PART XV: FLORISTICS OF THE SEABIRD BUSHLAND.

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FLORISTICS OF RESERVES AND BUSHLAND AREAS IN THE PERTH REGION PART XV: FLORISTICS OF SEABIRD BUSHLAND

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ABSTRACT

The Quindalup and Spearwood Dunes of Seabird Bushland with their outcropping Tamala Limestone form distinctive landscapes of ridges and ridge slopes clothed in dense shrublands with a few interspersed wooded valleys to the east. Six principal plant communities are present in the area: Coastal Shrublands, Sand Shrublands, Limestone Heaths, Shrub Mallees, Tuart (*Eucalyptus gomphocephala*) Woodlands and *Banksia attenuata* and *B. menziesii* Woodlands. At least six regional floristic community types are represented in the Bushland: type 28 (Spearwood *Banksia attenuata* or *Banksia - Eucalyptus* woodlands), type 29a (Coastal shrublands on shallow sands), type 29b (*Acacia* Shrublands on taller dunes), type 30c (Other mallees or scrubs) and several additional floristic groups on the incipient foredunes and coastal dunes. The Bushland contains a vascular flora of 383 taxa of which two taxa are non-flowering vascular plants, 106 are monocotyledons (87 natives and 19 weeds) and 275 are dicotyledons (235 natives and 40 weeds). Two species of Declared Rare Flora and four rare taxa are found in the Bushland. Fifty taxa are characteristic of coastal areas. Seabird Bushland is of exceedingly high conservation value containing large areas of the regional floristic community types in peak condition, typical of the Quindalup and Spearwood Dunes and their interface, an unusually rich and diverse flora typical of the Quindalup and Spearwood Dunes and a sufficiently large area of communities in combination to allow natural processes to occur. Previous assessments of the area's significance are supported and strengthened by this study.

INTRODUCTION

An extensive area of bushland lies between Seabird and Guilderton. The core of this area, and the subject of this study, is the vacant crown land immediately south of Seabird and part of Swan Location 11293 (Map 1). This area of bushland stretches for 7 kms along the coast and is 1 km to 4.2 kms wide. While this area is outside System 6 (the northern boundary is the Moore River, Department of Conservation and Environment 1983) it has been included in this report series as it is on the northern fringe of the System 6 area and was included in the Swan Coastal Plain survey (Gibson *et al.* 1994).

The Seabird Bushland has been included in previous studies by Tinley (1992), Griffin (1993) and Keighery and Gibson (1995).

Tinley (1992) in his study of the coast north of the Moore River noted that the Seabird area contained the southern node of diversity of the coastal limestone flora and deserved immediate reservation.

Griffin (1993) in his regional study of the Quindalup Dunes (and associated Tamala Limestone areas) between the Swan and Irwin Rivers recognised five sectors on site based variation in the flora and vegetation. The Seabird Bushland is located in Sector 5 (Swan River to Lancelin) which is described as

"The thin veneer of Holocene sand over Tamala Limestone and yellow sand dominates this Sector. This undulating surface was dominated by *Dryandra sessilis*, *Melaleuca cardiophylla* and *M. acerosa*. The older Holocene dunes perched on the Tamala have *Melaleuca acerosa* and the younger ones *Acacia rostellifera* and *A. cochlearis* dominating. There is also a narrow band of coastal dunes with typical vegetation for this landform.

The composition of most of the vegetation types in this Sector is distinct from sectors to the north and probably also those to the south (see Trudgen 1991 and Trudgen *et al.* 1990)." (Griffin 1993)

Griffin also drew attention to the lack of conservation reserves in this Sector, stating that

"There are no conservation reserves in this Sector covering Holocene deposits.". The reserves in this sector are "....just a few narrow recreation or other reserves.". He concluded that
" Although much of the Sector is dominated by land cleared for urban or rural landuses, there are several significant areas of uncleared vegetation." (Griffin 1993)

A series of areas were recommended for such reservation, including part of the Seabird Bushland and bushland at Wilbinga (Locations 9755, 9756 & 9757), Mindarie and areas to the south and west of Bold Park. Part of the Seabird Bushland was the subject of a specific recommendation.

"The coastal portion of leased Crown land south of Seabird (lease 392 428) should be excised and declared a reserve for the Conservation of Flora and Fauna and vested in the NP&NCA as a Nature Reserve." (Griffin 1993)

The only specific, though brief, study of the area known is that by Keighery and Gibson (1995) in which it was concluded that:

"This area is of exceedingly high conservation value, representing an opportunity to acquire a diverse area of coastal land near Perth, which conserves a range of typical and unusual coastal plants and communities. It is unlikely that another comparable area will be located again." (Keighery and Gibson 1995)

The natural values of the area have been recognised in the recent Central Coast Regional Strategy (Western Australian Planning Commission 1996). In the Seabird to Guilderton sector (Planning Unit C12) two of the "Major Issues and Planning Considerations" referred to the natural values of the study area. That is:

"Protection of the natural biota with particular attention given to the limestone endemic plant species south of Seabird." and "CALM intends to transfer large parts of the Leschenault and Lime Peaks pastoral leases and the Seabird VCL into the CALM estate." (Western Australian Planning Commission 1996)

As a consequence one of the "Planning and Management Guidelines" made in the Central Coast Regional Strategy states

"Determine the conservation values of Crown land and prepare a management plan with the aim of protecting limestone endemic plant species." (Western Australian Planning Commission 1996)

This study of the Seabird Bushland details the vegetation and flora values of a significant area of the lands referred to by Griffin (1993), Keighery and Gibson (1995) and Central Coast Regional Strategy (Western Australian Planning Commission 1996).

SURVEY METHOD

Survey work was performed over four flowering seasons in 1992, 1993, 1994 and 1995.

Seven $100m^2$ study sites were located in the area to sample the range of plant communities identified using aerial photographs and limited field interpretation. The location of these sites is shown on Map 2 and the sites are described in Appendix 1. Each of these sites were permanently located using four steel pegs. Information was recorded in a set format on physical location, vegetation structure and density and the total flora of the permanent study sites (Keighery 1994, Keighery *et al.* 1995). The sites were sampled on two occasions.

The seven sites were included in a detailed floristic survey of the Swan Coastal Plain (Gibson *et al.* 1994).

Opportunistic plant collections, that is collections from outside the sites, were made during foot and vehicular transects of the bushland areas at various times of the year over the four years of survey. Identification of plant collections was made and verified at the WA Herbarium. It is considered that approximately 90% of the flora has been documented.

GEOMORPHOLOGY AND SOILS

The Seabird Bushland is located on the Quindalup and Spearwood Dune Systems (Churchward and McArthur 1980). While the area is broadly mapped as Safety Bay Sand (Qrs, Wilde and Low 1978), that is sand of the Quindalup Dunes, and sand derived from the Tamala Limestone (Qpcs, Wilde and Low 1978) the area actually contains a complex interleaving of these two dune systems in association with outcropping Tamala Limestone. In the northern block the outcropping limestones comes close to the coast line. These small areas of outcropping limestone form a distinct band of cliffs that extends for almost two kilometres along the coast. Another area of outcropping limestone occurs further inland.

VEGETATION

The Vegetation Map

The vegetation map (Map 2) shows the distribution of the principal plant communities. The distribution of these communities is strongly correlated with soil type (Appendix 1). Mallees and shrublands or heaths are found on the Tamala Limestones and the Safety Bay Sands while, woodlands are found on the deeper sands in the swales.

Shrublands

Shrublands are the predominant vegetation in the study area. These are dominated principally by members of the Myrtaceae (*Melaleuca*) and Mimosaceae (*Acacia*) families. However a consistent feature of these shrublands is the presence of native grass and annual herb layers in the vegetation. Common and abundant grass species are *Spinifex longifolius* and *S. hirsutus* nearest to the coast and *Poa poiformis, P. porphyroclados* and *Stipa flavescens* further inland. The common and abundant annual herbs included *Parietaria debilis* (Urticaceae), *Daucus glochidiatus, Hydrocotyle* species, (Apiaceae), *Senecio lautus, Millotia tenuifolia, Leptorhynchos scabrus* (Asteraceae), *Crassula* species (Crassulaceae), *Triglochin* species (Juncaginaceae) and *Calandrinia* species (Portulacaceae).

Coastal Shrublands (Not mapped, Appendix 2: C)

The immediate vegetated coastal strip is characterised by *Spinifex* Grasslands and Chenopodiaceae and Aizoaceae Shrublands (incipient foredunes, Griffin 1993). As distance from the coast increases the diversity of shrubs increases and species such as *Scaevola crassifolia* and *Olearia axillaris* become significant (coastal dunes, Griffin 1993).

