetation structure can be made to fit differing height class scales if needed. The crown cover is estimated to as close to 5% as per the NVIS as well as the class rating in Muir (1977). Up to three dominant species were recorded as part of each layer and any more that three dominants were classed as mixed. Vegetation condition was recorded using the Keighery (2005) Vegetation Condition Scale. A reading was taken along the trap lines using a Lemmon Spherical Densiometer to provide a measure of canopy cover at each site.

Analysis

Estimates of species richness at each site were determined using all plant species that were able to be differentiated as different taxa within each site. To examine patterns in data, one-way ANOVAs (using SPSS 2008, version 17) were used to examining species richness between landform (Bassendean, Spearwood), vegetation type (*Banksia*, jarrah, *Melaleuca* and tuart) and fire age (young, old) were conducted. Post-hoc Tukey HSD tests were used to determine differences among vegetation types where applicable. As

the number of replicates within jarrah and tuart sites was particularly low (n = 4), we excluded these vegetation types to better examine the potential interaction between Banksia and Melaleuca vegetation type, and time since last fire. We conducted a two-way ANOVA using vegetation type (banksia vs Melaleuca) and time since last fire (Young, < 11 YSLF vs Old, > 16 YSLF).

For community analyses, taxa that could not be distinctly identified between sites were excluded from analysis. Where there were was difficulty in differentiating between similarly related taxa these were grouped (eg. *Xanthorrhoea preissii* and *Xanthorrhoea brunonis*). Subspecies were reduced to the parent taxa. See Appendix 3 for full list of grouped combinations and Appendix 4 for Species/Site list. The composition of species was examined among landscape features (landform unit, vegetation type and fuel age) using Multi-Response Permutation Procedure (MRPP, Mielke 1984), based on a rank-transformed Sorensen distance matrix in the statistical package, PC-ORD (McCune and Mefford 1999). Rare species (species that were observed in less than two sites) were not included in the analysis. MRPP is a type of nonparametric multivariate procedure for testing differences between groups and provides an A statistic, which is the chance-corrected within group agreement, and an associated p-value (McCune *et al.* 2002). Post-hoc pair-wise comparisons were used to examine differences in plant species composition among vegetation types. Where community composition differed significantly among factors ($\alpha < 0.05$), non-metric multidimensional scaling (NMDS, Kruskal 1964) was used to graphically depict the site assemblage relationships using PC-ORD (McCune and Mefford 1999). Dimensionality of ordinations was determined using scree plots and Monte Carlo tests.

An indicator species analysis, using Dufrene and Legenre's (1997) method, was also performed to detect which species were indicators of the three different landscape features from our study sites. Indicator species analysis combines information on the concentration of species and the faithfulness of occurrences within categories to produce a indicator value for each species within each categorical grouping (McCune and Mefford 1999). These indicator values are then tested for significance using MonteCarlo randomization techniques (McCune and Mefford 1999). A perfect indicator species should always be present and exclusive to a particular.

The species richness of the sites trapped for quenda and rakali are examined and provided in tabulated format.

Limitations

Due to time constraints, all floristic plots were sampled only once in Spring 2008. Some species that were not flowering at the time of sampling were unable to be identified and therefore not all collections were identified fully.

Results

Occurrence and distribution of flora

For the fauna sites there were, in total, 317 species in 197 Genera within 60 families (See Table 1.) This information was from the 1532 specimen records comprising 107 unknown taxa of which 7, 56 and 44 records were unable to be identified to family, genera and species respectively.

The number of species in families

Myrtaceae, Asteraceae, Papilionaceae and Proteaceae had 30, 34, 23 and 21 species respectively which represented over 30.9 % of the total species recorded in the fauna trap flora plots. There were also 26 families that had only one species represented within them making up 8.2 % of the total number of species (See table 1).

Table 1. Numbers of species in each family occurring in the floristic plots.

Family	Number of Species	% of Total Species	Family	Number of Species	% of Total Species
Myrtaceae	30	9.5	Loganiaceae	2	0.6
Asteraceae	24	7.6	Stackhousiaceae	2	0.6
Papilionaceae	23	7.3	Violaceae	2	0.6
Proteaceae	21	6.6	Xanthorrhoeaceae	2	0.6
Asparagaceae	19	6.0	Asphodelaceae	1	0.3
Poaceae	17	5.4	Brassicaceae	1	0.3
Cyperaceae	14	4.4	Campanulaceae	1	0.3
Haemodoraceae	13	4.1	Centrolepidaceae	1	0.3
Stylidiaceae	13	4.1	Chenopodiaceae	1	0.3
Orchidaceae	12	3.8	Colchicaceae	1	0.3
Epacridaceae	10	3.2	Commelinaceae	1	0.3
Apiaceae	7	2.2	Dennstaedtiaceae	1	0.3
Droseraceae	7	2.2	Fumariaceae	1	0.3

Family	Number of Species	% of Total Species	Family	Number of Species	% of Total Species
Mimosaceae	7	2.2	Haloragaceae	1	0.3
Restionaceae	7	2.2	Lamiaceae	1	0.3
Goodeniaceae	6	1.9	Lobeliaceae	1	0.3
Hemerocallidaceae	7	2.2	Loranthaceae	1	0.3
Dilleniaceae	5	1.6	Molluginaceae	1	0.3
Euphorbiaceae	5	1.6	Myoporaceae	1	0.3
Iridaceae	5	1.6	Orobanchaceae	1	0.3
Caryophyllaceae	4	1.3	Oxalidaceae	1	0.3
Geraniaceae	4	1.3	Polygalaceae	1	0.3
Crassulaceae	3	0.9	Primulaceae	1	0.3
Dasypogonaceae	3	0.9	Ranunculaceae	1	0.3
Lauraceae	3	0.9	Rhamnaceae	1	0.3
Portulacaceae	3	0.9	Santalaceae	1	0.3
Rubiaceae	3	0.9	Solanaceae	1	0.3
Rutaceae	3	0.9	Thymelaeaceae	1	0.3
Scrophulariaceae	3	0.9	Urticaceae	1	0.3
Casuarinaceae	2	0.6	Zamiaceae	1	0.3
			Total (62 Families)	**317**	**100%**

Myrtaceae, Poaceae, Asteraceae, Cyperaceae and Papilionaceae had 14, 14, 13, 9 and 9 species respectively which represented over 46% of the total species recorded in the Quenda/Rakali survey. There were also 19 families that had only one species represented within them making up 14.82 % of the total number of species (see Table 2).

Table 2. Numbers of species in each family occurring at Rakali/Quenda sites

Family	Number of Species	%of Total species	Family	Number of Species	%of Total species
Myrtaceae	14	10.94	Solanaceae	2	1.56
Poaceae	14	10.94	Xanthorrhoeaceae	2	1.56
Asteraceae	13	10.16	Boryaceae	1	0.78
Cyperaceae	9	7.03	Chenopodiaceae	1	0.78
Papilionaceae	9	7.03	Colchicaceae	1	0.78
Apiaceae	4	3.13	Crassulaceae	1	0.78
Asparagaceae	4	3.13	Epacridaceae	1	0.78
Iridaceae	4	3.13	Gentianaceae	1	0.78
Orchidaceae	4	3.13	Juncaceae	1	0.78
Restionaceae	4	3.13	Lauraceae	1	0.78
Goodeniaceae	3	2.34	Lentibulariaceae	1	0.78
Hemerocallidaceae	3	2.34	Lobeliaceae	1	0.78
Proteaceae	3	2.34	Oxalidaceae	1	0.78
Stylidiaceae	3	2.34	Philydraceae	1	0.78
Centrolepidaceae	2	1.56	Phytolaccaceae	1	0.78
Dilleniaceae	2	1.56	Polygonaceae	1	0.78
Droseraceae	2	1.56	Primulaceae	1	0.78
Euphorbiaceae	2	1.56	Rhamnaceae	1	0.78

Family	Number of Species	%of Total species
Geraniaceae	2	1.56
Haemodoraceae	2	1.56
Mimosaceae	2	1.56
Scrophulariaceae	1	0.78
Typhaceae	1	0.78
Verbenaceae	1	0.78
Total	**128**	**100**

Species composition with landscape features

Species Richness Estimates

Total species richness varied among the thirty six fauna sites surveyed, from a minimum of 13 species to a maximum of 72 species at Melaleuca and Banksia type vegetation communities respectively. There was no significant difference in species richness between landforms (ANOVA: $F_{1,34} = 0.154$, $p>0.05$; Figure 2 a) or between time since fire categories (ANOVA: $F_{1,34} = 0.918$, $p>0.05$; Figure 2 b). However, there was a significant difference in species richness between vegetation types (ANOVA: $F_{3,32} = 7.180$, $p=0.001$). Banksia vegetation types had significantly higher species richness than Melaleuca (Tukeys HSD post-hoc test: Banksia versus Melaleuca, $p<0.001$; Figure 2c). Jarrah and tuart did not differ significantly from the other vegetation types.

