

# Barwon Coast Vegetation Management Plan



**Final Draft**

Prepared for  
**Barwon Coast Committee of Management**

Prepared by  
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## Cover Photograph

The National and State significant plant species Austral Lotus (*Lotus australis* var *australis*) flowering at 13<sup>th</sup> Beach. Photograph by Bev Wood.

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## Summary

The Barwon Coast Committee of Management Inc. (Barwon Coast) has recently completed its Coastal Management Plan for the period to 2015. The Plan notes “Natural resource protection applies to all of the area managed by Barwon Coast to ensure that the ongoing ecological processes and associated habitat values of the coastal reserve are sustained. Further, programs will be established to maintain and continuously enhance biological diversity within the coastal reserve.” In keeping with that aim, this ecological assessment and vegetation management plan was commissioned by the Barwon Coast.

The Barwon Coast management area extends along the coast from Collendina (7W) in the east to Blue Rocks (42W) in the west, landward of the high water mark, a distance of approximately 13 kilometres. The area also incorporates the Bluff and part of the Barwon River estuary. For management purposes it is divided into six Management Zones that reflect the physical and land use characteristics of the study area.

In summary, this study recorded a total of 122 indigenous plant species. This includes populations of eight plant species that are assessed to be of State conservation significance. They are Coast Wirilda, Rare Bitter-bush, Creeping Coast Tussock-grass, Marsh Saltbush, Coast Fescue, Austral Lotus, Salt Fireweed and Coast Twin-leaf.

As a reflection of the physical diversity of the study area this vegetation is comprised of five different Ecological Vegetation Classes (EVCs). Two of these EVCs are ‘endangered’, one is ‘vulnerable’ and two are ‘depleted’ within the Otway Plain bioregion. This is a consequence of the amount of clearing of native vegetation (and the degraded state of much that remains) that has occurred.

Data for exotic plant species, indigenous non-vascular plant species (mosses, fungi and the like), indigenous and exotic fauna species (including non-vertebrate fauna) has also be correlated and presented.

This study confirms that the flora and fauna values of the Barwon Coast area are of such significance that the primary function of the study area should be for conservation of indigenous habitats where possible.

This study finds that much of the study area is in essence still a ‘natural’ area and that it is reasonable to assume that it is possible to maintain and/or restore the vegetation to a mostly indigenous ‘manageable ecosystem’.

The flora and fauna values of the Barwon Coast management area are however, under threat, primarily from weed invasions in the terrestrial vegetation communities. Continuing and enhanced management of these weed invasions is urgently required.

This study provides management prescriptions to guide future resource allocation for the next ten-year period, to achieve the stated priority of habitat protection and improvement across the Barwon Coast management area.

## 1 Introduction

This ecological assessment and vegetation management plan for the Barwon Coast management area was commissioned by the Barwon Coast Committee of Management Inc. (Barwon Coast). Concurrent with this report Barwon Coast has recently adopted the overarching Coastal Management Plan (CMP) for 2012/13 to 2014/15 (November 2012).

The CMP's strategic directions for Natural Resource Protection notes that "Natural resource protection applies to all of the area managed by Barwon Coast to ensure that the ongoing ecological processes and associated habitat values of the coastal reserve are sustained. Further, programs will be established to maintain and continuously enhance biological diversity within the coastal reserve." and has as its objectives to:

- Manage threats to the coastal and marine environment:
- Protect habitats, flora and fauna:
- Manage risks to foreshore users and to the environment:
- Manage resource demand as a Sustainable Organisation:

### 1.1 Aims

The aims of this assessment are to:

- Provide a comprehensive description and assessment of the current ecological values of the Barwon Coast area.
- Assess the significance of the vegetation (species and communities) of the Barwon Coast area.
- Identify the main threats to the ecological values.
- Provide management prescriptions.

### 1.2 Methods

To achieve the stated aims the following actions were taken:

- Review of the recent vegetation assessments.
- Review of the available faunal information.
- Review of the available historical information.
- A comprehensive field study that documents and maps the location of all vegetation communities, vegetation species, including significant species.
- Vegetation data collection methods consisted of Habitat Hectare Vegetation Quality assessments, quadrat data assessments, plant species lists and digital photographs.

The field study work was undertaken by this author, assisted by staff from Barwon Coast Coastal Operations, and in particular Bev Wood, during October and November 2012.

Data from previous fieldwork, including that undertaken in The Bluff study area by Mark Trengove and Bev Wood during October and November 2007 (Barwon Heads Bluff Ecological Assessment 2010). Several of the Bluff report study sites have been re-assessed during this survey. Past surveys at Ocean Grove dunes and at 13<sup>th</sup> Beach have also been incorporated into this report.

Fauna and non-vascular flora species data collected by Barwon Coast is also incorporated into this report.

### **1.2.1 Taxonomy**

Scientific names for plants follow the Census of Vascular Plants of Victoria (Walsh and Stajsic 2007). Common names for plants follow the Flora of Victoria Volumes 2-4 (Walsh and Entwisle 1994-1999).

### **1.2.2 Defining Significance**

A number of criteria are applied in order to assess the significance of flora species and vegetation communities. The definition of the criteria is detailed in Appendix 1.

### **1.2.3 Limitations**

The survey was conducted in spring, a time of year when most indigenous plant species are visible. As a result there are not considered to be any significant limitations to the study.

The survey includes only vascular flora. Non-vascular flora (mosses, lichens, fungi, etc.) was not recorded. Non-vascular flora was considered as a percentage cover value component of both the Net Gain field assessment and the quadrat assessment.

Fauna assessments were not undertaken.

## 2 The Study Area

The study area (Figure 1) extends along the coast from Collendina (7W) in the east to Blue Rocks (42W) in the west, landward of the high water mark, a distance of approximately 13 kilometres. The area also incorporates The Bluff and part of the Barwon River estuary.

East of the Barwon Head (The Bluff) the study area incorporates the barrier dune system and extends inland to The Esplanade and Ocean Throughway and then to the adjacent private property at Ocean Grove.

West of the Barwon Head the study area incorporates the barrier dune system and exposed outcrops and extends inland north of 13<sup>th</sup> Beach Road to boundary of the adjoining Golf Courses and private property at the west end.

At Barwon Heads, the Bluff and Barwon River precincts generally extend to the adjacent private property within the town and to Parks Victoria managed land upstream along the Barwon River.

The physiography and geology of the coastal area was described by Bird (1993).

*From the west the study area is comprised of high grassy dunes over Pleistocene dune calcarenite, which out crops in shore platform segments at low tide (13th Beach).*

*The Bluff (Mount Colite) consists of Pleistocene dune calcarenite with interbedded palaesols over basalt. The lower Barwon River reaches the sea at Barwon Heads. In its lower reaches it is fringed by Mangroves (*Avicennia marina* ssp *australasica*) and Saltmarsh. Tidal ebb and flow channels are separated by elongated sand shoals, exposed at low tide. At the River mouth the tidal channel rests upon a lava flow.*

*To the east a sandy beach, backed by Holocene dunes up to 20 metres high sweep from Ocean Grove (including The Spit) towards Point Lonsdale.*

The Bridgewater Formation is further described by Rosengren (2010).

*The buried ridge of the Bridgewater Formation aeolian calcarenite is the core to the dunes east of Ocean Grove, this calcarenite ridge functions as a wall intercepting sand blowing from the beach and providing a platform for building a high coast parallel linear dune ridge.*

The study area primarily consists of the areas of 'natural vegetation'. Areas that are managed primarily for utilitarian uses are generally not covered by this report (unless there is a management issue that causes the inclusion of these areas).

The Barwon Coast management area is located within the Otway Plains bioregion (DNRE 2002), which is located within in the Corangamite Catchment

Management Authority area. The study area is located within the City of Greater Geelong.

Rainfalls for the study area average at approximately 660mm per annum. Strong on-shore winds are a feature of this high-energy coastline, with high atmospheric salt deposition.

The vegetation of the study area varies from relatively intact (indigenous) fore-dune and rear dune vegetation towards the eastern extent of the study area to partially intact, often re-colonized indigenous vegetation within the central sector of the study area (closer to the towns of Barwon Heads and Ocean Grove) to partially intact, often re-colonized indigenous vegetation and relatively intact indigenous vegetation to the west. Environmental weeds species, including many serious environmental weeds have invaded, and continue to invade, much of the study area.

The study area is shown in Figure 1.



*Figure 1 Study Area shown in yellow.*

## 2.1 History of Land Use and Management

Prior to European colonization the Barwon Coast area was utilized by the Wadawurrung people for a variety of purposes for many thousands of years. 18 Aboriginal Cultural Heritage archaeological sites have been located at The Bluff alone. The majority of these sites are middens that are thought to be less than 5,000 years old and suggest that 'midden deposits and other Aboriginal sites were once very extensive' (Marshall and Webb 1997).

Grazing by introduced stock was first introduced by squatters into the study area before the 1850's. In the mid 1850s Barwon Heads and Ocean Grove townships were being established.

In 1889 the Barwon Heads Park Trust was established. An initial bequest to the Trust was for the sum of 5 pounds to plant a boxthorn hedge to keep cattle off The Bluff and an early contract for 20 pounds per annum for rabbit control.

Given the pioneering nature of the early European days, there was less awareness of ecological values as well as less available funding to manage impacts.

Over a period of time the foredunes have been colonized by exotic perennial grass, in particular Marram Grass (which was first planted in the study area in the 1890s and actively planted up to 1984 [Warren Chapman *pers comm*]) and Sea Wheat-grass (thought not to be actively introduced). These species have caused changes in the physical characteristics of the dunes and created pressures for indigenous biota.

In the 1970s several species of *Acacia*, *Eucalyptus*, *Melaleuca*, *Casuarina* and other species were introduced for dune stabilization at locations within 13<sup>th</sup> Beach by the Country Roads Board. Several of these species have since become naturalized environmental weeds, with the West Australian *Acacias*, in particular, becoming serious weeds.

In the early 1970's the State Government initiated the Barway Study (which included the area from The Bluff westward) in response to degradation caused by overuse of the coastal resources. Significant resources (relative to the limited funding that could be allocated by the Committees at the time) came to The Bluff, The Spit and Ocean Grove in the late 1970's and early 1980's through a State government initiative known as the Barwon Heads to Queenscliff Ad Hoc Committee. Sand dune protection works, improved visitor amenities and formal access ways were undertaken with these funds. Early efforts to restore the Bluff were also made with assistance from that initiative.

This in turn led to the development of more structured ongoing programs by committees recognizing environmental principles and developing management plans recognizing environment protection zones, by the Ocean Grove Foreshore



Committee and masterplans, such as the Barwon Heads Park Master Plan (1991) by the Barwon Heads Park Committee.

The study area has been managed by the Barwon Coast (the successor to Ocean Grove Foreshore and Barwon Heads Park Committee) since July 1995.

Community involvement has supported the Committee over time. As an example in the late 1980s local service clubs combined in Ocean Grove to undertake woody weed removal on the foreshore. The Friends of the Bluff were formed in 1994, since that time the ongoing partnership between the two groups has enabled a greater emphasis on restoration of The Bluff, as well as on interpretation and education.

Ongoing changes in land use, such as the reduction in the number of camping sites on The Spit and The Bluff, have given greater opportunity to restore ecological values. However the study area continues to be subjected to disturbance and degradation from a variety of sources such as anthropomorphic, meteorological, pest plant and introduced fauna.

Recent vegetation management works such as restoration, revegetation, fencing to exclude pressures and weed control have been orientated towards ecological outcomes such as improved vegetation quality and habitat values.

Since the advent of the 'Sea Change' phenomena approximately 14 years ago, additional pressures have been placed on the natural values of the Barwon Coast area generally. These pressures are ongoing.

Barwon Coast Committee of Management has recently adopted the overarching Coastal Management Plan for 2012/13 to 2014/15 (November 2012). This report identifies 'natural resource protection' as the first of the six key responsibilities.

## 2.2 Management Zones

In keeping with the Coast Management Plan, and to facilitate good management, the study area is divided into six management zones. These existing zones are adopted as management zones for this report. Consequently the study area is comprised of the following management zones:

Zone 1. Ocean Grove Dunes

Zone 2. Urban Foreshore

Zone 3. The Spit

Zone 4. Barwon River Estuary (River foreshore and developed caravan parks)

Zone 5. The Bluff

Zone 6. 13<sup>th</sup> Beach.

Refer to Figure 2 for the location of management zones.



*Figure 2 Study Area Management Zones*

Descriptions of the Management Zones are provided in Section 3.4. The data collected for the Management Zones are provided in Section 6.

## 3 Results

### 3.1 Indigenous Plant Species

A total of 273 vascular plant species were recorded for the study area. This is comprised of 121 indigenous plant species (44% of the total flora) and 152 exotic plant species (55% of the total flora). The indigenous vascular plant list (*refer below* Table 1), combines the data collected during this survey, the data collected during the 2010 Bluff survey and verified contemporary records collected by Barwon Coast staff (Bev Woods *pers comm*).

All indigenous vascular plant species recorded for the study area and conservation significance are listed in Table 1. High significance species are listed in bold type. All exotic vascular plant species recorded for the study area are listed in Table 5. Note that indigenous non-vascular plant species lists are provided according to management zones in Section 6 and in Section 8.

**Table 1 Indigenous Plant Species and Significance**

Botanical Name	Common Name	Conservation Significance
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle	L
<i>Acacia paradoxa</i>	Hedge Wattle	L
<i>Acacia pycnantha</i>	Golden Wattle	L
<b><i>Acacia uncifolia</i></b>	<b>Coast Wirilda</b>	<b>S</b>
<i>Acaena novea-zelandiae</i>	Bidgee-widgee	L
<i>Acitities megalocarpa</i>	Dune Thistle	L
<b><i>Adriana quadripartita</i></b>	<b>Rare Bitter-bush</b>	<b>N, S</b>
<i>Allocasuarina verticillata</i>	Drooping Sheoke	R
<i>Alyxia buxifolia</i>	Sea Box	R
<i>Amyema pendula</i> ssp <i>pendula</i>	Drooping Mistletoe	L
<i>Amyema preissii</i>	Wire-leaf Mistletoe	R
<i>Apium prostratum</i> ssp <i>prostratum</i>	Sea Celery	L
<i>Astroloma humifusum</i>	Cranberry Heath	L
<i>Atriplex cinerea</i>	Coast Saltbush	L
<b><i>Atriplex paludosa</i> ssp <i>paludosa</i></b>	<b>Marsh Saltbush</b>	<b>S</b>
<b><i>Poa billardierei</i></b>	<b>Coast Fescue</b>	<b>S</b>
<i>Austrostipa flavescens</i>	Coast Spear-grass	L
<i>Austrostipa semibarbata</i>	Fibrous Spear-grass	L
<i>Austrostipa stipoides</i>	Prickly Spear-grass	R
<i>Baumea juncea</i>	Bare Twig-rush	L
<i>Bursaria spinosa</i>	Sweet Bursaria	R
<i>Caladenia latifolia</i>	Pink Fairies	L
<i>Carex brevicaulis</i>	Short-stem Sedge	L
<i>Carex tereticaulis</i>	Basket Sedge	L
<i>Carpobrotus rossii</i>	Karkalla	L
<i>Cassytha melantha</i>	Course Dodder-laurel	L
<i>Cassytha pubescens</i>	Downy Dodder-laurel	L
<i>Clematis microphylla</i>	Small-leaf Clematis	L

<i>Convolvulus erubescens</i>	Blushing Bindweed	L
<i>Correa alba</i>	White Correa	R
<i>Correa reflexa</i>	Common Correa	R
<i>Cotula australis</i>	Common Cotula	L
<i>Cynoglossum australe</i>	Austral Hounds-tongue	L
<i>Cyrtostylis robusta</i>	Large Gnat Orchid	R
<i>Daucus glochidiatus</i>	Austral Carrot	L
<i>Dianella admixta</i>	Black-anther Flax-lily	L
<i>Dianella brevicaulis</i>	Coast Flax-lily	L
<i>Dichelachne crinita</i>	Long-hair Plume-grass	L
<i>Dichondra repens</i>	Kidney Weed	L
<i>Disphyma crassifolium ssp clavellatum</i>	Rounded Noon-flower	L
<i>Distichlis distichophylla</i>	Austral Salt-grass	L
<i>Enchyleana tomentosa</i>	Ruby Saltbush	L
<i>Erodium crinitum</i>	Blue Heron's-bill	R
<i>Exocarpus cupressiformis</i>	Cherry Ballart	R
<i>Ficinia nodosa</i>	Knobby Club-rush	L
<i>Frankenia pauciflora</i>	Sea Heath	R
<i>Geranium sp #2</i>	Variable Crane's-bill	R
<i>Gnaphalium indutum</i>	Tiny Cudweed	L
<i>Hemarthria uncinata</i>	Mat Grass	L
<i>Hemichroa pentandra</i>	Trailing Hemichroa	R
<i>Hibbertia sericea</i>	Silky Guinea-flower	R
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	L
<i>Hypoxis vaginata var brevistigmata</i>	Yellow Star	L
<i>Isolepis inundata</i>	Swamp Club-rush	L
<i>Juncus kraussii ssp australiensis</i>	Sea Rush	R
<i>Kennedia prostrata</i>	Running Postman	L
<i>Lachnagrostis billardieri ssp billardieri</i>	Coast Blown-grass	R
<i>Lachnagrostis filiformis</i>	Common Blown-grass	L
<i>Lepidosperma curtisiae</i>	Dwarf Sword-sedge	R
<i>Lepidosperma concavum</i>	Sand-hill Sword-sedge	R
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge	R
<i>Lepidosperma sp (narrow leaves)</i>	Sword-sedge	?
<i>Leptospermum laevigatum</i>	Coast Tea-tree	L
<i>Leucophyta brownii</i>	Cushion Bush	R
<i>Leucopogon parviflorus</i>	Coast Beard-heath	L
<i>Lobelia alata</i>	Angled Lobelia	L
<i>Lomandra filiformis</i>	Wattle Mat-rush	L
<i>Lomandra longifolia</i>	Spiny Mat-rush	L
<i>Lomandra micrantha</i>	Small-flower Mat-rush	R
<b><i>Lotus australis var australis</i></b>	<b>Austral Lotus</b>	<b>N, S</b>
<i>Luzulu meriodionalis</i>	Woodrush	L
<i>Melaleuca lanceolata</i>	Moonah	R
<i>Microtis arenaria</i>	Notched Onion Orchid	R
<i>Muehlenbeckia australis</i>	Climbing Lignum	L
<i>Myoporum insulare</i>	Common Boobialla	L
<i>Olearia axillaris</i>	Coast Daisy-bush	L
<i>Ozothamnus turbinatus</i>	Coast Everlasting	R
<i>Parietaria debilis</i>	Shade Pellitory	R

<i>Pimelea humilis</i>	Common Rice-flower	L
<i>Pimelea serphyllifolia</i> ssp <i>serphyllifolia</i>	Coast Rice-flower	R
<i>Plantago varia</i>	Variable Plantain	L
<i>Platylobium obtusangulum</i>	Common Flat-pea	L
<i>Poa labillardierei</i> var <i>labillardierei</i>	Common Tussock-grass	L
<i>Poa poiformis</i> var <i>poiformis</i>	Coast Tussock-grass	L
<b><i>Poa poiformis</i> var <i>ramifer</i></b>	<b>Creeping Coast Tussock-grass</b>	<b>S</b>
<i>Pomaderris paniculosa</i> ssp <i>parilia</i>	Coast Pomaderris	R
<i>Portulaca oleracea</i>	Common Purslane	L
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed	L
<i>Pultenea tenuifolia</i>	Slender Bush-pea	R
<i>Rhagodia candolleana</i>	Sea-berry Saltbush	L
<i>Rytidosperma caespitosum</i>	Common Wallaby-grass	L
<i>Rytidosperma geniculatum</i>	Knead wallaby-grass	L
<i>Rytidosperma racemosum</i>	Slender Wallaby-grass	L
<i>Rytidosperma setaceum</i>	Bristly Wallaby-grass	L
<i>Samolus repens</i>	Creeping Brookweed	L
<i>Sarcocornia quinqueflora</i> ssp <i>quinqueflora</i>	Beaded Glasswort	L
<i>Scaevola albidia</i>	Coast Fan-flower	R
<i>Schoenus apogon</i>	Common Bog-rush	L
<i>Schoenus nitens</i>	Shiny Bog-rush	R
<i>Sclerostegia arbuscula</i>	Shrubby Glasswort	R
<i>Selliera radicans</i>	Swamp Selliera	L
<i>Senecio biserratus</i>	Jagged Fireweed	L
<b><i>Senecio halophilus</i></b>	<b>Salt Fireweed</b>	<b>N, S</b>
<i>Senecio glomeratus</i>	Purple Fireweed	L
<i>Senecio pinnatifolius</i>	Variable Groundsel	R
<i>Senecio quadridentatus</i>	Cotton Groundsel	L
<i>Senecio spatulatus</i>	Dune Groundsel	L
<i>Solanum laciniatum</i>	Kangaroo Apple	L
<i>Sonchus hydrophilus</i>	Native Sow Thistle	R
<i>Spergularia marina</i>	Lesser Sea-spurrey	L
<i>Spinifex sericeus</i>	Hairy Spinifex	R
<i>Sporobolus virginicus</i>	Sand Couch	R
<i>Suaeda australis</i>	Austral Seablite	L
<i>Swainsona lessertiifolia</i>	Coast Swainson-pea	L
<i>Tetragonia implexicoma</i>	Bower Spinach	L
<i>Tetragonia tetragonoides</i>	NZ Spinach	L
<i>Themeda triandra</i>	Kangaroo Grass	L
<i>Threlkeldia diffusa</i>	Coast Bone-fruit	L
<i>Triglochin striatum</i>	Streaked Arrow-grass	L
<i>Veronica gracilis</i>	Slender Speedwell	L
<b><i>Zygophyllum billardieri</i></b>	<b>Coast Twin-leaf</b>	<b>S</b>

## Conservation Significance:

L – Local

R – Regional

**S – State****N – National**

### 3.1.2 Introduced Locally Indigenous Species

The following indigenous or near indigenous plant species have been known to be introduced into the study area.

**Table 2 indigenous or near indigenous plant species that have been known to be introduced into the study area**

Botanical Name	Common Name	Comment
<i>Olearia glutinosa</i>	Sticky Daisy-bush	Near Indigenous
<i>Olearia lepidophylla</i>	Club-moss Daisy-bush	Near Indigenous
<i>Allocasuarina verticillata</i>	Drooping Sheoke	Indigenous

While it is possible to know if the above three species were once present within the study area, it is considered appropriate for these species to be introduced via revegetation as they are considered plausible members of the indigenous flora that occur nearby and are of regional conservation significance.

Refer to Table 10 in Section 4.11 Revegetation for a list of indigenous plant species that have been utilized to date for revegetation within the study area.

### 3.1.3 Significant Plant Species

Plant species are assessed in terms of their significance for flora conservation. Typically species are described as being significant on a National, State, Regional or Local level. This significance is determined by assessing current conservation status. State or Regional significant species are those that are rare, uncommon or of a limited distribution, or those that are of taxonomic, biogeographic or ecological interest, or those that are not currently regenerating in sufficient numbers to maintain sustainable populations.

Due to the fragmented and degraded condition of much of the indigenous vegetation of the Bellarine, all indigenous species recorded within that area are considered to be of at least Local conservation significance. The significance of all indigenous species is provided in Table 1.

A definition of significance is provided in Appendix 1.

### ***National and State Significant Plant Species***

A total of eight plant species that are assessed to be of National and State conservation significance (i.e. High Conservation Significance) were recorded during this study. They are Coast Wirilda, Rare Bitter-bush, Creeping Coast Tussock-grass, Marsh Saltbush, Coast Fescue, Austral Lotus, Salt Fireweed and Coast Twin-leaf. Refer to Table 3 for a list of National and State significant species and conservation status. Refer to Figure 3 for the location of National and State significant species.

**Table 3 National and State Significant Plant Species**

<b>Botanical Name</b>	<b>Common Name</b>	<b>Conservation Status</b>
<i>Acacia uncifolia</i>	Coast Wirilda	r
<i>Adriana quadripartita</i>	Rare Bitter-bush	En
<i>Atriplex paludosa</i> ssp <i>paludosa</i>	Marsh Saltbush	r
<i>Poa billardieri</i>	Coast Fescue	r
<i>Poa poiformis</i> var <i>ramifer</i>	Creeping Coast Tussock-grass	r
<i>Lotus australis</i> var <i>australis</i>	Austral Lotus	En, k
<i>Senecio halophilus</i>	Salt Fireweed	R, r
<i>Zygophyllum billardieri</i>	Coast Twin-leaf	r

EN – endangered in Australia (IUNC 2001 criteria)

r – rare Victoria (DSE 2005)

R – rare Australia (DSE 2005)

k – Status poorly known but expected to be endangered, vulnerable or rare in Victoria (DSE 2005).





Figure 3 Location of High significant plant species.

### *Comment on the Status of High Significant Species within the Study Area*

#### **Coast Wirilda**

The distribution of populations appears to be naturally limited within the study area. Some regeneration is occurring. Ongoing revegetation actions appear to be sustaining populations.

Coast Wirilda is the dominant host plant for the Regionally significant Wire-leaf Mistletoe.

#### **Rare Bitter-bush**

The distribution of populations appears to be naturally limited within the study area, although populations have the ability to establish after disturbance events. Some regeneration is occurring, in particular at the 13<sup>th</sup> Beach population (Quadrat 3). Ongoing revegetation actions appear to be sustaining populations. Populations include both the glaucous and non-glaucous forms.

#### **Marsh Saltbush**

The distribution of populations appears to be naturally limited within the study area to the saltmarsh fringe sites of the Barwon estuary. Sufficient regeneration appears to be occurring to maintain populations.

#### **Coast Fescue**

The distribution of populations appears to be naturally limited within the study area. Coast Fescue is noted in the Flora of Victoria as 'possibly receding as the introduced Marram Grass advances'. This would appear to be the case within the study area. Some regeneration is occurring in association with prograding dunes, however some populations and suitable habitat appear to be in decline due to loss of the toe of some foredune areas. Ongoing revegetation actions appear to be contributing towards sustaining populations.

#### **Creeping Coast Tussock-grass**

The distribution of populations appears to be naturally limited within the study area. Some regeneration is occurring within the 13<sup>th</sup> Beach Management Zone. Ongoing revegetation actions appear to be contributing towards sustaining populations.

#### **Austral Lotus**

The distribution of populations appears to be naturally limited within the study area. Limited regeneration is occurring. However some populations and suitable habitat appear to be in decline due to loss of the toe of some foredune areas. Ongoing revegetation actions appear to be contributing towards sustaining populations. Ongoing seed collection and revegetation is likely to be required

#### **Salt Fireweed**

The occurrence of this species within the study area is atypical, as the species usually occurs on the margins of saline water bodies, particularly in western Victoria (Neville Walsh Melbourne Herbarium *pers comm*). The distribution of populations within the study area appears to be naturally limited to 13<sup>th</sup> Beach and The Spit. Some regeneration is occurring, in particular in response to the

recent wet years. As the plant is a short lived annual the value of revegetation is possibly limited. Populations will require monitoring and possible action to facilitate natural regeneration (such as the management of annual weed species).