Limestone Heaths (Map 2: LH, Appendix 2: LH)

In the areas with exposed Tamala Limestone and shallow soils there is a series of dense shrublands dominated by *Melaleuca acerosa, M. cardiophylla, Dryandra sessilis, Melaleuca huegelii* and *Acacia lasiocarpa.* One or all of the species may be dominant in different areas, forming a mosaic of shrubland and heath communities. These communities are not mapped individually as the dominants vary over small distances and the type and density of the dominants is closely related to the time since the last fire. A series of grasses and herbs are also typical of these communities, including: *Acanthocarpus preissii, Lomandra maritima* and *Stipa flavescens.*

Sand Shrublands (Map 2: SS, Appendix 2: H)

On the deeper Safety Bay sands the dominant vegetation is shrublands dominated by a series of tall shrubs such as *Acacia xanthina, A. rostellifera* and *A. lasiocarpa* and medium to low shrubs such as *Chamelaucium uncinatum, Conospermum stoechadis, Jacksonia sternbergiana, Scaevola crassifolia, Hibbertia spicata* subsp. *leptotheca* and *Melaleuca acerosa.* Typically these shrublands occur in association with *Stipa flavescens* and herbs such as *Lomandra maritima, Conostylis candicans* and *Senecio lautus* and sedges such as *Loxocarya flexuosa* and *Tetraria octandra.*

Shrub Mallee (Map 2: SM, Appendix 2: M)

An area of Shrub Mallee dominated by *Eucalyptus argutifolia* and *E. decipiens* occurs to the north of the study area. *Diplolaena angustifolia, Clematis linearifolia* and *Lepidosperma gladiatum* are characteristic of the understorey.

Woodlands

There are relatively few areas of woodland in the study area, woodlands being confined to the deeper sands in the swales. A series of trees such as Tuart (*Eucalyptus gomphocephala*), *Banksia attenuata* and *B. menziesii* are characteristic of these woodland .

Banksia Woodlands (Map 2: bW, Appendix 2: B)

Banksia attenuata and *B. menziesii* are the most common trees in these woodlands. The understorey is characterised by species such as *Allocasuarina humilis, Calothamnus quadrifidus, Hibbertia hypericoides, Tetraria octandra* and *Mesomelaena pseudostygia.*

Tuart Woodland (Map 2: tW, Appendix 2: T)

In a series of areas Tuart occurs at great enough density to form a woodland to forest. Associated understorey species are *Jacksonia sternbergiana, Grevillea vestita, Macrozamia riedlei* and *Xanthorrhoea preissii.*

Floristic Community Types

The regional study of the floristic variation of the Swan Coastal Plain by Gibson *et al.* (1994) identified four floristic community types in the in the Seabird Bushland (Table 1): type 28 (Spearwood *Banksia attenuata* or *Banksia - Eucalyptus* woodlands), type 29a (Coastal shrublands on shallow sands), type 29b (*Acacia* Shrublands on taller dunes) and type 30c (Other Mallees or scrubs).

Table 1: Floristic Community Types in the Study Area.
The relationship between the structural units used for mapping and the floristic units determined in the regional survey (Gibson *et al.* 1994).

Vegetation Mapping Unit	Site	Floristic Community Type
Woodlands		
Banksia Woodland		
	Site 6	28 (Spearwood *Banksia attenuata* or *Banksia - Eucalyptus* woodlands)
Shrublands		
Limestone Heaths		
	Sites 4, 5 & 8	29a (Coastal shrublands on shallow sands)
Sand Shrublands		
	Sites 2, 3 & 7	29b (*Acacia* Shrublands on taller dunes)
Shrub Mallee		
	Site 1	30c (Other mallees or scrubs)

There are also several additional floristic groups on the incipient foredunes and coastal dunes (Griffin 1993) in the area. On the incipient foredunes Griffin identified a regional floristic group in which the most consistently occurring species were *Spinifex hirsutus, Spinifex longifolius,*

Tetragonia decumbens and *Cakile maritima*. The group on the coastal dunes was identified by another group of consistently occurring species, including *Scaevola crassifolia*, *Olearia axillaris*, *Senecio lautus* and *Carpobrotus virescens*. Comparable groups were not identified by Gibson *et al.* (1994) as the study did not sample foredunes.

FLORA

The bushland contains a vascular flora of 383 taxa (Appendix 2). Of these, 324 are natives and 59 weeds. Two taxa are non-flowering vascular plants, 106 are monocotyledons (87 natives and 19 weeds) and 275 are dicotyledons (235 natives and 40 weeds). The Papilionaceae (24 natives, 4 weeds), Asteraceae (24 natives, 8 weeds), Proteaceae (23 natives), Orchidaceae (20 natives), Myrtaceae (18 natives), Poaceae (16 natives, 13 weeds), Cyperaceae (14 natives, 1 weed), Mimosaceae (12 natives), Apiaceae (11 natives), Epacridaceae (10 natives), Haemodoraceae (10 natives), Goodeniaceae (9 natives), Anthericaceae (8 natives) and Stylidiaceae (8 natives) are the most species rich families.

Significant Flora

Two species of Declared Rare Flora, Wabling Hill Mallee (*Eucalyptus argutifolia*) and *Chorizema varium*, are found in the study area.

Chorizema varium (Papilionaceae) was a presumed extinct taxon until rediscovered by E. A. Griffin in 1990 just north of the study area on Tamala Limestone in the Breton Bay area (Trudgen, Griffin and Keighery 1990). *Chorizema varium* was first collected by James Drummond in the Fremantle area soon after British settlement. This attractive low shrub with brick - red pea flowers then grew prolifically on the Tamala Limestone areas near Fremantle. Extensive searches in the Fremantle area have failed to locate any populations of this species and it is now considered extinct there. Seven populations are now known and all populations are associated with floristic community type 29a. This species has a very restricted geographical range being confined to a ten kilometre north - south transect in the vicinity of the study area. There are no known occurrences in a conservation reserve.

The Wabling Hill Mallee is also associated with Tamala Limestone. This species is known from a restricted area around Wabling Hill, Parrot Ridge and between Mindarie and Seabird.

Four rare taxa (priority taxa, that is taxa in consideration for declaration as Declared Rare Flora, Atkins 1995) are found in the study area: *Carpobrotus* sp. Hepburn (GJK 11518), *Conostylis pauciflora* subsp. *euryrhipis*, *Billardiera* sp. Seabird (GJK 12977) and *Stylidium maritima* ms.

Significant taxa of particular interest

Carpobrotus sp. Hepburn (GJK 11518) (Aizoaceae)

A large population of *Carpobrotus* sp. Hepburn was recorded at Seabird. This taxon is on the current priority Flora List CALM (Atkins 1996) as Priority 1. The first record for this taxon in the state was from the Hepburn Heights area (Keighery 1991). Survey work since this time has established that it is found in similar habitats (transitional zone between Tamala Limestone surfaces and deeper sands) from Hepburn Heights to Seabird. This taxon is often locally common but it is only currently known from one very small A-class reserve for the conservation of bushland, the Hepburn Heights Bushland. Current studies (G.J. Keighery pers. comm.) indicate that this taxon is an undescribed species of *Carpobrotus*. Unlike other species in the genus it has a non-fleshy fruit and the description of the species will require redefinition of the genus (all other members have fleshy fruit).

Gnaphalium indutum (Asteraceae)

Gnaphalium indutum was recorded in site 8 (Appendix 1). This is the southern-most record for this species on the mainland. This small grey annual daisy species is generally found on off-shore islands from the Recherche Archipelago to the Abrolhos.

Conostylis candicans subsp. *calcicola* (Haemodoraceae)

This is a small taxon of *Conostylis* found growing on near coastal calcareous sands from Dongara to Bunbury.

Hibbertia spicata subsp. *leptotheca* (Dilleniaceae)

This is one of the taxa characteristic of and endemic to Tamala Limestone ridges growing from Yalgorup to Wedge Island. This taxon has several forms the typical form grows at Seabird. This is a rare taxon (Priority 3).

Astroloma microcalyx (Epacridaceae)

This red flowered low spreading shrub grows on limestone ridges from Fremantle to Leeman. A closely related species grows on the Darling Plateau. This is a limestone endemic confined to the Swan Coastal Plain.

Hemiandra pungens Dune form (GJK 12864) (Lamiaceae)

A series of taxa are presently grouped as *Hemiandra pungens*. This variant is a prostrate glabrous plant, with short ovate pungent leaves and purple flowers that grows on coastal calcareous dunes from Wanneroo to Seabird.

Logania sp. aff. *littoralis* (GJK 14094) (Loganiaceae)

Two *Logania* taxa were found in the Seabird Bushland. *Logania vaginalis* was found growing in Tuart groves while another *Logania* with a more compact growth habit, short leaves and short, more floriferous inflorescences was found in the sand heaths where there is limestone at depth.