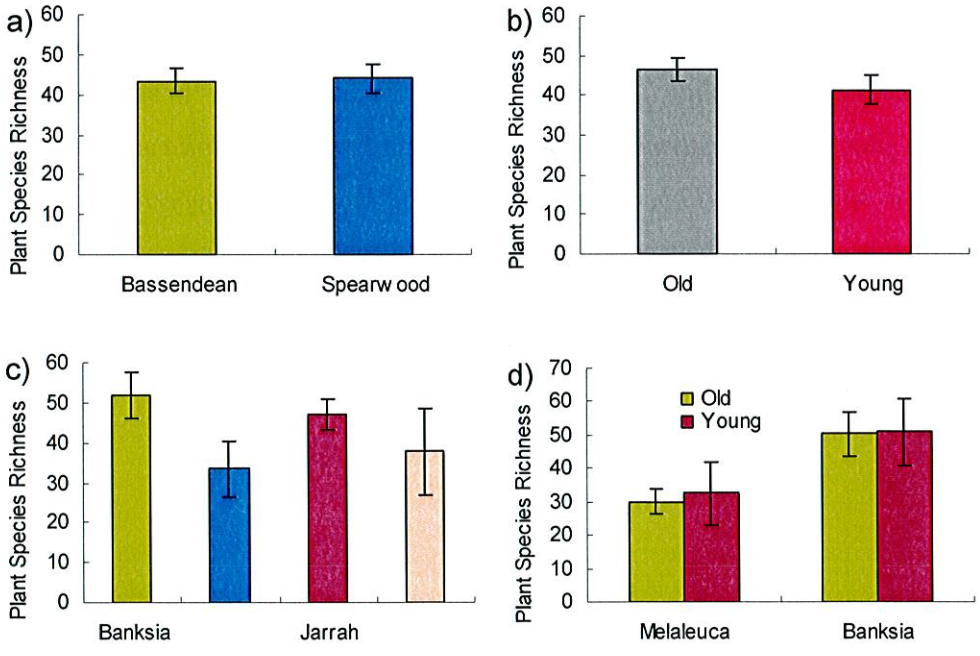

Figure 2. Mean (average) plant species richness (± 95% CI) across landform, time since fire (Young < 11 years and Old >16 years) and vegetation types, using all plot data and untransformed data for ease of interpretation.

Analysis on a subset of sites (only Banksia and Melaleuca sites) indicated that there was no significant interaction between time since fire and vegetation type (ANOVA: $F_{1,24} = 0.126$, $p>0.05$; Figure 2d). However, the differences between vegetation types was still distinct (ANOVA: $F_{1,24} = 17.442$, $p<0.001$, Figure 2d).

Community Analysis

Community analysis using Multiple Response Permutation Procedure or MRPP detected a significant difference between landform categories (MRPP: $A = 0.140$, $p < 0.001$). Community composition was not different between fire groups (MRPP: $A = 0.008$, $p > 0.05$), but did vary among vegetation types (MRPP: $A = 0.373$, $p < 0.001$). All of the vegetation types showed differences in community composition (for all pair-wise comparisons: $p<0.01$). NMDS found a stable 2-D solution (stress = 0.167) representing 76% variance with axis 1 representing 59% variance. A number of species were correlated with either landform or vegetation type (Figure 3). In particular, species that were associated with Spearwood sites included *Lagenphora huegelii*, *Hibbertia hypericoides* and *Alexgeorgea nitens* whilst species that were associates the Bassendean included *Drosera menziesii* subsp. *penicillaris*, *Petrophile linearis* and *Patersonia occidentalis*. Species that were associated with Banksia sites include *Drosera menziesii* subsp. *penicillaris*, *Petrophile linearis* and *Patersonia occidentalis.* In addition, some Melaleuca sites had *Hypocalymma angustifolium* and *Banksia ilicifolia* associated with them. It also appears that *Hibbertia hypericoides* and *Lagenphora hypericoides* are intermediately associated between Jarrah and Tuart vegetation types.

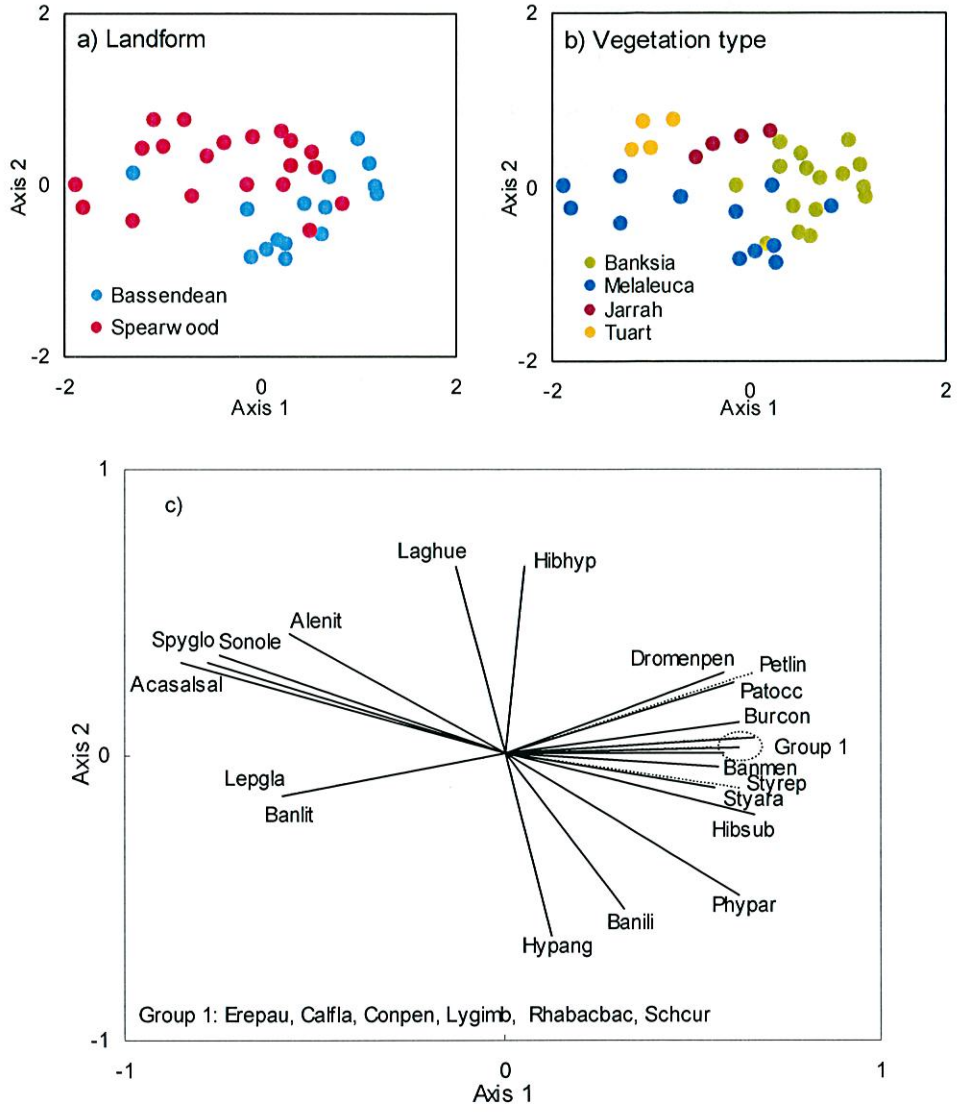

Figure 3. NMDS ordination (Sorensen distance measure) of plant assemblages (n = 229 species) in 36 floristic quadrats coded by a) landform and b) vegetation type. The ordination is in two dimensions (stress = 0.167), with axis 1 and 2 plotted (r^2 = 0.592 and 0.165 respectively. c) Correlations of plant species ($r^2 > 0.3$) with ordination. See Appendix 4 for species codes.

Within each category (landform, vegetation type, time since last fire) a number of indicator species were detected (Table 2), although their relative strength as indicators varied (as shown in Table X by the range in p-values). Spearwood sites were characterised by 15 plant species, including *Acacia saligna sub. saligna* and *Spyridium globulosum*, as well as *Haemodorum* sp flat leaf. In contrast, there were 25 indicator species for Bassendean sites, with *Conostylis juncea*, *Hibbertia subvaginata* and

Schoenus curvifolius being good indicators. Banksia sites were represented by 17 indicator species, unsurprisingly including *Banksia attenuata*, as well as *Boronia ramosa* subsp. *anethifolia* and *Drosera menziesii* subsp. *penicillaris*. Melaleuca sites had the least number of indicator species, with only *Eucalyptus rudis* and *Melaleuca preissiana* identified as indicators. Both of the tuart and jarrah sites only had 4 replicates, and the indicator species identified within these vegetation types should be examined with caution. However, *Eucalyptus gomphocephala* was a good indicator of tuart sites, as was *Ehrharta longiflora*, *Rhagodia baccata* subsp. *baccata* and *Sonchus oleraceus*. Indicator species of jarrah sites included *Eucalyptus marginata*, as well as *Bossiaea eriocarpa*, *Acacia wilsoniana*, and *Gompholobium tomentosa*. Few species were good indicators of time since fire, with *Banksia grandis*, *Caladenia flava* subsp. *flava*, *Elythranthera brunonis*, *Pterostylis pyramidalis*, *Tetraria octandra* and *Lomandra sericea* indicators of older sites, but surprisingly only one species, *Lobelia tenuior*, was an indicator of younger sites.

We caution that these indicator species are representative of the categories based on the study sites we selected in the GSS, and their usefulness as indicator species in other areas needs to be determined.

Table 2. Species identified as significant indicators of different categories within different factors (landform, vegetation type and time since fire) from Indicator Species Analysis (p-values for each species are shown).