### **Coast Twin-leaf**

The distribution of populations appears to be naturally limited within the study area. Sufficient regeneration appears to be occurring to maintain populations.

### **Regionally and Locally Significant Plant Species**

A total of 35 plant species were recorded during this study that are considered to be of Regional conservation significance. Refer to Table 4, below, for a list of Regionally significant plant species.

**Table 4 Regionally Significant Plant Species**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Allocasuarina verticillata</i>	Drooping Sheoke
<i>Alyxia buxifolia</i>	Sea Box
<i>Amyema preissii</i>	Wire-leaf Mistletoe
<i>Austrostipa stipoides</i>	Prickly Spear-grass
<i>Bursaria spinosa</i>	Sweet Bursaria
<i>Correa alba</i>	White Correa
<i>Correa reflexa</i>	Common Correa
<i>Cyrtostylis robusta</i>	Large Gnat Orchid
<i>Erodium crinitum</i>	Blue Heron's-bill
<i>Exocarpus cupressiformis</i>	Cherry Ballart
<i>Frankenia pauciflora</i>	Sea Heath
<i>Geranium</i> sp #2	Variable Crane's-bill
<i>Hemichroa pentandra</i>	Trailing Hemichroa
<i>Hibbertia sericea</i>	Silky Guinea-flower
<i>Juncus kraussii</i> ssp <i>australiensis</i>	Sea Rush
<i>Lachnagrostis billardieri</i> ssp <i>billardieri</i>	Coast Blown-grass
<i>Lepidosperma curtisiae</i>	Dwarf Sword-sedge
<i>Lepidosperma concavum</i>	Sand-hill Sword-sedge
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leucophyta brownii</i>	Cushion Bush
<i>Lomandra micrantha</i>	Small-flower Mat-rush
<i>Melaleuca lanceolata</i>	Moonah
<i>Microtis arenaria</i>	Notched Onion Orchid
<i>Ozothamnus turbinatus</i>	Coast Everlasting
<i>Parietaria debilis</i>	Shade Pellitory
<i>Pimelea serphyllifolia</i> ssp <i>serphyllifolia</i>	Coast Rice-flower
<i>Pomaderris paniculosa</i> ssp <i>parilia</i>	Coast Pomaderris
<i>Pultenea tenuifolia</i>	Slender Bush-pea
<i>Scaevola albida</i>	Fan Flower
<i>Schoenus nitens</i>	Shiny Bog-rush
<i>Sclerostegia arbuscula</i>	Shrubby Glasswort

<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Sonchus hydrophilus</i>	Native Sow Thistle
<i>Spinifex sericeus</i>	Hairy Spinifex
<i>Sporobulus virginicus</i>	Sand Couch

One taxon, *Lepidosperma* sp (narrow leaves), could not be assessed for conservation significance and it could not be identified to specific level, due to an absence of flowering material.

The remaining 77 indigenous vascular plant species are all assessed to be of Local conservation significance.

### ***Comment on Regionally Significant Plant Species***

#### **Large Gnat Orchid**

Large Gnat Orchid is of note as its presence in the study area is limited to one small population, located within a sheltered dune swale at Ocean Grove Quadrat 2. This population appears healthy, but it does not appear able to expand in size (Bev Woods *pers comm*) although it would seem that other suitable habitat is available to it (Bev Woods *pers comm*). This species also appears to have a limited distribution on the Bellarine Peninsula.

#### **Cherry Ballart**

Cherry Ballart is limited to one plant within the study area, located within The Bluff woodland area.

#### **Common Correa**

Common Correa is limited to one or small population on the foredune near Grants Lookout within the Urban Foreshore Zone. This species has a limited distribution within the Bellarine Peninsula.

#### **Coast Everlasting**

Coast Everlasting is limited to one or small populations on the foredune within the 13<sup>th</sup> Beach West and Central Zones. This species has a limited distribution within the Bellarine Peninsula.

#### **Shrubby Glasswort**

Shrubby Glasswort is limited to two small populations located on the east bank of the Barwon River. The Spit population is represented by apparently very mature specimens. This species has a limited distribution within the Bellarine Peninsula.

### 3.2 Ecological Vegetation Classes

Ecological Vegetation Classes (EVCs) are the primary level of classification of vegetation communities within Victoria. An EVC contains one or more plant (floristic) community, and represents a grouping of vegetation communities with broadly similar ecological attributes. Classification of EVCs in this report follows Oates and Toranto (2002).

The pre-1750 EVC mapping of the study area undertaken by Department of Sustainability and Environment (DSE) (DSE website *and refer to* Figure 4) indicates that the study area and immediate surrounds were comprised of the following EVCs:

- EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic.
- EVC 9 Coastal Saltmarsh.
- EVC 161 Coastal Headland Scrub.
- EVC 175 Grassy Woodland.
- EVC 858 Coastal Alkaline Scrub (syn Calcarenite Dune Woodland).

This assessment finds that the study area is comprised of partially intact to relatively intact native vegetation that accords with the ECV 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic, EVC 9 Coastal Saltmarsh, EVC 161 Coastal Headland Scrub, EVC 879 Coastal Dune Grassland and EVC 858 Coastal Alkaline Scrub.

Each EVC has a determined bioregional conservation significance (DNRE 2002). The bioregional conservation status of the extant EVCs is as follows in Table 5.

**Table 5 EVCs recorded for the study area and Bioregional Conservation Significance**

<b>EVC</b>	<b>BCS (Otway Plains)</b>
1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic	Depleted*
9 Coastal Saltmarsh	Endangered
161 Coastal Headland Scrub	Vulnerable
858 Coastal Alkaline Scrub	Endangered
879 Coastal Dune Grassland	Depleted*

**BCS** Bioregional Conservation Significance.

\* Based upon previously available DSE data.

**Endangered** is defined as an EVC where less than 10% of pre-european extent remains.

**Vulnerable** is defined as an EVC where 10 to 30% of pre-european extent remains.

**Depleted** is defined as an EVC where greater than 30% and up to 50% of the pre-european extent remains (DNRE 2002).

It should be noted that the vegetation community described as 'Coastal Moonah Woodland' is listed as a threatened community under the State Flora and Fauna

Guarantee Act (DSE website ii). This community is synonymous with EVC 858 Coastal Alkaline Scrub.

At the time of the field assessments and the preparation of this report, no bioregional benchmark was available from DSE for EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic. Consequently, to undertake the Habitat Hectare assessments in vegetation within this mosaic, the benchmark deemed most appropriate was utilized. This amounted to the use of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 879 Coastal Dune Grassland benchmarks (both bioregional benchmarks that have been available from DSE in the past) for the Habitat Hectare assessments.

## **EVC Descriptions**

The bioregional benchmarks provide descriptions of the vegetation of an EVC in a 'natural' state. These descriptions are paraphrased as follows for each of the local EVCs. Note that additional vegetative information is provided for each EVC in Appendix 2 - Bioregional Benchmarks.

### ***EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic***

Coastal Dune Scrub/Coastal Dune Grassland Mosaic covers the vegetation succession from the grasses and the halophytes of the foredune to the closed scrubs on the secondary dunes. These vegetation types typically occur on siliceous and calcareous sands that are subject to high levels of salt spray and continuous disturbance from onshore winds.

### ***EVC 9 Coastal Saltmarsh***

Coastal saltmarsh is comprised of succulent herbland to shrubland that occurs with the tidal littoral zone. This vegetation occurs within the lower reaches of the Barwon River.

### ***EVC 161 Coastal Headland Scrub***

Coastal Headland Scrub is comprised of a scrub or low shrubland to two metres tall. It occurs on rocky coastal headlands often associated with cliffs exposed to the stresses of extreme salt-laden winds and salt spray. This vegetation occurs on shallow sands along rocky sections of the coast.

### ***EVC 858 Coastal Alkaline Scrub***

Coastal Alkaline Scrub is comprised of a low woodland or tall shrubland to 8 metres tall, typically with a medium shrub layer, a small shrub layer and sedges, grasses and herbs in the ground layer. It is commonly dominated by Moonah. This vegetation occurs in near coastal, deep calcareous and largely stable sand dunes and swales, as well as on a variety of other geologies and soil types, between the elevations of 20-60 metres above sea level. Average rainfalls are typically between 550-950 mm.

### ***EVC 879 Coastal Dune Grassland***

Coastal Dune Grassland is comprised of the vegetation succession from the grasses and the halophytes of the foredune. This vegetation type typically occurs



on siliceous and calcareous sands that are subject to high levels of salt spray and continuous disturbance from onshore winds.

Refer to Figure 4 for the pre-1750 and Figure 5 for the 2005 distribution of EVCs in the study area.

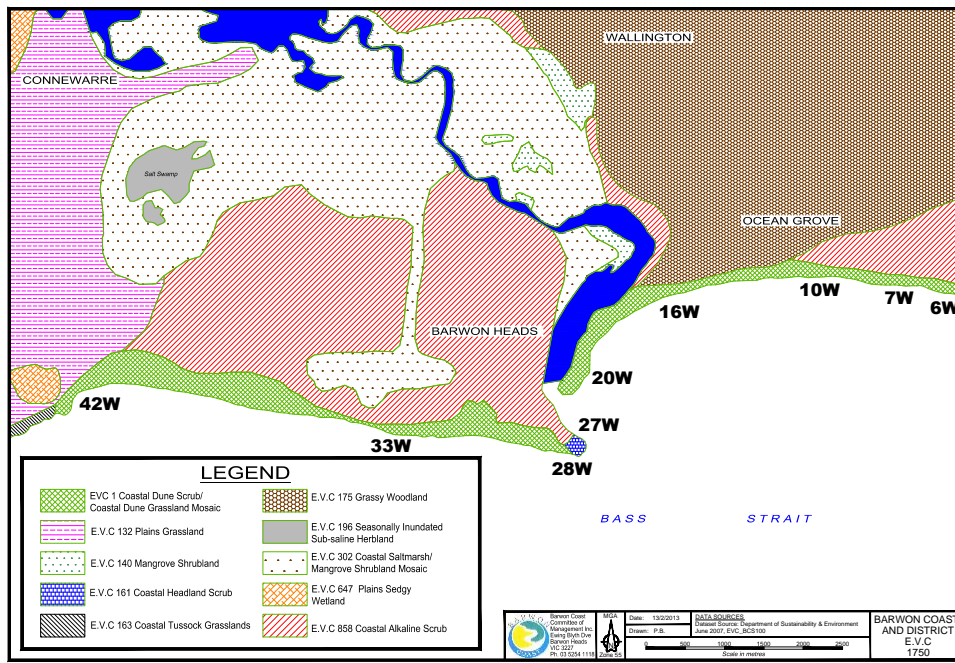


Figure 4 Pre 1750 EVCs (DSE data).

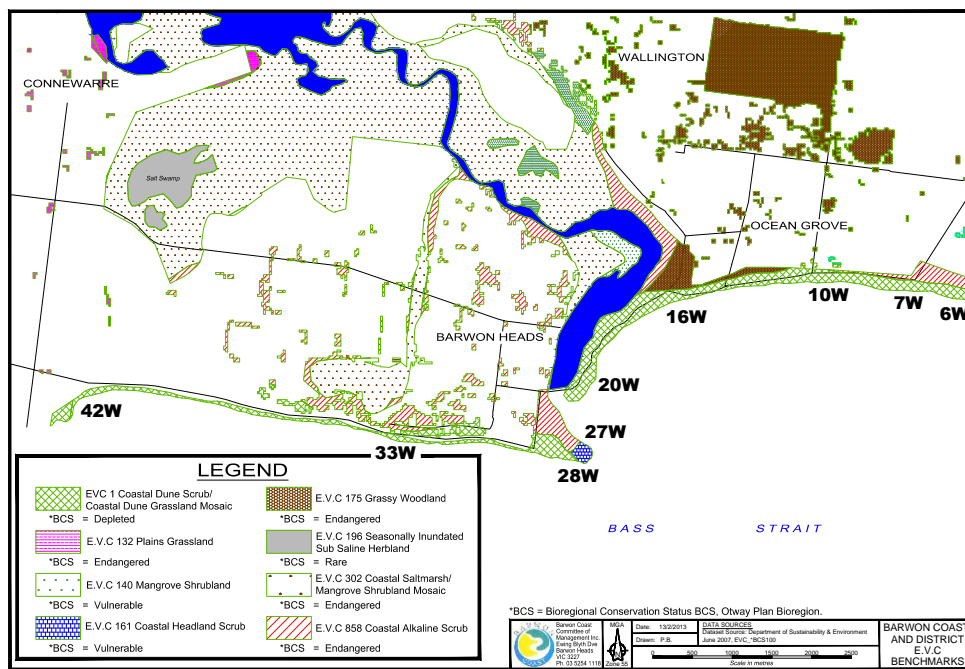


Figure 5 Current EVCs (DSE data).



### 3.3 Exotic Plant Species

A total of 152 exotic vascular plant species were recorded for the study area (55% of the total flora). The exotic plant species list (Table 6) combines the data collected during this survey, the data collected during the 2010 Bluff survey and verified contemporary records collected by Barwon Coast staff (Bev Woods *pers comm*).

Of the 152 species, 52 species (34% of the total exotic flora) are assessed to be a serious threat to biodiversity values.

11 of the serious weed species are Australian plants that are not indigenous to the study area.

In addition to the weed flora two naturally occurring indigenous species, Coast Teatree and Coast Wattle, are considered to be ecologically 'out of balance' (Carr 1992) to the extent that they are considered to be of detriment of the ecological values of the study area (*refer to Sections 4.7 and 4.8*).

Weed species are assigned a level of threat to the ecological values of the study area (i.e. Serious, Medium or Low). Refer to Section 4.6 for further discussion.

All recorded exotic vascular plant species recorded for the study area, life form and threat level are listed below in Table 6.

**Table 6 Exotic Plant Species, Life Form, Threat Level and Status**

Botanical Name	Common Name	Life Form	Threat	Status
<i>Acacia cupularis</i>	Coastal Umbrella Bush	MS	S	
<i>Acacia cyclops</i>	Red-eye Wattle	MS	S	
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle	MS	S	
<i>Acacia rostellifera</i>	Summer Wattle	LS	S	
<i>Acacia saligna</i>	Golden Wreath Wattle	LS	S	
<i>Acetosa sagittata</i>	Rambling Dock	SC	S	
<i>Aeonium arboreum</i>	Tree Aeonium	MS	M	
<i>Agapanthus praecox</i>	Agapanthus	MTG	S	
<i>Agave americana</i>	Century Plant	LH	M	
<i>Agonis flexuosa</i>	Willow Myrtle	LS	M	
<i>Aira</i> sp	Hair Grass	MTG	L	
<i>Allium triquetrum</i>	Angled Onion	MH	M	
<i>Aloe saphonaria</i>	Aloe	LH	M	
<i>Ammophila arenaria</i>	Marram Grass	LTG	S	
<i>Anagallis arvensis</i>	Pimpernel	MH	L	
<i>Araucaria heterophylla</i>	Norfolk Island Pine	LT	M	
<i>Arctotheca calendula</i>	Capeweed	LH	M	
<i>Arctotis stoechadifolia</i>	White Arctotis	SS	M	
<i>Argyranthemum frutescens</i>	Marguerite Daisy	SS	M	
<i>Arisaema</i> sp	Jack in the pulpit	MH	L	
<i>Asparagus asparagoides</i>	Bridal Creeper	SC	S	WoNS, R

<i>Asparagus officinalis</i>	Asparagus	SC	M	
<i>Asphodelus fistulosus</i>	Onion Weed	MH	M	R
<i>Avena fatua</i>	Wild Oat	MTG	M	
<i>Banksia intergifolia</i>	Coast Banksia	MT	M	
<i>Berkheya rigida</i>	African Thistle	MH	M	
<i>Brassica x napus</i>	Canola	MH	M	
<i>Briza maxima</i>	Large Quaking Grass	MNG	M	
<i>Bromus catharticus</i>	Prairie Grass	MTG	M	
<i>Bromus diandrus</i>	Great Brome	MTG	M	
<i>Bromus hordeaceus</i> ssp <i>hordeaceus</i>	Soft Brome	MTG	M	
<i>Cakile maritima</i>	Sea Rocket	MH	S	
<i>Callistemon sp</i>	Bottlebrush	LS	M	
<i>Cardamine hirsuta</i>	Common Bittercress	SH	L	
<i>Carpobrotus aequilaterus</i>	Angled Pigface	MH	S	
<i>Casaurina glauca</i>	Swamp Sheoke	LS	M	
<i>Catapogon rigidum</i>	Fern Grass	MTG	M	
<i>Centaurium erythraea</i>	Common Centaury	SH	L	
<i>Centranthus ruber</i>	Red Valerian	MH		
<i>Cerastium glomeratum</i>	Common Chickweed	SH	L	
<i>Chenopodium album</i>	Fat Hen	MH	L	
<i>Chenopodium glaucum</i>	Glaucous Goosefoot	MH	L	
<i>Chrysanthemoides monilifera</i> ssp <i>monilifera</i>	Boneseed	MS	S	WoNS, RC
<i>Cirsium vulgare</i>	Spear Thistle	LH	M	R
<i>Clematis vitalba</i>	Old Mans Beard	C	L	
<i>Conyza bonariensis (sumatrensis)</i>	Flax-leaf Fleabane	MH	M	
<i>Conyza canadiensis</i>	Canadian Fleabane	LH	M	
<i>Coprosma repens</i>	Mirror Bush	MS	S	
<i>Cortaderia selloana</i>	Pampas Grass	LTG	S	
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	MS	S	
<i>Cotyledon orbiculata</i>	Cotyledon	LH	M	
<i>Crassula multicava</i>	Shade Crassula	MH	S	
<i>Cupressus macrocarpa</i>	Monterey Cypress	LT	S	
<i>Cynodon dactylon</i>	Couch Grass	MNG	M	
<i>Dactylis glomerata</i>	Cocksfoot	MTG	S	
<i>Delairea odorata</i>	Cape Ivy	SC	S	
<i>Diplotaxis tenuifolia</i>	Sand Rocket	MH	M	
<i>Dipogon lignosus</i>	Dolichos Pea	SC	S	
<i>Drosanthemum candens</i>	Redondo Creeper	LH	S	
<i>Echium candicans</i>	Pride of Madiera	MS	M	
<i>Ehrharta calycina</i>	Perennial Veldt-grass	MTG	S	
<i>Ehrharta erecta</i>	Panic Veldt-grass	MTG	S	
<i>Ehrharta longiflora</i>	Annual Veldt-grass	MTG	S	
<i>Emex australis</i>	Spiny Emex	MH	M	
<i>Eucalyptus botryoides</i>	Mahogany Gum	MT	M	
<i>Eucalyptus cladocalyx</i>	Sugar Gum	LT	M	
<i>Eucalyptus diversifolia</i>	Soap Mallee	MT	M	
<i>Eucalyptus gomphacephala</i>	Tuart Gum	MT	M	
<i>Eucalyptus leucoxylon x rosea</i>	Yellow Gum	MS	M	
<i>Eucalyptus maculata</i>	Spotted Gum	LT	M	
<i>Euphorbia paralias</i>	Sea Spurge	MH	S	
<i>Euphorbia peplus</i>	Petty Spurge	SH	L	

<i>Euphorbia terracina</i>	Terracina Spurge	MH	S	
<i>Ferraria crispa</i>	Black Flag	Gc	S	
<i>Foeniculum vulgare</i>	Fennel	LH	S	RC
<i>Freesia alba</i>	White Freesia	Gc	S	
<i>Fumaria muralis</i>	Smoke Plant	MH	M	
<i>Galena pubescens</i>	Blanket Weed	MH	S	
<i>Galium murale</i>	Bedstraw	SH	L	
<i>Gazania</i> sp	Gazania	MH	S	
<i>Genista linifolia</i>	Flax-leaf Broom	LS	S	RC
<i>Gladiolus undulatus</i>	Wild Gladiola	Gc	M	
<i>Hakea drupacea</i>	Sweet Hakea	MS	S	
<i>Hedera helix</i>	English Ivy	SC	S	
<i>Hedypnois rhagadioloides</i> ssp <i>cretica</i>	Cretan Hedypnois	SH	L	
<i>Helminthotheca echioides</i>	Bristly Ox Tongue	MH	M	
<i>Hypochaeris radicata</i>	Flatweed	SH	M	
<i>Lachenalia</i> sp	Mexican Soldiers	SH	M	
<i>Lactuca serriola</i>	Prickly Lettuce	MH	L	
<i>Lagurus ovatus</i>	Hare's-tail Grass	MTG	M	
<i>Leotodon taraxacoides</i>	Hairy Hawkbit	MH	L	
<i>Limonium hyblaëum</i>	Sea Lavender	MH	S	
<i>Lobularia maritima</i>	Sweet Alyssum	MH	L	
<i>Lolium perenne</i>	Perennial Rye-grass	MTG	M	
<i>Lycium ferocissimum</i>	Boxthorn	LS	S	WoNS, RC
<i>Malva dendromorpha</i>	Tree Mallow	LH	M	
<i>Marrubium vulgare</i>	Horehound	MH	M	R
<i>Medicago polymorpha</i>	Burr Medic	SH	M	
<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle	LS	S	
<i>Melaleuca nessophila</i>	Purple Honey-myrtle	MS	M	
<i>Melilotus indicus</i>	Sweet Melilot	MH	M	
<i>Mersembryanthemum crystallinum</i>	Ice Plant	LH	S	
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort	SH	L	
<i>Morea setifolia</i>	Thread Iris	MH	M	
<i>Muscari armeniacum</i>	Grape Hyacinth	SH	L	
<i>Nassella neesiana</i>	Chilean Needle-grass	MTG	S	WoNS, RC
<i>Nassella trichomata</i>	Serrated Tussock	MTG	S	WoNS, RC
<i>Nerium oleander</i>	Oleander	MS	M	
<i>Osteospermum fruticosum</i>	South African Daisy	SS	M	
<i>Oxalis pes-caprae</i>	Soursob	MH	S	R
<i>Parapholis incurva</i>	Coast Barb-grass	MTG	M	
<i>Paraserianthes lophantha</i> ssp <i>lophantha</i>	Cape Wattle	MS	S	
<i>Parietaria judiaca</i>	Spreading Pellitory	MH	M	
<i>Pelargonium peltatum</i>	Ivy-leaf Pelargonium	MH	M	
<i>Pennisetum clandestinum</i>	Kikuyu	MNG	S	
<i>Petrorhagia dubia</i>	Proliferous Pink	MH	M	
<i>Phalaris aquatica</i>	Canary Grass	LTG	S	
<i>Phalaris minor</i>	Lesser Canary-grass	LTG	L	
<i>Pinus maritima</i>	Maritime Pine	LT	S	
<i>Pittosporum undulatum</i>	Sweet Pittosporum	MT	S	FFG Act
<i>Plantago coronopus</i> ssp <i>coronopus</i>	Buck's-horn Plantain	MH	M	
<i>Plantago lanceolata</i>	Ribwort	MH	M	

<i>Polycarpon tetraphyllum</i>	Four-leaf Allseed	MH	L	
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort	MS	S	
<i>Polygonum arenastrum</i>	Sand Wireweed	SH	L	
<i>Rapistrum rugosum</i>	Giant Mustard	LH	M	
<i>Rhamnus alaternus</i>	Italian Buckthorn	MS	S	
<i>Romulea rosea</i>	Common Onion Grass	SH	M	
<i>Rumex crispus</i>	Curled Dock	MH	M	
<i>Salvia verbenaca</i> var <i>verbenaca</i>	Wild Sage	MH	L	
<i>Senecio angulatus</i>	Climbing Groundsel	SC	S	
<i>Senecio elegans</i>	Purple Groundsel	MH	M	
<i>Silybum marianum</i>	Variegated Thistle	MH	M	
<i>Solanum linnaeanum</i>	Apple of Sodom	MH	M	
<i>Solanum nigrum</i>	Black Nightshade	MH	M	
<i>Sonchus asper</i>	Prickly Sow Thistle	MH	M	
<i>Sonchus oleraceus</i>	Common Sow Thistle	MH	M	
<i>Sporobolus africanus</i>	Rat-tail Grass	MTG	M	
<i>Stellaria media</i>	Chickweed	MH	L	
<i>Stenotaphrum secundatum</i>	Buffalo Grass	MNG	S	
<i>Taraxacum officinale</i>	Dandelion	MH	L	
<i>Templetonia retusa</i>	Coral Pea	SS	M	
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass	MNG	S	
<i>Tragopogon porrifolius</i>	Salsify	MH	M	
<i>Trifolium dubium</i>	Clover	SH	L	
<i>Veronica hederifolia</i>	Ivy-leaf Speedwell	MH	M	
<i>Vicia sativa</i>	Common Vetch	SC	M	
<i>Vinca major</i>	Blue Periwinkle	SC	S	
<i>Vulpia bromoides</i>	Squirrel-tail Fescue	MTG	M	
<i>Vulpia fasciculata</i>	Sand Fescue	MTG	M	
<i>Vulpia myoris</i>	Fescue	MTG	M	
<i>Yucca gloriosa</i>	Spanish Dagger	LH	M	

### **Life Form**

LT- Large Tree, MT- Medium Tree, LS- Large Shrub, MS- Medium Shrub, SS- Small Shrub. LH- Large Herb, MH- Medium Herb, SH- Small Herb, Gc – Cormous Geophyte, LTG- Large Tufted Graminoid, MTG- Medium Tufted Graminoid, MNG- Medium Non-tufted Graminoid, SC- Scrambler/Climber.

### **Threat Level:**

S – Serious

M – Medium

L – Low

### **Status**

WoNS – Weed of National Significance.

RC – Regionally Controlled

R – Restricted (CaLP Act) (*refer to 4.6*).

### 3.3.1 Legislation and Policy implications

The following government legislation and policy is of relevance to the management of weeds (and biodiversity) within the study area. The status of implicated weed species is given in Table 6.

#### **Commonwealth Weeds of National Significance**

The Commonwealth Government has identified and declared 20 weed species as Weeds of National Significance (WoNS). Due to the threat they pose to the economy, biodiversity and other values on a national scale (Commonwealth Government of Australia Website i) . 5 weed species recorded in the study area are WoNS).

#### **Victorian Flora and Fauna Guarantee Act 1988**

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.

Threatening processes listed under the Act that apply to the study area are:

- Invasion of native vegetation by 'environmental weeds'.
- Spread of Sweet Pittosporum in areas outside its natural distribution.

#### **Victorian Catchment and Land Protection Act 1994**

The Catchment and Land Protection Act 1994 (CaLP Act) obliges managers and owners to effect control of noxious weed species listed under the Act as 'Regionally Prohibited', 'Regionally Controlled' or 'State Restricted' within the relevant Catchment Management Authority region, in this case the Corangamite CMA.

### 3.4 Management Zone Descriptions

For the purposes of this report, the study area is comprised of the following management zones:

#### **Vegetation Community Management Zone Descriptions**

Each of the Management Zones is described as follows. Also included are the key values and roles for each Management Zone as defined in the CMP.