This taxon is most similar to the recently described *L. littoralis* which is found in coastal heath to the north of the study area between Geraldton and Cape Range. *Logania* sp. aff. *littoralis* has a similar distribution to *Billardiera* sp. Seabird (see below).

Alyogyne huegelii var. *glabrata* (Malvaceae)
This taxon has broad pinnate leaves and white to pale pink maroon centred flowers that open narrowly to form a tube in contrast with *Alyogyne huegelii* var. *huegelii* that has terete pinnate leaves and lilac flowers that open fully. *Alyogyne huegelii* var. *glabrata* grows on calcareous sands, that are generally associated with limestone ridges. *Alyogyne huegelii* var. *glabrata* grows from Yalgorup to Dongara but is uncommon between Yanchep and Yalgorup.

Acacia alata var. *tetrantha* (Mimosaceae)
This hairy form of *Acacia alata* is characteristic of shallow soils over Tamala Limestone. The typical form of *Acacia alata* is found on the Darling Scarp and Plateau.

Acacia idiomorpha (Mimosaceae)
This species occurs from Seabird north to Shark Bay.

Acacia lasiocarpa var. *lasiocarpa* (Mimosaceae)
Acacia lasiocarpa var. *lasiocarpa* is found in near coastal areas generally on Tamala surfaces near the coast but, it is also characteristic of the Beach Ridge Plain at Becher Point.

Eremophila glabra subsp. *albicans* (Myoporaceae)
A series of subspecies have can be distinguished in *Eremophila glabra* (A. Chinnock pers. comm.). The form found along the west coast on calcareous dunes and sand overlying limestone is the widely cultivated grey - leafed red - flowered spreading shrub form of the taxon. While relatively common along the west coast, this taxon is confined to the west coast of WA south of Exmouth.

Chamelaucium uncinatum (Myrtaceae)
Populations of late flowering, almost prostrate forms of *Chamelaucium uncinatum* (Geraldton Wax) occur on sandy soils on the sea cliffs in the northern half of the area. This is a potentially very significant horticultural form, and material is being established in cultivation at Kings Park. The more typical upright shrub form of the species grows on the sand dunes in the south of the study area.

Eucalyptus petrensis (Myrtaceae)
This straggly spreading mallee with smooth barked stems occurs from Yalgorup to north of Jurien. This species grows in dense stands on Tamala Limestone surfaces and is a limestone endemic.

Caladenia longicauda subsp. *calcigena* ms (Orchidaceae)
This a recently recognised taxon of limestone hills and ridges. Found from Lancelin to Bunbury, it is a limestone endemic.

Jacksonia calcicola ms (Papilionaceae)
This species was previously known as *Jacksonia stricta* (J. Chappil pers. comm.).

Nemcia reticulatum (coastal form) (Papilionaceae)
This distinct broad leaved coastal form is very common on near-coastal sands and sand over Tamala Limestone on the Plain extending from Yalgorup to Northampton. It is found in Yalgorup National Park and Neerabup National Park.

Billardiera sp. Seabird (GJK 12977) (Pittosporaceae)
A population of an apparently undescribed subspecies of *Billardiera ringens* (E. Bennett pers. comm.) was located on limestone cliffs in the north-western section of the study area. *Billardiera ringens*, the Chapman River Creeper, is found in the Geraldton area. *Billardiera* sp. Seabird is a prostrate shiny leaved shrub, with brilliant red - orange flowers unlike the more creeper like typical form. *Billardiera* sp. Seabird is currently only known with certainty from this one site in the Seabird area.

Grevillea crithmifolia (Proteaceae)
This prostrate *Grevillea* with pink buds and white flowers is found growing on limestone ridges and calcareous sands from Yalgorup to Dongara.

Grevillea preissii (Proteaceae)
This attractive red flowered low shrub grows on limestone ridges from Yalgorup to Leeman. It is a limestone endemic and has recently been separated from the closely related *G. thelemanniana*.

Hakea lissocarpha (Proteaceae)
While *Hakea lissocarpha* is found on both the Plain and the Darling Plateau it is confined to near coastal sands associated with limestone on the Plain. This species is found from Kalbarri to Israelite Bay.

Petrophile brevifolia subsp. nov. (Proteaceae) (Keighery 1992)
Presently this form of *Petrophile brevifolia* is known from limestone surfaces from Jurien Bay to Seabird. This taxon has pink flowers compared to normal yellow flowered form that is known to grow in *Banksia* Woodland from Alkimos to Shenton Bushland.

Petrophile serruriae subsp. nov. (Proteaceae) (Keighery 1992)
This is a pink flowered variant of a normally yellow flowered species of the Darling Range. This subspecies is apparently disjunct between Bunbury and Hamelin Bay, a pattern also found in

Trachymene coerulea. This taxon grows on limestone ridges from Cervantes to Bunbury with a disjunct occurrence at Hamelin Bay.

Trymalium ledifolium var. *ledifolium* (Rhamnaceae)
This taxon was previously referred to as *T. albicans* (Keighery 1992, Gibson *et al.* 1994). A limestone endemic, this erect low shrub is found from Yalgorup to north of Jurien.

Diplolaena angustifolia (Rutaceae)
This limestone endemic is found from Leeman to Yanchep.

Leptomeria empetriformis (Santalaceae)
A low erect shrub found in limestone ridges from Dongarra to Yalgorup. This is the type form of the species, which has been confused with *Leptomeria cunninghamii.*

Diplopeltis huegelii var. *huegelii* (Sapindaceae)
Currently *Diplopeltis huegelii* has several varieties. The typical variety is endemic to limestone ridges between Yalgorup and Dongara . Another variety occurs on the Darling Scarp and Plateau and has been recognised in the past as *D. lehmanii.* However it is considered that both varieties are subspecies of *D. huegelii* so, *D. huegelii and D. lehmanii,* will be combined and the subspecies described under *D. huegelii.*

Rulingia luteiflora (Sterculiaceae)
A population of *Rulingia luteiflora,* recorded from a stand of Tuart, is the southern most record for this species.

Stylidium maritima ms (Stylidiaceae)
This species is related to *Stylidium affine* but occurs in near coastal locations on calcareous soils and limestone on the coastal plain from Cliff Head to Yalgorup. Although it can be locally common, populations are not common and much of its habitat between Cliff Head and Yalgorup has been cleared or degraded. This is a rare taxon (Priority 3).

Stylidium junceum (limestone variant) (Stylidiaceae)
This form of *S. junceum* grows tall enough to allow its large pale pink flowers to emerge above the shrubs of the Limestone Heath. This is a distinct variant of *S. junceum* which grows on limestone ridges from Yalgorup to Cliff Head.

Pimelea calcicola (Thymeliaceae)
Pimelea calcicola is an erect white or pink flowered low shrub found on limestone ridges between Yalgorup and Lancelin. It is a limestone endemic.

VEGETATION CONDITION

General Condition

The majority of the Seabird Bushland is in pristine to excellent condition. The grass and annual herb layers that are characteristic of intact coastal vegetation were evident in all shrubland sites. The significant representation of the annual members of the Apiaceae, Asteraceae, Crassulaceae, Juncaginaceae and Portulacaceae families in the flora of the area (Appendix 2) demonstrate this feature of the vegetation.

However the *Banksia* and Tuart Woodlands in the swales have been substantially disturbed by grazing and in some areas clearing for pasture development and there is significant weed invasion in these areas (Map 2). These few areas disturbed by heavy grazing, and partial clearance should prove easily repairable if the current disturbance is minimised, and limited weed control undertaken to assist re-vegetation.

Weeds

Over 50 species of weeds are found in Seabird Bushland. While most species have relatively little impact and are confined to areas of high levels of disturbance, several species are of concern as they are known to spread into areas that are not significantly disturbed (Dixon and Keighery 1995, Keighery 1995). These are Cape Tulip (*Homeria flaccida*) and Geraldton Carnation Weed (*Euphorbia terracina*). Also of concern are the weedy grasses which although presently only abundant in the disturbed edges of tracks and cleared grazed areas, have the potential to invade when widespread disturbance occurs. Frequent fires can create conditions suitable for grassy weed invasion.

DISCUSSION

Vegetation

Four floristic community types were identified in the Seabird Bushland in the most recent regional study of the flora of the Swan Coastal Plain (Gibson *et al.* 1994) based on detailed sampling of the plant communities of the Plain (Table 1). All of these floristic community types are found in 'super group 4' which is typical of Spearwood and Quindalup Dunes. Type 28 is typical of the Spearwood Dunes and types 29a, 29b and 30c are typical of Quindalup Dunes. Two additional coastal Quindalup Dune groups (Griffin 1993) are also expected to occur in the area.