	Landform		Vegetation Type				Time Since Fire	
Species code	Spearwood	Bassendean	Banksia	Melaleuca	Tuart	Jarrah	Old	Young
Acapre	NS	NS	NS	NS	NS	**0.0156**	NS	NS
Acasalsal	**0.0074**	NS	NS	NS	**0.0102**	NS	NS	NS
Acawil	NS	NS	NS	NS	NS	**0.0006**	NS	NS
Adecygcyg	NS	**0.0054**	NS	NS	NS	NS	NS	NS
Alenit	NS	**0.0254**	**0.0044**	NS	NS	NS	NS	NS
Antlit	NS	NS	**0.0188**	NS	NS	NS	NS	NS
Banatt	NS	NS	**0.0004**	NS	NS	NS	NS	NS
Bandaldal	NS	NS	NS	NS	NS	**0.0296**	NS	NS
Bangra	NS	NS	NS	NS	NS	NS	**0.0414**	NS
Banili	NS	**0.0294**	NS	NS	NS	NS	NS	NS
Banmen	NS	NS	**0.0216**	NS	NS	NS	NS	NS
Bansescyg	NS	NS	NS	NS	NS	**0.046**	NS	NS
Borramant	NS	**0.0096**	**0.009**	NS	NS	NS	NS	NS
Boseri	NS	NS	NS	NS	NS	**0.0008**	NS	NS
Burcon	NS	NS	**0.0318**	NS	NS	NS	NS	NS
Calfla	NS	**0.0116**	**0.011**	NS	NS	NS	NS	NS
Calflafla	NS	NS	NS	NS	NS	NS	**0.039**	NS

	Landform		Vegetation Type				Time Since Fire	
Species code	**Spearwood**	**Bassendean**	**Banksia**	**Melaleuca**	**Tuart**	**Jarrah**	**Old**	**Young**
Callat	NS	NS	NS	NS	**0.0222**	NS	NS	NS
Conjun	NS	**0.0018**	**0.0408**	NS	NS	NS	NS	NS
Dasbro	NS	**0.004**	NS	NS	NS	NS	NS	NS
Dauglo	NS	NS	NS	NS	**0.0016**	NS	NS	NS
Desfle	NS	NS	NS	NS	NS	**0.0462**	NS	NS
Diccap	**0.0234**	NS	NS	NS	NS	NS	NS	NS
Dromenpen	NS	NS	**0.0078**	NS	NS	NS	NS	NS
Dropar	NS	**0.0302**	NS	NS	NS	NS	NS	NS
Ehrlon	**0.049**	NS	NS	NS	**0.0006**	NS	NS	NS
Elybru	NS	NS	NS	NS	NS	NS	**0.0418**	NS
Erepau	NS	NS	**0.0108**	NS	NS	NS	NS	NS
Eucgom	**0.025**	NS	NS	NS	**0.0006**	NS	NS	NS
Eucmar	NS	NS	NS	NS	NS	**0.0194**	NS	NS
Eucrud	NS	NS	NS	**0.033**	NS	NS	NS	NS
Euppel	NS	NS	NS	NS	**0.0176**	NS	NS	NS
Germol	NS	NS	NS	NS	**0.0018**	NS	NS	NS
Gomtom	NS	NS	NS	NS	NS	**0.0016**	NS	NS
Haespf	**0.005**	NS	NS	NS	NS	**0.0026**	NS	NS
Hakrus	NS	NS	NS	NS	NS	**0.0292**	NS	NS
Harcom	**0.011**	NS	NS	NS	NS	**0.0418**	NS	NS
Hibhyp	**0.032**	NS	NS	NS	NS	**0.0144**	NS	NS
Hibsp	NS	**0.0112**	NS	NS	NS	NS	NS	NS
Hibsub	NS	**0.001**	**0.0194**	NS	NS	NS	NS	NS
Hypang	NS	**0.0138**	NS	NS	NS	NS	NS	NS
Jacflo	NS	**0.008**	NS	NS	NS	NS	NS	NS
Kenpro	NS	NS	NS	NS	NS	**0.0104**	NS	NS
Kungla	NS	**0.0276**	NS	NS	NS	NS	NS	NS
Laghue	**0.0326**	NS	NS	NS	NS	**0.0148**	NS	NS
Laxramram	NS	**0.0138**	NS	NS	NS	NS	NS	NS
Leucon	NS	**0.0116**	NS	NS	NS	NS	NS	NS
Leupol	NS	NS	**0.026**	NS	NS	NS	NS	NS
Leupro	**0.0244**	NS	NS	NS	NS	NS	NS	NS
Lobten	NS	NS	NS	NS	NS	NS	NS	**0.046**
Lomher	NS	NS	NS	NS	NS	**0.0448**	NS	NS
Lommar	NS	NS	NS	NS	**0.0018**	NS	NS	NS
Lommicmic	NS	NS	NS	NS	NS	**0.0156**	NS	NS
Lomser	NS	NS	NS	NS	NS	NS	**0.0398**	NS
Lomsua	NS	**0.0324**	NS	NS	NS	NS	NS	NS
Lygimb	NS	**0.0342**	**0.0118**	NS	NS	NS	NS	NS
Macfra	NS	NS	NS	NS	NS	**0.0166**	NS	NS
Melpre	NS	NS	NS	**0.0046**	NS	NS	NS	NS
Mespse	**0.025**	NS	NS	NS	NS	**0.0406**	NS	NS
Myocap	NS	NS	NS	NS	**0.0222**	NS	NS	NS
Nuyflo	NS	NS	**0.0276**	NS	NS	NS	NS	NS
Ortlaxlax	NS	NS	NS	NS	NS	**0.0178**	NS	NS
Petmac	NS	NS	NS	NS	NS	**0.0288**	NS	NS
Phispi	NS	**0.0048**	**0.0268**	NS	NS	NS	NS	NS
Phlcil	NS	NS	**0.0448**	NS	NS	NS	NS	NS
Phypar	NS	**0.0206**	NS	NS	NS	NS	NS	NS
Ptepyr	NS	NS	NS	NS	NS	NS	**0.047**	NS
Pulret	NS	**0.0276**	NS	NS	NS	NS	NS	NS
Rhabacbac	NS	NS	NS	NS	**0.0004**	NS	NS	NS

	Landform		Vegetation Type				Time Since Fire	
Species code	**Spearwood**	**Bassendean**	**Banksia**	**Melaleuca**	**Tuart**	**Jarrah**	**Old**	**Young**
Romrosaus	NS	NS	NS	NS	**0.0222**	NS	NS	NS
Schcae	NS	**0.0326**	NS	NS	NS	NS	**0.0454**	NS
Schcur	NS	**0.003**	**0.041**	NS	NS	NS	NS	NS
Sonole	NS	NS	NS	NS	**0.001**	NS	NS	NS
Sowlax	**0.01**	NS	NS	NS	NS	NS	NS	NS
Spyglo	**0.0012**	NS	NS	NS	**0.0064**	NS	NS	NS
Stemed	NS	NS	NS	NS	**0.0182**	NS	NS	NS
Styara	NS	**0.0094**	NS	NS	NS	NS	NS	NS
Styneu	**0.0476**	NS	NS	NS	NS	NS	NS	NS
Styrig	NS	**0.0118**	NS	NS	NS	NS	NS	NS
Tetoct	**0.0492**	NS	NS	NS	NS	NS	**0.0202**	NS
Thymanpat	**0.0274**	NS	NS	NS	NS	NS	NS	NS
Tricam	NS	NS	NS	NS	**0.0222**	NS	NS	NS
Waisua	NS	**0.0338**	NS	NS	NS	NS	NS	NS
Xanpre	NS	NS	NS	NS	NS	**0.007**	NS	NS
Total # of species	**15**	**25**	**17**	**2**	**15**	**21**	**7**	**1**

Flora of interest

Priority 1.

Dampiera triloba Lindl. has not been seen on the Swan Coastal Plain for 63 years and was thought to be extinct from this area (Gibson *et al.* 1996). The last collection was made in October 1945 by C.A. Gardener in Gnangara (Florabase, Western Australian Herbarium 2009). Species and Communities branch of DEC has now assigned this species to Priority 1 conservation code.

Priority 3

Cyathochaeta teretifolia was found at only one site.

Priority 4

Stachystemon axillaris was found at only one site.

Weeds

Forty six species of weeds were encountered during the study and are marked with an asterisk in the species list (Appendix 1).

Summary and Recommendations

The species richness was significantly different between Banksia and Melaleuca vegetation types but did not differ significantly between any other treatments. It would be an interesting study to further look at the interactions between the flora species and fauna species. It would also be useful to continue monitoring the plots to enable the unidentified species to be clarified and also to be used as pre and post fire studies across the GSS study area. It may be useful to use the flora plots as a university study project that could introduce students to the flora of the Swan Coastal Plain.

Surveying for populations of the Priority species found during the survey, especially the Priority 1 taxa. These taxa are in need of urgent survey as it is known from only one extant population on the Swan Coastal Plain and from one occurrence east of Manjimup.

Stachystemon axillaris is a priority 4 species and although this taxa require monitoring every 5-10 years, this population should be surveyed and mapped to find its extent and then included in any future monitoring.

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Appendix 1. Identified flora species list for the GSS Fauna sites.