Additional data for each of the Local Vegetation Communities (i.e. Location, Habitat Hectare assessment data, vegetative quadrat data, indigenous and exotic vascular plant species lists, fauna species lists and photographs of representative indigenous flora and fauna) is described as follows in this section and is provided by management zones in Section 6.

The indigenous plant species described are the structurally dominant and those of high conservation significance (full species lists are provided in Section 6).

#### **Zone 1. Ocean Grove Dunes**

Consists of a barrier dune system, with well developed foredune, reardune and interdune swales. Largely supports relatively intact indigenous vegetation comprised of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 858 Coastal Alkaline Scrub.

The high conservation significance plant species that are recorded within this management zone are Rare Bitter-bush, Coast Fescue and Coast Twin-leaf.

Six quadrat study sites have been established in this management zone.

#### **Key Values (CMP):**

- Wide dune formation with extensive indigenous flora, providing fauna habitat
- Quiet beach character with feeling of remoteness from nearby residential development
- The main dog accessible beach within Barwon Coast's area of management.

#### **Role:**

Primarily protection and enhancement of locally indigenous flora and fauna, with allowance for passive eco-based recreation where it does not impact upon conservation values.

## **Zone 2. Urban Foreshore**

Consists of a barrier dune system, with well developed foredune, and reardune and interdune swales. Due to past disturbance this system largely supports partially intact indigenous and regenerating vegetation comprised of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 858 Coastal Alkaline Scrub.

Sections of the urban foreshore are developed for amenity use. Landscape plantings associated with the utilitarian areas look to reflect the naturally occurring vegetation, in accordance with the existing landscape plan.

No high conservation significance plant species are recorded within this management zone.

No quadrat study sites have been established in this management zone.

### **Key Values (CMP):**

- Broad expanse of beach supporting high beach visitation numbers
- A variety of landscape spaces, complementary to the beach experience
- Extensive car parking, catering for large numbers of visitors
- Direct access for pedestrians and cyclists from neighbouring residential areas
- Direct and easy beach access for people of all abilities
- A high level of visitor infrastructure, including the Ocean Grove Surf Beach Complex and a substantial amenity block incorporating all-ability functionality
- High level surfing activities and life saving activities
- Dog free zone in peak summer.

### **Role:**

Provision for beach recreation and intensive tourism use (including opportunities to enjoy coastal views). This zone is a clear point of focus for community and some intermittent commercial uses.



### Zone 3. The Spit

Consists of a barrier dune system that partially defines the course and seaward destination of the Barwon River. Supports areas of relatively intact indigenous vegetation as well as areas of regenerating vegetation comprised of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 858 Coastal Alkaline Scrub.

Areas of The Spit to the rear of the foredune have historically been utilized for camping. Much of this area is currently being restored.

Areas of the Spit on the Barwon River side of the Barwon Heads-Ocean Grove Road have also historically been utilized for camping. Much of this use continues, consequently the vegetation management is modified to accommodate these uses.

The high conservation significance plant species that are recorded within this management zone are Rare Bitter-bush, Marsh Saltbush, Coast Fescue, Salt Fireweed and Coast Twin-leaf.

Four quadrat study sites have been established in this management zone.

#### **Key Values (CMP):**

- Access to both surf beach and safe river beach
- Extensive existing, but modified, dune vegetation creating a landscape with high amenity for informal recreation and tourism uses, including seasonal camping on the river side of the Spit
- Visitor facilities suited to both day visitors and seasonal camping
- Extensive use of existing trails and paths on both sides of the Spit
- Informal car parking areas, associated with beach access points
- Direct and easy beach access
- Wader birds in estuary
- Unpowered camping for 6 weeks a year (peak summer).

#### **Role:**

Provision for eco-based recreation (including beach walking, fishing, swimming, cycling) married with seasonal “bush camping” experiences

Provision for overflow beach activity during peak periods when the Urban Foreshore Zone is at capacity

Improvement of conservation values through revegetation.

#### **Zone 4. Barwon River Estuary**

Supports areas of partially intact indigenous vegetation as well as areas of regenerating vegetation comprised of EVC 9 Coastal Saltmarsh fringing the River and EVC 858 Coastal Alkaline Scrub on higher ground.

The Estuary supports relatively large areas of modified land for the provision of caravan park services. These areas consist of predominately non-indigenous vegetation that is managed for utilitarian uses. In more recent time there has been a program of including indigenous larger plant species where appropriate.

The high conservation significance plant species that are recorded within this management zone are Coast Wirilda and Marsh Saltbush. Mature stands of Moonah exist that are significant representatives of the Coastal Alkaline Scrub EVC.

Two quadrat study sites have been established in this management zone.

#### **Key Values CMP):**

- High ecological and habitat values of the river estuary
- Strong landscape character drawing on the visual interaction between the Barwon River, the Spit and The Bluff
- Access to safe riverine beaches, contrasting with nearby surf beaches
- Opportunity for river based recreation, again contrasting with surf beach recreation
- Cultural heritage, particularly in the settlement of Barwon Heads and the maritime history associated with the River
- Recreational Caravan and camping opportunities
- Linkages to the Barwon Bluff Marine Sanctuary
- Linkages to the Lake Connewarre State Game Reserve
- The operation of the Barwon Estuary Heritage Centre (Lobster Pot).

#### **Role:**

Provision for a range of sheltered beach and primarily water-based recreational opportunities as an alternative to open beach based recreation, while preserving conservation values through protection and enhancement.

Provision of a range of accommodation experiences within crown land caravan parks.

Retention of a strong and distinctive visual identity for the Port, based around natural and maritime images.

## **Zone 5. The Bluff**

Consists of a headland formed of tertiary dune calcarenite with interbedded palaeosols over basalt. Supports areas of relatively intact indigenous vegetation as well as areas of regenerating vegetation comprised of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic, EVC 161 Coastal Headland Scrub and EVC 858 Coastal Alkaline Scrub.

Historically much of The Bluff has been heavily impacted upon. However the regenerating vegetation over much of the disturbed areas is illustrative of the capacity for vegetation to re-establish, given appropriate management.

The high conservation significance plant species that are recorded within this management zone are Coast Wirilda, Coast Fescue, Creeping Coast Tussock-grass and Coast Twin-leaf.

Three quadrat study sites (that were established during The Bluff study) have been re-sampled in this management zone.

### **Key Values (CMP):**

- The landscape character of the Bluff landform
- Indigenous cultural heritage associated with the Bluff
- Indigenous flora and fauna
- Walking trail network, providing viewing opportunities and connecting with both 13<sup>th</sup> Beach and Barwon Heads
- Involvement of the Friends of the Bluff in environmental management of the Bluff
- The Barwon Bluff Marine Sanctuary
- Dog free area year round.

### **Role:**

Protection and enhancement of locally indigenous flora and fauna, with allowance for community education and passive eco-based recreation, including sightseeing, where this does not impact upon conservation values.

## **Zone 6. 13<sup>th</sup> Beach.**

Consists of a barrier dune system, with well developed foredune, read dune and interdune swales and exposed rocky outcrops.

Fresh water holes that supports wetland vegetation are located near 33W and 34W. A lower lying area located to the west of 33W that supports Sea Rush and Coast Sword-sedge dominated vegetation is associated with the Lake Murtnaghurt system.

Historically much of 13<sup>th</sup> Beach has been heavily impacted upon. Settlement, the construction of the Great Ocean Road in the 1920s, military use during the 2<sup>nd</sup> World War period, mobility and surfing in the 1950s led to pressures on the dunes and upon the Torquay- Barwon Heads Road (13<sup>th</sup> Beach Road) which was sealed in the 1960s. The then Country Roads Board, in the 1970s initiated dune stabilization programs to protect the asset of the roadway. This involved extensive reshaping of the dune system, sand trap fencing and the introduction of exotic plant species such as Marram Grass on the foredune and non-indigenous native trees and shrubs on the rear dunes. Consequently, it appears that large tracts of the 13<sup>th</sup> Beach rear dunes, while carrying predominately indigenous vegetation have relatively poor species diversity.

Supports areas of relatively intact indigenous vegetation as well as areas of regenerating vegetation comprised of EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 858 Coastal Alkaline Scrub.

The high conservation significance plant species that are recorded within this management zone are Wirilda, Rare Bitter-bush, Coast Fescue, Salt Fireweed, Austral Lotus, Creeping Coast Tussock-grass and Coast Twin-leaf.

13 quadrat study sites have been established in this management zone.

### **Key Values (CMP):**

- Biodiversity values, particularly important Hooded Plover nesting areas
- Extensive remnant dune vegetation
- “Wild” beach character
- Significant surf destination
- Dog accessible beaches other than between 34W and 35W during peak summer (13<sup>th</sup> Beach patrolled swimming beach) and 40W to 42W year round.

### **Role:**

Primarily protection and enhancement of local indigenous dune flora and fauna (particularly the Hooded Plover habitat), with allowance for passive eco-based recreation, including surfing, where this does not impact upon conservation values.

### 3.4.1 Habitat Hectares

*Habitat Hectares* is an accounting method for measuring habitat quality and quantity that has been developed by DSE for Net Gain Assessment (Vegetation Quality Field Assessment). The habitat hectares approach is site based. Each site consists of one EVC and one vegetation condition class. It is therefore uniform within limits.

Under the Victorian Native Vegetation Management Framework (DNRE 2002) habitat hectares are calculated only where the understorey is at least 25% of the benchmark for that particular EVC. These sites are referred to as *Habitat Zones* in Net Gain Terminology.

Each Habitat Zone has a *habitat score* of between 0 and 100, with extensive intact vegetation having a theoretical score of 100. The habitat score has ten components: large trees, tree canopy cover, understorey, weediness, recruitment, organic litter, logs, patch size, neighbourhood context and distance to core area.

Each Habitat Zone has a *habitat hectare value*, where the habitat score is multiplied by the area in hectares. For example, 6 ha of vegetation with a habitat score of 50 equals 3 habitat hectares.

Although there is a theoretical top score of 100, it is not possible to achieve this score in the study area. This is due to a component of the scoring being based on 'landscape' characteristics, i.e. the condition of the vegetation in areas adjacent to the study area. The landscape component scores for the study area assessments were 8 for all of the Habitat Zones (out of a potential 25). Therefore the highest maximum score that could be achieved at the study area would be 83 (assuming that the town of Barwon Heads is not at some time in the future revegetated).

Habitat Hectare data was collected at selected sites to provide a method to measure vegetation quality and to measure changes in vegetation quality over time. Sites were selected to reflect 'typical' vegetation quality and site conditions or to record sites with particular values (*refer to* Section 6).

Each of the sites surveyed qualified as a Habitat Zone. The Habitat Hectare scores and conservation significance for each site are provided in Table 7.

Note that the score for each site is intended to provide a snapshot of the 'quality' or degree of intactness for each site. It is also intended that the assessments (along with the other measures) will provide a benchmark so that future assessment can measure any changes in vegetation quality over time.

The survey utilized the DSE Vegetation Quality Field Assessment Sheet Version 1.3 and the DSE Bioregional Benchmarks that were current at the time (DSE website iii). Examples of the Assessment Sheet and the Bioregional Benchmarks are provided in Appendix 6 & 7.

The complete habitat hectare assessments are provided in the management zones data section (Section 6).

Although the benchmark for EVC 858 describes Moonah as a 'tree canopy cover' species, the EVC has no benchmark tree life form. Consequently the Habitat Hectare assessments undertaken for this EVC are accorded a 'tree canopy cover' score but no 'large tree' score. This apparent anomaly is standardized in the scoring process according to the DSE guidelines (DSE 2004).

As previously noted benchmarks formerly available from DSE (for EVC 1 Coastal Dune Scrub/Coastal Dune Grassland Mosaic and EVC 879 Coastal Dune Grassland) are utilized during this study, as no benchmarks are currently available from DSE.

Refer to Figure 5 for the distribution of habitat hectare/quadrat study sites within the study area.



*Figure 5 Distribution of habitat hectare/quadrat study sites within the study area.*

**Table 7**      **Habitat Hectare Score Summaries and Significance**

<b>Site</b>	<b>EVC</b>	<b>Habitat Hectare score /100</b>	<b>BCS</b>	<b>Overall Significance</b>
Ocean Grove Dunes				
Q1	858	47	Endangered	Very High
Q2	858	45	Endangered	Very High
Q3	1	52	Depleted	Medium
Q4	1	46	Depleted	Medium
Q5	879	49	Depleted	Medium
Q6	858	41	Endangered	Very High
The Spit				
Q1	879	38	Depleted	Medium
Q2	879	30	Depleted	Medium
Q3	1	26	Depleted	Low
Q4	1	60	Depleted	High
Barwon River Estuary				
Q1	9	47	Endangered	Very High
Q2	858	29	Endangered	High
The Bluff				
Q1	1	60	Depleted	High
Q2	858	41	Endangered	Very High
Q3	1	49	Depleted	Medium
13 <sup>th</sup> Beach				
Q1	879	49	Depleted	Medium
Q2	879	42	Depleted	Medium
Q3	1	46	Depleted	Medium
Q4	1	46	Depleted	Medium
Q5	879	61	Depleted	High
Q6	1	49	Depleted	Medium
Q7	1	52	Depleted	Medium
Q8	1	45	Depleted	Medium
Q9	858	55	Endangered	Very High
Q10	1	52	Depleted	Medium
Q11	1	61	Depleted	High
Q12	879	47	Depleted	Medium
Q13	1	58	Depleted	Medium

**BCS** – Bioregional Conservation Significance.

**Overall Significance** – A combination of the habitat hectare score and the Bioregional Conservation Significance (DSE 2004).



### 3.4.2 Vegetation Quadrats

Quadrat data was collected at the same selected sites (as the Habitat Hectare sites) to provide an additional method to measure vegetation quality and as an additional tool to measure changes in vegetation quality over time.

#### Quadrat Methodology

Each quadrat consists of a 100 square metre site. Quadrat data method is based upon the modified Braun-Blanquet scale (Gullan 1978). Within each quadrat all vascular plant species are assigned a cover value according to the following values-

- + cover value < 1%, few individuals
- 1 cover value 1-5%, any number of individuals
- 2 cover value 5-20%, any number of individuals
- 3 cover value 20-50%, any number of individuals
- 4 cover value 50-75%, any number of individuals
- 5 cover value 75-100%, any number of individuals.

The following data was also collected:

Cover value (%) of organic litter

Cover value (%) of bare earth

Cover value (%) of non-vascular flora (lichens, mosses etc.).

Vegetation description - a description of the vegetation type.

Vegetation condition - observations of the condition of the vegetation.

Quadrat site Description – Location, aspect, slope and any relevant information.

Quadrat locations are marked on site with a permanent metal star picket placed at the south east corner (unless otherwise indicated) and are located utilising GPS technology.

Quadrat sites locations were selected to reflect 'typical' vegetation quality and site conditions or to record sites with particular values (*refer to* Section 6).

Table 8 (below) provides a summary of the quadrat data, including EVC, plant species and location.

Refer to Figure 5 for the distribution of habitat hectare/quadrat study sites within the study area.

**Table 8      Quadrat Data Summary and Location**

Site	EVC	Indigenous Species	Exotic Species	Location SE Corner (MGA Easting/Northing)	
Ocean Grove Dunes					
Q1	858	17	11	285202.92	5761266.80
Q2	858	13	5	284911.78	5761248.69
Q3	1	17	7	284931.12	5761187.73
Q4	1	18	9	284604.59	5761236.74
Q5	879	16	7	284246.00	5761221.69
Q6	858	13	10	284329.997	5761321.133
The Spit					
Q1	879	4	2	281221.64	5759807.11
Q2	879	1	1	281360.92	5759941.59
Q3	1	9	11	281355.19	5759982.38
Q4	1	7	9	281924.33	5760717.57
Barwon River Estuary					
Q1	9	11	1	282396.59	5761660.28
Q2	858	11	13	280872.19	5760071.77
The Bluff					
Q1	1	25	7	281201.98	5759032.52
Q2	858	15	8	281334.71	5759064.52
Q3	1	14	12	280889.56	5759066.69
13 <sup>th</sup> Beach					
Q1	879	11	10	275068.00	5759828.31
Q2	879	10	6	275298.74	5759876.98
Q3	1	19	14	275483.45	5760036.02
Q4	1	11	11	275307.69	5759998.68
Q5	879	13	6	276911.65	5759650.53
Q6	1	15	6	277733.18	5759612.49
Q7	1	17	5	277761.31	5759601.38
Q8	1	17	12	278074.56	5759627.53
Q9	858	23	11	279533.91	5759410.16
Q10	1	15	5	277416.65	5759702.45
Q11	1	14	6	279410.17	5759238.71
Q12	879	10	3	279996.59	5759233.25
Q13	1	17	7	279964.15	5759316.84

Location data is provided for the south-east corner of the quadrat.

The quadrat assessment data is provided in the management zones data section.

### 3.4.3 Plant Species

Plant species lists were compiled for the total area and for each management zone. The species list data is provided by management zone in the management zones data section. A plant species list for the entire study area is provided in Tables 1 & 5.

### 3.4.4 Fauna

There are no historic records of any systematic surveys of the terrestrial fauna of the study area. However records of fauna sighting within the study area have been kept by Barwon Coast staff over the last seven years. These records form the main resource for the data provided in the vegetation management zones data section (Section 6).

Barwon Coast has undertaken recent mammal trapping programs and has recently renewed a Scientific Research Permit with DSE to continue a mammal trapping program for another three years. Under the initial trapping program no indigenous fauna species were recorded.

Barwon Coast has also introduced a fauna monitoring program using remote sensor cameras. Indigenous birds, mammals and reptiles have been recorded utilizing this technology.

Table 9 (below) provides the number of recorded fauna species by group for each of the management zones.

**Table 9 Summary of Fauna Records by Management Zone**

Species	Ocean Grove Dunes	Urban Foreshore	The Spit	Estuary	The Bluff	13 <sup>th</sup> Beach
Mammals	4	2	4	3	9	6
Reptiles	4	1	2	1	5	5
Frogs	1	-	-	2	3	4
Birds	25	14	19	31	39	30
Insects/Spiders	26	7	38	17	54	42
Combined Exotic	10	10	11	9	11	11

### 3.4.5 Photographs

Digital photographs of the quadrat/habitat hectare sites were taken at the time of each assessment. Where physically possible photographs have been taken from the southeast corner of the quadrat. These photographs are provided in the management zones data section.

## 4 Vegetation Management

### 4.1 Introduction

“The main objective of any bushland management program should be the creation of a ‘manageable ecosystem’, resulting in the rehabilitation of a native vegetation community and restoration of wildlife habitat. This process of recreating the right conditions for regrowth of the desired plant community can be initiated by the removal of exotic plants and the encouragement of the indigenous species to re-establish themselves” (Duggan 1993 ii).

It is clear that the flora and fauna values of the Barwon Coast area are of such significance that the primary function of the study area should be for conservation where possible. It is imperative that management actions be designed to maintain and enhance these values. This is already recognized in existing management guidelines.

The flora and fauna values are however, under threat, primarily from weed invasions in the terrestrial vegetation communities. Continuing and enhanced management of these weed invasions is urgently required.

As much of the study area is in essence still a ‘natural’ area (i.e. the natural processes appear to be mostly still occurring, the soil profile is still mostly intact and is not subjected to external pressures such as nutrient overloads, etc.) ***it is reasonable to assume that it is possible to maintain and/or restore the vegetation to a mostly indigenous ‘manageable ecosystem’.***

#### 4.4.1 Aims

Based upon the data collected, a set of aims that encapsulate management outcomes, including a model of the vegetation for each management zone, are described as follows.

The purpose of this exercise is to guide the allocation of resources for vegetation management works programs (as prescribed in Management Prescriptions Section 5).

### Ocean Grove Dunes Management Zone

#### ***Reardunes***

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Maintain and increase populations of Orchid spp.
- Maintain and increase Moonah woodland dominated vegetation.

#### Character of vegetation

- Maintain existing woodland/shrubland communities, including understorey diversity (such as moss beds). Reinforce Moonah character

by selective revegetation with EVC 858 species where appropriate. Monitor and manage, where appropriate, any increases in Coast Teatree and Coast Wattle populations.

### ***Foredunes***

- Reduce cover value of weeds.
- Reduce, eradicate or contain serious weeds.
- Selective stabilization of dune sands.
- Maintain and increase populations of Austral Lotus.

Character of vegetation:

- Maintain existing grassland/shrubland communities.

### **Ocean Grove Urban Foreshore Management Zone**

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Selective stabilization of dune sands.
- Manage vegetation for utilitarian uses.

Character of vegetation:

- Maintain existing woodland/shrubland communities.

### **The Spit Management Zone**

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Selective stabilization of dune sands.
- Monitor and contain Sea Wheat-grass in areas of Coast Fescue populations.
- Maintain and increase populations of Orchid spp, Coast Fescue and Salt Fireweed.
- Maintain and increase Moonah dominated vegetation.
- Restore abandoned camping areas.
- Manage vegetation for utilitarian use as required (camping and activity areas) while maintaining areas of indigenous character vegetation.

Character of vegetation:

- Maintain existing woodland/shrubland communities, including understorey diversity (such as moss beds). Introduce Moonah character by selective revegetation with EVC 858 species where appropriate. Monitor and manage, where appropriate, any increases in Coast Teatree and Coast Wattle populations (in areas of relatively intact vegetation only). Maintain indigenous character of utilitarian areas.

### **The Barwon River Estuary Management Zone**

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Maintain and increase populations of Wirilda and Marsh Saltbush.
- Maintain and increase Moonah woodland dominated vegetation.
- Manage vegetation for utilitarian use as required while maintaining areas of indigenous character vegetation.

#### **Character of vegetation:**

- Maintain existing woodland/shrubland communities, including understorey diversity (such as moss beds). Reinforce Moonah character by selective revegetation with EVC 858 species where appropriate. Monitor and manage, where appropriate, any increases in Coast Teatree and Coast Wattle populations (in areas of relatively intact vegetation only).

### **The Bluff Management Zone**

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Maintain and increase populations of Coast Wirilda, Coast Fescue, Creeping Coast Tussock-grass and Coast Twin-leaf.
- Maintain and increase Moonah woodland dominated vegetation.
- Manage vegetation for utilitarian use as required while maintaining areas of indigenous character vegetation.

#### **Character of vegetation:**

- Maintain existing woodland/shrubland communities, including understorey diversity. Reinforce Moonah character by selective revegetation with EVC 858 species where appropriate. Monitor and manage, where appropriate, any increases in Coast Teatree and Coast Wattle populations.

## **13<sup>th</sup> Beach Management Zone**

### ***Reardunes***

- Reduce cover value of weeds.
- Reduce or eradicate serious weeds.
- Reduce or eradicate non-indigenous trees and shrubs (planted by the CRB) while maintaining habitat values.
- Maintain and increase populations of Orchid spp, Rare-bitter Bush, Salt Fireweed and Creeping Coast Tussock-grass.
- Maintain and increase Moonah woodland dominated vegetation.

#### Character of vegetation:

- Maintain existing woodland/shrubland communities, including understorey diversity (such as moss beds). Reinforce Moonah character by selective revegetation with EVC 858 species where appropriate. Monitor and manage, where appropriate, any increases in Coast Teatree and Coast Wattle populations. Maintain areas of open Coast Beard-heath dominated vegetation (by controlling Coast Teatree and Coast Wattle populations).

### ***Foredunes***

- Reduce cover value of weeds.
- Reduce, eradicate or contain serious weeds.
- Selective stabilization of dune sands.
- Monitor and contain Sea Wheat-grass and Marram grass.
- Maintain and increase populations of Austral Lotus, Creeping Coast Tussock-grass, Coast Fescue and Coast Twin-leaf.
- Manage erosion as required.

#### Character of vegetation:

- Maintain existing grassland/shrubland communities.



## 4.2 Weed Invasions

“Invasive exotic plant species are a major cause of ecosystem destruction and contribute significantly to the decline of the distinctive Australian quality of our coastal landscapes” (Arnold 1981).

The data presented here shows the extent of the weed invasion problem in the study area. Particularly in the foredune grassland and rear dune shrubland communities weed species are heading towards the domination of the indigenous flora. In particular Myrtle-leaf Milkwort (*Polygala myrtifolia*) and Bridal Creeper (*Asparagus asparagoides*) have the potential to dominate the ground and middle storey of the Moonah and Coast Teatree areas (although recent biological control efforts have lessened the impact of Bridal Creeper at the Bluff and appear to have also lessened the impact across the study area), while Western Coastal Wattle (*Acacia cyclops*) has proven to be very invasive at The Bluff.

This study identifies 52 species of weeds (*refer to* Table 10) that, due to their adverse biological impact or potential adverse environmental impact are assessed as being ‘Serious’, and therefore require some form of control or elimination from the study area. A further 76 species of medium or medium-potentially serious impact level are also identified. These species will also require monitoring and may require some form of control or elimination from at least parts of the study area.

Consideration will also have to be given to the sources of weed invasion with a view to limiting future reintroduction and to other weed species which are known to occur in the region and could become established at Barwon Coast.

Refer Section 4.6 for further discussion and to Table 10 (*below*) for a list of weeds that require management, including life form, location by management zone and control target.

## 4.3 Biological Impacts of Weeds

Weeds compete with established indigenous plants for essential resources such as water and nutrients, but competition for light is probably the most significant short term interaction (Carr et al 1992).

Weeds affect the ability of native plants to germinate or to set seed so that populations of native species become critically small.

Weeds also have the potential to impact upon faunal values. Some weed species provide no or limited nutritional value or are not palatable for some fauna species (Madeline Glynn Barwon Coast Staff *pers comm.*). Weed invaded ecosystems are also known to disrupt and displace local fauna populations through loss of habitat (McDonald 1989, Muyt 2001).

Pest animals are also known to spread weeds, for example foxes are known to spread Boneseed by eating the fleshy berries and defecating the seeds (Carr *et al* 1992).

The impacts of climate change, specifically reduced rainfall, warmer temperatures and the potential for increased scale and intensity of fire may also favour weed species (CSIRO website i).

It is reasonable to assume that weed invasion is causing the progressive decline of indigenous biota, particularly in the grassland and shrubland communities. This may not be readily apparent to the casual observer because the immediate impression gathered is that of the dominance of the indigenous vegetation. While no quantifiable data exists to confirm this there is an obvious lack of regeneration of indigenous species within the weed invaded areas. Personal observations and communications confirm that without continuing ongoing management, there will be a steady increase in the dominance of weeds.

## **Hybridisation**

“An interesting phenomenon, interspecific hybridisation involving exotic and indigenous species, is known. It may be regarded as an invasion of the genes.” (Carr in *Flora of Victoria Vol 1* 1993).

Hybridisation between *in situ* indigenous plant species and introduced member of the genus that has been introduced species can potentially impact upon the long term genetic health of the indigenous flora. Genera that have been affected within the local area include *Acacia* sp (Carr *et al* 1992) and *Carpobrotus* sp.