Five of the six community types recorded in the study area are reserved, being found in at least one Nature Reserve or National Park (Gibson *et al.* 1994, Table 2; Griffin 1993) and are generally

well distributed along the coast (for example Maps 3a - 3c). Floristic community type 30c is too poorly known to give any assessment of its conservation status.

However a feature of all of the reserves located on the coast is their consistent lack of significant representation of large areas in which natural processes can be expected to continue to occur. These areas are generally narrow coastal strips with minimal representation of other typical Quindalup and Spearwood units, designed in an attempt to conserve the beaches not the vegetation of the coastal dunes. The Seabird Bushland contains contiguous large areas of the best known examples of the regional floristic groups.

Table 2:
Regional Conservation Status of the Floristic Community Types from Gibson *et al.* (1994).

Floristic Community Type	Reservation Status#	Conservation Status
Woodlands		
28 (Spearwood *Banksia attenuata* or *Banksia - Eucalyptus* woodlands)	Present in two or more Cons. Reserves	Low risk
Shrublands		
29a (Coastal shrublands on shallow sands	Present in one Cons. Reserves	Susceptible
29b (*Acacia* Shrublands on taller dunes)	Present in one Cons. Reserves	Susceptible

Conservation Reserves are National Parks or Nature Reserves

Flora

The diversity of flora in the area (322 native taxa) is exceptionally high for an area that is floristically most strongly allied with the Quindalup Dunes. Griffin's study (1993) described a total flora of 377 taxa for his entire region and a comparison with other areas of Quindalup Dunes to the south of the study area (Table 3 and Keighery and Keighery 1993) also illustrates that the area has high species richness for its type.

The unusually rich assemblage of species for a coastal and near coastal site found in the Seabird Bushland is related to the following features of the bushland.

(i) The bushland is a relatively undisturbed large block of coastal land. Other areas of comparable size such as the Becher Point (M106) near Rockingham consist of a relatively simple landform of Quindalup dunes and swales, with wetlands occupying the swales. Hence the flora is remarkably different (Keighery and Keighery 1993) to that present at Seabird.

(ii) The bushland is in a transition area from the coast to the Spearwood Dunes, enabling a greater diversity of habitats to occur. The diversity of habitats is further increased as the limestone surfaces in the area are overlain by both Holocene sands (sands of the Quindalup Dunes or Safety Bay Sands) and sands derived from Tamala Limestones (Spearwood Dunes).

Table 3
A comparison of the floras of bushland areas of predominantly Quindalup Dunes considered for conservation. The areas are listed from south to north and their location is shown on Map 1.

Bushland Area	Total Taxa	Native Taxa	Non - Native Taxa (%)
M 103[1] (Lake Cooloongup and Walyungup)	256	174	82 (32%)
M 106[2] (Becher Point or Port Kennedy area)	240	172	68 (28%)
M 46[3] (Mount Claremont)	177	117	58 (33%)
M 36 [4] (Trigg/Karrinyup reserves)		175	
Alkimos [5]	224	188	36 *
Ningana [6]	184	155	29 *
Wilbinga [7]	233	216	17 *
Seabird	378	321	57 (15%)
Breton Bay [8]	178	164	14 *

1 Keighery, Keighery and Gibson 1996
2 Keighery and Keighery 1993
3 Keighery and Keighery 1993
4 Keighery unpublished data
5 Trudgen and Keighery 1990a
6 Trudgen and Keighery 1990b
7 Trudgen, Griffin and Keighery 1990
8 Trudgen, Griffin and Keighery 1990

* Lists for areas M106, part M103 and M46 are based on multiple visits to the areas over several years and lists are considered to be 90% complete while lists for Alkimos, Ningana, Wilbinga and Breton Bay were generally based on visits in a single year and are considered <80% complete. Also weeds were not systematically collected in these studies, therefore the weeds as a percentage of the flora have not been calculated for these areas.

As a consequence of the size, condition and soils in the area the bushland contains a large suite of species characteristic of the shallow soils over Tamala Limestone (15 taxa, Appendix 2). Many of these taxa are generally confined to these land surfaces (Appendix 2). Of particular significance is the presence of large populations of three very restricted taxa: *Eucalyptus argutifolia*, *Chorizema varium*, *Billardiera* sp. Seabird (GJK 12977). The *Billardiera* is presently only known from this area and the *Chorizema* from this area and the area immediately to the north. The area also contains very significant populations of taxa typical of shallow soils over Tamala Limestone such as *Conostylis pauciflora* subsp. *euryrhipis*, *Carpobrotus* sp. Hepburn (GJK11518), *Hibbertia spicata* subsp. *leptotheca*, *Hemiandra pungens* Dune Form, *Alyogyne huegelii* var *glabrata*, *Nemcia reticulata* Coast form, *Grevillea crithmifolia* , *Grevillea preissii*, *Petrophile serruriae* subsp. nov., *Petrophile brevifolia* subsp. nov., *Trymalium ledifolium* var. *ledifolium*, *Diplolaena angustifolia*, *Leptomeria empetriformis*, *Diplopeltis huegelii* var. *huegelii*, *Stylidium maritima* ms and *Pimelea calcicola.* (Keighery 1992).

At least ten of the 50 taxa characteristic of coastal areas in the study area are also found on the eastern side of the Plain and/or the Darling Scarp and Plateau. Most of these taxa have distinctive forms on the coastal limestones and sands. Some of these taxa are recognised taxonomically as subspecies or varieties, while others are recognised as forms.

Four of the taxa characteristic of limestone surfaces, *Eucalyptus foecunda*, *E. decipiens*, *Melaleuca huegelii* and *Dodonaea aptera*, have recently been recognised as characteristic species of a series of limestone deposits (Muchea Limestones) on the eastern side of the Plain (Keighery and Keighery 1995).

Populations of other significant taxa such as the late flowering, almost prostrate forms of *Chamelaucium uncinatum* (Geraldton Wax) add to the significance of the area.

CONCLUSION

The Quindalup and Spearwood Dunes of Seabird Bushland with their outcropping Tamala Limestone form distinctive landscapes of ridges and ridge slopes clothed in dense shrublands with a few interspersed wooded valleys to the east.

Seabird Bushland has very significant potential as a regional conservation area as it contains:

- large areas of the regional floristic community types in peak condition, typical of the Quindalup and Spearwood Dunes and their interface
- an unusually rich and diverse flora of the Quindalup and Spearwood Dunes
- a sufficiently large area of communities in combination to allow natural processes to occur.

This area is of exceedingly high conservation value, representing a diverse area of coastal land near Perth, which conserves a range of typical and unusual coastal plants and communities. It is unlikely that another comparable area will be located. Previous assessments of the area's significance by Tinley (1992), Griffin (1993) and Keighery and Gibson (1995) are supported and strengthened.

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Appendix 1: Vegetation Descriptions and Condition

General Information

Broad mapping units are used for the vegetation mapping (Map 2). The determination of these units is based on vegetation descriptions from the sites. The actual location of the sites is indicated on the map. The vegetation descriptions for each of the mapped units are from the areas considered to best illustrate these units, being 'typical' and in the best condition.

Sites are grouped on the basis of the mapping units and the floristic community type. An * indicates that the floristic community type for the unit and/or site has been inferred from the floristics.

Keys to the terminology used for the vegetation descriptions and specific condition ratings are given in Keighery (1994).

Site Descriptions

Floristic Community Type 28

Mapping Unit - *Banksia* Woodlands

Site SEAB 6 (Gibson *et al.* 1994)
Scattered *Banksia attenuata* to Woodland over scattered *Xanthorrhoea preissii* Tall Open Shrubland over *Allocasuarina humilis, Calothamnus quadrifidus* and *Hibbertia hypericoides* Open Low Heath over **Ursinia anthemoides* Very Open Herbland and *Tetraria octandra* and *Mesomelaena pseudostygia* Open Sedgeland..
Condition Rating Good to very good
Comments: Past grazing and fires are considered to be the most likely cause of the reduced cover of the natives in the understorey. This has led to a significant cover of *Ursinia anthemoides*.
Soil: yellow sand
Drainage: well Aspect: gentle to the south west

Floristic Community Type 29a

Mapping Unit - Limestone Heath

Site SEAB 4 (Gibson *et al.* 1994)
Melaleuca huegelii , Spyridium globulosum and *Acacia lasiocarpa* Open Low Heath over *Senecio lautus* Very Open Herbland.
Condition Rating Pristine
Soil: grey sand
Drainage: well Aspect: gentle to the south west

Site SEAB 5 (Gibson *et al.* 1994)
Thomasia cognata, Rhagodia baccata, Melaleuca huegelii, Templetonia retusa, Chorizema varium and *Grevillea preissii* Open Low Heath over *Stipa flavescens* Very Open Grassland and *Acanthocarpus preissii* and *Lomandra maritima* Very Open Herbland.
Condition Rating Pristine
Soil: grey sand over limestone, 20% of the surface is exposed limestone
Drainage: well Aspect: gentle to the south west