Family	Genus	Species	Infra Rank	Infra Name	Conservation Code
APIACEAE	*Daucus*	*glochidiatus*			
	Eryngium	*pinnatifidum sens lat*			
	Homalosciadium	*homalocarpum*			
	Hydrocotyle	*callicarpa*			
	Hydrocotyle	*diantha*			
	Trachymene	*pilosa*			
	Xanthosia	*huegelii*			
ASPARAGACEAE	*Chamaescilla*	*corymbosa*	*subsp.*	*corymbosa*	
	Dichopogon	*capillipes*			
	Laxmannia	*ramosa*	*subsp.*	*ramosa*	
	Laxmannia	*sessiliflora*			
	Laxmannia	*squarrosa*			
	Lomandra	*caespitosa*			
	Lomandra	*hermaphrodita*			
	Lomandra	*maritima*			
	Lomandra	*micrantha*	*subsp.*	*micrantha*	
	Lomandra	*preissii*			
	Lomandra	*sericea*			
	Lomandra	*suaveolens*			
	Sowerbaea	*laxiflora*			
	Thysanotus	*arenarius*			
	Thysanotus	*manglesianus*			
	Thysanotus	*patersonii*			
	Thysanotus	*sparteus*			
	Thysanotus	*thyrsoideus*			
	Thysanotus	*triandrus*			
ASPHODELACEAE	*Bulbine*	*semibarbata*			
ASTERACEAE	*Brachyscome*	*iberidifolia*			
	Cirsium	*vulgare*			*
	Conyza	*bonariensis*			*
	Helichrysum	*luteoalbum*			
	Hyalosperma	*cotula*			
	Hypochaeris	*glabra*			*
	Hypochaeris	*radicata*			*
	Lactuca	*serriola*			*
	Lagenophora	*huegelii*			
	Millotia	*myosotidifolia*			
	Pithocarpa	*pulchella*			
	Podotheca	*angustifolia*			
	Podotheca	*chrysantha*			
	Podotheca	*gnaphalioides*			
	Quinetia	*urvillei*			
	Senecio	*diaschides*			*
	Siloxerus	*humifusus*			
	Sonchus	*asper*			*
	Sonchus	*oleraceus*			*
	Ursinia	*anthemoides*			*
	Waitzia	*acuminata*	*var.*	*acuminata*	
	Waitzia	*suaveolens*			
	Waitzia	*suaveolens*	*var.*	*flava*	

Family	Genus	Species	Infra Rank	Infra Name	Conservation Code
	Waitzia	*suaveolens*	*var.*	*suaveolens*	
BRASSICACEAE	*Heliophila*	*pusilla*			*
CAMPANULACEAE	*Wahlenbergia*	*capensis*			*
CARYOPHYLLACEAE	*Cerastium*	*glomeratum*			*
	Petrorhagia	*dubia*			*
	Spergularia	*diandra*			*
	Stellaria	*media*			*
CASUARINACEAE	*Allocasuarina*	*fraseriana*			
	Allocasuarina	*humilis*			
CENTROLEPIDACEAE	*Centrolepis*	*drummondiana*			
CHENOPODIACEAE	*Rhagodia*	*baccata*	*subsp.*	*baccata*	
COLCHICACEAE	*Burchardia*	*congesta*			
COMMELINACEAE	*Cartonema*	*philydroides*			
CRASSULACEAE	*Crassula*	*colorata*	*var.*	*acuminata*	
	Crassula	*colorata*	*var.*	*colorata*	
	Crassula	*decumbens*	*var.*	*decumbens*	
CYPERACEAE	*Baumea*	*juncea*			
	Caustis	*dioica*			
	Cyathochaeta	*teretifolia*			3
	Gahnia	*trifida*			
	Isolepis	*marginata*			
	Lepidosperma	*aff scabrum*			
	Lepidosperma	*gladiatum*			
	Lepidosperma	*leptostachyum*			
	Lepidosperma	*striatum*			
	Mesomelaena	*pseudostygia*			
	Schoenus	*caespititius*			
	Schoenus	*curvifolius*			
	Schoenus	*subfascicularis*			
	Tetraria	*octandra*			
DASYPOGONACEAE	*Acanthocarpus*	*preissii*			
	Calectasia	*narragara*			
	Dasypogon	*bromeliifolius*			
DENNSTAEDTIACEAE	*Pteridium*	*esculentum*			
DILLENIACEAE	*Hibbertia*	*aurea*			
	Hibbertia	*huegelii*			
	Hibbertia	*hypericoides*			
	Hibbertia	*racemosa*			
	Hibbertia	*subvaginata*			
DROSERACEAE	*Drosera*	*bulbosa*			
	Drosera	*erythrorhiza*			
	Drosera	*glanduligera*			
	Drosera	*macrantha*	*subsp.*	*macrantha*	
	Drosera	*menziesii*	*subsp.*	*penicillaris*	
	Drosera	*pallida*			
	Drosera	*parvula*			
EPACRIDACEAE	*Andersonia*	*heterophylla*			
	Andersonia	*lehmanniana*	*subsp.*	*lehmanniana*	
	Astroloma	*ciliatum*			
	Conostephium	*minus*			
	Conostephium	*pendulum*			
	Conostephium	*preissii*			
	Leucopogon	*conostephioides*			
	Leucopogon	*polymorphus*			
	Leucopogon	*propinquus*			
	Lysinema	*ciliatum*			
EUPHORBIACEAE	*Euphorbia*	*peplus*			*
	Monotaxis	*occidentalis*			
	Phyllanthus	*calycinus*			

Family	Genus	Species	Infra Rank	Infra Name	Conservation Code
	Poranthera	*microphylla*			
	Stachystemon	*axillaris*			4
FUMARIACEAE	*Fumaria*	*muralis*			*
GERANIACEAE	*Geranium*	*molle*			*
	Pelargonium	*capitatum*			*
	Pelargonium	*littorale*			
	Pelargonium	*littorale*	*subsp.*	*littorale*	
GOODENIACEAE	*Dampiera*	*linearis*			
	Lechenaultia	*floribunda*			
	Lechenaultia	*linarioides*			
	Scaevola	*nitida*			
	Scaevola	*repens*	*var.*	*angustifolia*	
	Scaevola	*repens*	*var.*	*repens*	
HAEMODORACEAE	*Anigozanthos*	*humilis*	*subsp.*	*humilis*	
	Anigozanthos	*manglesii*	*subsp.*	*manglesii*	
	Conostylis	*aculeata*			
	Conostylis	*aculeata*	*subsp.*	*aculeata*	
	Conostylis	*aculeata*	*subsp.*	*cygnorum*	
	Conostylis	*juncea*			
	Conostylis	*setigera*			
	Conostylis	*setigera*	*subsp.*	*setigera*	
	Conostylis	*teretifolia*			
	Conostylis	*teretifolia*	*subsp.*	*planescens*	
	Haemodorum	*laxum*			
	Haemodorum	*spicatum*			
	Phlebocarya	*ciliata*			
HALORAGACEAE	*Gonocarpus*	*pithyoides*			
HEMEROCALLIDACEAE	*Arnocrinum*	*preissii*			
	Corynotheca	*micrantha*			
	Corynotheca	*micrantha*	*subsp.*	*micrantha*	
	Dianella	*revoluta*			
	Hensmania	*turbinata*			
	Stypandra	*glauca*			
	Tricoryne	*elatior*			
IRIDACEAE	*Gladiolus*	*caryophyllaceus*			*
	Homeria	*flaccida*			*
	Orthrosanthus	*laxus*	*var.*	*laxus*	
	Patersonia	*occidentalis*			
	Romulea	*rosea*	*var.*	*australis*	*
LAMIACEAE	*Hemiandra*	*pungens*			
LAURACEAE	*Cassytha*	*glabella*			
	Cassytha	*pomiformis*			
	Cassytha	*racemosa*			
LOBELIACEAE	*Lobelia*	*tenuior*			
LOGANIACEAE	*Logania*	*vaginalis*			
	Phyllangium	*paradoxum*			
LORANTHACEAE	*Nuytsia*	*floribunda*			
MIMOSACEAE	*Acacia*	*alata*			
	Acacia	*cyclops*			
	Acacia	*huegelii*			
	Acacia	*pulchella*	*var.*	*glaberrima*	
	Acacia	*saligna*	*subsp.*	*saligna*	
	Acacia	*stenoptera*			
	Acacia	*willdenowiana*			
MOLLUGINACEAE	*Macarthuria*	*apetala*			
MYOPORACEAE	*Myoporum*	*caprarioides*			
MYRTACEAE	*Astartea*	*affinis*			
	Astartea	*scoparia*			
	Beaufortia	*elegans*			

Family	Genus	Species	Infra Rank	Infra Name	Conservation Code
	Calothamnus	*quadrifidus*			
	Calothamnus	*sanguineus*			
	Calytrix	*flavescens*			
	Calytrix	*fraseri*			
	Corymbia	*calophylla*			
	Eremaea	*asterocarpa*			
	Eremaea	*beaufortioides*			
	Eremaea	*pauciflora*			
	Eucalyptus	*globulus*			*
	Eucalyptus	*gomphocephala*			
	Eucalyptus	*marginata*			
	Eucalyptus	*rudis*			
	Eucalyptus	*todtiana*			
	Hypocalymma	*angustifolium*			
	Kunzea	*glabrescens*			
	Leptospermum	*spinescens*			
	Melaleuca	*preissiana*			
	Melaleuca	*rhaphiophylla*			
	Melaleuca	*seriata*			
	Melaleuca	*systena*			
	Melaleuca	*trichophylla*			
	Pericalymma	*ellipticum*			
	Regelia	*ciliata*			
	Regelia	*inops*			
	Scholtzia	*involucrata*			
	Taxandria	*linearifolia*			
	Verticordia	*nitens*			
ORCHIDACEAE	*Caladenia*	*flava*	*subsp.*	*flava*	
	Caladenia	*latifolia*			
	Diuris	*longifolia*			
	Drakea	*gracillis*			
	Elythranthera	*brunonis*			
	Leptoceras	*menziesii*			
	Paracaleana	*nigrata*			
	Pterostylis	*pyramidalis*			
	Pterostylis	*recurva*			
	Pterostylis	*sanguinea*			
	Pterostylis	*vittata*			
	Pyrorchis	*nigricans*			
OROBANCHACEAE	*Orobanche*	*minor*			*
OXALIDACEAE	*Oxalis*	*corniculata*			*
PAPILIONACEAE	*Aotus*	*procumbens*			
	Bossiaea	*eriocarpa*			
	Daviesia	*divaricata*			
	Gastrolobium	*capitatum*			
	Gastrolobium	*nervosum*			
	Gompholobium	*aristatum*			
	Gompholobium	*confertum*			
	Gompholobium	*scabrum*			
	Gompholobium	*tomentosum*			
	Hardenbergia	*comptoniana*			
	Hovea	*trisperma*			
	Isotropis	*cuneifolia*	*subsp.*	*cuneifolia*	
	Jacksonia	*floribunda*			
	Jacksonia	*furcellata*			
	Jacksonia	*sternbergiana*			
	Kennedia	*prostrata*			
	Melilotus	*indicus*			*
	Pultenaea	*reticulata*			