Of particular concern at the study area is the impact upon the indigenous populations of Coast Wattle (*Acacia longifolia* ssp *sophorae*) by hybridisation with the introduced Sallow Wattle (*Acacia longifolia* ssp *longifolia*) (this hybrid has already been recorded in the region). *Acacia longifolia* ssp *longifolia* and any *Acacia longifolia* ssp *sophorae* x *Acacia longifolia* ssp *longifolia* hybrids should be removed from the study area and the surrounding area to limit this impact (*refer to Serious Environmental Weeds*).

#### 4.4 Impact of Weed Invasions on Fauna

Faunal species may be affected either directly or indirectly by weed invasions (Carr *et al* 1992).

Changes in ecosystem function or structure (due to weed invasions) may adversely affect some species and favour some others, but in the long term massive ecosystem disruption and faunal extinction seem inevitable (MacDonald *et al* 1989).

Although scant data is available for the study area, it is reasonable to assume that weed invasions are having an impact upon faunal populations. The removal of weed species as recommended should help to conserve and enhance faunal populations.

#### **Management Considerations**

One possible concern with the removal of weed species is the potential for the direct localized loss of food or shelter that exotic species may be providing. This is considered to be a significant consideration in areas where little or no indigenous vegetation remains (Duggan 1993 ii). Within the study area, the dominant vegetation is still mostly indigenous. Consequently the staged removal of environmental weed species, as recommended, is not considered to pose a threat to faunal populations. However consideration should be given to the timing of works and the amount of vegetation removal in each works program (*refer also to 3.4 Basic Principals of Weed Control*).

## 4.5 Origins of Weeds

Identification of the origins of weeds is instructive. With this information steps can be taken to lessen the source of invasive plant propagules (seeds, bulbs etc.). Steps can also be taken to ensure that invasive species are not selected for use in surrounding areas, thus potentially introducing more weed species. It is estimated that at least 60% of Victoria's more than 900 species of naturalized plants have originated as "garden escapes" from horticulture (Carr *et al* 1992).

Within the study area 152 exotic species (55% of the total flora) have been recorded. A breakdown of the origins of the serious weeds is as follows:

62 species	Garden Escapes
11 species	Agriculture
14 species	Ecological works (Dune stabilization etc)
62 species	Accidental (widespread ruderal weeds)
3 species	possibly accidental and /or garden escapes.

41% of the weed species recorded owe their origin to horticulture. The number of serious weed species that owe their origin to horticulture is 27 (out of 63) or 43%. A number of these horticultural species are now recognized as weeds (although often as weeds of the garden rather than of the natural environment), however many of them can still be seen growing in nearby residential gardens.

It is also worth noting that 19 of the recorded weed species are non-indigenous Australian native species.

#### 4.5.1 Weeds in Surrounding Areas

Many of the serious environmental weeds species identified in this report have seeds or propagules that are spread by animals or by the wind and therefore they will require control or removal from nearby gardens and public land so that they do not remain as a constant source for reintroduction into the study area. It is worth noting, however, that this number of plants would represent only a small percentage of the total number of exotic plants used in horticulture in the area.

Work arrangements are in place with the City of Greater Geelong, Barwon Water, Vicroads and the Barwon Heads Golf Club (all neighbours) to address co-operative weed management.

#### 4.6 Weed Management

Due to the extent of the weed invasion problem across the study area, weed control will remain, for some time, one of the main management focuses. Weed control must therefore be adequately planned and funded to gain maximum benefit out of the available resources.

It is a specific outcome of this report to assist management in establishing a works program for the management of priority weeds with broad cost estimates.

While there is currently an actively involved volunteer contingent it must be recognized that volunteers have limited time to give to management works and that volunteer availability may vary overtime. Therefore weed management works must remain predominately the responsibility of management.

It is not always possible to predict the exact outcome of weed control actions. For example, after the removal of weeds, a site may become colonized by other weed species or by indigenous species. However these primary colonizers may then be replaced over time by indigenous “climax” species or they may be replaced by other serious weeds. Thus it is important to be prepared to employ an adaptive (rather than overly prescriptive) approach to weed control. It will be important to keep records, including photographs, of all activities. Over a period of time it is likely that the techniques already employed will be further developed and refined to suit the conditions of the study area.

For this study weeds species that require management are grouped into the following categories:

- Serious Weeds.
- Priority Weeds (a subset of Serious Weeds).
- New and Emerging Weeds.
- Persistence Weeds.

Each of these weed categories is discussed and documented as follows (4.6.1, 4.6.2, 4.6.3 and 4.6.4).

### **Basic Principals for Weed Control**

There are a number of broad principals for weed control work that can be applied to the study area. The application of the following principals will help to ensure effective and efficient use of available time.

- Work from the least invaded areas into the worst areas (this is a modified version of the “Bradley Technique”).
- Cause as little disturbance to the soil surface as is possible (this will limit the amount of disturbed area that is available for colonization by other weeds).
- Limit the amount of seed set of weed species (this is a matter of timing, when possible control species before seed set, or undertake works to limit seeding on plants that you do not have the time to control).
- Control any serious weed species that are not currently widespread within the Reserve before they become well established.
- Ensure that any weeds that are controlled are not able to regenerate vegetatively. In the case of seedlings that have been hand pulled this means not leaving the roots in contact with the soil, in the case of weeds that regenerate by vegetative means, suckers, corms, succulents etc, this may mean removing all plant material from the Reserve.
- Maintain a clean working environment. Make sure weeds are not spread around with tools, clothing etc.
- Use herbicide carefully, according to manufacturers recommendations, use wick applicators rather than spot sprayers where possible to reduce drift to non-target species
- Use a dye such as “Kiwi Highlite” with all herbicides.
- Don’t remove any weeds unless sure of the correct identification.
- Only attempt the amount of weeding that can be revisited to undertake further works as required.
- Maintain a diary recording all aspects of weed control work.
- When removing woody weeds in the spring through to early summer be careful to check first for nesting birds that may be sensitive to disturbance.

Further information (identification, biology, ecology, distribution, status etc.) on most of the serious weed species can be obtained from literature, notably Parsons and Cuthbertson (2001), Muylt (2001), Blood (2001) and Richardson *et al* (2006).

#### 4.6.1 Serious Weeds

This study identifies 52 species of weeds (*refer to* Table 6) that, due to their adverse biological impact or potential adverse environmental impact are assessed as being 'Serious', and therefore require some form of control, containment or elimination from the study area.

The following control targets for serious weeds are recommended:

- Eradicate: species is considered a realistic option to eradicate from the study area.
- Control: species requires control to reduce or maintain populations within the study area, as eradication is not considered plausible.
- Contain: species is not considered plausible to eradicate or control, so species is to be contained in certain locations to protect assets such as significant species or to limit the establishment of further populations.
- Monitor: species requires monitoring with a view to management as required.

Refer to Table 10 for a list of serious weed species, life form, distribution by management zone, control target and comment on current management status.

**Table 10 Serious Weed Species, Life Form, distribution by Management Zone, Control Target and comment on current management status**

Botanical Name	Life Form	1	2	3	4	5	6	New/ Emerge	Control Target	Comments on current status
<i>Acacia cupularis</i>	MS						*		E	Removed, monitor.
<i>Acacia cyclops</i>	MS					*			E	Ongoing removal.
<i>Acacia longifolia</i> ssp <i>longifolia</i>	MS	*	*	*	*	*	*		?C/E	
<i>Acacia rostellifera</i>	MS						*		E	Removed, monitor.
<i>Acacia saligna</i>	MS	*		*					E	Removed, monitor.
<i>Acetosa sagittata</i>	SC				*			*	E	Sprayed, unsuccessful.
<i>Agapanthus praecox</i>	MTG			*	*		*		E	
<i>Ammophila arenaria</i>	LTG	*	*	*	*	*	*		Cn	
<i>Asparagus asparagoides</i>	SC	*	*	*	*	*	*		Cn	Biological Control, ongoing.
<i>Cakile maritima</i>	MH	*	*	*	*	*	*		Cn	Ongoing targeted removal.
<i>Carpobrotus aequilaterus</i>	MH		*						E	
<i>Chrysanthemoides monilifera</i>	MS	*		*		*	*		E	Ongoing removal.
<i>Conzysa</i> sp ( <i>?sumatrensis</i> )	LH			*			*		Cn	Ongoing removal.
<i>Cortaderia selloana</i>	LTG						*	*	E	
<i>Coprosma repens</i>	MS	*		*	*	*	*		E	Ongoing removal.
<i>Crassula multicava</i>	MH			*					E	
<i>Cupressus macrocarpa</i>	LT		*		*		*		E	
<i>Dactylis glomerata</i>	MTG	*	*	*	*				E	
<i>Delairea odorata</i>	SC	*		*	*				E	Lontrel ongoing.



<i>Dipogon lignosus</i>	SC	*	*	*	*	*	*		E	Lontrel ongoing.
<i>Drosanthemum candens</i>	LH	*							E	Sprayed, monitor.
<i>Ehrharta calycina</i>	MTG	*						*	E	Removed, monitor.
<i>Ehrharta erecta</i>	MTG	*	*	*	*	*	*		C	
<i>Ehrharta longiflora</i>	MTG	*	*	*			*		C	
<i>Euphorbia paralias</i>	MH	*		*			*		? C/E	Removed, monitor.
<i>Euphorbia terracina</i>	MH	*	*	*	*	*	*		? C/E	
<i>Ferraria crispa</i>	Gc				*	*	*		E	Sprayed, monitor.
<i>Foeniculum vulgare</i>	LH						*		E	
<i>Freesia alba</i>	Gc				*	*	*		? C/E	
<i>Galena pubescens</i>	MH								Cn	
<i>Gazania sp</i>	MH	*	*		*	*	*		E	Sprayed, monitor.
<i>Genista linifolia</i>	LS	*	*						E	
<i>Hedera helix</i>	SC			*	*				E	
<i>Limonium hyblaum</i>	MH						*	*	E	Ongoing removal.
<i>Lycium ferocissimum</i>	LS	*	*	*		*	*		Cn	Ongoing removal.
<i>Melaleuca armillaris</i>	MS			*	*		*		E	
<i>Mersembryanthemum crystallinum</i>	LH	*				*			E	
<i>Nassella trichomata</i>	MTG						*	*	E	Sprayed, monitor.
<i>Nassella neesiana</i>	MTG			*				*	E	Removed, monitor.
<i>Oxalis pes-caprae</i>	MH	*	*	*	*	*	*		M/C	
<i>Paraserianthes lophantha</i> <i>ssp lophantha</i>	LS						*	*	M	Removed, monitor.
<i>Pennisetum clandestinum</i>	MNG	*	*	*	*	*	*		Cn	Ongoing herbicide.
<i>Phalaris aquatica</i>	LTG			*			*		C	
<i>Pinus maritima</i>	LT						*		E	
<i>Pittosporum undulatum</i>	MT	*	*	*	*				? C/E	
<i>Polygala myrtifolia</i>	MS	*	*	*	*	*	*		? C/E	Ongoing removal.
<i>Rhamnus alaternus</i>	MS	*	*	*	*	*	*		? C/E	Ongoing removal.
<i>Senecio angulatus</i>	SC			*					E	Ongoing removal.
<i>Stenotaphrum secundatum</i>	MNG	*	*	*	*	*	*		Cn	Ongoing herbicide.
<i>Thinopyrum junceiforme</i>	MNG	*	*	*	*	*	*		Cn	Trail herbicide
<i>Vinca major</i>	SC			*			*		M	Sprayed, monitor.

### Control Targets

The following control targets are recommended for each of the serious weed species:

E- Eradicate

C- Control

Cn- Contain

M- Monitor

### Life Form

LT- Large Tree, MT- Medium Tree, LS- Large Shrub, MS- Medium Shrub, SS- Small Shrub. LH- Large Herb, MH- Medium Herb, SH- Small Herb, Gc – Cormous Geophyte, LTG- Large Tufted Graminoid, MTG- Medium Tufted Graminoid, MNG- Medium Non-tufted Graminoid, SC- Scrambler/Climber.

#### 4.6.2 Priority Weeds

Priority weeds are a subset of the serious weeds. A total of 19 species are identified that are considered to constitute the most significant or potentially most significant impacts to biodiversity values. Due to their significance they command a significant proportion of works time.

Table 11 provides a list of priority weed species, life form and distribution by management zone. Each priority species is also profiled and mapped. Refer to Section 7 for profiles and distribution maps for the priority weed species.

**Table 11 Priority Weed Species, Life Form and Distribution by Management Zone**

Botanical Name	Life Form	1	2	3	4	5	6
<i>Acacia cupularis</i>	MS				*		*
<i>Acacia cyclops</i>	MS					*	*
<i>Acacia longifolia</i> ssp <i>longifolia</i>	MS	*	*	*	*	*	*
<i>Acacia rostellifera</i>	LS						*
<i>Acacia saligna</i>	LS	*		*			
<i>Ammophila arenaria</i>	MNG	*	*	*	*	*	*
<i>Asparagus asparagoides</i>	SC	*	*	*	*	*	*
<i>Chrysanthemoides monilifera</i>	MS	*		*		*	*
<i>Coprosma repens</i>	MS-LS	*		*	*	*	*
<i>Dipogon lignosus</i>	SC	*	*	*	*	*	*
<i>Ehrharta calycina</i>	MTG	*					
<i>Euphorbia paralias</i>	MH	*		*			*
<i>Euphorbia terracina</i>	MH	*	*	*	*	*	*
<i>Lycium ferocissimum</i>	LS	*	*	*		*	*
<i>Nassella trichomata</i>	MTG						*
<i>Nassella neesiana</i>	MTG			*			
<i>Polygala myrtifolia</i>	MS	*	*	*	*	*	*
<i>Rhamnus alaternus</i>	LS	*	*	*	*	*	*
<i>Thinopyrum junceiforme</i>	MNG	*	*	*	*	*	*

### 4.6.3 New and Emerging Weeds

New and/or emerging weeds are weeds that are assessed to be a potential threat to biodiversity values and that currently have a limited distribution within the study area and are considered to be relatively recent arrivals. These weeds require prompt management (elimination) to limit greater invasion and subsequent ongoing management.

New and/or emerging weeds that are assessed to be 'Serious' or potentially 'Serious' are identified as such in Table 10. A total of 11 new and/or emerging weeds are identified.

Refer to Table 12 for a list of new and emerging weeds, life form and distribution by management zone. Refer to Section 7 for a distribution map identifying the location of each new and emerging weed species.

**Table 12 New and emerging weeds, life form and distribution by management zone.**

Botanical Name	Life Form	1	2	3	4	5	6
<i>Acetosa sagittata</i>	SC				*		
<i>Berkheya rigida</i>	MH					*	*
<i>Conzysa sp (sumatriensis)</i>	LH				*		*
<i>Cortaderia selloana</i>	LTG						*
<i>Ehrharta calycina</i>	MTG	*					
<i>Galena pubescens</i>	GC	*	*	*	*	*	*
<i>Limonium hyblaenum</i>	MH						*
<i>Nassella trichomata</i>	MTG						*
<i>Nassella neesiana</i>	MTG			*			
<i>Parietaria judiaca</i>	MH				*		
<i>Senecio elegans</i>	MH	*		*			*

#### 4.6.4 Persistence Weeds

Persistence weeds are weeds that are assessed to be a threat to biodiversity values and that currently have established populations within the study area that have been subjected to successful management works to date. In most instances these weeds can be currently assessed to be 'contained'. Ongoing works are required to ensure these species do not become re-established (and then further invasive). In most instances the management aim is achieve long term elimination of these species. A total of 30 persistence weeds are identified.

Refer to Table 13 for a list of persistence weeds, life form and distribution by management zone. Refer to Section 7 for a distribution map identifying the location of the persistence weed species.

**Table 13 Persistence weeds, life form and distribution by management zone.**

Botanical Name	Life Form	1	2	3	4	5	6	Manage
<i>Aeonium arboreum</i>	MS			*				E
<i>Agapanthus praecox</i>	MTG			*	*		*	E
<i>Aloe saponaria</i>	LH						*	E
<i>Arctotis stoechadifolia</i>	SS	*						E
<i>Banksia integrifolia</i>	MT					*	*	E
<i>Carpobrotus aequilaterus</i>	MH		*					E
<i>Cotoneaster glaucophyllus</i>	MS				*		*	E
<i>Cotyledon orbiculata</i>	MH	*						E
<i>Crassula multicava</i>	MH			*				E
<i>Cupressus macrocarpa</i>	LT		*		*		*	E
<i>Delairea odorata</i>	SC	*		*	*			E
<i>Drosanthemum candens</i>	LH	*						E
<i>Ehrharta erecta</i>	MTG	*	*	*	*	*	*	C
<i>Ehrharta longiflora</i>	MTG	*	*	*			*	C
<i>Ferraria crispa</i>	Gc				*	*	*	
<i>Foeniculum vulgare</i>	LH						*	E
<i>Freesia alba</i>	Gc				*	*	*	? C/E
<i>Gazania</i> sp	MH	*	*		*	*	*	E
<i>Genista linifolia</i>	LS	*	*					E
<i>Hedera helix</i>	C			*	*			E
<i>Mersembryanthemum crystallinum</i>	LH	*				*		E
<i>Nerium oleander</i>							*	E
<i>Oxalis pes-caprae</i>	MH	*	*	*	*	*	*	M
<i>Paraserianthes lophantha</i> ssp <i>lophantha</i>	LS						*	M
<i>Pennisetum clandestinum</i>	MNG	*	*	*	*	*	*	Cn
<i>Pinus maritima</i>	LT						*	E
<i>Pittosporum undulatum</i>	MT	*	*	*	*			? C/E
<i>Senecio angulatus</i>	SC			*				E
<i>Stenotaphrum secundatum</i>	MNG	*	*	*	*	*	*	Cn
<i>Vinca major</i>	SC			*			*	E

## 4.7 Status of Coast Teatree and Coast Wattle

### Coast Teatree

Coast Teatree is identified as a Very Serious weed in Victoria (Carr *et al* 1992). Coast Teatree is currently well established as the climax community in much of the areas of habitat that is available to it. This is generally thought to be the way it has always been. This has also been seen as “natural” and therefore it is assumed that the best option for preserving conservation values is to maintain the areas of Coast Teatree woodland as they are.

It is considered that the western distribution of Coast Teatree reaches its ‘natural’ limit at or somewhere near Barwon Heads. Further to the west, i.e. at Breamlea and beyond, Coast Teatree is considered an environmental weed. At Breamlea for example it was not present until the 1960’s (Trenrove 1999). It is also considered a weed if it invades further inland from what it its ‘natural’ distribution of being confined to the coastal fringe (Trenrove 1992, Geoff Carr *pers comm.*).

### Recommendations

- Manage the Moonah/Coast Teatree Woodland to maintain the community within its established distribution.
- Initiate planting of Moonah and associated plant species in areas of Coast Teatree to restore a Moonah dominated community (where appropriate i.e. within EVC 858).
- Monitor the distribution of Coast Teatree within the study area. If it is found to be invading shrubland communities then investigate means of control.
- Monitor regeneration of Coast Teatree within its existing distribution.

### Coast Wattle

Coast Wattle is well established across much of the dune shrubland within the study area. Assessments undertaken at the Bluff (2010) and the current study demonstrate the increasing cover of Coast Wattle at the Bluff, while within the larger study area it is apparent that it is also increasing its cover.

While it is considered to be indigenous to the study area, it is also identified as a Very Serious weed in Victoria (Carr *et al* 1992) where it is also identified as an ecologically ‘out of balance’ species.

### Recommendations

- Manage Coast Wattle to limit further expansion within its established distribution.

- Initiate planting of Moonah and associated plant species in areas of Coast Wattle to restore a Moonah dominated community (where appropriate i.e. within EVC 858).
- Undertake localized control of Coast Wattle where it threatens biodiversity values.
- Monitor the distribution of Coast Wattle within the study area. If it is found to be invading shrubland communities then investigate means of control.
- Monitor regeneration of Coast Wattle within its existing distribution.

The City of Greater Geelong is currently conducting a review of the status of Coast Teatree and Coast Wattle between Point Lonsdale and Breamlea (Jeanette Spittle, City of Greater Geelong *pers comm*), being undertaken by Ecology Australia. The results of that report may provide further direction for the management of both these species.

#### 4.8 Status of Coast Banksia

Coast Banksia (*Banksia integrifolia*) is a species that is considered to be at the natural edge of its western distribution somewhere near Barwon Heads. A population near the eastern end of Buckley Park is generally considered to be indigenous (Trengove 1992) while large individual specimens within Barwon Heads township may or may not be planted. Coast Banksia is also known to be an aggressive environmental weed on the Bellarine Peninsula, for example at Point Richards (Trengove 2004) and Point Edwards (Trengove 1999). There is no conclusive evidence that Coast Banksia is indigenous to the study area.

#### **Recommendations**

- Coast Banksia should only be considered for revegetation works within the study area if it can be established that planting stock is of local provenance and that the plant is in fact indigenous to the study area. Any populations of Coast Banksia that become established within the study area should be treated as weeds.
- Existing planted specimens of Coast Banksia that exist as utilitarian plantings in substantially modified landscapes, such as the caravan park and main beach car park should be retained until natural senescence. At that stage they should be replaced with indigenous species. Monitor these specimens as potential sources of new naturalized populations.



#### 4.9 Management of Marram Grass and Sea Wheat-grass

Marram Grass and Sea Wheat-grass are both identified as Very Serious weeds within Victoria (Carr *et al* 1992).

Marram Grass was introduced to Victoria to stabilize coastal sand dunes in the 1860s. It was introduced into the study area in the 1890s and was still actively planted up until at least 1985 at Collendina under advice from the Soil Conservation Authority (Warren Chapman *pers comm*). It is demonstrated that sand accretion under Marram Grass has built higher and steeper modern dunes (Bird 1993, Heyligers 1985).

Sea Wheat-grass was first recorded on the shores of Port Phillip Bay in the 1930s. Unlike Marram Grass and the indigenous *Spinefex* it is tolerant of brackish groundwater and can cope with wave oversplash (Heyligers 2009), so it is more able to colonize the seaward edge of the primary dune. Sea Wheat-grass traps and stabilizes sands where native vegetation does not generally occur, thereby altering the natural beach landforms and preventing the movement of sand. It creates a berm or slope in front of the foredune in areas of prograding shoreline while hummocky dune fields develop in high wind environments (Rudman 2003).

Combined these species constitute a considerable threat to the study area dune system, in particular the foredunes (although Marram Grass is not limited to the foredunes). Faunal habitat values, such as shore bird nesting sites, are impacted upon and significant plant species, such as Dune Fescue and Austral Lotus, are directly impacted upon (Carr *et al* 1992 and Rudman 2003).

Accumulation of sand within invaded dune systems can also remove sand from beach, surf and inshore areas affecting sand movement and sand availability along the coast (Rudman 2003). Native sand binding grasses do not compete well against the rapid growth rates and sand accumulation capability of Marram Grass (Kirkpatrick & Harris 1995).

Marram Grass and Sea Wheat-grass can also grow in areas of sand not otherwise occupied by native vegetation. The inevitable conclusion is that native sand binding plant communities will steadily decline in extent if no action is taken to protect them from invasion by Marram Grass and Sea Wheat-grass.

The challenges in managing these weeds are complex. Two of the most pressing issues are:

- The potential impacts of control works upon ecological, archeological and geophysical values.
- The resources required to undertake control works.

***Recommendations*****Contain distribution:**

- Establish eradication zones for each species. Establish a monitoring and control program.
- Identify and manage sites not currently invaded

**Minimize adverse impacts:**

- Identify priority sites for protection.
- Protect priority sites from invasion or adverse impacts by Marram Grass and Sea Wheat-grass.

Note that Sea Spurge also requires ongoing management to ensure that it does not also colonize and dominate the foredunes. Works to date have been successful in containing this weed.

Sea Rocket is also an exotic foredune colonizer that may require management attention in some circumstances.

Refer to Section 7 Priority Weed Distribution for profiles and distribution maps of Marram Grass, Sea Wheat-grass and Sea Spurge.

#### 4.10 Brush Matting

Brush matting has been used as a dune stabilization management tool within the study area since at least the 1970s, when works were undertaken by the Country Roads Board along 13<sup>th</sup> Beach. Laying brush as a technique to combat dune blowout was the main approach under the Queenscliff to Barwon Heads Ad Hoc program in the mid 1980s (replacing Marram Grass use) (Warren Chapman *pers comm*). As an education and conservation awareness program, brush matting is a focus activity for school groups, led by the Marine Discovery Centre since the 1980s.

The aim of brush matting has been broadly to halt localized erosion and to 'stabilize' dunes. The laying of brush matting changes the way wind passes over the exposed sand surface to reduce localized erosion and trap moving sand granules to stabilize and create micro environments for dune plant recruitment.

More recently this has developed into a more specific activity primarily utilized to recover specific localized erosion spots caused by human traffic and to deter unwanted people traffic (and associated impacts).

A number of issues and concerns relating to the use of brush matting have arisen. These concerns are summarized as follows:

- The introduction of environmental weeds through use of foreign material carrying plant seed and propagules.
- Assisting the spread of indigenous 'out of balance species' through the use of material carrying plant seed and propagules.
- Creating niche environments for the spread of existing environmental weeds.
- The appropriateness of attempting to modify 'natural' processes such as sand drift.
- Modification of faunal habitat values.
- Visual impacts.

#### **Recommendations**

The continued limited use of brush matting, as is the current practice, is recommended, under the following circumstances:

- Brush matting should be of local provenance plant material that is known to be free of plant seed and propagules, unless specifically for regeneration.
- Imported material providing it is known that this material is known to be free of plant seed and propagules.
- Deterring unwanted traffic.
- For specific localized erosion events where that erosion event is considered likely to lead to greater ecological impacts.

### 4.11 Natural Regeneration

Natural regeneration is the process of allowing the indigenous vegetation to regenerate *in situ*. It involves reproduction both from seed and vegetative means.

In a 'natural' environment this would occur following a disturbance event, or if favorable conditions occurred which would enable regeneration to occur. Examples of typical disturbance factors include fire, a tree falling and grazing or digging by an animal. The event or particular combination of events creates the niche to allow regeneration to occur.

In a natural ecosystem it may not be necessary for regeneration to occur every year. It may be several decades until the appropriate disturbance factor or favorable conditions arise to cause regeneration (particularly for longer lived species).

In some sections of the study area it is evident that little natural regeneration of the indigenous flora is occurring. This may be because of the effect of competition from exotic species or because of the lack of a disturbance factor (or for some other reason).

Conversely, in other sections of the study area, in particular in areas of exposed sands within the dune systems, there has been apparently good regeneration of some indigenous species as a consequence of the two recent relatively wet years.

Natural regeneration has several benefits over revegetation:

- It is more 'natural', plants regenerate in more or less the locations and densities that is naturally intended.
- It helps to conserve the local genetic variability.
- It may reveal some of the 'hidden' biodiversity, species that are present only as soil stored seed or species that are not generally included in revegetation programs.
- It is often less expensive and less time consuming than revegetation.
- There is less likelihood of accidentally introducing unwanted foreign organisms.

However there are also some potential disadvantages:

- It may be difficult to manipulate local conditions to trigger regeneration.
- Species other than those desired may regenerate.
- Some species may not regenerate in desirable numbers or densities.