Site SEAB 8 (Gibson *et al.* 1994)
Acacia lasiocarpa, Thomasia cognata, Billardieria sp. Seabird, *Melaleuca cardiophylla, Olearia*

axillaris and *Acacia truncata* Open Low Heath over *Stipa flavescens* Very Open Grassland and *Acanthocarpus preissii* Very Open Herbland.
Condition Rating Pristine
Soil: grey sand over limestone, 30% of the surface is exposed limestone
Drainage: well Aspect: steep to the west

Floristic Community Type 29b

Mapping Unit - Sand Heath

Site SEAB 2 (Gibson *et al.* 1994)
Acacia lasiocarpa, Oxylobium reticulatum, Chamelaucium uncinatum and *Scaevola crassifolia* Open Low Heath over *Stipa flavescens* Very Open Grassland, *Lomandra maritima* Open Herbland and *Loxocarya flexuosa* Open Sedgeland.
Condition Rating Pristine
Soil: grey sand
Drainage: well Aspect: gentle to the south west

Site SEAB 3 (Gibson *et al.* 1994)
Acacia xanthina and *A. rostellifera* Open Shrubland over *Acacia lasiocarpa, Hibbertia spicata* subsp. *leptotheca* and *Melaleuca acerosa* Open Low Heath over *Lomandra maritima* Open Herbland.
Condition Rating Excellent
Soil: grey sand over grey sand
Drainage: well Aspect: gentle to the south west

Site SEAB 7 (Gibson *et al.* 1994)
Chamelaucium uncinatum, Conospermum stoechadis, Acacia lasiocarpa, Melaleuca acerosa and *Jacksonia sternbergiana* Open Low Heath over *Stipa flavescens* Very Open Grassland, *Conostylis candicans* and *Senecio lautus* Very Open Herbland and *Tetraria octandra* Very Open Sedgeland.
Condition Rating Excellent
Soil: grey sand
Drainage: well Aspect: gentle to the north east

Floristic Community Type 30c

Mapping Unit - Shrub Mallee

Site SEAB 1 (Gibson *et al.* 1994)
Eucalyptus argutifolia and *E. decipiens* Shrub Mallee over *Diplolaena angustifolia* Low Open Shrubland over *Clematis linearifolia* Very Open Vines *Lepidosperma gladiatum* Very Open Sedgeland.
Condition Rating Excellent
Soil: brown humus rich sand, over sand and limestone in places
Drainage: well Aspect: gentle to the south west

Appendix 2: Flora List

Key

Column 1: Family, Conservation Status and Regional distributions

Conservation Status

Conservation and Land Management Declared Rare Flora and Priority Taxa (Atkins 1996)

R = Declared Rare Flora
1 = Priority 1: Poorly Known Taxa
2 = Priority 2: Poorly Known Taxa
3 = Priority 3: Poorly Known Taxa
4 = Priority 4: Rare Taxa

Regional distributions

Regional ecological preferences

L = taxa characteristic of skeletal soils over Tamala Limestone
C = taxa characteristic of coastal calcareous sands (Quindalup Dunes and Spearwood Dunes)
E = taxa characteristic of eastern side of the Swan Coastal Plain and Darling Scarp and Plateau
e = endemic

Geographical Location (range ends)

N = population at the northern limit of their known geographic range
S = population at the southern limit of their known geographic range

Column 2: Taxon

Names follow Gibson *et al.* (1994) unless indicated otherwise. Taxa yet to be named have an attached reference collection number from the relevant collector. A * preceding the name indicates a weed. An "ms" after the name indicates that this is a manuscript name which is yet to be published while (F) indicates that this taxon has a distinct form in the Seabird Bushland.

Columns 3 - 9: Plant Communities (comparable unit on Map 2)

LH	= Limestone Heaths	(Map 2: LH)
H	= Sand Shrublands	(Map 2: SS)
B	= *Banksia* Woodland	(Map 2: bW)
M	= Shrub Mallee	(Map 2: SM)
T	= Tuart Woodland	(Map 2: tW)
D	= Disturbed	(Map 2: D)
C	= Coastal Dunes	(not mapped)

		LH	H	B	M	T	D	C
Aizoaceae								
*	Carpobrotus aequilaterus						•	
	Carpobrotus aequilaterus X sp. Hepburn (GJK 11518)						•	
*	Carpobrotus edulis			•		•		
1 Le	Carpobrotus sp. Hepburn (GJK 11518)		•					
	Carpobrotus virescens		•					•
*	Tetragonia decumbens							•
	Tetragonia implexicoma							•
	Tetragonia tetragonoides	•						
Amaranthaceae								
	Ptilotus drummondii			•				
	Ptilotus polystachyus			•				
Anthericaceae								
	Arthropodium capillipes					•		
	Corynotheca micrantha		•	•				
	Sowerbaea laxiflora			•				
C E	Thysanotus arenarius		•	•				
	Thysanotus manglesianus					•		
	Thysanotus patersonii					•		
	Thysanotus triandrus			•				
	Tricoryne elatior		•	•				
Apiaceae								
	Apium annuum	•			•			
	Apium prostratum var. prostratum		•					
	Daucus glochidiatus	•						
	Eryngium pinnatifidum subsp. pinnatifidum			•		•		
	Homalosciadium homalocarpum	•		•				
	Hydrocotyle diantha				•			
	Hydrocotyle hispidula		•					
	Hydrocotyle tetragonocarpa		•					
	Trachymene coerulea	•						
	Trachymene pilosa		•	•				
	Xanthosia huegelii			•				
Asphodelaceae								
*	Trachyandra divaricata						•	•
Asteraceae								
	Actites megalocarpa							•
	Angianthus cunninghamii							•
*	Arctotheca calendula					•	•	•
*	Arctotheca populifolia							•
	Asteridea pulverulenta			•				
	Brachyscome iberidifolia (F)			•				
	Calocephalus brownii		•					•
*	Carduus pycnocephalus					•		
	Cotula australis	•						
*	Dittrichia graveolens						•	
	Gnaphalium indutum	•						
	Gnaphalium sphaericum		•			•		
	Hyalosperma cotula	•		•	•			
*	Hypochaeris glabra		•	•		•	•	
	Lagenifera huegelii			•				
C	Leptorhynchos scabrus		•					
	Millotia tenuifolia	•	•	•				
	Olearia axillaris		•					

		LH	H	B	M	T	D	C
	Olearia rudis	•						
	Ozothamnus cordatus		•					•
	Podolepis gracilis		•			•		
	Podotheca angustifolia			•				
	Podotheca chrysantha			•				
	Podotheca gnaphalioides		•	•		•		
	Rhodanthe corymbosum	•			•			
	Quinetia urvillei	•	•	•				
	Senecio lautus subsp. maritimus	•	•			•		•
	Siloxerus humifusus	•		•				
*	Sonchus oleraceus				•	•		
*	Urospermum picroides					•		
*	Ursinia anthemoides			•			•	
	Waitzia citrina			•				
Brassicaceae								
*	Brassica tournefortii					•	•	
*	Cakile maritima							•
*	Heliophila pusilla		•				•	
	Lepidium rotundum		•					
	Stenopetalum gracile		•					
Campanulaceae								
*	Wahlenbergia capensis						•	
	Wahlenbergia preissii	•		•		•		
Caryophyllaceae								
*	Cerastium glomeratum	•	•		•		•	
*	Petrorhagia velutina					•	•	
*	Sagina maritima	•						
*	Silene nocturna					•	•	
*	Stellaria media				•	•		
Casuarinaceae								
	Allocasuarina fraseriana			•				
	Allocasuarina humilis	•	•	•				
Centrolepidaceae								
	Centrolepis drummondiana		•	•				
	Centrolepis polygyna	•						
Chenopodiaceae								
	Atriplex cinerea	•						•
	Enchylaena tomentosa	•				•		•
	Rhagodia baccata subsp. dioica							•
	Salsola kali							•
	Threlkeldia diffusa							•
Colchicaceae								
	Burchardia congesta (= B. umbellata Gibson *et al.* 1994)		•	•				
L	Wurmbea monantha	•						
Crassulaceae								
	Crassula colorata	•	•	•	•	•		
	Crassula exserta	•			•			
*	Crassula glomerata	•	•					•
*	Crassula natans	•						
	Crassula pedicellosa		•					