Family	Genus	Species	Infra Rank	Infra Name	Conservation Code
	Sphaerolobium	*drummondii*			
	Templetonia	*retusa*			
	Trifolium	*campestre*			*
	Trifolium	*dubium*			*
	Viminaria	*juncea*			
POACEAE	*Aira*	*cupaniana*			*
	Amphipogon	*turbinatus*			
	Austrodanthonia	*occidentalis*			
	Austrostipa	*compressa*			
	Austrostipa	*macalpinei*			
	Briza	*maxima*			*
	Briza	*minor*			*
	Bromus	*arenarius*			
	Bromus	*diandrus*			*
	Dichelachne	*crinita*			
	Ehrharta	*calycina*			*
	Ehrharta	*longiflora*			*
	Holcus	*setiger*			*
	Microlaena	*stipoides*			
	Pentaschistis	*airoides*			*
	Vulpia	*myuros*	*forma*	*megalura*	*
	Vulpia	*myuros*	*forma*	*myuros*	*
POLYGALACEAE	*Comesperma*	*calymega*			
PORTULACACEAE	*Calandrinia*	*corrigioloides*			
	Calandrinia	*granulifera*			
	Calandrinia	*liniflora*			
PRIMULACEAE	*Anagallis*	*arvensis*	*var.*	*caerulea*	*
PROTEACEAE	*Adenanthos*	*cygnorum*	*subsp.*	*cygnorum*	
	Adenanthos	*obovatus*			
	Banksia	*attenuata*			
	Banksia	*dallanneyi*	*subsp.*	*dallanneyi*	
	Banksia	*grandis*			
	Banksia	*ilicifolia*			
	Banksia	*littoralis*			
	Banksia	*menziesii*			
	Banksia	*sessilis*	*var.*	*cygnorum*	
	Conospermum	*boreale*	*subsp.*	*boreale*	
	Hakea	*costata*			
	Hakea	*lissocarpha*			
	Hakea	*prostrata*			
	Hakea	*ruscifolia*			
	Persoonia	*comata*			
	Persoonia	*saccata*			
	Petrophile	*linearis*			
	Petrophile	*macrostachya*			
	Petrophile	*serruriae*			
	Stirlingia	*latifolia*			
	Synaphea	*spinulosa*	*subsp.*	*spinulosa*	
RANUNCULACEAE	*Clematis*	*linearifolia*			
RESTIONACEAE	*Alexgeorgea*	*nitens*			
	Chordifex	*microcodon*			
	Desmocladus	*fasciculatus*			
	Desmocladus	*flexuosus*			
	Dielsia	*stenostachya*			
	Hypolaena	*exsulca*			
	Lyginia	*imberbis*			
RHAMNACEAE	*Spyridium*	*globulosum*			
RUBIACEAE	*Galium*	*murale*			*
	Opercularia	*hispidula*			

Appendix 3. Species codes and name of site where found.

Unconfirmed plant identification are indicated by ? or non scientific names
† Indicates taxa were combined under the same code for NMDS analysis.
* Indicates 229 species codes used in NMDS analysis.

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
? APRE	*? Acanthocarpus preissii*																				+																									
? APRO	*? Apium prostratum*																																								+					
? B	*? Burchardia*																		+																											
? CSP	*? Caladenia sp*																		+					+																					
? CPUN	*? Crypandra pungens*																				+																									
? DBRA	*? Disa bracteata*					+																																								
? LMEN	*? Leptoceris menziesii*																				+																									
? PSP	*? Paracaleana sp*																														+														
? PCOR	*? Phyllopodium cordatum*																																											+	
? RSP	*? Romulae sp*																		+																											
? TSP	*? Thelymitra sp*																					+																							
* ACAALA	*Acacia alata*																		+						+																				
ACACYC	*Acacia cyclops*																+																										+			
* ACAHUE	*Acacia huegelii*									+																				+								+							
* ACAPULGLA	*Acacia pulchella var. glaberrima*			+	+					+		+	+		+	+			+		+	+	+	+	+	+	+	+	+		+							+	+					
* ACASALSAL	*Acacia saligna subsp. saligna*		+	+		+											+	+	+	+						+	+	+																	
ACASTE	*Acacia stenoptera*																													+															
* ACAWIL	*Acacia willdenowiana*						+	+												+																										
* ACAPRE	*Acanthocarpus preissii*																		+	+																										
* ADECYGCYG	*Adenanthos cygnorum subsp. cygnorum*				+				+	+	+	+																																	
ADEOBO	*Adenanthos obovatus*																																			+									
AIR	*Aira*																			+																									
AIR	*Aira = 15b*																										+																	
* AIRCUP	*Aira cupaniana*							+	+				+						+		+	+	+	+	+				+	+				+	+								
* ALENIT	*Alexgeorgea nitens*												+		+	+						+								+		+	+			+								
* ALLFRA	*Allocasuarina fraseriana*		+					+															+																					
* ALLHUM	*Allocasuarina humilis*																				+		+																					
ALT	*Alternate obovate*						+																																						
AMP	*Amphiopgon = 16a*																													+														
AMPAMP	*Amphipogon amphipogonoides*																																							+					
* AMPTUR	*Amphipogon turbinatus*												+		+	+																													

	Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
*	ANAARVCAE	*Anagallis arvensis var. caerulea*		+	+		+														+			+				+					+												+
*	ANDHET	*Andersonia heterophylla*												+			+																													
*	ANDLEHLEH	*Andersonia lehmanniana subsp. lehmanniana*									+					+									+																					
	ANG? M	*Angianthus ? micropodiodes*																																												+
*	ANIHUMHUM	*Anigozanthos humilis subsp. humilis*							+		+			+		+	+							+											+				+						
	ANIMANMAN	*Anigozanthos manglesii subsp. manglesii*																										+																	
*	ANTLIT	*Anthocercis littorea*			+																						+																		
*	AOTPRO	*Aotus procumbens*								+					+																															
	ARCCAL	*Arctotheca calendula*																																								+				
	ARC	*Arctotheca calendula*					+																																							
*	ARNPRE	*Arnocrinum preissii*									+						+																													
	ASTAFF	*Astartea affinis*																												+															+
*	ASTSCO	*Astartea scoparia*											+		+																						+			+						
	AST	*Asteracea crinkle prickle*					+																																							
	AST? X	*Astroloma ? xerophyllum*			+																+																									
	ASTCIL	*Astroloma ciliatum*						+																																						
	AST	*Astroloma variable*															+																													
	ASTXER	*Astroloma xerophyllum*																																								+				
	ATR? P	*Atriplex ? prostrata arrowhead leaves*																																									+			
	AUSOCC	*Austrodanthonia occidentalis*																						+																						
	AUS	*Austrostipa*																													+														
*	AUSCOM	*Austrostipa compressa*											+	+																		+	+												
*	AUSMAC	*Austrostipa macalpinei*													+																										+					
	AVEBAR	*Avena barbata*																																										+		
*	BANATT	*Banksia attenuata*		+	+	+					+	+	+	+			+	+						+	+	+	+				+			+	+	+		+	+					
*	BANDALDAL	*Banksia dallanneyi subsp. dallanneyi*						+	+																		+																		
*	BANGRA	*Banksia grandis*		+				+	+																+																				
*	BANILI	*Banksia ilicifolia*										+	+				+																+			+		+							
*	BANLIT	*Banksia littoralis*																	+	+									+	+															
*	BANMEN	*Banksia menziesii*				+					+	+		+			+	+			+			+	+	+						+	+				+	+						
*	BANSESCYG	*Banksia sessilis var. cygnorum*					+		+													+																							
	BARTRI	*Bartsia trixago*			+																																									
	BAUART	*Baumea articulata*																																								+	+	+		
*	BAUJUN	*Baumea juncea*																		+		+							+	+													+	+		
*	BEAELE	*Beaufortia elegans*									+			+		+	+													+	+								+						
	BORPURPUR	*Boronia purdieana subsp. purdieana*									+																																			
*	BORRAMANT	*Boronia ramosa subsp. anethifolia*									+	+	+	+	+	+	+	+															+	+							+					

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
BORSCI	*Borya scirpoidea*																																											+	
* BOSERI	*Bossiaea eriocarpa*						+	+		+			+		+	+			+	+			+	+					+	+		+	+				+	+							
* BRAIBE	*Brachyscome iberidifolia*				+																								+																+
* BRIMAX	*Briza maxima*				+							+							+	+	+	+				+		+			+	+	+	+									+	+	
* BRIMIN	*Briza minor*			+		+																							+															+	+
BRO? D	*Bromus ? diandrus*				+											+																					+								
BROARE	*Bromus arenarius*		+																																										
BRODIA	*Bromus diandrus*		+																																							+	+		
BROSP	*Bromus sp*																																											+	
BULSEM	*Bulbine semibarbata*																							+																					
BUN	*Bunch grass*																																									+			
BUN	*Bunched grass*					+																																							
* BURCON	*Burchardia congesta*									+		+	+		+	+				+	+	+	+	+						+				+	+		+	+					+		+
CAL? F	*Caladenia ? flava*							+	+	+																													+						
CAL	*Caladenia flava*																													+															
* CALFLAFLA	*Caladenia flava subsp. flava*				+		+							+																			+												
* CALLAT	*Caladenia latifolia*		+	+																																									
CALSP	*Caladenia sp*							+				+				+					+	+				+											+							+	
CALCOR	*Calandrinia corrigioloides*																															+													
CALGRA	*Calandrinia granulifera*																															+													
CALLIN	*Calandrinia liniflora*																															+													
* CALNAR	*Calectasia narragara*																			+			+																						
* CALQUA	*Calothamnus quadrifidus*																			+	+	+																							
* CALSAN	*Calothamnus sanguineus*																			+																									
CAL? A	*Calytrix ? angulata*				+																										+														
* CALFLA	*Calytrix flavescens*									+			+		+	+								+						+			+	+			+	+							
* CALFRA	*Calytrix fraseri*																															+													
CARSPJ	*Cardamine sp Jandakot (P.Luff. S.n. 4/7/1969)*								+			+														+																			
CAR? A	*Carpobrotus ? aequilaterus*																									+													+						
CAR? E	*Carpobrotus ? edulis*																																										+		
CAR? V	*Carpobrotus ? virescens*																+																												
* CARSP	*Carpobrotus sp*		+															+		+																						+			
CARPHI	*Cartonema philydroides*																															+													
CAS? P	*Cassytha ? pomiformis*												+																																
* CASGLA	*Cassytha glabella*								+																										+										
* CASPOM	*Cassytha pomiformis*														+	+								+													+	+							
CASRAC	*Cassytha racemosa*																								+														+			+			