## 4.12 Revegetation

Revegetation, either by direct seeding or by planting of nursery grown stock, is a technique that is most often employed in areas that are substantially depleted of the natural vegetative cover. The majority of the study is essentially a 'natural' area, i.e. still covered by its indigenous vegetation. As such, sufficient seed and plant propagules should be available (both from living plants and the soil stored seed bank) to allow natural regeneration to occur (*Refer to 4.11 - Natural Regeneration*). Consequently revegetation is not considered to be a major management issue for much of the study area.

Instances where revegetation has localized application include erosion control, after track closure works or physical works, after the removal of weed species (if natural regeneration fails) or to supplement populations of indigenous species that are significant, have limited distributions or are not currently regenerating in sufficient numbers to maintain populations, or to introduce populations that are not currently extant but are thought to be plausible members of the local flora (e.g. Club-moss Daisy-bush, Sweet Bursaria and Drooping Sheoke).

Where revegetation is employed the following guidelines should be adopted:

- All plant material should be from naturally occurring indigenous species.
- Material should only be collected from appropriate local provenances of plants, collected from a number of individual plants to maintain genetic diversity.
- Care should be taken to ensure that the plants that seed is collected from are not damaged or subjected to over collecting (as a guideline the maximum amount of seed to be collected from each plant is 10%).
- Permits are required for the collection of seed from native plants on public land.
- Stock should be free of weeds and exotic pathogens.
- Plants should only be introduced into the vegetation communities they are known to be indigenous to.
- Plants should be planted at densities that approximate their natural habit.

Refer to Table 14, below, for a list of indigenous plant species that have been utilized for revegetation to date within the study area. Also refer to Section 3.1.2 for discussion of the use of introduced locally occurring indigenous plant species.

**Table 14 Indigenous Plant Species Utilized for Revegetation to Date**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia paradoxa</i>	Hedge Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acacia uncifolia</i>	Coast Wirilda
<i>Acaena novae-zealandiae</i>	Bidgee-widgee
<i>Adriana quadripartita</i>	Rare Bitter-bush
<i>Allocasuarina verticillata</i>	Drooping Sheoke
<i>Alyxia buxifolia</i>	Sea Box
<i>Atriplex paludosa</i> ssp <i>paludosa</i>	Marsh Saltbush
<i>Austrostipa flavescens</i>	Coast Spear-grass
<i>Austrostipa stipoides</i>	Prickly Spear-grass
<i>Banksia marginata</i>	Silver Banksia
<i>Busaria spinosa</i>	Sweet Bursaria
<i>Clematis microphylla</i>	Small-leaf Clematis
<i>Correa alba</i>	White Correa
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dianella admixta</i>	Black-anther Flax-lily
<i>Dichelachne crinita</i>	Long-hair Plume-grass
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Hibbertia sericea</i>	Silky Guinea-flower
<i>Kennedia prostrata</i>	Creeping Coast Postman
<i>Lachnograstis billardieri</i> ssp <i>billardieri</i>	Coast Blown-grass
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Lomandra filiformis</i>	Wattle Mat-rush
<i>Lomandra longifolia</i>	Spiny Mat-rush
<i>Melaleuca lanceolata</i>	Moonah
<i>Microlaena stipoides</i>	Weeping Grass
<i>Myoporum insulare</i>	Common Boobialla
<i>Olearia lepidophylla</i>	Club-moss Daisy-bush
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Pultenaea tenuifolia</i>	Slender Bush-pea
<i>Pimelea serpyllifolia</i>	Coast Rice-flower
<i>Poa billiardieri</i>	Dune Fescue
<i>Poa poiformis</i>	Coast Tussock-grass
<i>Pomaderris paniculosa</i>	Coast Pomaderris
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Scaveola albida</i>	Coast Fan-flower
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Spinifex sericeus</i>	Hairy Spinifex
<i>Themeda triandra</i>	Kangaroo Grass
<i>Zygophyllum billiardieri</i>	Coast Twin-leaf

### 4.13 Monitoring

The intent of monitoring is to establish a base and a subsequent ongoing record of the conditions and the impacts (changes in vegetation quality) of management works on vegetation, to provide a record of ecological health and of any benefits (vegetation quality improvements) gained from investments made.

#### ***Recommendations***

##### **Ongoing Works**

Prior to vegetation management works being undertaken record existing conditions to establish benchmark. This is to be comprised of the following:

- Photo point, recorded utilizing GIS technology.
- Written records of vegetation condition, plant diversity and other relevant observations.

##### **Quadrat and Habitat Hectare Assessments**

As described in Sections 3.4.1 and 3.4.2 vegetative quadrats have been established as component of this study (and for the earlier Bluff study).

Monitor quadrat sites and record data once every 5 years or earlier as required (i.e in the event of significant disturbance event (post fire, etc.) or prior to management works being undertaken at sites.

##### **Other Monitoring Projects**

Outside of the monitoring prescriptions established by this report there are additional reports and projects that are contributing to the knowledge base of the study area. These include:

- Community Monitoring of Coastal Moonah Woodland on the Bellarine Peninsula project.
- 40-42w vegetation project.
- Ocean Grove vegetation transects.

Monitoring of these projects should also be continued as a component of the monitoring program.



## 5 Management Prescriptions

Section 5 provides management prescriptions for the six management zones, presented in table format.

The management prescriptions cover a 10-year period and are divided into years 1-2, 3-6 and 7-10. The order of the listing of actions, from top to bottom is intended to reflect the relevant importance (priority) of each action.

### 5.1 Determination of Resource Allocation

A number of factors were considered to inform resource allocation. In particular a matrix was developed to determine high priority (high value) areas. This matrix considered the following factors:

- Diversity of plant species.
- Cover values of weed species.
- Size and relative remoteness of area (as a measure of habitat value in the absence of comprehensive fauna data).

As previously defined (*in* Section 4.1) “It is clear that the flora and fauna values of the Barwon Coast area are of such significance that the primary function of the study area should be for conservation where possible. It is imperative that management actions be designed to maintain and enhance these values. This is already recognized in existing management guidelines. The flora and fauna values are however, under threat, primarily from weed invasions in the terrestrial vegetation communities. Continuing and enhanced management of these weed invasions is urgently required. As much of the study area is in essence still a ‘natural’ area it is reasonable to assume that it is possible to maintain and/or restore the vegetation to a mostly indigenous ‘manageable ecosystem’.”

Work targets generally commence with priority areas and areas with exiting commitments. Works programs that are addressing priority weeds would also address other serious weeds as is practicable.

## 5.2 Works Activities

As has previously been discussed, weed management constitutes, and will continue to constitute, a sizable portion of resource allocations. Consequently resource allocation for weed management works is determined utilizing a model that targets reduced cover values over time. For example priority weed management works are designed to ensure weed cover is contained across the study area during years 1-2 and is decreased over years 3-6 and 7-10 as defined. This is in keeping with current practices as defined by DSE (i.e. for Net Gain offsetting and other programs such as Eco-tender).

Work activities are divided into fields, as described below. Fields have been determined based upon priority and type of activity, framed within a holistic approach with the highest priority being the restoration of habitat values. Consequently, high value attributes are identified to ensure these values are consistently recognized.

### Works Focus and Activities Fields

- *High values*: nominate the higher/primary flora and fauna values of the subzone.
- *Assessment and Monitoring*: recording quadrats and pre-works measurement, (photo points, etc).
- *Serious Pest Plants*: primary works targets, priority weeds.
- *New and Emerging*: new and emerging weeds that warrant immediate and short term priority.
- *Persistence activities*: includes regular attention to rare and special plants, management of regionally controlled weeds and weed species with persistent soil stored seed banks or vegetative re-growth.
- *Rehabilitation and revegetation [including obligation areas]*: vegetation offset management plans etc, revegetation, developed areas, intensive management of significant assets.
- *Pest Animals*, control programs for recognized vertebrate pests – rabbits, fox, rat, cat, feral avifauna.
- *Fauna [Protection and Assessment]*: i.e. hooded plover response, seal protection, fauna monitoring.
- *Education and protection*: community, school groups, field work to support the protection of habitat from the threat of human impacts.

### 5.3 Management Zones and Sub-zones

Management Zones are further divided into sub-zones (Ocean Grove West Fore dune, Ocean Grove West Reardune, etc.) as required based upon size, location and physical characteristics to facilitate resource allocation. (*refer to Table 15 and Figure 6*).

**Table 15 Management Zones and sub-zones areas**

<b>MANAGEMENT ZONE</b>	<b>SUB-ZONE</b>	<b>AREA</b>
Ocean Grove Dunes 7W to 13W	1. Rear dune 7W - 10W	13.7 ha
	2. Fore dune 7W - 10W	6.1 ha
	3. Rear dune 10W - 13W	5.1 ha
	4. Fore dune 10W - 13W	2.6 ha
Urban Foreshore 13W to 16W	5. Grants 13W - 14W	3.7 ha
	6. OG Main Beach 14W - 16W	8.7 ha
The Spit 16W to 20W	7. Fore dune - 16W to Bridge	7.1 ha
	8. Rear dune - 16W to Bridge	16.7 ha
	9. Riverside	12.0 ha
Barwon River Estuary	10. Riverview Family Caravan Park	12.8 ha
	11. Flinders Pde - 24W to Bridge	2.7 ha
	12. Barwon Heads Park - Bridge to 27W	13.4 ha
The Bluff 27W To 30W (the Corner)	13. Headland	5.0 ha
	14. Dune	8.3 ha
	15. Woodland, EBD	4.0 ha
13th Beach 30W (the Corner) to 42W	16. East Fore dune	11.3 ha
	17. East Rear dune	27.4 ha
	18. Central Fore dune	8.0 ha
	19. Central Rear dune	35 ha
	20. West Fore dune	8.1 ha
	21. West Rear dune	23.6 ha

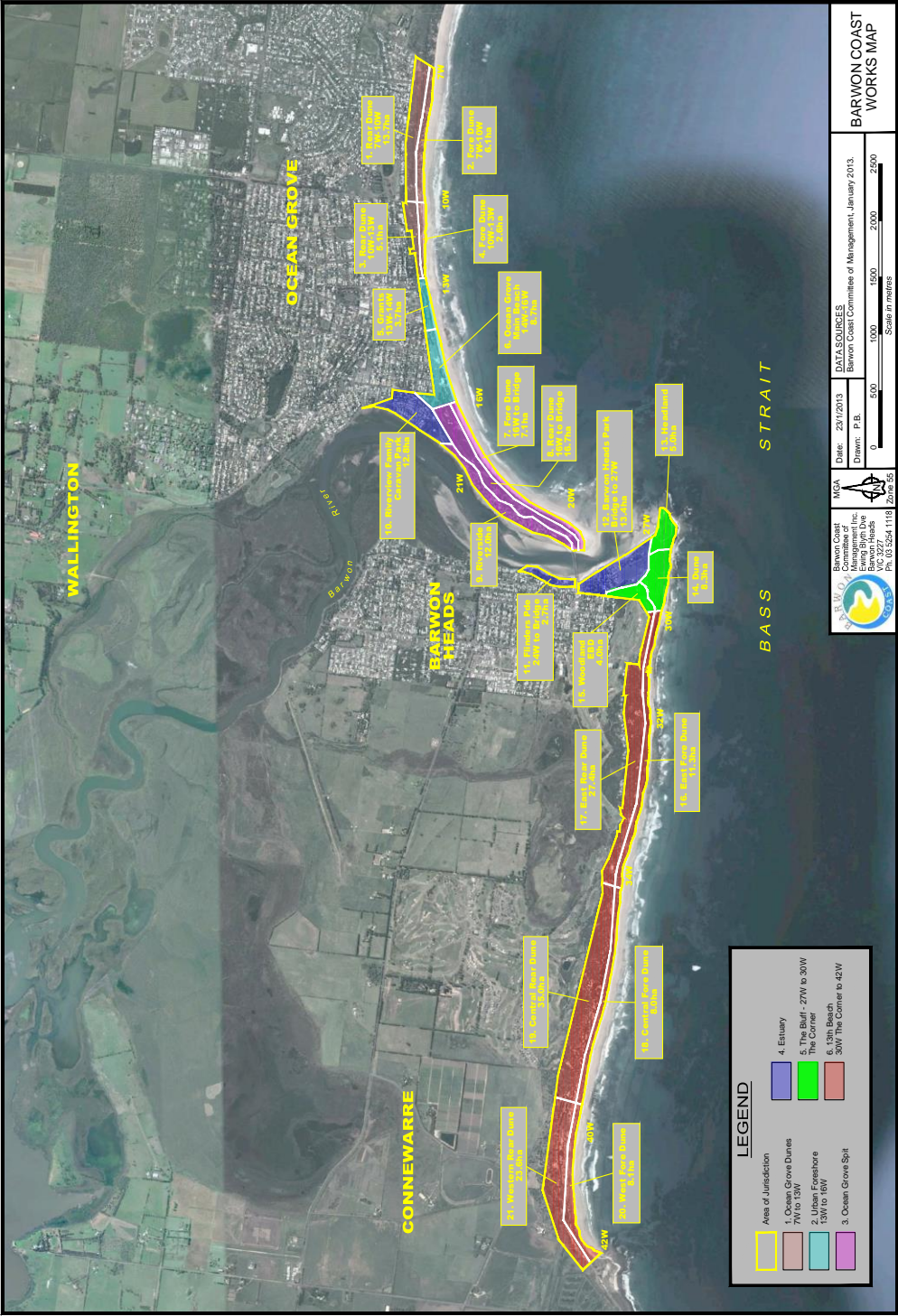


Figure 6 Location of Management Zones and Sub-zones

## 5.4 Management Zone Work Program

OCEAN GROVE DUNES	Values Issues				Years 1 & 2				Years 3 - 6				Years 7 - 10			
	East	East	West	West	East	East	West	West	East	East	West	West	East	East	West	West
	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear
High Values	Austral Lotus Hooded Plover	Orchids Moonah		Orchids												
Assessment & Monitoring	Quadrats	Moonah project Quadrats			Photo points	Photo points	Photo points	Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Photo points	Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Photo points	Photo points
Priority and Serious Pest Plants	<i>Milkwort Wattles</i> <i>Bridal Creeper</i>	<i>Milkwort Wattles</i> <i>Bridal Creeper</i>			Contain	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5%	Reduce cover to < 5%	Reduce cover to < 5%	Reduce cover to < 5%
New and Emerging	Perennial Veldt-grass				1 manage 2 eradicate	1 manage 2 eradicate	1 manage 2 eradicate	1 manage 2 eradicate	Ongoing monitor and manage as required							
Persistence activities	Flax-leaf Broom				Contain	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5%	Reduce cover to < 5%	Reduce cover to < 5%	Reduce cover to < 5%
Pest Animals	Rabbits Foxes				Works dependant upon introduction of appropriate pesticide for fox. Monitor for rabbits											
Rehabilitation/ Revegetation [inc. obligation areas]	Austral Lotus	Moonah woodland		Moonah woodland	Austral Lotus increase cover through active revegetation to achieve additional 50 plants per year for 5 years and monitor.											
					Rehabilitate existing Moonah woodland Year 3 onwards.      Revegetate to create addition Moonah woodland Year 5 onwards.											
					Revegetate to create addition Moonah woodland Year 5 onwards											
Fauna [Protection Assessment]	Hooded Plover				Protection of Hooded Plover to assist fledging of chicks (signage, fencing, shelter, education) as required depending upon seasonal breeding. Undertake fauna monitoring.											
Education and Protection					Ongoing component required for casual education opportunities. Brush matting of intrusion damage as observed. Signage and fencing of intrusion damage as observed.											

URBAN	Values Issues		Years 1 & 2		Years 3 - 6		Years 7 - 10	
	Hodgson & Grants	Main Beach	Hodgson & Grants	Main Beach	Hodgson & Grants	Main Beach	Hodgson & Grants	Main Beach
High Values								
Assessment & Monitoring			Photo points	Photo points	Photo points	Photo points	Photo points	Photo points
Priority Pest Plants			Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5%	Reduce cover to < 5%
New and Emerging			1 manage 2 eradicate	1 manage 2 eradicate	ongoing monitor and manage as required			
Persistence activities			Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5%	Reduce cover to < 5%
Pest Animals	Fox Rabbit		Works dependant upon introduction of appropriate pesticide for fox Monitor for rabbits					
Rehabilitation and revegetation [inc. obligation areas]			Works according to existing landscape plan and offset obligation.					
Fauna [Protection Assessment]								
Education and Protection			Ongoing component required for casual education opportunities. Brush matting of intrusion damage as observed. Signage and fencing of intrusion damage as observed.					

OCEAN GROVE SPIT	Values Issues			Years 1 & 2			Years 3 - 6			Years 7 - 10		
	Fore	Rear	Riverside	Fore	Rear	Riverside	Fore	Rear	Riverside	Fore	Rear	Riverside
High Values	Coast Fescue Salt Fireweed	Orchids	Moonah Rare Bitter- bush									
Assessment & Monitoring	Coast Fescue Salt Fireweed			Photo points			Monitor quadrats Photo points			Monitor quadrats Photo points		
Priority Pest Plants	Milkwork Dolichos	Milkwork Dolichos Bridal Creeper	Dolichos Bridal Creeper	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5
New and Emerging	Purple Groundsel			1 manage 2 eradicate			Ongoing monitor and manage as required.					
Persistence activities		Tree Aeonium Climbing Groundsel			Contain			Reduce cover to < 40		Reduce cover to < 5		
Pest Animals		Fox Rabbit	Fox Rabbit	Works dependant upon introduction of appropriate pesticide for fox Monitor for rabbits								
Rehabilitation and revegetation				Revegetation for utilitarian use. Rehabilitation of former camping areas.								
Fauna [Protection Assessment]												
Education and Protection				Ongoing component required for casual education opportunities. Brush matting of intrusion damage as observed. Signage and fencing of intrusion damage as observed.								



ESTUARY	Values Issues			Years 1 & 2			Years 3 - 6			Years 7 - 10		
	RFCP	BHCP	Flinders	RFCP	BHCP	Flinders	RFCP	BHCP	Flinders	RFCP	BHCP	Flinders
High Values	Moonah woodland Marsh Saltbush	Moonah woodland	Coast Wirilda									
Assessment & Monitoring	Moonah project		quadrat	Photo points	Photo points	Photo points	Photo points	Photo points	Monitor quadrats Photo points	Photo points	Photo points	Monitor quadrats Photo points
Priority Pest Plants	Milkwort Bridal Creeper	Buckthorn	Buckthorn	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5
New and Emerging			Rambling Dock Spreading Pellitory			1 manage 2 eradicate	Ongoing monitor and manage as required.					
Persistence activities	Ivy, Freesia, Agapanthus, Gazania		Ivy, Freesia, Agapanthus, Gazania	Contain		Contain	Reduce cover to < 40		Reduce cover to < 40	Reduce cover to < 5		Reduce cover to < 5
Pest Animals	Fox Rabbit	Fox	Fox	Works dependant upon introduction of appropriate pesticide for Fox Monitor for Rabbits								
Rehabilitation and revegetation				Revegetation for utilitarian use. Rehabilitation of former camping areas.								
Fauna [Protection Assessment]												
Education and Protection												



THE BLUFF	Values Issues			Years 1 & 2			Years 3 - 6			Years 7 - 10		
	Headland	Dune	Woodland	Headland	Dune	Woodland	Headland	Dune	Woodland	Headland	Dune	Woodland
High Values	Coast Wirilda, Coast Fescue, Creeping Coast Tussock-grass Coast Twin-leaf Moonah woodland	Coast Fescue, Creeping Coast Tussock-grass and Coast Twin-leaf	Coast Wirilda Moonah woodland									
Assessment & Monitoring	Quadrats Moonah Project	Quadrats	Quadrats	Photo points	Photo points	Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points	Monitor quadrats Photo points
Priority Pest Plants	Wattles Bridal Creeper	Wattles	Wattles Buckthorn Bridal Creeper	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5
New and Emerging			African Thistle			Contain		0	Reduce cover to < 40			Reduce cover to < 5
Persistence activities	Black Flag Buffalo Grass	Black Flag Broom	Black Flag	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5
Pest Animals	Fox Rabbit	Fox Rabbit	Fox Rabbit	Works dependant upon introduction of appropriate pesticide for Fox. Monitor for Rabbits								
Rehabilitation and revegetation [inc obligation areas]	Revegetation	Revegetation of past oval site	Vicroads offsets	Revegetation for conservation. Rehabilitation of former camping/ utilitarian areas.								
Fauna [Protection Assessment]				Undertake fauna monitoring.								

Education and Protection				Ongoing component required for casual education opportunities. Brush matting of intrusion damage as observed. Signage and fencing of intrusion damage as observed.
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13 <sup>th</sup> BEACH	Values Issues Rare Bitter-bush, Coast Fescue, Salt Fireweed, Austral Lotus, Creeping Coast Tussock-grass and Coast Twin-leaf.						Years 1 & 2						Years 3 - 6						Years 7 - 10					
	East	East	Central	Central	West	West	East	East	Central	Central	West	West	East	East	Central	Central	West	West	East	East	Central	Central	West	West
	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear	Fore	Rear
High Values	Hooded plover Coast Fescue Austral Lotus	Moonah Orchid sp Wirilda			Hooded plover	Rare Bitter-bush																		
Assessment & Monitoring	Quadrats	Quadrats Moonah Project	Quadrats	Quadrats	Quadrats	Quadrats	Photo points	Photo points	Photo points	Photo points	Photo points	Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points	Monitor or quadrats Photo points
Priority Pest Plants	Sea-wheat Spurge	Acacia sp Milkwork	Marra	Bridal Creeper	Acacia sp Marram Sea-wheat Spurge	Marram	Contain	Contain	Contain	Contain	Contain	Contain	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5	Reduce cover to < 5
New and Emerging Pest Plants	Sea Lavender	African Thistle			Fleabane	Pampas Grass																		

Persistence activities							Contain	Contain			Contain	Contain	Reduce cover to < 40	Reduce cover to < 40			Reduce cover to < 40	Reduce cover to < 40	Reduce cover to < 5	Reduce cover to < 5			Reduce cover to < 5	Reduce cover to < 5
Pest Animals	Fox Rabbit						Works dependant upon introduction of appropriate pesticide for Fox Monitor for Rabbits																	
Rehabilitation and revegetation [inc. obligation areas]	Stairs Offset  Austral Lotus	Trail Offset	Minor car park Austral Lotus	Diversity revegetation	Road recovery revegetation Austral Lotus	CRB planting revegetation	Austral Lotus increase cover through active revegetation to achieve additional 50 plants per year for 5 years and monitor. Diversity revegetation years 3-10. CRB planting revegetation ongoing.																	
Fauna [Protection Assessment]	Hooded plover				Hooded plover		Protection of Hooded Plover to assist fledging of chicks (signage, fencing, shelter, education) as required depending upon seasonal breeding. Undertake fauna monitoring.																	
Education and Protection							Ongoing component required for casual education opportunities.  Brush matting of intrusion damage as observed.  Signage and fencing of intrusion damage as observed.																	

## 6 Management Zone Data

This sections provides data for each of the six Management Zones:

- Zone 1. Ocean Grove Dunes
- Zone 2. Urban Foreshore
- Zone 3. The Spit
- Zone 4. Barwon River Estuary
- Zone 5. The Bluff
- Zone 6. 13<sup>th</sup> Beach.

The data presented is as follows:

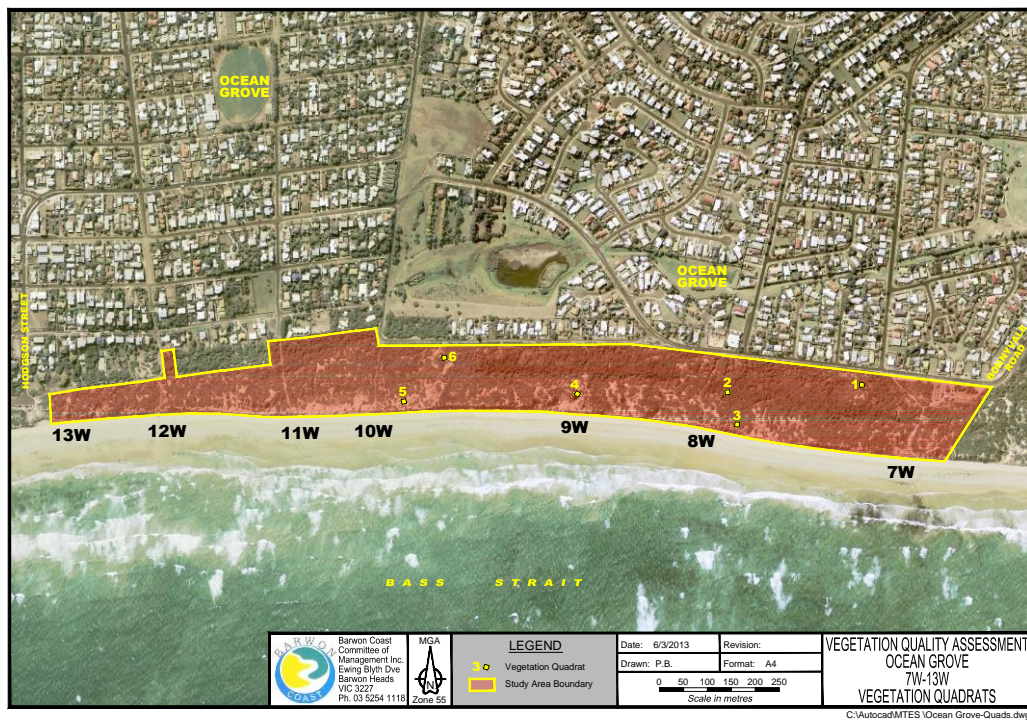
- Location maps.
- Indigenous plant species list.
- Exotic plant species list.
- Indigenous fauna species list.
- Vegetative quadrat data.
- Habitat hectare scores (Vegetation Quality Field Assessments).
- Flora photographs.
- Fauna photographs.

Verbal descriptions of each vegetation community management zone are provided in 3.4.

Methods and rationale for data collection is provided in Section 3.4.

The flora and fauna photograph pages were prepared by Bev Wood.