		LH	H	B	M	T	D	C
Cuscutaceae								
*	Cuscuta epithymum		•	•	•			
Cyperaceae								
	Carex preissii					•		
*	Cyperus tenellus			•		•		
	Isolepis cernua	•						
	Isolepis marginata			•	•	•		
	Isolepis nodosa	•						•
	Lepidosperma angustatum		•	•		•		
	Lepidosperma gladiatum							•
	Lepidosperma longitudinale			•	•			
	Lepidosperma scabrum				•			
	Mesomelaena stygia			•				
	Schoenus clandestinus			•		•		
	Schoenus curvifolius			•				
	Schoenus grandiflorus		•			•		
Le	Schoenus lanatus	•						
	Tetraria octandra			•				
Dasypogonaceae								
C	Acanthocarpus preissii		•			•		•
	Lomandra caespitosa			•				
	Lomandra hermaphrodita			•				
C	Lomandra maritima		•					
Dennstaedtiaceae (Fern)								
	Pteridium esculentum					•		
Dilleniaceae								
	Hibbertia acerosa			•				
	Hibbertia aurea		•	•				
	Hibbertia huegelii			•				
	Hibbertia hypericoides		•	•				
	Hibbertia racemosa	•	•			•		
Le	Hibbertia spicata subsp. leptotheca	•						
	Hibbertia subvaginata			•				
Droseraceae								
	Drosera erythrorhiza			•				
	Drosera glanduligera	•	•	•				
	Drosera macrantha		•	•				
	Drosera menziesii				•			
Epacridaceae								
	Acrotriche cordata	•						
Le	Astroloma microcalyx	•						
	Astroloma pallidum		•	•				
	Conostephium pendulum			•				
	Leucopogon australis		•					
	Leucopogon parviflorus		•					
	Leucopogon propinquus	•			•	•		
	Leucopogon racemulosus		•					
	Leucopogon sprengelioides		•	•				
	Lysinema ciliatum		•					
Euphorbiaceae								
	Adriana quadripartita		•					•
	Beyeria cinerea	•						
*	Euphorbia peplus				•	•		

		LH	H	B	M	T	D	C
*	Euphorbia terracina		•				•	
	Phyllanthus calycinus		•	•		•		
	Poranthera microphylla	•	•	•				
Frankeniaceae								
	Frankenia pauciflora	•						
Gentianaceae								
*	Centaurium erythraea	•						
Geraniaceae								
*	Erodium cicutarium	•				•	•	
	Geranium solanderi		•			•		
*	Pelargonium capitatum	•					•	•
	Pelargonium littorale		•					
Goodeniaceae								
	Dampiera lavandulacea (F)		•					
	Dampiera linearis		•					
	Lechenaultia linarioides	•	•					
	Scaevola canescens		•	•				
	Scaevola crassifolia	•	•					•
	Scaevola globulifera		•					
	Scaevola nitida	•						
	Scaevola phlebopetala			•				
	Scaevola thesioides	•						
Gyrostemonaceae								
	Tersonia cyathiflora		•	•				
Haemodoraceae								
	Anigozanthos humilis		•	•				
	Anigozanthos manglesii		•	•				
	Conostylis aculeata subsp. aculeata		•	•				
C	Conostylis candicans subsp. calcicola	•	•	•				
1 C	Conostylis pauciflora subsp. euryrhipis		•					
	Conostylis pauciflora • candicans		•					
	Conostylis teretifolia subsp. planescens		•					
	Haemodorum laxum			•				
	Haemodorum paniculatum			•				
	Haemodorum spicatum			•				
Haloragaceae								
	Gonocarpus pithyoides		•					
Iridaceae								
*	Gladiolus caryophyllaceus			•				
*	Homeria flaccida					•	•	
	Patersonia occidentalis			•				
*	Romulea rosea	•				•	•	
Juncaceae								
*	Juncus bufonius	•						•
Juncaginaceae								
	Triglochin calcitrapum	•	•	•	•	•		
	Triglochin centrocarpum			•	•	•		
	Triglochin trichophorum	•			•			
Lamiaceae								
	Hemiandra pungens dune form (GJK 12864)		•					

		LH	H	B	M	T	D	C
	Westringia dampieri		•					
Lauraceae								
	Cassytha flava		•					
	Cassytha glabella				•			
	Cassytha pomiformis		•					
	Cassytha racemosa	•			•	•		
Lobeliaceae								
	Lobelia gibbosa		•					
	Lobelia tenuior			•				
Loganiaceae								
	Logania sp. aff. littoralis (GJK 14094)		•					
	Logania vaginalis					•		
	Phyllangium paradoxum (= Mitrasacme paradoxa in Gibson *et al.* 1994, Dunlop 1996)		•	•				•
Loranthaceae								
	Nuytsia floribunda			•				
Malvaceae								
	Alyogyne huegelii var. glabrata	•	•					
	Lavatera plebeia							•
Mimosaceae								
Le	Acacia alata var. tetrantha	•						
	Acacia cochlearis				•			
	Acacia cyclops				•	•		
	Acacia huegelii		•	•				
S	Acacia idiomorpha		•					
C	Acacia lasiocarpa var. lasiocarpa	•						
	Acacia pulchella var. glaberrima		•	•				
	Acacia rostellifera		•					
	Acacia saligna					•		
C	Acacia truncata	•						
	Acacia willdenowiana			•				
	Acacia xanthina							
Molluginaceae								
	Macarthuria australis			•				
Myoporaceae								
C	Eremophila glabra subsp. albicans	•	•					
	Myoporum insulare	•					•	
Myrtaceae								
CE	Calothamnus quadrifidus	•	•					
	Calothamnus sanguineus			•				
	Calytrix angulata			•				
	Calytrix strigosa (F)		•					
	Chamelaucium uncinatum (F)		•					
	Eremaea pauciflora			•				
R C	Eucalyptus argutifolia				•			
C E	Eucalyptus decipiens				•	•		
C	Eucalyptus gomphocephala					•		
	Eucalyptus marginata			•				
Le	Eucalyptus petrensis				•			
	Hypocalymma robustum			•				
	Leptospermum spinescens		•	•				
	Melaleuca acerosa		•					

		LH	H	B	M	T	D	C
	Melaleuca cardiophylla	•						
C E	Melaleuca huegelii	•						
	Melaleuca scabra		•	•				
	Scholtzia laxiflora		•	•				
Olacaceae								
	Olax benthamiana		•					
Onagraceae								
*	Oenothera drummondii							•
Orchidaceae								
	Acianthus reniformis var. huegelii				•	•		
	Caladenia bicalliata		•					
	Caladenia deformis			•				
	Caladenia flava		•	•				
	Caladenia latifolia					•		
Le	Caladenia longicauda subsp. calcigena ms	•						
	Caladenia varians			•				
	Diuris magnifica		•	•				
	Elythranthera brunonis			•				
	Eriochilus dilatatus	•						
	Leporella fimbriata			•				
	Microtis media					•		
Le	Prasophyllum calcicola ms	•						
	Prasophyllum elatum				•			
	Pterostylis aspera	•						
	Pterostylis nana	•			•	•		
	Pterostylis recurva			•				
	Pterostylis sanguinea			•				
	Pyrorchus nigricans (= Lyperanthus nigricans Gibson *et al.* 1994)		•	•		•		
	Thelymitra campanulata		•	•				
Orobanchaceae								
*	Orobanche minor		•		•	•		
Oxalidaceae								
	Oxalis perennans				•	•		
Papilionaceae								
	Bossiaea eriocarpa		•	•				
R Le	Chorizema varium	•						
	Daviesia decurrens		•					
	Daviesia divaricata	•	•					
	Daviesia physodes			•				
	Daviesia triflora			•				
	Gompholobium confertum			•				
	Gompholobium tomentosum		•	•				
	Hardenbergia comptoniana	•	•		•	•		
	Hovea trisperma			•				
	Isotropis cuneifolia			•				
C	Jacksonia calcicola ms (= J. stricta Gibson *et al.* 1994)		•					
	Jacksonia densiflora			•				
	Jacksonia furcellata			•				
	Jacksonia sternbergiana			•				
C E	Kennedia coccinea	•						
	Kennedia prostrata		•	•				
*	Lupinus cosentinii					•		
*	Medicago polymorpha				•	•	•	