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
CAS	*Cassytha sp*																																												+
CAUDIO	*Caustis dioica*																												+																
CENASI	*Centella asiatica*																																						+	+	+				
CENARI	*Centrolepis aristata*																																											+	+
* CENDRU	*Centrolepis drummondiana*						+														+	+	+	+											+		+								+
CENPOL	*Centrolepis polygyna*			+																												+				+								+
* CERGLO	*Cerastium glomeratum*																																				+								+
CHAARI	*Chaetanthus aristatus*																																		+										+
CHACORCOR	*Chamaescilla corymbosa subsp. corymbosa*																																											
CHOMIC	*Chordifex microcodon*															+																												
CICFIL	*Cicendia filiformis*																																											+
* CIRVUL	*Cirsium vulgare*					+																																						
CLELIN	*Clematis linearifolia*		+																																									
COMCAL	*Comesperma calymega*																																+											
CONBORBOR	*Conospermum boreale subsp. boreale*																						+																					
* CONMIN	*Conostephium minus*												+		+																													
* CONPEN	*Conostephium pendulum*						+						+	+	+	+					+			+					+	+			+	+				+					
CON	*Conostephium pendulum*									+																																	
CONPRE	*Conostephium preissii*																																		+									
CONACU	*Conostylis aculeata*						+																																				
* CONACUACU	*Conostylis aculeata subsp. aculeata*																				+	+							+	+													
* CONACUCYG	*Conostylis aculeata subsp. cygnorum*						+			+													+	+																			
CONCAN	*Conostylis candicans*																																									+		
* CONJUN	*Conostylis juncea*									+					+	+																			+		+						
†* CONSET	*Conostylis setigera*																				+																						
†* CONSET	*Conostylis setigera subsp. setigera*																				+									+	+												
†* CONTER	*Conostylis teretifolia*															+					+																						
†* CONTER	*Conostylis teretifolia subsp. planescens*						+	+														+	+	+																			
* CONBON	*Conyza bonariensis*					+											+																								+			
CORCAL	*Corymbia calophylla*																			+																							+		
†* CORMIC	*Corynotheca micrantha*																													+					+								
†* CORMIC	*Corynotheca micrantha subsp. micrantha*																											+															
CRA	*Crassula branched*																																			+								
* CRACOLACU	*Crassula colorata var. acuminata*																											+				+											
* CRACOLCOL	*Crassula colorata var. colorata*										+													+											+		+						
CRADECDEC	*Crassula decumbens var. decumbens*																																			+								
CYATER	*Cyathochaeta teretifolia*																																				+							

	Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	VEA
	CYNDAC	*Cynodon dactylon*																																							+					
	CYPSP	*Cyperus sp*																		+																										
*	DAMLIN	*Dampiera linearis*														+	+												+	+		+					+								
	DAMTRI	*Dampiera triloba*										+	+																												+					
*	DASBRO	*Dasypogon bromeliifolius*									+																								+	+	+	+							
	DAU	*Daucus ?=47*		+	+	+	+		+																																				
*	DAUGLO	*Daucus glochidiatus*																									+	+					+												
	DAVDIV	*Daviesia divaricata*																								+																			
*	DESFAS	*Desmocladus fasciculatus*			+											+	+									+				+															
*	DESFLE	*Desmocladus flexuosus*		+	+			+	+		+				+						+	+	+		+	+		+			+					+								
*	DIAREV	*Dianella revoluta*		+			+																							+		+													
	DICCRI	*Dichelachne crinita*																				+																								
*	DICCAP	*Dichopogon capillipes*			+																+	+						+	+	+															
	DIESTE	*Dielsia stenostachya*													+						+	+																			+					
	DISBRA	*Disa bracteata*																																								+				
	DIULON	*Diuris longifolia*		+																																										
	DIV	*Divided*																																								+				
	DRAGRA	*Drakea gracillis*																																+											
	DRO	*Drosera*							+																																		+			
	DRO? M	*Drosera ? menzeissii*																																											+	
	DRO	*Drosera =6b*								+																																				
*	DROBUL	*Drosera bulbosa*						+															+								+														
*	DROERY	*Drosera erythrorhiza*							+		+						+								+										+										
	DROGIG	*Drosera gigantea*																																												
	DROGLA	*Drosera glanduligera*				+																																						+	+	
*	DROMACMAC	*Drosera macrantha subsp. macrantha*								+																									+										
	DRO	*Drosera menz*																																					+							
*	DROMENPEN	*Drosera menziesii subsp. penicillaris*						+			+	+		+		+	+					+	+	+	+																				
*	DROPAL	*Drosera pallida*			+						+																																			
*	DROPAR	*Drosera parvula*										+		+		+																								+						
	EHRCAL	*Ehrharta calycina*																																		+				+						
*	EHRLON	*Ehrharta longiflora*		+	+																						+	+		+										+		+	+	+		
*	ELYBRU	*Elythranthera brunonis*				+		+															+												+										
	ELYSP	*Elythranthera sp*																				+		+	+	+																				
*	EREAST	*Eremaea asterocarpa*																						+							+														
*	EREBEA	*Eremaea beaufortioides*									+																					+														
*	EREPAU	*Eremaea pauciflora*												+		+	+							+	+	+					+			+	+			+	+						

	Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
	ERE	*Eremaea pauciflora*									+																																		
*	ERYPIN	*Eryngium pinnatifidum sens lat*		+																	+																								
	EUCGLO	*Eucalyptus globulus*																											+																
*	EUCGOM	*Eucalyptus gomphocephala*		+	+																+	+					+																+			
*	EUCMAR	*Eucalyptus marginata*						+	+																																		+			
*	EUCRUD	*Eucalyptus rudis*					+												+	+										+				+												
*	EUCTOD	*Eucalyptus todtiana*									+												+			+									+											
	EUP	*Euphorbia*																																				+								
*	EUPPEL	*Euphorbia peplus*			+																					+																				
*	EXOSPA	*Exocarpos sparteus*			+																										+															
	FIN	*Fine apium*					+																																							
	FIN	*Fine grass*								+													+	+																			+			
	FIN	*Fine grass was 65*																							+																				
	FUMMUR	*Fumaria muralis*																								+																				
*	GAHTRI	*Gahnia trifida*																+										+	+														+			+
*	GALMUR	*Galium murale*			+		+																																							
*	GASCAP	*Gastrolobium capitatum*														+	+									+					+			+							+					
	GASNER	*Gastrolobium nervosum*																														+														
*	GERMOL	*Geranium molle*		+	+																						+																		
	GLA	*Glabrous grass*				+																																								
*	GLACAR	*Gladiolus caryophyllaceus*								+		+		+									+		+	+					+											+			
	GOMARI	*Gompholobium aristatum*																							+																				
	GOMCAP	*Gompholobium capitatum/tomentosum*										+	+																																	
	GOMCON	*Gompholobium confertum*																														+														
	GOMSCA	*Gompholobium scabrum*																															+													
*	GOMTOM	*Gompholobium tomentosum*				+		+	+		+			+			+				+	+	+			+				+	+		+											
	GOM	*Gompholobium tomentosum*																						+																					
*	GONPIT	*Gonocarpus pithyoides*															+														+	+													
	GOO? P	*Goodenia ? pulchella*								+																																			
	GOOMIC	*Goodenia micrantha*																																											+
	GRA	*Grass bunched*													+																														
	GRA	*Grass stackhousia*																																+											
†*	HAESPF	*Haemodorum laxum*						+	+													+	+	+	+																				
†*	HAESPF	*Haemodorum sp flat leaf*																			+	+						+																+		
†*	HAESPT	*Haemodorum sp terete*									+	+				+																														
†*	HAESPT	*Haemodorum spicatum*												+	+																		+		+	+	+								
	HAI	*Hairy ligule*																												+					+										