## Zone 1 Ocean Grove Dunes



**Indigenous Plant Species Recorded for the Ocean Grove Dunes**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Acacia paradoxa</i>	Hedge Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acaena novae-zealandiae</i>	Bidgee-widgee
<i>Actites megalocarpa</i>	Dune Thistle
<i>Adriana quadripartita</i>	Rare Bitter-bush
<i>Allocasuarina verticillata</i>	Drooping Sheoke
<i>Apium prostratum</i>	Sea Celery
<i>Atriplex cinerea</i>	Coast Saltbush
<i>Austrostipa flavescens</i>	Coast Spear-grass
<i>Caladenia latifolia</i>	Pink Fairies
<i>Carpobrotus rossii</i>	Karkalla
<i>Cassytha pubescens</i>	Downy Dodder-laurel
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Correa alba</i>	White Correa
<i>Cotula australis</i>	Common Cotula
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dianella revoluta</i>	Black-anther Flax-lily
<i>Dichondra repens</i>	Kidney Weed
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort
<i>Lachnagrostis billiardieri</i> ssp. <i>billiardieri</i>	Coast Blown-grass
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Lotus australis</i> var <i>australis</i>	Austral Lotus
<i>Melaleuca lanceolata</i>	Moonah
<i>Myoporum insulare</i>	Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Olearia glutinosa</i>	Sticky Daisy-bush
<i>Parietaria debilis</i>	Shade Pellitory
<i>Poa billardieri</i>	Coast Fescue
<i>Poa labillardieri</i> var <i>labillardieri</i>	Common Tussock-grass
<i>Poa poiformis</i>	Coast Tussock-grass
<i>Pomaderris paniculosa</i>	Coast Pomaderris
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
<i>Pultenaea tenuifolia</i>	Slender Bush-pea
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Rytidosperma geniculatum</i>	Kneed Wallaby-grass
<i>Rytidosperma racemosum</i>	Clustered Wallaby-grass
<i>Schoenus apogon</i>	Common Bog-rush
<i>Senecio pinnatifolius</i>	Variable Groundsel



<i>Solanum laciniatum</i>	Kangaroo Apple
<i>Spinifex sericeus</i>	Hairy Spinifex
<i>Swainsona lessertifolia</i>	Coast Swainson-pea
<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Threlkeldia diffusa</i>	Coast Bone-fruit
<i>Veronica gracilis</i>	Slender Speedwell
<i>Zygophyllum billiardieri</i>	Coast Twin-leaf

### Exotic Plant Species Recorded for the Ocean Grove Dunes

Botanical Name	Common Name
<i>Acacia cyclops</i>	Red-eye Wattle
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Acacia saligna</i>	Golden Wreath Wattle
<i>Agapanthus praecox</i>	Agapanthus
<i>Aira</i> sp	Hair Grass
<i>Ammophila arenaria</i>	Marram Grass
<i>Arctotis stoechadifolia</i>	White Arctotis
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Avena fatua</i>	Wild Oat
<i>Briza maxima</i>	Large Quaking Grass
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Callistemon</i> sp	Bottlebrush
<i>Cardamine hirsuta</i>	Flickweed
<i>Carpobrotus aequilaterus</i>	Angled Pigface
<i>Centaurium erythraea</i>	Common
<i>Centranthus ruber</i>	Red Valerian
<i>Cerastium glomeratum</i>	Common Chickweed
<i>Chrysanthemoides monolifera</i> ssp <i>monolifera</i>	Boneseed
<i>Cirsium vulgare</i>	Spear Thistle
<i>Coprosma repens</i>	Mirror Bush
<i>Crassula multicava</i>	Shade Crassula
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Drosanthemum candens</i>	Redondo Creeper
<i>Ehrharta calycina</i>	Perennial Veldt-grass
<i>Ehrharta erecta</i>	Panic Veldt-grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Euphorbia paralias</i>	Sea Spurge
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania</i> sp	Gazania
<i>Genista linifolia</i>	Flax-leaf Broom
<i>Lobularia maritima</i>	Sweet Alyssum
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn

<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca nessophila</i>	Purple honey myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Mersembryanthemum crystallinum</i>	Ice Plant
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort
<i>Oxalis pes-caprae</i>	Soursob
<i>Parapholis incurva</i>	Coast Barb-grass
<i>Paraserianthes lophantha</i> ssp <i>lophantha</i>	Cape Wattle
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Phalaris aquatica</i>	Canary Grass
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago coronopus</i> ssp <i>coronopus</i>	Buck's-horn Plantain
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Senecio elegans</i>	Purple Groundsel
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Templetonia retusa</i>	Coral Pea
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass
<i>Trifolium dubium</i>	Clover
<i>Vicia sativa</i>	Common Vetch
<i>Vulpia bromoides</i>	Squirrel-tail Fescue

### Indigenous Fauna Species Recorded for the Ocean Grove Dunes

<b>Mammals</b>	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
<b>Marine</b>	
Leopard Seal	<i>Hydrurga leptonyx</i>
Seal Aust Fur	<i>Arctocephalus pusillus</i>
Weddell Seal	<i>Leptonychotes weddellii</i>
<b>Reptiles</b>	
Blue-tongued Lizard	<i>Tiliqua scincoides</i>
Copperhead Snake	<i>Austrelaps superbis</i>
Garden Skink	<i>Lampropholis delicia</i>
Jacky Lizard	<i>Amphobolus muncatus</i>
Mbled Gecko	<i>Christinus marmoratus</i>
<b>Frogs</b>	
Brown Treefrog	<i>Litoria ewingii</i>
<b>Birds</b>	
Australian Magpie	<i>Gymnorhina tibicen</i>

Barn Owl	<i>Tito alba</i>
Black-faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>
Black-shouldered Kite	<i>Elanus axillaris</i>
Cormorant Black	<i>Phalacrocorax carbo</i>
Eastern Rosella	<i>Platycerus eximus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Hooded Plover	<i>Thinornis rubicollis</i>
Little Penguin	<i>Eudyptula minor</i>
Little Raven	<i>Corvus melliori</i>
Musk Lorikeet	<i>Glossopsitta concinna</i>
Mudlark	<i>Grallia cyanoleuca</i>
New Holland Honeyeater	<i>Phyidonyris novaehollandiae</i>
Pacific Gull	<i>Larus pacificus</i>
Pelican	<i>Pelecanus conspicillatus</i>
Red Wattlebird	<i>Anchochaera carunculata</i>
Silvereye	<i>Zosterops lateralis</i>
Silver Gull	<i>Larus novaehollandiae</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Welcome Swallow	<i>Hirundo neoxena</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Willy Wagtail	<i>Rhipidura leucophrys</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
<b>Insects and Spiders</b>	
Acacia Weevil	<i>Lapropius sp</i>
	<i>Anthela denticulata</i>
Australian Painted Lady	<i>Vanessa kershawi</i>
Blue Grass Butterfly	<i>Zizina labrados</i>
Botany Bay Weevil	<i>Chrysolopus spetabilis</i>
Burrowing Bee	<i>Halictidae Fam</i>
Cicada	<i>Psaltoda moerens</i>
Common Slantface	<i>Acrida conica</i>
Dragonfly Tau Emerald	<i>Hemicordulia tau</i>
Dragonfly Blue Skimmer	<i>Ortheum caledonicum</i>
Dragonfly Wandering Percher	<i>Diplacodes bipunctata</i>
Done Fly	<i>Eristalinus punctulatus</i>
Fiddler Beetle	<i>Eupocila australasiae</i>
Garden Spider	<i>Araneus sp</i>
Ground Beetle	<i>Euryscaphus obesus</i>
Hairy Flower Wasp	<i>Campsomeris tasmaniensis</i>
Ichneumon Wasp	<i>Netelia sp</i>
Mole Cricket	<i>Gryllotalpa sp</i>
Moth	<i>Epicoma melanostricta</i>
Lady Bird	<i>Coccinella transversalis</i>
Leaf Curling Spider	<i>Phonognatha graeffei</i>
Looper	<i>Geometroidea Family</i>

Meadow Argus	<i>Junonia villida</i>
Passalid Beetle	<i>Pharochilus rugiceps</i>
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>
Potter Wasp	
Praying Mantis	<i>Tenodera sp</i>
Saltbush Blue Butterfly	<i>Theclinessthes serpentata</i>
Sand Wasp	<i>Bembix sp</i>
Spider Wasp	<i>Cryptocheilus bicolor</i>
Tiger Moth	
Trapdoor Spider	<i>Stanwellia sp</i>
Tachnid Sp	<i>Rutilia sp</i>
Water Beetle	<i>Hydrophilus latipalpus</i>
Wingless Blue Wasp	<i>Diamma bicolor</i>
Wolf Spider	<i>Lycosa godeffroy</i>

### Exotic Fauna Species Recorded for the Ocean Grove Dunes

Black Rat	<i>Rattus rattus</i>
Feral Cat	<i>Felis cattus</i>
House Mouse	<i>Mus musculus</i>
Red Fox	<i>Vulpes vulpes</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Stumus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina sp</i>

## Ocean Grove Dunes Quadrat and Habitat Hectare Assessments

### Ocean Grove Q1

The quadrat is selected to reflect typical existing conditions of relatively intact EVC 858 vegetation. Located in the east rear-dune sub-zone.

### Quadrat Location Easting/Northing

Quadrat 1-A	285202.92	5761266.80
Quadrat 1-B	285203.33	5761255.24
Quadrat 1-C	285192.95	5761254.66
Quadrat 1-D	285193.84	5761263.30

### Quadrat

EVC 858	Coll MT BW CB	Date 24/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Aparagus asparagoides</i>	+
<i>Austrostipa flavescens</i>	1	<i>Catapodium rigidum</i>	1
<i>Carpobrotus rossii</i>	1	<i>Chrysanthemoides monilifera</i>	+
<i>Clematis microphylla</i>	1	<i>Coprosma repens</i>	+
<i>Cynoglossum australe</i>	+	<i>Ehrharta calycina</i>	+
<i>Daucus glochidiatus</i>	+	<i>Ehrharta erecta</i>	+
<i>Dianella brevicaulis</i>	+	<i>Ehrharta longiflora</i>	+
<i>Dichondra repens</i>	1	<i>Lagurus ovatus</i>	+
<i>Leptospermum laevigatum</i>	3	<i>Polygala myrtifolia</i>	3
<i>Leucopogon parviflorus</i>	2	<i>Sonchus oleraceus</i>	+
<i>Melaleuca lanceolata</i>	1	<i>Stellaria media</i>	+
<i>Olearia axillaris</i>	+		
<i>Rhagodia candolleana</i>	+		
<i>Senecio pinnatifolius</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	1		
<i>Zygophyllum billardieri</i>	+		
non-vascular flora	1		
organic litter	50		
bare earth	5		

**Habitat Hectare**

Site – OG Q1		24/10/12	MT BW CB JR
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	5
	Lack of Weeds	25	4
	Understorey	15	15
	Recruitment	10	3
	Organic Matter	5	5
	Logs	5	2
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	47
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 34 = 39 + 8 = 47$



Ocean Grove Q1 photo point north-east corner.

## Ocean Grove Q2

The quadrat is selected to reflect typical existing conditions and orchid populations, in particular the large Gnat Orchid. Located in the east rear-dune sub-zone.

### Quadrat Location Easting/Northing

Quadrat 2-A	284911.78	5761248.69
Quadrat 2-B	284921.35	5761250.62
Quadrat 2-C	284922.29	5761246.64
Quadrat 2-D	284912.53	5761238.79

### Quadrat

EVC 858	Coll MT BW CB	Date 24/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Aparagus asparagoides</i>	+
<i>Caladenia latifolia</i>	+	<i>Coprosma repens</i>	+
<i>Clematis microphylla</i>	1	<i>Ehrharta erecta</i>	1
<i>Cyrtostylis robusta</i>	1	<i>Hypochaeris radicata</i>	+
<i>Daucus glochidiatus</i>	+	<i>Polygala myrtifolia</i>	+
<i>Dianella brevicaulis</i>	+		
<i>Dichondra repens</i>	1		
<i>Leptospermum laevigatum</i>	4		
<i>Leucopogon parviflorus</i>	+		
<i>Olearia axillaris</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Tetragonia implexicoma</i>	+		
non-vascular flora	5		
organic litter	50		
bare earth	1		



**Habitat Hectare**

Site – OG Q2		24/10/12	MT BW CB JR
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	3
	Lack of Weeds	25	11
	Understorey	15	10
	Recruitment	10	1
	Organic Matter	5	5
	Logs	5	2
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	45
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 33 = 37 + 8 = 44$



Ocean Grove Q2 photo point north-east corner.



### Ocean Grove Q3

The quadrat is selected to reflect typical existing conditions as well as populations of Orchids and Coast Blown-grass. Located in the east fore-dune sub-zone.

### Quadrat Location Easting/Northing

Quadrat 3-A	284931.12	5761187.73
Quadrat 3-B	284932.26	5761171.51
Quadrat 3-C	284941.94	5761170.96
Quadrat 3-D	284944.33	5761181.04

### Quadrat

EVC 1	Coll MT BW CB	Date 24/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Aparagus asparagoides</i>	+
<i>Acitites megalocarpa</i>	+	<i>Catapodium rigidum</i>	1
<i>Apium prostratum</i>	1	<i>Parapholis incurva</i>	+
<i>Caladenia latifolia</i>	+	<i>Senecio elegans</i>	+
<i>Carpobrotus rossii</i>	+	<i>Stelleria media</i>	+
<i>Clematis microphylla</i>	+	<i>Thinopyrum junceiforme</i>	1
<i>Daucus glochidiatus</i>	+	<i>Vulpia muralis</i>	+
<i>Dianella brevicaulis</i>	+		
<i>Dichondra repens</i>	1		
<i>Ficinia nodosa</i>	+		
<i>Lachnogrostris billardieri</i>	+		
<i>Leptospermum laevigatum</i>	4		
<i>Leucopogon parviflorus</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Senecio pinnatifolius</i>	+		
<i>Swainsona lessertifolia</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	1		
organic litter	50		
bare earth	20		

**Habitat Hectare**

Site – OG Q3		24/1/12	MT BW CB JR
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	52
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 32 = 44 + 8 = 52$



Ocean Grove Q3 photo point south-east corner.

## Ocean Grove Q4

The quadrat is selected to reflect typical Moonah woodland existing conditions. Located in the east rear-dune sub-zone.

### Quadrat Location Easting/Northing

quad 4 a	284604.59	5761236.74
quad 4 b	284598.05	5761239.06
quad 4 c	284602.37	5761244.87
quad 4 d	284609.596	5761242.649

### Quadrat

EVC 1	Coll MT BW	Date 25/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acitites megalocarpa</i>	+	<i>Catapodium rigidum</i>	1
<i>Apium prostratum</i>	+	<i>Cerastium glomeratum</i>	+
<i>Carpobrotus rossii</i>	1	<i>Lagurus ovatus</i>	+
<i>Crassula sieberiana</i>	+	<i>Medicago polymorpha</i>	+
<i>Daucus glochidiatus</i>		<i>Melilotus indicus</i>	1
<i>Dianella brevicaulis</i>	+	<i>Polygala myrtifolia</i>	3
<i>Dichondra repens</i>	1	<i>Sonchus oleraceus</i>	+
<i>Ficinia nodosa</i>	+	<i>Stelleria media</i>	+
<i>Lachnagrostis billardieri</i>	1	<i>Vulpia muralis</i>	2
<i>Leucopogon parviflorus</i>	2		
<i>Lotus australis</i>	1		
<i>Melaleuca lanceolata</i>	1		
<i>Olearia axillaris</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Senecio pinnatifolius</i>	+		
<i>Spinefex sericeus</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	1		
non-vascular flora	1		
organic litter	50		
bare earth	5		

**Habitat Hectare**

Site – OG Q4		25/10/12	MT BW BG
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	46
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 28 = 38 + 8 = 46$



Ocean Grove Q4 photo point south-east corner.

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## Ocean Grove Q5

The Quadrat location is selected to reflect typical existing conditions and populations of Coast Blown-grass. Located in the east fore-dune sub-zone.

### Quadrat Location Easting/Northing

quad 5 b	284236.54	5761218.63
quad 5 c	284235.22	5761228.77
quad 5 d	284245.25	5761231.63
quad 5 a	284246.00	5761221.69

### Quadrat

EVC 879	Coll MT BW	Date 25/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acitites megalocarpa</i>	+	<i>Ammophilla arenaria</i>	1
<i>Carpobrotus rossii</i>	1	<i>Coprosma repens</i>	+
<i>Crassula sieberiana</i>	+	<i>Melilotus indicatus</i>	2
<i>Daucus glochidiatus</i>	+	<i>Oxalis pes-capraea</i>	+
<i>Ficinia nodosa</i>	+	<i>Parapholis incurva</i>	+
<i>Dianella brevicaulis</i>	+	<i>Stenotaphrum secundatum</i>	+
<i>Dichondra repens</i>	+	<i>Vulpia muralis</i>	1
<i>Lachnograstis billardieri</i>	+		
<i>Leptospermum laevigatum</i>	+		
<i>Leucopogon parviflorus</i>	1		
<i>Olearia axillaris</i>	+		
<i>Rhagodia candolleana</i>	+		
<i>Senecio pinnatifolius</i>	+		
<i>Spinefex sericeus</i>	2		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	-		
organic litter	5		
bare earth	75		



**Habitat Hectare**

Site – OG Q5		25/10/12	MT BW
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	3
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	49
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 30 = 41 + 8 = 49$



Ocean Grove Q5 photo point south-east corner.

Mark Trengove Ecological Services

## Ocean Grove Q6

The Quadrat location is selected to reflect typical existing Moonah woodland conditions, including population of Shade Pellitory. Located in the east rear-dune sub-zone.

### Quadrat Location Easting/Northing

South east	284329.997	5761314.994
South west	284322.927	5761311.287
North west	284321.884	5761320.207
North east	284328.027	5761321.133

### Quadrat

EVC 858	Coll MT BW	Date 25/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Carpobrotus rossii</i>	1	<i>Aparagus asparagoides</i>	+
<i>Clematis microphylla</i>	+	<i>Bromus diandrus</i>	+
<i>Cynoglossum australe</i>	+	<i>Ehrharta erecta</i>	1
<i>Daucus glochidiatus</i>	+	<i>Ehrharta longiflora</i>	1
<i>Leptospermum laevigatum</i>	1	<i>Lagurus ovatus</i>	1
<i>Leucopogon parviflorus</i>	1	<i>Polygala myrtifolia</i>	1
<i>Melaleuca lanceolata</i>	3	<i>Rhamnus alaternus</i>	+
<i>Parietaria debilis</i>	1	<i>Sonchus oleraceus</i>	+
<i>Rhagodia candolleana</i>	1	<i>Stelleria media</i>	+
<i>Senecio pinnatifolius</i>	+	<i>Vulpia muralis</i>	+
<i>Swainsona lessertifolia</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	5		
organic litter	30		
bare earth	30		

**Habitat Hectare**

Site – OG Q6		25/10/12	MT BW
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0
	Lack of Weeds	25	7
	Understorey	15	15
	Recruitment	10	0
	Organic Matter	5	5
	Logs	5	2
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	41
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 29 = 33 + 8 = 41$



Ocean Grove Q6 photo point south-east corner.



## Ocean Grove Dunes Flora



*Melaleuca lanceolata*



*Leucopogon parviflorus*



*Pultenaea tenuifolia*



*Parietaria debilis*



*Swainsona lessertifolia*



*Lotus australis*



*Caladenia latifolia*



*Cyrtostylis robusta*



*Daucus glochidiatus*



*Clematis microphylla*



*Kennedia prostrata*



*Rhagodia candolleana*



*Pycnoporus coccineus*



*Coltricia cinnamomea*



*Aleurina ferruginea*

### Ocean Grove Dunes Fauna



Crown of Thorns Spider- *Gasteracantha minax*



Blue Wren - *Malurus cyaneus*



Twisted Leaf Moth - *Circopetes obtusata*



Fiddler Beetle - *Eupocila australasiae*



Ground Beetle - *Euryscaphus obesus*



Marbled Gecko - *Christinus marmoratus*



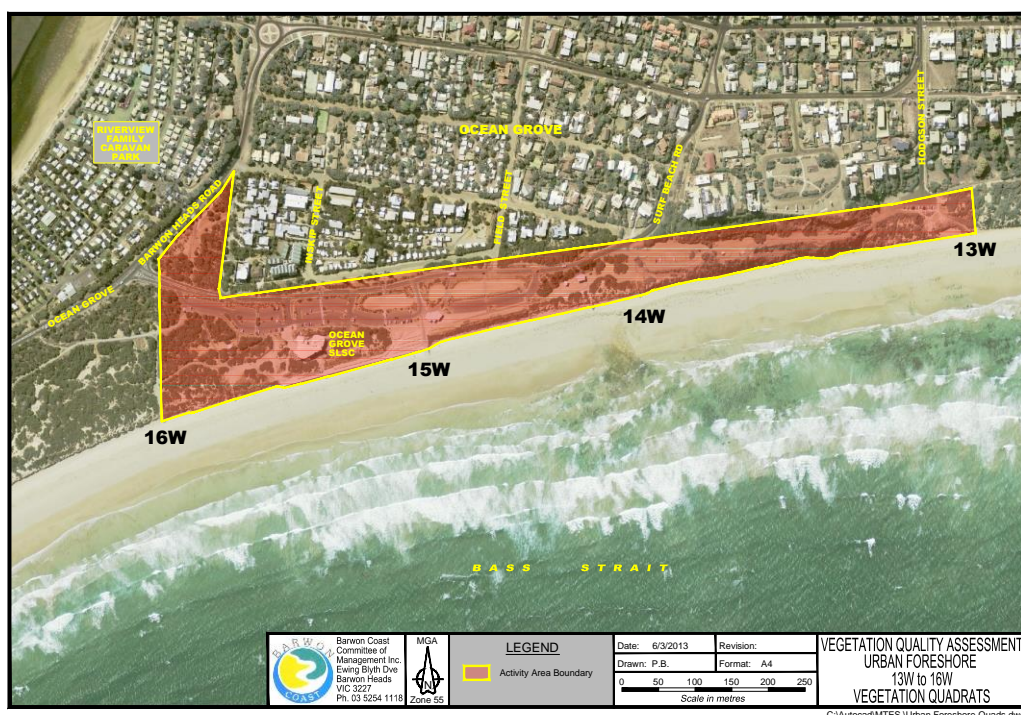
Larvae of Yellow Admiral Butterfly



Yellow Admiral Butterfly - *Vanessa itea*



## Zone 2 Urban Foreshore



## Indigenous Plant Species Recorded for the Urban Foreshore

Botanical Name	Common Name
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Carpobrotus rossii</i>	Karkalla
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Correa reflexa</i>	Common Correa
<i>Cotula australis</i>	Common Cotula
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Short-stemmed Flax-lily
<i>Dichondra repens</i>	Kidney Weed
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Lachnagrostis billiardieri</i> ssp <i>billiardieri</i>	Coast Blown-grass
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Melaleuca lanceolata</i>	Moonah
<i>Myoporum insulare</i>	Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Olearia lepidophylla</i>	Clubmoss Daisy-bush
<i>Parietaria debilis</i>	Shade Pellitory

<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Threlkeldia diffusa</i>	Coast Bonefruit

### Exotic Plant Species Recorded for the Urban Foreshore

Botanical Name	Common Name
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Agapanthus praecox</i>	Agapanthus
<i>Aira</i> sp	Hair Grass
<i>Allium triquetrum</i>	Angled Onion
<i>Ammophila arenaria</i>	Marram Grass
<i>Anagallis arvensis</i>	Pimpernel
<i>Araucaria heterophylla</i>	Norfolk Island Pine
<i>Arctotheca calendula</i>	Capeweed
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Avena fatua</i>	Wild Oat
<i>Banksia integrifolia</i>	Coast Banksia
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Cardamine hirsuta</i>	Flickweed
<i>Carpobrotus aequilaterus</i>	Angled Pigface
<i>Catapogon rigidum</i>	Fern Grass
<i>Cerastium glomeratum</i>	Common Chickweed
<i>Chrysanthemoides monolifera</i> ssp <i>monolifera</i>	Boneseed
<i>Coprosma repens</i>	Mirror Bush
<i>Cupressus macrocarpa</i>	Monterey cypress
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Ehrharta erecta</i>	Panic Veldt-grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Euphorbia paralias</i>	Sea Spurge
<i>Euphorbia peplus</i>	Petty Spurge
<i>Euphorbia terracina</i>	Terracina Spurge
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania</i> sp	Gazania
<i>Genista linifolia</i>	Flax leaf Broom
<i>Lagurus ovatus</i>	Hare's-tail Grass
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn
<i>Malva dendromorpha</i>	Tree Mallow
<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca nessonophila</i>	Purple Honey-myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort

<i>Oxalis pes-caprae</i>	Soursob
<i>Parapholis incurva</i>	Coast Barb-grass
<i>Paraserianthes lophantha ssp lophantha</i>	Cape Wattle
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Phalaris aquatica</i>	Canary Grass
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago coronopus ssp coronopus</i>	Buck's-horn Plantain
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Romulea rosea</i>	Common Onion Grass
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Senecio elegans</i>	Purple Groundsel
<i>Sonchus asper</i>	Prickly Sow Thistle
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass
<i>Trifolium dubium</i>	Clover
<i>Vicia sativa</i>	Common Vetch
<i>Vulpia bromoides</i>	Squirrel-tail Fescue

### Indigenous Fauna Species Recorded for the Urban Foreshore

<b>Mammals</b>	
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
<b>Marine</b>	
Australian Fur Seal	<i>Arctocephalus pusillus</i>
Leopard Seal	<i>Hydrurga leptonyx</i>
<b>Reptiles</b>	
Garden Skink	<i>Lampropholis sp</i>
<b>Birds</b>	
Australian Magpie	<i>Gymnorhina tibicen</i>
Galah	<i>Cactua roseicapilla</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Little Penguin	<i>Eudyptula minor</i>
Little Raven	<i>Corvus melliori</i>
Mudlark	<i>Grallia cyanoleuca</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
New Holland Honeyeater	<i>Phydonryis novaehollandiae</i>
Pacific Gull	<i>Larus pacificus</i>
Pelican	<i>Pelecanus conspicillatus</i>
Pied Currawong	<i>Strepera graculina</i>

Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Silver Gull	<i>Larus novaehollandiae</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
White Bellied Sea Eagle	<i>Haliaeetus leucogaster</i>
Willy Wagtail	<i>Rhipidura leucophrys</i>
Welcome Swallow	<i>Hirundo neoxena</i>
<b>Insects and Spiders</b>	
	<i>Anthela denticulata</i>
Australian Painted Lady	<i>Vanessa kershawi</i>
Damselfly-Aurora Bluetail	<i>Ischnura aurora</i>
Garden Spider	<i>Argiope aurantia</i>
Grapevine Hawk Moth	<i>Hippotion celerio</i>
Hairy Flower Wasp	<i>Campsomeris tasmaniensis</i>
Jewel Beetle	<i>Castiarina cruentata</i>
Lady Bird	<i>Coccinella transversalis</i>
Pie-dish Beetle	<i>Pterohelaeus</i> spp.
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>
Red-backed Spider	<i>Latrodectus hasselti</i>
Sand Wasp	<i>Bembix</i> sp
Soldier Beetle	<i>Cantharidae</i>
Spider Wasp	<i>Cryptocheilus bicolor</i>
Wandering Percher	<i>Diplacodes bipunctata</i>
Yellow Admiral Butterfly	<i>Vanessa itea</i>

### Exotic Fauna Species Recorded for the Urban Foreshore

Black Rat	<i>Rattus rattus</i>
Feral Cat	<i>Felis cattus</i>
House Mouse	<i>Mus musculus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Red Fox	<i>Vulpes vulpes</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Sturnus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina</i> sp

No quadrat or Habitat Hectare data was collected for the Urban Foreshore Zone.