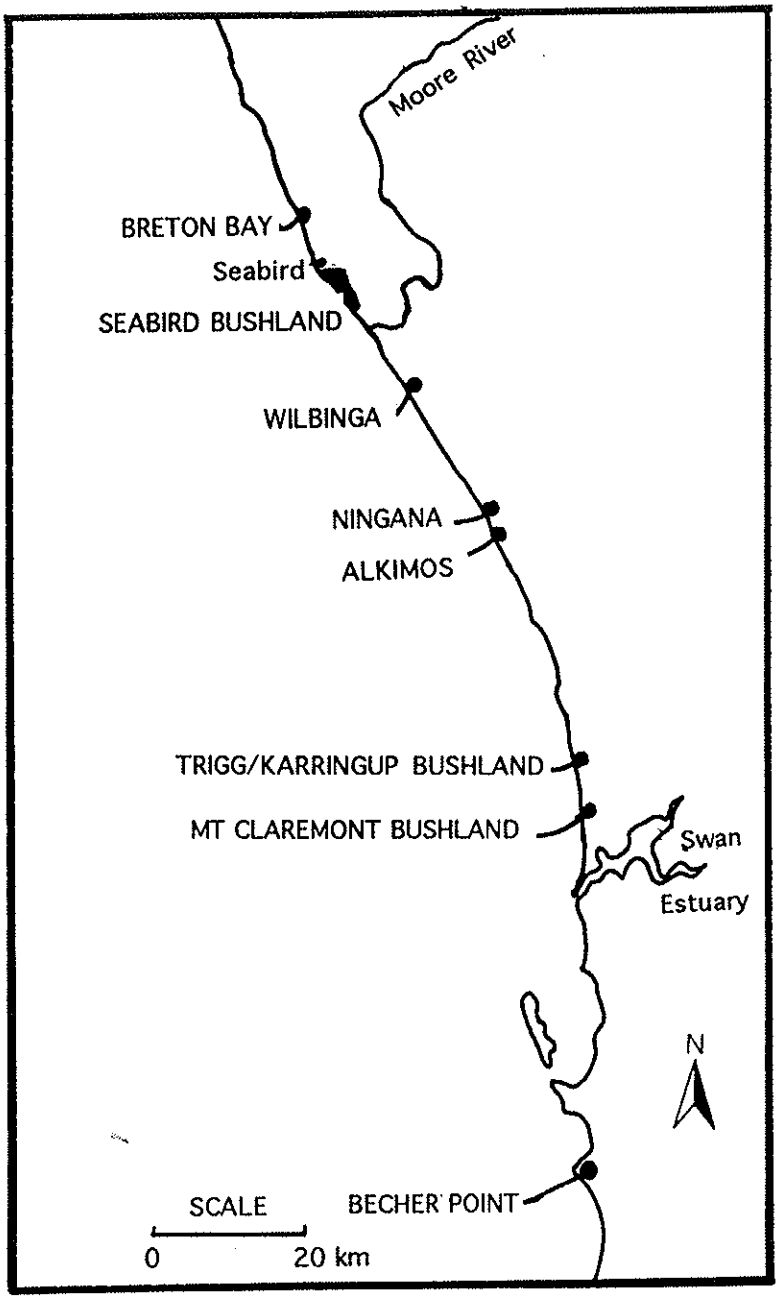
			LH	H	B	M	T	D	C
	*	Melilotus indicus	•				•	•	
C		Nemcia reticulata (F)		•					
		Sphaerolobium medium		•	•				
		Templetonia retusa	•						
	*	Trifolium campestre	•			•			
Phormiaceae									
		Dianella divaricata	•	•	•		•		
Pittosporaceae									
1 Le		Billardiera sp. Seabird (GJK 12977) (= B. aff. ringens GJK 12977 Gibson *et al.*)	•						
		Pronaya fraseri			•				
Plantaginaceae									
		Plantago exilis	•						
Poaceae									
	*	Aira caryophyllea					•	•	
		Amphipogon turbinatus			•				
	*	Avena fatua					•	•	
	*	Briza maxima				•	•	•	
	*	Briza minor					•	•	
C		Bromus arenarius		•					
	*	Bromus diandrus					•	•	
	*	Catapodium rigidum	•						
	*	Cynodon dactylon					•	•	
		Danthonia caespitosa		•	•				
		Danthonia setacea		•					
	*	Ehrharta calycina			•			•	
	*	Ehrharta longiflora		•			•		
	*	Lagurus ovatus					•	•	
	*	Lolium multiflorum	•				•	•	
		Microlaena stipoides			•		•		
		Neurachne alopecuroidea			•				
	*	Poa annua	•					•	
		Poa drummondiana	•						
		Poa poiformis	•				•		
C		Poa porphyroclados		•					
C		Spinifex hirsutus							•
C		Spinifex longifolius							•
		Sporobolus virginicus	•						•
		Stipa compressa		•	•				
C E		Stipa flavescens		•			•		
		Stipa tenuifolia	•	•					
	*	Vulpia membranacea	•						
	*	Vulpia myuros					•	•	
Polygalaceae									
		Comesperma confertum		•	•				
C E		Comesperma integerrimum				•			
C		Comesperma virgatum			•				
Portulacaceae									
		Calandrinia brevipedata		•	•				
		Calandrinia calyptrata		•					
		Calandrinia corrigioloides	•	•	•	•	•		
		Calandrinia granulifera	•	•	•				
		Calandrinia liniflora		•		•			

		LH	H	B	M	T	D	C
Primulaceae								
*	Anagallis arvensis					•	•	
Proteaceae								
	Adenanthos cygnorum			•				
	Banksia attenuata			•				
	Banksia grandis			•				
	Banksia ilicifolia			•				
	Banksia menziesii			•				
	Banksia prionotes			•				
	Conospermum triplinervium		•	•				
	Dryandra lindleyana (= D. nivea Gibson *et al.*)		•	•	•	•		
	Dryandra sessilis	•	•					
C	Grevillea crithmifolia	•	•					
Le	Grevillea preissii (= G. thelemanniana subsp. preissii Gibson *et al.*)	•						
C E	Grevillea vestita	•		•				
	Hakea costata		•	•				
C E	Hakea lissocarpha			•				
	Hakea prostrata		•	•				
C E	Hakea trifurcata	•	•	•	•			
	Persoonia comata			•				
C	Petrophile brevifolia subsp. nov. (GJK 10364)	•	•					
	Petrophile linearis			•				
	Petrophile macrostachya		•	•				
Le	Petrophile serruriae subsp. nov.(GJK 11421)	•						
	Stirlingia latifolia			•				
	Synaphea spinulosa		•	•				
Ranunculaceae								
	Clematis microphylla		•			•		
	Ranunculus pumilio					•		
Restionaceae								
	Alexgeorgea nitens		•	•				
	Hypolaena exsulca			•				
	Loxocarya aspera	•	•	•				
	Loxocarya flexuosa			•				
	Lyginia barbata			•				
Rhamnaceae								
C	Cryptandra mutila	•						
	Spyridium globulosum		•					
Le	Trymalium ledifolium subsp. ledifolium (= T. albicans Gibson *et al.*)	•						
Rubiaceae								
*	Galium murale	•	•			•		
	Opercularia spermacocea		•					
	Opercularia vaginata	•		•		•		
Rutaceae								
L C	Diplolaena angustifolia		•					
	Eriostemon spicatus			•				
Santalaceae								
	Exocarpos sparteus	•	•		•			
Le	Leptomeria empetriformis	•	•					
	Leptomeria preissiana	•						

		LH	H	B	M	T	D	C
	Santalum acuminatum		•					
Sapindaceae								
C	Diplopeltis huegelii var. huegelii	•	•					
C E	Dodonaea aptera				•			
Scrophulariaceae								
*	Bellardia trixago					•		
*	Dischisma arenarium		•					
*	Parentucellia latifolia	•				•		
Solanaceae								
	Anthocercis ilicifolia		•					
*	Solanum nigrum	•				•	•	
	Solanum sodomeum					•	•	
	Solanum symonii				•	•		
Stackhousiaceae								
	Stackhousia pubescens	•	•	•				
	Tripterococcus brunonis			•				
Sterculiaceae								
	Guichenotia ledifolia			•				
	Rulingia luteiflora					•		
	Thomasia cognata	•				•		
	Thomasia triphylla		•			•		
Stylidiaceae								
	Levenhookia stipitata		•	•				
	Stylidium brunonianum			•				
	Stylidium calcaratum			•				
	Stylidium junceum	•						
	Stylidium macrocarpum		•					
3 Ce	Stylidium maritima ms	•						
	Stylidium piliferum			•				
	Stylidium repens		•	•				
Thymelaeaceae								
Le	Pimelea calcicola	•						
	Pimelea ferruginea		•					
	Pimelea sulphurea			•				
Urticaceae								
	Parietaria debilis	•			•			
Violaceae								
	Hybanthus calycinus		•	•				
Xanthorrhoeaceae								
	Xanthorrhoea preissii			•		•		
Zamiaceae								
	Macrozamia riedlei		•	•		•		
Zygophyllaceae								
	Zygophyllum fruticulosum		•				•	
	Zygophyllum simile		•					

Map 1: Seabird Bushland Location.

Seabird Bushland and the general location of other comparable bushland areas.