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
HAI	*Hairy ligule = 16a*																													+															
* HAKCOS	*Hakea costata*																					+	+																						
* HAKLIS	*Hakea lissocarpha*			+															+																										
* HAKPRO	*Hakea prostrata*																		+				+																						
* HAKRUS	*Hakea ruscifolia*						+	+													+	+		+																					
HAKVAR	*Hakea varia*																																											+	
* HARCOM	*Hardenbergia comptoniana*						+	+											+						+	+	+	+															+		
HELLUT	*Helichrysum luteoalbum*																+																												
HELPUS	*Heliophila pusilla*			+																																									
HEMPUN	*Hemiandra pungens*																																					+							
HENTUR	*Hensmania turbinata*						+																																						
HER	*Herb*											+																																	
* HIBAUR	*Hibbertia aurea*																																				+	+							
* HIBHUE	*Hibbertia huegelii*						+														+	+	+	+																					
* HIBHYP	*Hibbertia hypericoides*			+			+	+		+						+			+	+	+	+	+			+							+											+		
* HIBRAC	*Hibbertia racemosa*																		+					+																					
* HIBSP	*Hibbertia sp Gnangara*										+		+																				+				+	+							
HIBSTE	*Hibbertia stellaris*																																												+
* HIBSUB	*Hibbertia subvaginata*									+	+		+	+	+	+														+	+		+	+			+	+							
HOLSET	*Holcus setiger*			+																																									
* HOMHOM	*Homalosciadium homalocarpum*											+		+						+	+	+	+										+							+						
HOMFLA	*Homeria flaccida*		+																																									+	+	
* HOVTRI	*Hovea trisperma*			+															+	+	+			+																				+		
* HYACOT	*Hyalosperma cotula*																																		+	+									
HYBCAL	*Hybanthus calycinus*																									+																			
HYBFLOFLO	*Hybanthus floribundus subsp. floribundus*																									+																			
HYD? P	*Hydrocotyle ? pilifera*																									+																			
HYDALA	*Hydrocotyle alata*																																												+
* HYDCAL	*Hydrocotyle callicarpa*								+												+																								
HYDDIA	*Hydrocotyle diantha*			+																																									
* HYPANG	*Hypocalymma angustifolium*								+		+	+																							+	+			+						
HYP	*Hypochaeris*										+																											+							
* HYPGLA	*Hypochaeris glabra*			+	+	+	+	+	+					+				+	+	+			+	+	+	+		+	+		+	+	+	+	+	+	+		+					+	+
HYP	*Hypochaeris glabra*											+									+											+													
HYPRAD	*Hypochaeris radicata*																									+																+			
HYP	*Hypochareis serrate*													+																															
* HYPEXS	*Hypolaena exsulca*									+	+		+	+							+	+	+						+			+	+	+	+									

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
IRISP	*Iridaceae sp*																																												+
ISO	*Isolepis large*																					+																							+
* ISOMAR	*Isolepis marginata*											+		+										+	+						+	+						+						
ISOSCA	*Isotoma scapigera*																																											+	
* ISOCUNCUN	*Isotropis cuneifolia subsp. cuneifolia*												+							+																									
* JACFLO	*Jacksonia floribunda*									+			+		+																														
* JACFUR	*Jacksonia furcellata*				+									+													+		+		+							+	+						
* JACSTE	*Jacksonia sternbergiana*						+														+																							
JUNPAL	*Juncus pallidus*																																							+				
KEN	*Kennedia*							+																																				
* KENPRO	*Kennedia prostrata*						+												+	+						+		+															
KENSP	*Kennedia sp*						+																				+	+																
* KUNGLA	*Kunzea glabrescens*				+	+		+	+			+		+																	+		+			+							
KUNMICMIC	*Kunzea micrantha subsp. micrantha*																																										+	+
LACSER	*Lactuca serriola*																									+														+				
* LAGHUE	*Lagenophora huegelii*		+	+		+	+	+		+									+	+	+	+									+												
* LAXRAMRAM	*Laxmannia ramosa subsp. ramosa*									+						+																				+							
LAXSES	*Laxmannia sessiliflora*																						+																				
LAXSQU	*Laxmannia squarrosa*																																					+						
* LECFLO	*Lechenaultia floribunda*												+			+													+	+					+							
LECLIN	*Lechenaultia linarioides*																									+																
LEP? E	*Lepidosperma ? effusum*																																							+				
LEP? L	*Lepidosperma ? longitudinale*																																								+			
* LEPAFF	*Lepidosperma aff scabrum*														+	+																	+									+		
LEPEFF	*Lepidosperma effusum*																																									+		
* LEPGLA	*Lepidosperma gladiatum*																+	+									+	+																
* LEPLEP	*Lepidosperma leptostachyum*																							+																				
LEPLON	*Lepidosperma longitudinale*																																											+
†* LEPSP	*Lepidosperma sp*																					+														+								
†* LEPSP	*Lepidosperma sp Coastal Dune (R.J. Cranfield 9963)*			+																+	+	+								+														
* LEPSTR	*Lepidosperma striatum*																										+								+				+					
LEPMEN	*Leptoceras menziesii*					+																																						
* LEPSPI	*Leptospermum spinescens*																							+						+													
LEU? C	*Leucopogon ? conostephioides*														+																												
LEU? C	*Leucopogon ? conostephoides*															+																					+							
* LEUCON	*Leucopogon conostephioides*										+		+	+		+																	+					+	+				
* LEUPOL	*Leucopogon polymorphus*																				+	+	+	+													+	+					

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
* LEUPRO	*Leucopogon propinquus*						+	+																																					
* LEVPUS	*Levenhookia pusilla*																																		+	+									
* LEVSTI	*Levenhookia stipitata*				+				+													+	+	+						+	+		+		+									
LOB? T	*Lobelia ? tenuior*																										+	+																	
* LOBTEN	*Lobelia tenuior*																+		+						+	+						+													
* LOGVAG	*Logania vaginalis*																										+	+																	
LOLMUL	*Lolium multiflorum*																																												
LOM? C	*Lomandra ? caespitosa*																																						+						
LOM? H	*Lomandra ? hemaphrodita*																																		+										
LOM? MMIC	*Lomandra ? micrantha subsp. micrantha*						+	+												+			+	+																				
LOM? S	*Lomandra ? suaveolens*														+	+																+													
* LOMCAE	*Lomandra caespitosa*							+		+									+			+							+															
LOM	*Lomandra caespitosa*												+																																
* LOMHER	*Lomandra hermaphrodita*						+	+		+					+							+		+																				
LOM	*Lomandra long*			+																																								
* LOMMAR	*Lomandra maritima*	+		+																						+																		
* LOMMICMIC	*Lomandra micrantha subsp. micrantha*																		+	+																							+		
* LOMPRE	*Lomandra preissii*														+	+											+	+																	
* LOMSER	*Lomandra sericea*									+											+											+		+										
LOMSP	*Lomandra sp*						+	+					+								+		+											+				+						
* LOMSUA	*Lomandra suaveolens*									+		+												+													+							
LOM	*Lomandra twisted green*																																											
LOM	*Lomandra twisted green(preissi*																					+																						
LOTANG	*Lotus angustissimus*																																											+	
LOX	*Loxocarya*									+																																		
LYG	*Lyginia 2*									+																																		
* LYGIMB	*Lyginia imberbis*									+			+		+	+								+					+		+		+		+								
LYSCIL	*Lysinema ciliatum*																							+																				
MACAPE	*Macarthuria apetala*												+																															
* MACFRA	*Macrozamia fraseri*			+		+	+	+											+	+	+					+	+	+										+	+					
MEDPOL	*Medicago polymorpha*																																								+			
MEL? S	*Melaleuca ? seriata*																							+																				
MELLATLAT	*Melaleuca lateriflora subsp. lateriflora*																																											+
* MELPRE	*Melaleuca preissiana*				+				+					+						+									+	+					+	+			+					
* MELRHA	*Melaleuca rhaphiophylla*																+	+										+												+	+			
* MELSER	*Melaleuca seriata*																																+	+										
* MELSYS	*Melaleuca systena*			+																+		+																						

	Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
*	MELTRI	*Melaleuca trichophylla*												+		+	+								+				+																	+
	MELVIM	*Melaleuca viminea*																																													+
	MELIND	*Melilotus indicus*																	+																								+				
*	MESPSE	*Mesomelaena pseudostygia*						+													+	+	+	+	+																						
*	MICSTI	*Microlaena stipoides*		+		+			+				+							+							+	+	+		+		+													
	MICALB	*Microtis alba*																																										+	+		
	MICMEDMED	*Microtis media subsp. media*																																										+			
*	MILMYO	*Millotia myosotidifolia*			+																				+							+												+		
	MONOCC	*Monotaxis occidentalis*																																+													
	MYO	*Myoporum*																																										+			
*	MYOCAP	*Myoporum caprarioides*		+	+																																										
*	NUYFLO	*Nuytsia floribunda*											+												+	+						+															
	OPEHIS	*Opercularia hispidula*																										+																			
*	OPEVAG	*Opercularia vaginata*										+		+																+	+																
	OPE	*Opercularia vaginata*																																+													
*	OROMIN	*Orobanche minor*		+																		+				+																				
*	ORTLAXLAX	*Orthrosanthus laxus var. laxus*							+													+																									
	OXACOR	*Oxalis corniculata*		+																																								+			
	OXASP	*Oxalis sp*		+																						+																				
	PARNIG	*Paracaleana nigrata*																																	+												
	PAR? C	*Parietaria ? cardiostegia*																									+																				
	PAR? D	*Parietaria ? debilis*																								+																				
*	PARDEB	*Parietaria debilis*		+	+															+																											
*	PATOCC	*Patersonia occidentalis*						+			+			+		+	+							+		+									+											+
*	PELCAP	*Pelargonium capitatum*																										+	+	+																
*	PELLIT	*Pelargonium littorale*			+																																										
*	PELLITLIT	*Pelargonium littorale subsp. littorale*																			+							+																	
	PENCLA	*Pennisetum clandestinum*																																													
*	PENAIR	*Pentaschistis airoides*																																+													
*	PERELL	*Pericalymma ellipticum*								+																											+	+						+		
	PERDEC	*Persicaria decipiens*																																										+			
*	PERCOM	*Persoonia comata*			+											+																															
	PERSAC	*Persoonia saccata*																																					+							
*	PETLIN	*Petrophile linearis*						+	+		+	+				+	+					+	+	+	+					+	+			+	+			+							
*	PETMAC	*Petrophile macrostachya*							+												+	+		+	+																				
*	PETSER	*Petrophile serruriae*							+																										+											
	PET	*Petrorhagia capitatum*																																										+			