## Urban Foreshore Flora



*Leucopogon parviflorus*



*Leptospermum laevigatum*



*Atriplex cinerea*



*Olearia axillaris*



*Threlkeldia diffusa*



*Carpobrotus rossii*



*Dianella brevicaulis*



*Ficinia nodosa*



*Apium prostratum*



*Dichondra repens*



*Tetragonia implexicoma*



*Clematis microphylla*



*Coprinellus micaceus* group



*Scleroderma* sp



*Caprinellus truncorum*

### Urban Foreshore Fauna



Wandering Percher - *Diplacodes bipunctata*



Grapevine Hawk Moth - *Hippotion celerio*



Garden Spider - *Araneus* sp.



Pelican - *Pelecanus conspicillatus*



Pie-dish Beetle - *Pterohelaeus* sp.



Welcome Swallow - *Hirundo neoxena*



Australian Painted Lady - *Vanessa kershawi*



Soldier Beetle- *Chauliognathus lugubris*



**Zone 3 The Spit**

**Indigenous Plant Species Recorded for The Spit**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Acacia paradoxa</i>	Hedge Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acaena novae-zealandiae</i>	Bidgee-widgee
<i>Actites megalocarpa</i>	Dune Thistle
<i>Adriana quadripartita</i>	Rare Bitter-bush
<i>Allocasuarina verticillata</i>	Drooping Sheoak
<i>Apium prostratum</i>	Sea Celery
<i>Atriplex cinerea</i>	Coast Saltbush
<i>Atriplex paludosa</i>	Marsh Saltbush
<i>Austrostipa flavescens</i>	Coast Spear-grass
<i>Caladenia latifolia</i>	Pink Fairies
<i>Carpobrotus rossii</i>	Karkalla
<i>Cassytha pubescens</i>	Downy Dodder-laurel
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Correa alba</i>	White Correa
<i>Cotula australis</i>	Common Cotula
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dichondra repens</i>	Kidney Weed
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Melaleuca lanceolata</i>	Moonah
<i>Myoporum insulare</i>	Common Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Olearia glutinosa</i>	Sticky Daisy-bush
<i>Parietaria debilis</i>	Shade Pellitory
<i>Poa billiardierei</i>	Coast Blown-grass
<i>Poa labillardierei</i> var <i>labillardierei</i>	Common Tussock-grass
<i>Poa poiformis</i>	Coast Tussock-grass
<i>Pomaderris paniculosa</i>	Coast Pomaderris
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Rytidosperma racemosum</i>	Slender Wallaby-grass
<i>Rytidosperma setaceum</i>	Bristly Wallaby-grass
<i>Sarcocornia quinqueflora</i>	Beaded Glasswort
<i>Senecio halophilus</i>	Salt Fireweed
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Solanum laciniatum</i>	Kangaroo Apple
<i>Spinifex sericeus</i>	Hairy Spinifex
<i>Suaeda australis</i>	Austral Seablite
<i>Tecticornia arbuscula</i>	Shrubby Glasswort

<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Themeda triandra</i>	Kangaroo Grass
<i>Threlkeldia diffusa</i>	Coast Bone-fruit
<i>Zygophyllum billiardieri</i>	Coast Twin-leaf

### Exotic Plant Species Recorded for The Spit

Botanical Name	Common Name
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Acacia rostellifera</i>	Summer Wattle
<i>Aeonium arboreum</i>	Tree Aeonium
<i>Agapanthus praecox</i>	Agapanthus
<i>Agonis flexuosa</i>	Willow myrtle
<i>Aira</i> sp	Hair Grass
<i>Allium triquetrum</i>	Angled Onion
<i>Aloe saphonaria</i>	Aloe
<i>Ammophila arenaria</i>	Marram Grass
<i>Arctotheca calendula</i>	Capeweed
<i>Arctotis stoechadifolia</i>	White Arctotis
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Asphodelus fistulosus</i>	Onion Weed
<i>Avena fatua</i>	Wild Oat
<i>Banksia integrifolia</i>	Coast banksia
<i>Brassica x napus</i>	Canola
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Bromus hordaceus</i>	Soft Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Callistemon</i> sp	Bottlebrush
<i>Cardamine hirsuta</i>	Flickweed
<i>Catapogon rigidum</i>	Fern Grass
<i>Cerastium glomeratum</i>	Common Chickweed
<i>Chenopodium album</i>	Fat Hen
<i>Chrysanthemoides monolifera</i> ssp <i>monolifera</i>	Boneseed
<i>Conyza bonariensis</i>	Flax-leaf Fleabane
<i>Coprosma repens</i>	Mirror Bush
<i>Cotyledon orbiclar</i>	Cotyledon
<i>Crassula multicava</i>	Shade Crassula
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Ehrharta erecta</i>	Panic Veldt Grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Emex australis</i>	Spiny Emex
<i>Enchium candicans</i>	Pride of Madiera
<i>Eucalyptus gomphacephala</i>	Tuart Gum
<i>Eucalyptus leucocolon</i> x <i>rosea</i>	Yellow Gum
<i>Euphorbia paralias</i>	Sea Spurge
<i>Euphorbia peplus</i>	Petty Spurge

<i>Euphorbia terracina</i>	Terracina Spurge
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania</i> sp	Gazania
<i>Hedera helix</i>	English Ivy
<i>Hedypnois rhagadoiloides</i> ssp <i>cretica</i>	Cretan Hedypnois
<i>Lagurus ovatus</i>	Hare's-tail Grass
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn
<i>Malva dendromorpha</i>	Tree Mallow
<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle
<i>Melaleuca nessonophila</i>	Purple Honey-myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort
<i>Nassella neesiana</i>	Chilean Needle-grass
<i>Oxalis pes-caprae</i>	Soursob
<i>Parapholis incurva</i>	Coast Barb-grass
<i>Paraserianthes lophantha</i> ssp <i>lophantha</i>	Cape Wattle
<i>Pelargonium peltatum</i>	Ivy-leaf Pelargonium
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Phalaris aquatica</i>	Canary Grass
<i>Phalaris minor</i>	Lesser Canary Grass
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago coronopus</i> ssp <i>coronopus</i>	Buck's-horn Plantain
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Rapistrum rugosum</i>	Giant Mustard
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Romulea rosea</i>	Common Onion Grass
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Senecio elegans</i>	Purple Groundsel
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum linnaeanum</i>	Apple of Sodom
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass
<i>Trifolium dubium</i>	Clover
<i>Veronica hederifolia</i>	Ivy-leaf Speedwell
<i>Vicia sativa</i>	Common Vetch
<i>Vinca major</i>	Blue Periwinkle
<i>Vulpia bromoides</i>	Squirrel-tail Fescue

**Indigenous Fauna Species Recorded for The Spit**

<b>Mammals</b>	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Yellow-bellied Sheathtailed Bat	<i>Saccolaimus flaviventris</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
<b>Marine</b>	
Australian Fur Seal	<i>Arctocephalus pusillus</i>
<b>Reptiles</b>	
Blue-tongued Lizard	<i>Tiliqua scincoides</i>
Garden Skink	<i>Lampropholis</i> sp
<b>Birds</b>	
Australian Hobby	<i>Falco longipennis</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Black-shouldered Kite	<i>Elanus axillaris</i>
Black Faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>
Eastern Rosella	<i>Platycerus eximus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Fire-tailed Finch	<i>Stagonopleura belle</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Little Raven	<i>Corvus melliori</i>
Mudlark	<i>Grallia cyanoleuca</i>
New Holland Honeyeater	<i>Phyidonyris novaehollandiae</i>
Pacific Gull	<i>Larus pacificus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Silveryeye	<i>Zosterops lateralis</i>
Silver Gull	<i>Larus novaehollandiae</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
White-browed Scrubwren	<i>Secornis frontalis</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
<b>Insects and Spiders</b>	
Acacia Weevil	<i>Laptopius</i> sp
	<i>Anthela denticulata</i>
Aust Painted Lady	<i>Vanessa kershawi</i>
Botany Bay Weevil	<i>Chrysolopus spectabilis</i>
Burrowing Bee	<i>Halictidae</i> Fam
Broken Leaf Moth	<i>Circopetes obtusata</i>
Common Slantface	<i>Acrida conica</i>
Dragonfly Tau Emerald	<i>Hemicordulia tau</i>
Eastern Brown Tigertail	<i>Archaeosynthemis orientalis</i>
Moth	<i>Epicoma melanospila</i>
False Garden Mantis	<i>Pseudomantis albifimbriata</i>



Fiddler Beetle	<i>Eupocila australasiae</i>
Flower Wasps	
Garden Spider	<i>Araneus</i> sp
Golden Orb Weaver	<i>Nephila</i> sp
Grass Dart Butterfly	<i>Taractrocera</i> sp
Grass Mantis	<i>Archimantis latistyla</i>
Ground Beetle	<i>Euryscaphus obesus</i>
Ichneumon Wasp	<i>Netelia</i> sp
Jewel Beetle	<i>Castiarina cruentata</i>
Mole Cricket	<i>Gryllotalpa</i> sp
Katydid	<i>Torbia</i> sp
Lacewing	<i>Myodactylus</i> sp
Lady Bird	<i>Coccinella transversalis</i>
Leaf Curling Spider	<i>Phonognatha graeffei</i>
Longicorn Beetle	<i>Ancita antennata</i>
Looper	<i>Geometroidea</i> Family
Meadow Argus	<i>Junonia villida</i>
Orchid Dupe Wasp	<i>Lissopimpla excelsa</i>
Passalid Beetle	<i>Pharochilus rugiceps</i>
Pie Dish Beetle	<i>Pterohelaeus</i> sp
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>
Praying Mantis	<i>Tenodera</i> sp
Saltbush Blue Butterfly	<i>Theclinessthes serpentata</i>
Trapdoor Spider	<i>Stanwellia</i> sp
Tachnid Sp	<i>Rutilla</i> sp
Yellow Admiral Butterfly	<i>Vanessa itea</i>
Wingless Flower Wasp	<i>Hemithynnus</i> sp

### Exotic Fauna Species Recorded for The Spit

Black Rat	<i>Rattus rattus</i>
Feral Cat	<i>Felis cattus</i>
House Mouse	<i>Mus musculus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Red Fox	<i>Vulpes vulpes</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Stumus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina</i> sp

## The Spit Quadrat and Habitat Hectare Assessments

### The Spit Q1

The quadrat location is selected to reflect colonization of prograding foredune as well as populations of Coast Fescue and Hairy Spinifex.

### Quadrat Location Easting/Northing

spit se	281221.64	5759807.11
spit sw	281211.78	5759805.94
spit nw	281210.85	5759816.06
spit ne	281220.85	5759817.77

### Quadrat

EVC 879	Coll MT BW	Date 25/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Poa billardierei</i>	1	<i>Cakile maritima</i>	1
<i>Spinefex sericeus</i>	1	<i>Thinopyrum junceiforme</i>	2
<i>Clematis microphylla</i>	+		
<i>Olearia axillaris</i>	+		
non-vascular flora	-		
organic litter	-		
bare earth	75		

**Habitat Hectare**

Site – Spit Q1		25/10/12	MT BW
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	7
	Understorey	15	15
	Recruitment	10	0
	Organic Matter	5	0
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	38
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 22 = 30 + 8 = 38$



The Spit Q1 photo point south-east corner.

Mark Trengove Ecological Services



## The Spit Q2

The quadrat location is selected to monitor regeneration of a population of Coast Fescue on a prograding foredune.

### Quadrat Location Easting/Northing

20w se	281360.92	5759941.59
20w sw	281351.46	5759938.58
20w nw	281350.52	5759948.38
20w ne	281359.91	5759951.82

### Quadrat

EVC 879	Coll MT BW	Date 25/10/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Poa billardierei</i>	1	<i>Cakile maritima</i>	1
non-vascular flora	-		
organic litter	-		
bare earth	90		

**Habitat Hectare**

Spit Q2		25/10/12	MT BW
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	5
	Recruitment	10	0
	Organic Matter	5	0
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	30
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 16 = 22 + 8 = 30$



The Spit Q2 photo point south-east corner.

### The Spit Q3

The quadrat location is selected to reflect a population of Salt Fireweed. Note that the quadrat is 25 m<sup>2</sup>.

### Quadrat Location Easting/Northing

quad 8 ne	281360.13	5759984.89
quad 8 se	281355.19	5759982.38
quad 8 nw	281357.05	5759987.62
quad 8 sw	281356.68	5759980.89

### Quadrat

EVC 1	Coll MT BW	Date 25/10/12	Size 25m <sup>2</sup> (5m x 5m)
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Clematis microphylla</i>	1	<i>Asparagus asparagoides</i>	2
<i>Daucus glochidiatus</i>	1	<i>Bromus diandrus</i>	1
<i>Dianella brevicaulis</i>	1	<i>Catapodium rigidum</i>	2
<i>Dichondra repens</i>	1	<i>Dipogon lignosus</i>	2
<i>Leucopogon parviflorus</i>	1	<i>Ehrharta longiflora</i>	1
<i>Olearia axillaris</i>	+	<i>Euphorbia terracina</i>	1
<i>Rhagodia candolleana</i>	2	<i>Fumaria muralis</i>	+
<i>Senecio halophilus</i>	1	<i>Lagurus ovatus</i>	2
<i>Threlkeldia diffusa</i>	1	<i>Melilotus indicus</i>	1
		<i>Sonchus oleraceus</i>	+
		<i>Stellaria media</i>	+
non-vascular flora	-		
organic litter	5		
bare earth	20		

**Habitat Hectare**

Site – Spit Q3		13/11/12	MT BW SS
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	4
	Understorey	15	5
	Recruitment	10	0
	Organic Matter	5	4
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	26
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 13 = 18 + 8 = 26$



The Spit Q3 photo point south-east corner.

## The Spit Q4 Horseshoe

The quadrat location is selected to reflect existing conditions being regeneration following the removal of disturbance (camping).

### Quadrat Location Easting/Northing

17w	281924.33	5760717.57
17w	281920.87	5760708.55
17w	281913.94	5760717.63
17w	281911.03	5760709.02

### Quadrat

EVC 1	Coll MT BW SS JR	Date 12/11/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	1	<i>Catapodium rigidum</i>	1
<i>Carpobrotus rossii</i>	1	<i>Chrysanthemoides monilifera</i>	+
<i>Ficinia nodosa</i>	+	<i>Dipogon lignosus</i>	1
<i>Leptospermum laevigatum</i>	2	<i>Lagurus ovatus</i>	1
<i>Leucopogon parviflorus</i>	2	<i>Medicago polymorpha</i>	1
<i>Olearia axillaris</i>	+	<i>Polygala myrtifolia</i>	1
<i>Rhagodia candolleana</i>	1	<i>Sonchus oleraceus</i>	+
		<i>Stelleria media</i>	+
		<i>Vulpia muralis</i>	2
non-vascular flora	5		
organic litter	35		
bare earth	10		



**Habitat Hectare**

Site – Spit Q4		12/11/12	MT BW SS JR
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	10
	Organic Matter	5	4
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	60
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 38 = 52 + 8 = 60$



The Spit Q4 photo point south-east corner.

## The Spit Flora



*Leptospermum laevigatum*



*Leucopogon parviflorus*



*Pimelea serpyllifolia*



*Senecio pinnatifolius*



*Caladenia latifolia*



*Daucus glochidiatus*



*Senecio halophilus*



*Austrofestuca littoralis*



*Poa poiformis* var. *ramifer*



*Ficinia nodosa*



*Clematis microphylla*



*Rhagodia candolleana*



*Peziza* sp



*Postia pelliculosa*



*Phellinus robusta*



## The Spit Fauna



Black-faced Cuckoo-shrike - *Coracina novaehollandiae*



Butcherbird Juv. - *Cracticus torquatus*



Firetail - *Stagonopleura bella*



Flower Wasps - *Tiphidae* Family



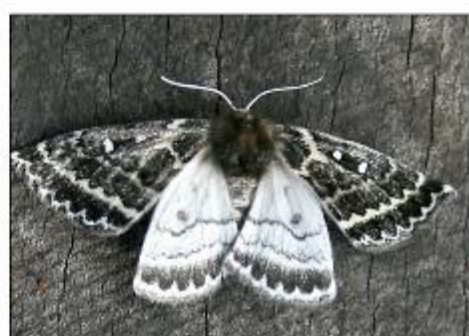
Acacia Weevil - *Laptopius* sp.



Tau Emerald Dragonfly - *Hemicordia tau*



Larvae of *Anthela denticulata*



*Anthela denticulata*



**BARWON HEADS**

**OZONE ROAD**

**24W**

**25W**

**FLINDERS**

**26W**

**BARWON HEADS CARAVAN PARK**

**BARWON HEADS CARAVAN PARK**

**27W**

**Barwon River**

**ESTUARY**

**RIVERVIEW FARM CARAVAN PARK**

**OCEAN GROVE**

**Barwon River**

**Scale in metres**

**0 50 100 150**

**Scale in metres**

**LEGEND**

**Vegetation Quadrat**

**Barwon Coast Boundary**

**Date: 13/3/2013**

**Revision:**

**Drawn: P.B.**

**Format: A4**

**VEGETATION QUALITY ASSESSMENT ESTUARY ZONE VEGETATION QUADRATS**

**Indigenous Plant Species Recorded for the Barwon River Estuary**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Acacia uncifolia</i>	Wirilda
<i>Amyema pendula</i>	Drooping Mistletoe
<i>Amyema preissii</i>	Wire-leaf Mistletoe
<i>Atriplex cinerea</i>	Coast Saltbush
<i>Atriplex cinerea</i>	Coast Saltbush
<i>Atriplex paludosa</i>	Marsh Saltbush
<i>Carpobrotus rossii</i>	Karkalla
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Cotula australis</i>	Common Cotula
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dichondra repens</i>	Kidney Weed
<i>Distichlis distichophylla</i>	Austral Salt-grass
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Hemichroa pentandra</i>	Trailing Hemichroa
<i>Juncus kraussii</i>	Sea Rush
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Melaleuca lanceolata</i>	Moonah
<i>Myoporum insulare</i>	Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Olearia lepidophylla</i>	Clubmoss Daisy-bush
<i>Parietaria debilis</i>	Shade Pellitory
<i>Poa billiardieri</i>	Coast Blown-grass
<i>Poa poliformis</i>	Coast Tussock-grass
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Samolus repens</i>	Creeping Brookweed
<i>Sarcocornia quinqueflora</i>	Beaded Glasswort
<i>Schlerostegia arbuscula</i>	Shrubby glasswort
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Sporobolus virginicus</i>	Salt Couch
<i>Suaeda australis</i>	Austral Seablite
<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Threlkeldia diffusa</i>	Coast Bone-fruit
<i>Triglochin striata</i>	Streaked Arrow-grass

**Exotic Plant Species Recorded for the Barwon River Estuary**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia cupularis</i>	Coastal Umbrella Bush
<i>Acacia cyclops</i>	Red-eye Wattle
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Acetosa sagittata</i>	Rambling Dock
<i>Agapanthus praecox</i>	Agapanthus
<i>Aira</i> sp	Hair Grass
<i>Ammophila arenaria</i>	Marram Grass
<i>Araucaria heterophylla</i>	Norfolk island pine
<i>Arisaema</i> sp	Jack in the pulpit
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Asparagus officinalis</i>	Asparagus
<i>Asphodelus fistulosus</i>	Onion Weed
<i>Avena fatua</i>	Wild Oat
<i>Banksia integrifolia</i>	Coast Banksia
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Callistemon</i> sp	Bottlebrush
<i>Cardamine hirsuta</i>	Flickweed
<i>Catapogon rigidum</i>	Fern Grass
<i>Cerastium glomeratum</i>	Common Chickweed
<i>Chenopodium glaucum</i>	Glaucous Goosefoot
<i>Chrysanthemoides monolifera</i> ssp <i>monolifera</i>	Boneseed
<i>Conyza bonariensis</i>	Flax-leaf Fleabane
<i>Cupressus macrocarpa</i>	Monterey Cypress
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Drosanthemum candens</i>	Redondo Creeper
<i>Ehrharta erecta</i>	Panic Veldt Grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Emex australis</i>	Spiny Emex
<i>Eucalyptus botryoides</i>	Southern Mahogany
<i>Eucalyptus cladocalyx</i>	Sugar Gum
<i>Eucalyptus gomphacephala</i>	Tuart Gum
<i>Eucalyptus maculata</i>	Spotted Gum
<i>Euphorbia peplus</i>	Petty Spurge
<i>Euphorbia terracina</i>	Terracina Spurge
<i>Fumaria muralis</i>	Wall Fumitory
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania</i> sp	Gazania
<i>Gladiolus undulatus</i>	Wild Gladiola
<i>Hakea drupacea</i>	Sweet Hakea
<i>Hedera helix</i>	English Ivy
<i>Lactuca serriola</i>	Prickly Lettuce
<i>Lagurus ovatus</i>	Hare's-tail Grass

<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn
<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca armillaris</i>	Bracelet Honey-myrtle
<i>Melaleuca nessophila</i>	Purple Honey-myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Mersebryanthemum crystallinum</i>	Ice Plant
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort
<i>Morea setifolia</i>	Thread Iris
<i>Oxalis pes-caprae</i>	Soursob
<i>Parietaria judiaca</i>	Wall Pellitory
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Phalaris aquatica</i>	Canary Grass
<i>Pittosporum undulatum</i>	Sweet Pittosporum
<i>Plantago coronopus ssp coronopus</i>	Buck's-horn Plantain
<i>Polycarpon tetraphyllum</i>	Four-leaf Allseed
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Polygonum arenastrum</i>	Sand Wireweed
<i>Rapistrum rugosum</i>	Giant Mustard
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Romulea rosea</i>	Common Onion Grass
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass
<i>Trifolium dubium</i>	Clover
<i>Vicia sativa</i>	Common Vetch

### Indigenous Fauna Species Recorded for the Barwon River Estuary

<b>Mammals</b>	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
<b>Marine</b>	
Australian Fur Seal	<i>Arctocephalus pusillus</i>
Elephant Seal	<i>Mirounga leonina</i>
<b>Reptiles</b>	
Copperhead Snake	<i>Austrelaps superbus</i>
Garden Skink	<i>Lampropholis delicia</i>
<b>Frogs</b>	
Brown Treefrog	<i>Litoria ewingii</i>
Marsh Frog	
Pobblebonk	<i>Limnodynastes dumerilii</i>
<b>Birds</b>	



Australian Magpie	<i>Gymnorhina tibicen</i>
Barn Owl	<i>Tito alba</i>
Black Swan	<i>Cygnus atratus</i>
Cormorant Great	<i>Phalacrocorax carbo</i>
Cormorant Pied	<i>Phalacrocorax varius</i>
Cormorant Little Pied	<i>Phalacrocorax melanoleucos</i>
Cormorant Little Black	<i>Phalacrocorax sulcirostris</i>
Eastern Rosella	<i>Platycerus eximus</i>
Fire-tailed Finch	<i>Stagonopleura belle</i>
Galah	<i>Cactua roseicapilla</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Horsfield's Bronze Cuckoo	<i>Chrysococcyx basilis</i>
Letter winged Kite	<i>Elanus scriptus</i>
Little Raven	<i>Corvus melliori</i>
Masked Lapwing	<i>Vanellus miles</i>
Mudlark	<i>Grallia cyanoleuca</i>
New Holland Honeyeater	<i>Phyidonyris novaehollandiae</i>
Pacific Gull	<i>Larus pacificus</i>
Pelican	<i>Pelecanus conspicillatus</i>
Pied Currawong	<i>Strepera graculina</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Silvereye	<i>Zosterops lateralis</i>
Silver Gull	<i>Larus novaehollandiae</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Welcome Swallow	<i>Hirundo neoxena</i>
White-browed Scrubwren	<i>Secornis frontalis</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Willy Wagtail	<i>Rhipidura leucophrys</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
<b>Insects and Spiders</b>	
	<i>Anthela eurphica</i>
Bird-dung Spider	<i>Celaenia kinbergi</i>
Damselfly – Aurora Bluetail	<i>Ischnura aurora</i>
Drone Fly	<i>Eristalinus punctulatus</i>
Garden Spider	<i>Araneus sp</i>
Grass Dart Butterfly	<i>Taractrocera sp</i>
Grapevine Hawk Moth	<i>Hippotion celerio</i>
Katydid	<i>Torbia sp</i>
Lacewing	<i>Myodactylus sp</i>
Lady Bird	<i>Coccinella transversalis</i>
Leaf Curling Spider	<i>Phonognatha graeffei</i>
Looper	<i>Geometroidea Family</i>
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>

Praying Mantis	<i>Tenodera</i> sp
Red-backed Spider	<i>Latrodectus hasselti</i>
Saltbush Blue Butterfly	<i>Theclinessthes serpentata</i>
Spiny Jewel Spider	<i>Gasteracantha minax</i>
Wingless Flower Wasp	<i>Hemithynnus</i> sp

**Exotic Fauna Species Recorded for the Barwon River Estuary**

Black Rat	<i>Rattus rattus</i>
House Mouse	<i>Mus musculus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Stumus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina</i> sp

## Barwon River Estuary Quadrat and Habitat Hectare Assessments

### Barwon River Estuary Q1

The quadrat location is selected to reflect typical existing conditions of saltmarsh vegetation. Note quadrat is 120m<sup>2</sup>.

### Quadrat Location Easting/Northing

river se	282396.59	5761660.28
river beach	282390.63	5761659.22
river beach	282387.39	5761679.27
river	282393.58	5761680.40

### Quadrat

EVC 9	Coll MT BW BD	Date 8/11/12	Size 120m <sup>2</sup> (6m x 20m)
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Atriplex cinerea</i>	1	<i>Cakile maritima</i>	+
<i>Atriplex paludosa</i>	1		
<i>Distichlis distichophylla</i>	1		
<i>Hemichroa pentandra</i>	1		
<i>Juncus kraussii</i>	1		
<i>Samolus repens</i>	1		
<i>Sarcocornia quinqueflora</i>	1		
<i>Schlerostegia arbuscula</i>	1		
<i>Sporobolus virginicus</i>	1		
<i>Suaeda australis</i>	1		
<i>Triglochin striata</i>	+		
non-vascular flora	-		
organic litter	25		
bare earth	30		



## Habitat Hectare

Site – River Q1		8/11/12	MT BW
<b>EVC 9</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	47
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 29 = 39 + 8 = 47$



Barwon River Estuary Q1 photo point south-east corner.

## Barwon River Estuary Q2

The quadrat location is selected to reflect a population of Coast Wirilda. Note *Allocasuarina verticillata* planted.

### Quadrat Location Easting/Northing

flinders se	280872.19	5760071.77
flinders sw	280861.70	5760067.64
flinders	280863.18	5760078.53
butt of wattle	280851.96	5760074.86

### Quadrat

EVC 858	Coll MT BW SS JR	date 12.11.2012	size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous</b>		<b>Exotic</b>	
<i>Acacia sophorae</i>	1	<i>Acetosa sagittata</i>	+
<i>Acacia uncifolia</i>	1	<i>Asparagus asparagoides</i>	2
<i>Amyema pressii</i>	1	<i>Bromus diandrus</i>	1
<i>Austrodanthonia</i> sp	+	<i>Cynodon dactylon</i>	+
<i>Austrostipa flavescens</i>	1	<i>Dipogon lignosus</i>	1
<i>Clematis microphylla</i>	1	<i>Ehrharta erecta</i>	+
<i>Dianella breviculis</i>	+	<i>Ehrharta longifolia</i>	
<i>Leptospermum laevigatum</i>	2	<i>Euphorbia terracina</i>	+
<i>Leucopogon parviflorus</i>	1	<i>Fumaria muralis</i>	+
<i>Rhagodia candoleana</i>	+	<i>Lolium</i> sp	+
<i>Tetragonia implexicoma</i>	3	<i>Rhamnus alaternus</i>	+
		<i>Sonchus oleaceus</i>	+
		<i>Stenotaphrum secundatum</i>	1
non-vascular flora	1		
organic litter	5		
bare earth	8		

**Habitat Hectare**

Site – River Q2		12/11/12	MT BW SS JR
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	2
	Lack of Weeds	25	7
	Understorey	15	5
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	29
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 18 = 21 + 8 = 29$



Barwon River Estuary Q2 photo point south-east corner.