Map 2: Vegetation Map

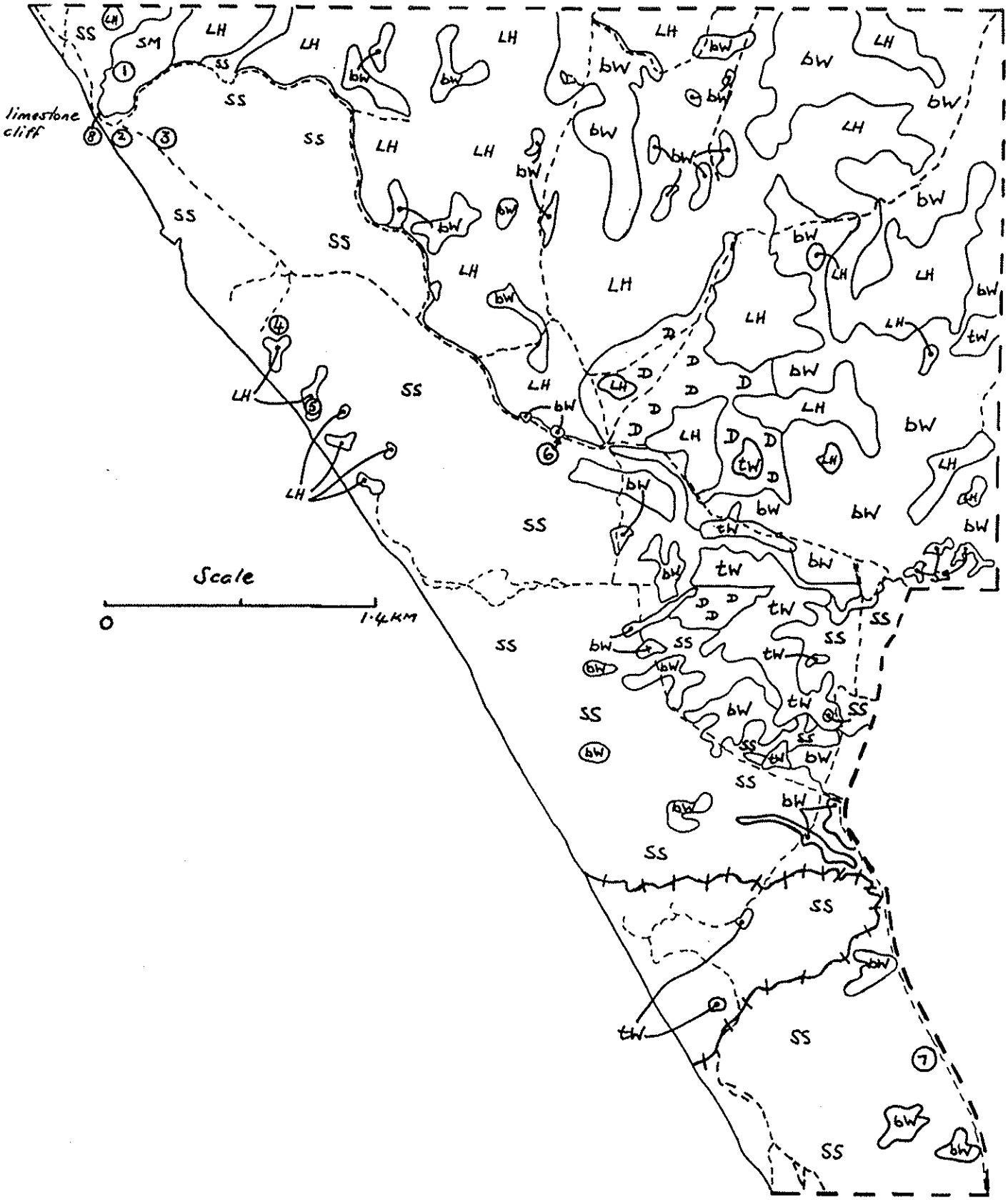
Key

- Seabird Bushland Boundary
- plant community boundary
- Blow out boundary
- (2) Site location
- Tracks

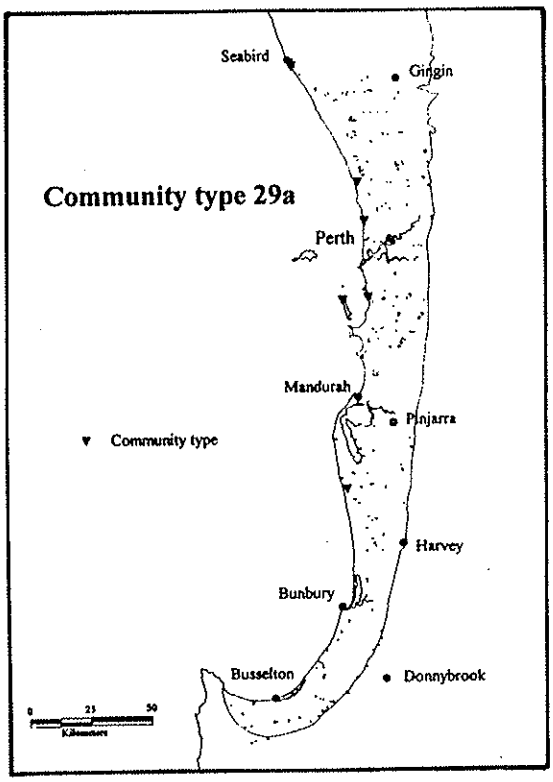
Mapped Plant Communities (comparable units in Appendix 2)

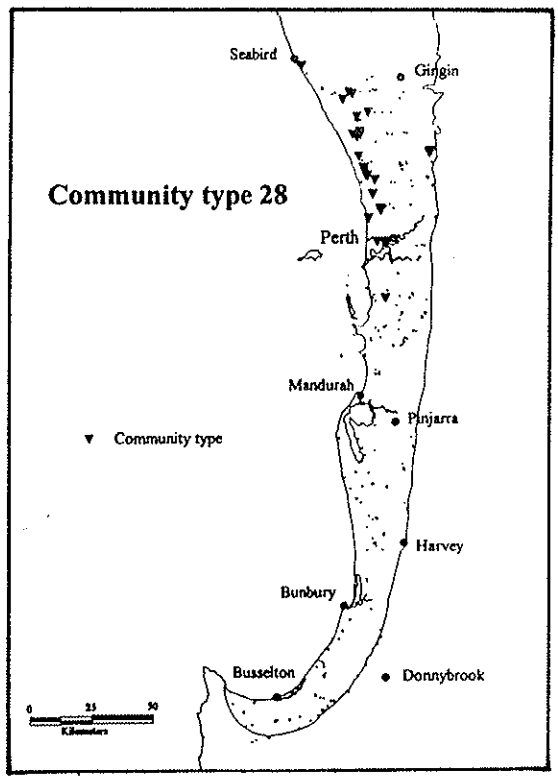
LH	=	Limestone Heath (Appendix 2: LH)
SS	=	Sand Shrublands (Appendix 2: H)
SM	=	Shrub Mallee (Appendix 2: M)
bW	=	*Banksia* Woodland (Appendix 2: B)
tW	=	Tuart Woodland (Appendix 2: T)
D	=	Degraded (cleared areas and track edges, Appendix 2: D)

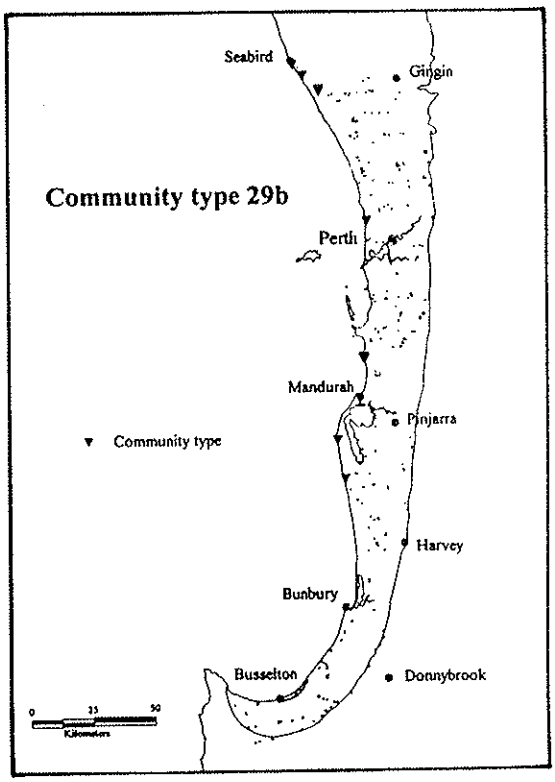
Map 2: Vegetation Map



Map 3: Distribution of the Floristic Community Types
(from Gibson *et al.* 1994)







FLORISTICS of RESERVES and BUSHLAND AREAS

of the

PERTH REGION (SYSTEM 6)

PARTS XI - XV

by

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February 1997

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