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
* PETDUB	*Petrorhagia dubia*																		+									+																	
* PHISPI	*Philotheca spicata*									+					+	+																		+			+	+							
PHIPYGPYG	*Philydrella pygmaea subsp. pygmaea*																																												+
* PHLCIL	*Phlebocarya ciliata*										+		+		+	+													+	+	+	+	+	+										
PHYNOD	*Phyla nodiflora*																																									+			
* PHYPAR	*Phyllangium paradoxum*								+		+	+	+		+	+						+		+					+	+	+		+	+	+	+	+						
PHYCAL	*Phyllanthus calycinus*			+																																									
PHYOCT	*Phytolacca octandra*																																								+				
PIMROSROS	*Pimelea rosae subsp. rosae*																								+																			
PITPUL	*Pithocarpa pulchella*																							+																			
POAANN	*Poa annua*					+																																		+				
POASP	*Poaceae sp*																																											
* PODANG	*Podotheca angustifolia*																						+									+											
* PODCHR	*Podotheca chrysantha*																																					+							
* PODGNA	*Podotheca gnaphalioides*				+		+	+	+		+	+		+								+		+						+	+	+		+		+			+				+
POLTEN	*Polypogon tenellus*																																											+
* PORMIC	*Poranthera microphylla*			+					+												+	+	+					+	+	+					+								
PTEESC	*Pteridium esculentum*					+																																						
PTE? V	*Pterostylis ? vittata*																										+																	
PTEAFF	*Pterostylis aff nana*																																									+		
* PTEPYR	*Pterostylis pyramidalis*	+		+		+															+																						
* PTEREC	*Pterostylis recurva*						+															+																					
PTESAN	*Pterostylis sanguinea*											+																																
PTESP	*Pterostylis sp*																				+	+																						
PTEVIT	*Pterostylis vittata*																															+												
PTE	*Pterostylos nana was#44*									+																																		
* PULRET	*Pultenaea reticulata*					+						+																								+	+							
PUR	*Purple coarse hair*																																							+				
* PYRNIG	*Pyrorchis nigricans*				+		+			+	+											+	+						+	+		+										
* QUIURV	*Quinetia urvillei*																							+									+		+				+				
REA	*Really tall bunched*					+																																						
RED	*Red herb*										+																																	
* REGCIL	*Regelia ciliata*								+		+	+																			+										+		
* REGINO	*Regelia inops*																																				+	+				+		
* RHABACBAC	*Rhagodia baccata subsp. baccata*	+		+													+								+	+																	
RIC	*Rice grass*																																									+		
ROMROS	*Romulea rosea*																																									+		

	Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
*	ROMROSAUS	*Romulea rosea var. australis*		+	+																																									
	RUMSP	*Rumex sp*			+																																									
	SAMJUN	*Samolus junceus*																																												+
	SAM	*Samolus repens ? stylidium*									+																																			
	SCANIT	*Scaevola nitida*																								+																				
†*	SCAREP	*Scaevola repens var. angustifolia*																										+																		
†*	SCAREP	*Scaevola repens var. repens*						+																																						
	SCH? C	*Schoenus ? clandestinus*								+																																				
	SCH? P	*Schoenus ? plumosus*																																												+
	SCH? S	*Schoenus ? subfascicularis*																												+	+															
*	SCHCAE	*Schoenus caespititius*														+	+																	+	+										
*	SCHCUR	*Schoenus curvifolius*									+			+		+	+								+										+		+		+	+	+				
	SCH	*Schoenus curvifolius*																													+															
	SCHSUB	*Schoenus subfascicularis*																				+																								
	SCH? I	*Scholtzia ? involucrata*									+																					+			+	+		+		+						
*	SCHINV	*Scholtzia involucrata*												+		+	+														+	+														
*	SENDIA	*Senecio diaschides*					+																																							
*	SILHUM	*Siloxerus humifusus*				+				+														+	+					+	+	+	+				+	+							
	SMA	*Small fine grass*								+																																				
	SOL? A	*Solanum ? americanum*																																								+		+		
	SOLAUR	*Solanum aviculare*																																								+				
	SOLNIG	*Solanum nigrum*																																								+				
	SON? O	*Sonchus ? oleraceus*																																							+					
	SONASP	*Sonchus asper*					+																																							
*	SONOLE	*Sonchus oleraceus*		+	+		+											+	+							+	+														+	+				
	SONSP	*Sonchus sp*																												+													+			
*	SOWLAX	*Sowerbaea laxiflora*		+	+																+	+	+							+			+												
	SPEDIA	*Spergularia diandra*																															+													
	SPHDRU	*Sphaerolobium drummondii*																								+																				
*	SPYGLO	*Spyridium globulosum*		+	+													+	+	+	+						+	+	+	+													+			
	STAAXI	*Stachystemon axillaris*									+																																			
	STAMON	*Stackhousia monogyna*								+																																				
	STA	*Stalk leaved orchid=/- caladen*						+																																						
*	STEMED	*Stellaria media*																									+	+																		
*	STILAT	*Stirlingia latifolia*						+	+								+						+	+		+													+						
	STY? C	*Stylidium ? calcaratum*																								+																				
*	STYADP	*Stylidium adpressum*																						+	+	+																				

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
* STYAND	*Stylidium androsaceum*									+			+		+	+				+	+	+						+	+		+				+								
* STYARA	*Stylidium araeophyllum*								+																																				
* STYBRU	*Stylidium brunonianum*																					+	+											+	+									
* STYCAL	*Stylidium calcaratum*																				+	+	+																					
* STYCRO	*Stylidium crossacephalum*																																											
* STYNEU	*Stylidium neurophyllum*																																											
STYOBT	*Stylidium obtusatum*																																											
* STYREP	*Stylidium repens*																																											
STY	*Stylidium repens*																																											
* STYRIG	*Stylidium rigidulum*																																										
STYSCA	*Stylidium scariosum*																																											
* STYSCH	*Stylidium schoenoides*																																										
* STYSPD	*Stylidium sp Darling Range*																																											
* STYSPK	*Stylidium sp Kalbarri*																																											
STY	*Stylidium tall*																																											
* STYGLA	*Stypandra glauca*																																											
* SYNSPISPI	*Synaphea spinulosa subsp. spinulosa*																																											
TAL	*Tall bunched*																																											
TAXLIN	*Taxandria linearifolia*																																											
* TEMRET	*Templetonia retusa*																																											
* TETOCT	*Tetraria octandra*																																											
THE? S	*Thelymitra ? sp*																																											
THESP	*Thelymitra sp*																																											
THY? M	*Thysanotus ? manglesianus*																																											
THY? M	*Thysanotus ? multiflorus*																																											
* THYARE	*Thysanotus arenarius*																																											
†* THYMANPAT	*Thysanotus manglesianus*																																											
†* THYMANPAT	*Thysanotus patersonii*																																											
THYSPA	*Thysanotus sparteus*																																											
* THYTHY	*Thysanotus thyrsoideus*																																											
THYTRI	*Thysanotus triandrus*																																											
* TRAPIL	*Trachymene pilosa*																																											
* TRIELA	*Tricoryne elatior*																																											
* TRICAM	*Trifolium campestre*																																											
TRIDUB	*Trifolium dubium*																																											
TRISP	*Triglochin sp*																																											
TRIBUN	*Tripterococcus brunonis*																																											

Species Code	Species	Site	1A	1B	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B	10A	10B	11A	11B	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20A	20B	GNA	GOO	JOO	LMN	NOW	TWS	YEA
TYPORI	*Typha orientalis*																																									+			
UPR	*Upright grass?=17b29*																														+														
* URSANT	*Ursinia anthemoides*				+						+	+		+						+	+	+	+	+				+		+	+	+	+	+	+		+	+				+		
UTRMUL	*Utricularia multifida*																																										+		+
VEL	*Veldt grass*																+																													
VERVIR	*Verbascum virgatum*																								+																				
VERCAL	*Veronica calycina*			+																																									
* VERNIT	*Verticordia nitens*									+	+		+																		+														
VICSATNIG	*Vicia sativa subsp. nigra*																																								+				
* VIMJUN	*Viminaria juncea*																										+	+												+					
* VULMYUMEG	*Vulpia myuros forma megalura*			+					+					+					+															+										
* VULMYUMYU	*Vulpia myuros forma myuros*	+									+						+	+																											
VULSP	*Vulpia sp*																																		+		+							
WAHCAP	*Wahlenbergia capensis*																											+																
WAHSP	*Wahlenbergia sp*													+																+														
* WAIACUACU	*Waitzia acuminata var. acuminata*																					+	+																					
WAI	*Waitzia hairy*								+																																			
†* WAISUA	*Waitzia suaveolens*																																+	+										
†* WAISUA	*Waitzia suaveolens var. flava*								+																																			
†* WAISUA	*Waitzia suaveolens var. suaveolens*				+		+		+		+	+		+								+	+														+						
WHO	*Whorled*																																											+	
WURSP	*Wurmbea sp*																																											+	
XAN? P	*Xanthorrhoea ? preissii/brunonis*			+																																								
* XANBRU	*Xanthorrhoea brunonis*						+	+	+		+	+							+	+	+		+	+			+	+	+			+	+	+	+						+		
* XANPRE	*Xanthorrhoea preissii*				+		+	+	+		+				+		+		+	+	+	+	+	+			+	+	+		+	+	+	+	+					+		
XAN	*Xanthosia grey ?=53*																							+																				
* XANHUE	*Xanthosia huegelii*						+			+			+							+	+	+			+													+	+					