Mark Trengove Ecological Services



## Barwon River Estuary Flora



*Acacia uncifolia*



*Leucopogon parviflorus*



*Sclerostegia arbuscula*



*Amyema preissii*



*Atriplex cinerea*



*Cynoglossum australe*



*Dianella brevicaulis*



*Austrostipa flavescens*



*Distichlis distichophylla*



*Ficinia nodosa*



*Clematis microphylla*



*Rhagodia candolleana*



*Cyanthus olla*



*Clavulina sp*



*Trametes versicolor*

## Barwon River Estuary Fauna



Lesser long-eared Bat - *Nyctophilus geoffroyi*



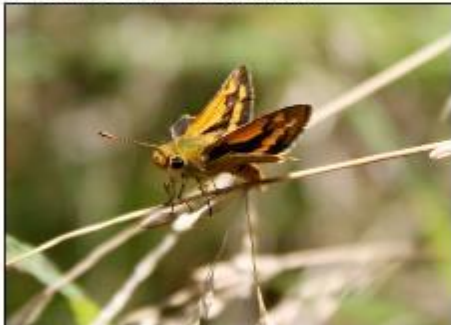
Jewel Beetles - *Castiarina* sp.



Royal Spoonbill - *Platalea regia*



Mosquito - *Culex* sp



Grass Dart Butterfly - *Taractrocer a* sp.



Marsh Frog - *Lymnodynastes tasmaniensis*



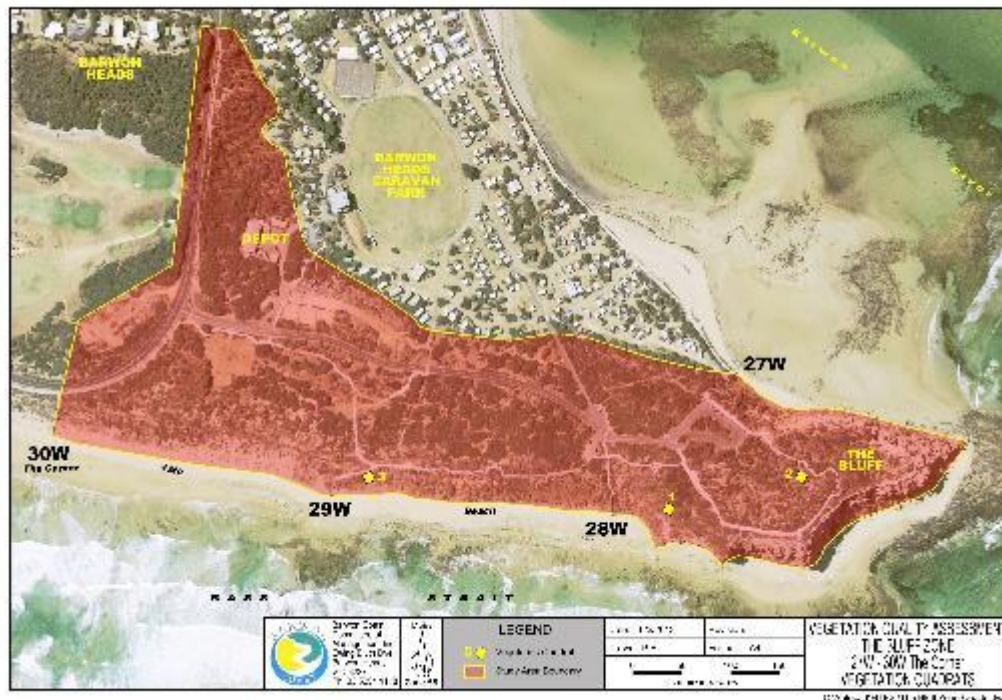
Female Flower Wasp - *Hemithynnus* sp.



Centipede - *Cormocephalus auranripes*



## Zone 5 The Bluff





**Indigenous Plant Species Recorded for The Bluff**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia uncifolia</i>	Wirilda
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Acacia paradoxa</i>	Hedge Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acaena novae-zealandiae</i>	Bidgee-widgee
<i>Actites megalocarpa</i>	Dune Thistle
<i>Allocasuarina verticillata</i>	Drooping Sheoke
<i>Alyxia buxifolia</i>	Sea Box
<i>Apium prostratum</i>	Sea Celery
<i>Astroloma humifusum</i>	Cranberry Heath
<i>Austrostipa flavescens</i>	Coast Spear-grass
<i>Austrostipa semibarbata</i>	Fibrous Spear-grass
<i>Austrostipa stipoides</i>	Prickly Spear-grass
<i>Baumea juncea</i>	Bare Twig-rush
<i>Busaria spinosa</i>	Sweet Busaria
<i>Caladenia latifolia</i>	Pink Fairies
<i>Carex breviculmis</i>	Short-stemmed Sedge
<i>Carpobrotus rossii</i>	Karkalla
<i>Cassytha pubescens</i>	Downy Dodder-laurel
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Correa alba</i>	White Correa
<i>Cotula australis</i>	Common Cotula
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dianella admixta</i>	Black-anther Flax-lily
<i>Dichelachne crinita</i>	Long-hair Plume-grass
<i>Dichondra repens</i>	Kidney Weed
<i>Disphyma crassifolium</i>	Rounded Noon-flower
<i>Distichlis distichlophylla</i>	Austral Salt-grass
<i>Exocarpus cupressiformis</i>	Cherry Ballart
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Frankenia pauciflora</i>	Southern Sea-heath
<i>Geranium</i> No 2	Austral Crane's-bill
<i>Hibbertia sericea</i>	Silky Guinea-flower
<i>Hydrocottle laxiflora</i>	Stinking Pennywort
<i>Hypoxis vaginata</i> var <i>brevistigmata</i>	Tiny Weatherglass
<i>Kennedia prostrata</i>	Running Postman
<i>Lachnagrostis billiardierei</i> var <i>labilliardierei</i>	Coast Blown-grass
<i>Lepidosperma concavum</i>	Sand-hill Sword-sedge
<i>Lepidosperma curtisiae</i>	Dwarf Sword-sedge
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath

<i>Lomandra filiformis</i>	Wattle Mat-rush
<i>Lomandra longifolia</i>	Spiny Mat-rush
<i>Lomandra micrantha</i>	Small flowered Mat-rush
<i>Luzula meriodionalis</i>	Woodrush
<i>Melaleuca lanceolata</i>	Moonah
<i>Microlaena stipoides</i>	Weeping Grass
<i>Microtis arenaria</i>	Notched Onion Orchid
<i>Muehlenbeckia adpressa</i>	Climbing Lignum
<i>Myoporum insulare</i>	Common Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Parietaria debilis</i>	Shade Pellitory
<i>Pimelea humilis</i>	Common Rice-flower
<i>Platylobium obtusangulum</i>	Common Flat-pea
<i>Poa billardierei</i>	Coast Fescue
<i>Poa labillardierei</i> var <i>labillardierei</i>	Common Tussock-grass
<i>Poa poiformis</i> var <i>ramifer</i>	Creeping Coast Tussock-grass
<i>Pomaderris paniculosa</i>	Coast Pomaderris
<i>Portulaca oleracea</i>	Common Purslane
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
<i>Pultenaea tenuifolia</i>	Slender Bush Pea
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Scavola albida</i>	Coast Fan-flower
<i>Selliera radicans</i>	Creeping Brookweed
<i>Senecio biserratus</i>	Jagged Fireweed
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Solanum laciniatum</i>	Kangaroo Apple
<i>Spergularia marina</i>	Lesser Sea-spurrey
<i>Swainsona lessertifolia</i>	Coast Swainson-pea
<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Themeda triandra</i>	Kangaroo Grass
<i>Threlkeldia diffusa</i>	Coast Bone-fruit
<i>Zygophyllum billiardieri</i>	Coast Twin-leaf

### Exotic Plant Species Recorded for The Bluff

Botanical Name	Common Name
<i>Acacia cyclops</i>	Red-eye Wattle
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Agapanthus praecox</i>	Agapanthus
<i>Aira</i> sp	Hair Grass
<i>Ammophila arenaria</i>	Marram Grass
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Asphodelus fistulosis</i>	Onion Weed
<i>Avena fatua</i>	Wild Oat
<i>Banksia integrifolia</i>	Coast Banksia
<i>Berkheya rigida</i>	African Thistle

<i>Briza maxima</i>	Large Quaking Grass
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Cardamine hirsuta</i>	Flickweed
<i>Catapogon rigidum</i>	Fern Grass
<i>Cerastium glomeratum</i>	Common Chickweed
<i>Chrysanthemoides monolifera ssp monolifera</i>	Boneseed
<i>Coprosma repens</i>	Mirror Bush
<i>Crassula sarmentosa</i>	Toothed Crassula
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Ehrharta erecta</i>	Panic Veldt Grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Euphorbia paralias</i>	Sea Spurge
<i>Euphorbia peplus</i>	Petty Spurge
<i>Euphorbia terracina</i>	Terracina Spurge
<i>Ferraria crispa</i>	Black Flag
<i>Freesia alba</i>	White Freesia
<i>Fumaria muralis</i>	Wall Fumitory
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania sp</i>	Gazania
<i>Gladiolus undulatus</i>	Wild Gladiola
<i>Lagurus ovatus</i>	Hare's-tail Grass
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn
<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca nessonophila</i>	Purple Honey-myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Mersembyanthemum crystallinum</i>	Ice Plant
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort
<i>Oxalis pes-caprae</i>	Soursob
<i>Parapholis incurva</i>	Coast Barb-grass
<i>Pelargonium peltatum</i>	Ivy-leaf Pelargonium
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Phalaris aquatica</i>	Canary Grass
<i>Plantago coronopus ssp coronopus</i>	Buck's-horn Plantain
<i>Plantago lanceolata</i>	Ribwort
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Senecio elegans</i>	Purple Groundsel
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass

<i>Trifolium dubium</i>	Clover
<i>Vicia sativa</i>	Common Vetch

### Indigenous Fauna Species Recorded for The Bluff

<b>Mammals</b>	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Australina Fur Seal	<i>Arctocephalus pusillus</i>
NZ Fur Seal	<i>Arctocephalus forsteri</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
Water Rat	<i>Hydromys chryogaster</i>
Yellow-bellied Sheathtailed Bat	<i>Saccolaimus flaviventris</i>
<b>Reptiles</b>	
Blue-tongued Lizard	<i>Tiliqua scincoides</i>
Copperhead Snake	<i>Austrelaps superbus</i>
Eastern Brown Snake	<i>Pseudonaja textilis</i>
Garden Skink	<i>Lampropholis delica</i>
Jacky Lizard	<i>Amphobolus muncatus</i>
<b>Frogs</b>	
Brown Treefrog	<i>Litoria ewingii</i>
Spotted Marshfrog	<i>Limnodynastes tasmaniensis</i>
Pobblebonk	<i>Limnodynastes dumerilii</i>
<b>Birds</b>	
Australian Hobby	<i>Falco longipennis</i>
Australian Magpie	<i>Gymnorhina tibicen</i>
Barn Owl	<i>Tito alba</i>
Buff Banded rail	<i>Gallirallus philippensis</i>
Black Cormorant	<i>Phalacrocorax sulcirostris</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Crimson Rosella	<i>Platycerus elegans</i>
Eastern Rosella	<i>Platycerus eximus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Fire-tailed Finch	<i>Stagonopleura belle</i>
Galah	<i>Cactua roseicapilla</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Horsfields Bronze Cuckoo	<i>Chrysococcyx basalis</i>
Little Raven	<i>Corvus melliori</i>
Masked Lapwing	<i>Vanellus miles</i>
Musk Lorikeet	<i>Glossopsitta concinna</i>
Mudlark	<i>Grallia cyanoleuca</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
New Holland Honeyeater	<i>Phydonryis novaehollandiae</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Pacific Gull	<i>Larus pacificus</i>

Pied Currawong	<i>Strepera graculina</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Silvereye	<i>Zosterops lateralis</i>
Silver Gull	<i>Larus novaehollandiae</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>
Spotted Pardalote	<i>Pardalotus punctatus</i>
Striated Field Wren	<i>Calamanthus fuliginosus</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
Swamp Harrier	<i>Circus approximans</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Welcome Swallow	<i>Hirundo neoxena</i>
White-faced Heron	<i>Egretta novaehollandiae</i>
Willy Wagtail	<i>Rhipidura leucophrys</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Yellow-tailed Black Cockatoo	<i>Calyptorhynchus funereus</i>
<b>Insects and Spiders</b>	
Acacia Weevil	<i>Laptopus sp</i>
Ant Lion Adult	<i>Myrmeleon sp</i>
	<i>Anthela euryphica</i>
Aust Painted Lady	<i>Vanessa kershawi</i>
Badge Huntsman	<i>Neoparassus punctatus</i>
Bird-dung Spider	<i>Celaenia kinbergi</i>
Black Rock Scorpion	<i>Urodacus manicatus</i>
Blue Ant	<i>Diamma bicolor</i>
Blue Grass Butterfly	<i>Zizina labrados</i>
Bogong Moth	<i>Agrotis infusa</i>
Botany Bay Weevil	<i>Chrysolopus spectabilis</i>
Brine Fly	<i>Ephydriidae Fam</i>
Bullant	<i>Myrmecia sp</i>
Orange footed Centipede	
Christmas Beetle	<i>Anoplognathus sp</i>
Cicada	<i>Psaltoda moerens</i>
Common Grasshopper	<i>Macrotona australis</i>
Cotton Harlequin Bug	<i>Tectocoris diophthalmus</i>
Damselfly-Common Bluetail	<i>Ischnura heterosticta</i>
Common Slantface	<i>Acrida conica</i>
Dragonfly Tau Emerald	<i>Hemicordulia tau</i>
Dragonfly Wandering Percher	<i>Diplacodes bipunctata</i>
Eastern Brown Tigertail	<i>Archaeosynthemis orientalis</i>
False Garden Mantis	<i>Pseudomantis albifimbriata</i>
Fiddler Beetle	<i>Eupocila australasiae</i>
Golden Orb Weaver	<i>Nephila sp</i>
Gold Green Stag Beetle	<i>Lamprima latreillei</i>
Green Blotched Moth	<i>Cosmodes elegans</i>
Ground Beetle	<i>Euryscaphus obesus</i>

Hawk Moth Larvae	<i>Thereta</i> sp
Heliotrope Moth	<i>Utetheisa pulchelloides</i>
Ichneumon Wasp	<i>Netelia</i> sp
Jewel Beetle	<i>Castiarina cruentata</i>
Jack Jumper Ant	<i>Myrmecia nigrocincta</i>
Mole Cricket	<i>Gryllotalpa</i> sp
Lady Bird	<i>Coccinella transversalis</i>
Leaf Curling Spider	<i>Phonognatha graeffei</i>
Looper	<i>Geometroidea</i> Family
Mealy Bugs	<i>Pseudococcus</i> sp
Meadow Argus	<i>Junonia villida</i>
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>
Praying Mantis	<i>Tenodera</i> sp
Saltbush Blue Butterfly	<i>Theclinesstes serpentata</i>
Spiny Jewel Spider	<i>Gasteracantha minax</i>
Spotted Jezebel Butterfly	<i>Delias aganippe</i>
Stag Beetle	<i>Lamprina</i> sp
Sugar Ant	<i>Camponotus nigriceps</i>
Tiger Moth	<i>Amata</i> sp
Two spotted Grass Skipper	<i>Pasma tasmanicus</i>
Two spotted Line Blue	<i>Nacaduba biocellata</i>
Tachnid Sp	<i>Rutilla</i> sp
Yellow Admiral Butterfly	<i>Vanessa itea</i>
Wolf Spider	<i>Lycosa godeffroy</i>

### Exotic Fauna Species Recorded for The Bluff

Black Rat	<i>Rattus rattus</i>
Feral Cat	<i>Felis cattus</i>
House Mouse	<i>Mus musculus</i>
Rabbit	<i>Oryctolagas cuniculus</i>
Red Fox	<i>Vulpes vulpes</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Stumus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina</i> sp



## The Bluff Dunes Quadrat and Habitat Hectare Assessments

### The Bluff Q1

The quadrat location is selected to reflect diverse Prickly Spear-grass dominated vegetation. The Bluff Q1 is referred to as Q1 in The Bluff report.

### Quadrat Location Easting/Northing

quad 1	281201.98	5759032.52
quad 1	281204.95	5759042.05
quad 1	281195.35	5759045.16
quad 1	281189.04	5759038.73

### Quadrat

EVC 1	Coll MT BW SS	Date 13/11/12	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Actites megalocarpus</i>	+	<i>Anagallis arvensis</i>	+
<i>Alyxia buxifolia</i>	+	<i>Asparagus asparagoides</i>	+
<i>Austrostipa stipoides</i>	2	<i>Chrysanthemoides monilifera</i>	+
<i>Carpobrotus rossii</i>	+	<i>Coprosma repens</i>	+
<i>Clematis microphylla</i>	+	<i>Lagurus ovatus</i>	+
<i>Correa alba</i>	+	<i>Sonchus oleraceus</i>	+
<i>Dianella brevicaulis</i>	+	<i>Stenotaphrum secundatum</i>	1
<i>Dichondra repens</i>	+		
<i>Disphyma crassifolium</i>	+		
<i>Hydrocotyle laxiflora</i>	+		
<i>Lachnagrostis billardieri</i>	+		
<i>Lepidosperma gladiatum</i>	+		
<i>Leucophyta brownii</i>	+		
<i>Leucopogon parviflorus</i>	1		
<i>Melaleuca lanceolata</i>	+		
<i>Olearia axilaris</i>	2		
<i>Pimelea serpyllifolia</i>	+		
<i>Pultenaea tenuifolia</i>	+		
<i>Rhagodia candolleana</i>	1		
<i>Rytidosperma setaceum</i>	+		
<i>Senecio pinnatifolius</i>	+		
<i>Swainsona lesseriifolia</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkedia diffusa</i>	+		
<i>Zygophyllum billardieri</i>	+		
non-vascular flora	2		
organic litter	20		
bare earth	5		

**Habitat Hectare**

<b>Site – Bluff Q1</b>		<b>13/11/12</b>	<b>MT BW SS</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	7
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	60
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 38 = 52 + 8 = 60$



The Bluff Q1 photo point south-east corner.

## The Bluff Q2

The quadrat location is selected to reflect typical existing conditions.  
The Bluff Q2 is referred to as Q5 in The Bluff report.

### Quadrat Location Easting/Northing

quad 2 star peg	281334.71	5759064.52
quad 2 butt leuc	281332.38	5759080.92
quad 2	281327.91	5759071.71
quad 2	281338.70	5759074.76

### Quadrat

EVC 1	Coll MT BW SS	Date 13/11/2012	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous</b>		<b>Exotic</b>	
<i>Alyxia buxifolia</i>	+	<i>Acacia cyclops</i>	+
<i>Austrostipa flavescens</i>	1	<i>Asparagus asparagoides</i>	1
<i>Carpobrotus rossii</i>	+	<i>Dipogon lignosus</i>	+
<i>Clematis microphylla</i>	1	<i>Laguarus ovatus</i>	1
<i>Dianella brevicaulis</i>	+	<i>Lycium ferrocissimum</i>	+
<i>Leptospermum laevigatum</i>	1	<i>Medicago polymorpha</i>	1
<i>Leucopogon parviflorus</i>	+	<i>Rhamnus alaternus</i>	+
<i>Melaleuca lanceolata</i>	2	<i>Senecio angulatus</i>	+
<i>Olearia axilaris</i>	2		
<i>Pimelea serpyllifolia</i>	+		
<i>Rhagodia candoleana</i>	+		
<i>Swainsona lessertiifolia</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	+		
<i>Zygophyllum billardieri</i>	+		
non-vascular flora	-		
organic litter	10		
bare earth	20		

**Habitat Hectare**

Site – Bluff Q2		13/11/12	MT BW SS
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	5
	Logs	5	0
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	41
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 27 = 33 + 8 = 41$



The Bluff Q2 photo point south-east corner.

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## The Bluff Q3

The quadrat location is selected to reflect typical existing conditions.  
The Bluff Q3 is referred to as Q7 in The Bluff report.

### Quadrat Location Easting/Northing

quad 3 east of 29w	280889.56	5759066.69
quad 3	280898.65	5759069.30
quad 3	280886.60	5759074.75
quad 3	280897.29	5759077.01

### Quadrat

EVC 1	Coll MT BW SS	Date 13/11/2012	Size 100m <sup>2</sup>
Botanical Name	Cover value	Botanical Name	Cover value
<b>Indigenous</b>		<b>Exotic</b>	
<i>Actites megalocarpus</i>	+	<i>Ammophila arenaria</i>	+
<i>Apium prostratum</i>	+	<i>Bromus diandrus</i>	+
<i>Carpobrotus rossii</i>	+	<i>Bromus hordeaceus</i>	+
<i>Clematis microphylla</i>	1	<i>Catapodium rigidum</i>	+
<i>Ficinia nodosa</i>	1	<i>Conzys bonariensis</i>	+
<i>Lachnagrostis billardieri</i>	1	<i>Hypochaeris radicata</i>	+
<i>Leptospermum laevigatum</i>	+	<i>Lagurus ovatus</i>	1
<i>Leucophyta brownii</i>	1	<i>Medicago polymorpha</i>	1
<i>Leucopogon parviflorus</i>	+	<i>Plantago coronopus</i>	1
<i>Olearia axillaris</i>	1	<i>Polycarpon tetraphylla</i>	+
<i>Rhagodia candoleana</i>	+	<i>Stellaria media</i>	+
<i>Senecio pinnatifolius</i>	+	<i>Thinopyrum junceiforme</i>	1
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	-		
organic litter	10		
bare earth	20		



**Habitat Hectare**

Site – Q3		13/11/12	MT BW SS
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	3
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	49
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 30 = 41 + 8 = 49$



The Bluff Q3 photo point south-east corner.



## The Bluff Flora



*Alyxia buxifolia*



*Leucopogon parviflorus*



*Correa alba*



*Leucophyta brownii*



*Olearia axillaris*



*Carpobrotus rossii*



*Austrostipa stipoides*



*Austrofestuca littoralis*



*Lachnagrostis billiardieri*



*Zygophyllum billiardieri*



*Clematis microphylla*



*Cassytha pubescens*



*Schizophyllum commune*



*Inocybe sp*



*Valvariella speciosa*



### The Bluff Fauna



Green Xmas Beetle - *Lamprima* sp.



White Faced Heron - *Egretta novaehollandiae*



Echidna - *Tachyglossus aculeatus*



Ring-tailed Possum - *Pseudocheirus peregrinus*



Blue-tongued Lizard - *Tiliqua scincoides*



Nankeen Kestrel - *Falco cenchroides*

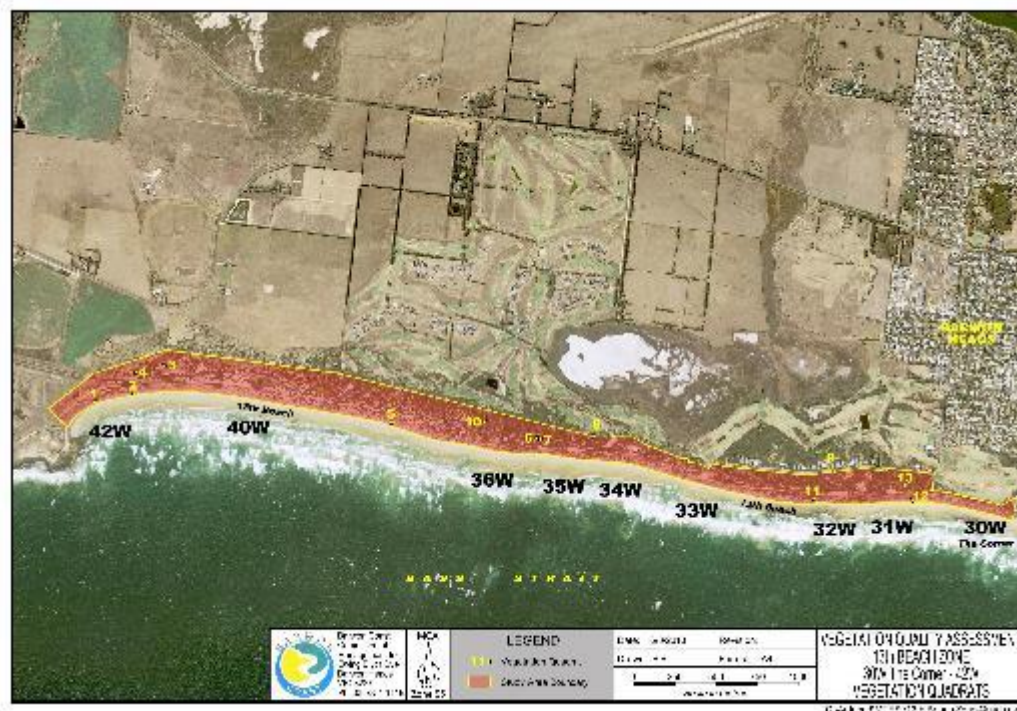


Caper White Butterfly - *Belenois java*



Green Blotched Moth - *Cosmodes elegans*

## Zone 6 13<sup>th</sup> Beach



**Indigenous Plant Species Recorded for 13<sup>th</sup> Beach**

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia longifolia</i> ssp <i>sophorae</i>	Coast Wattle
<i>Acacia uncifolia</i>	Wirilda
<i>Acaena novae-zealandiae</i>	Bidgee-widgee
<i>Actites megalocarpa</i>	Dune Thistle
<i>Adriana quadripartita</i>	Rare Bitter-bush
<i>Apium prostratum</i>	Sea Celery
<i>Atriplex cinerea</i>	Coast Saltbush
<i>Austrostipa flavescens</i>	Coast Spear-grass
<i>Caladenia latifolia</i>	Pink Fairies
<i>Carpobrotus rossii</i>	Karkalla
<i>Clematis microphylla</i>	Small-leaved Clematis
<i>Convolvulus erubescens</i>	Blushing Bindweed
<i>Correa alba</i>	White Correa
<i>Cotula australis</i>	Common Cotula
<i>Cynoglossum australe</i>	Austral Hounds-tongue
<i>Daucus glochidiatus</i>	Austral Carrot
<i>Dianella brevicaulis</i>	Coast Flax-lily
<i>Dichondra repens</i>	Kidney Weed
<i>Distichlis distichlophylla</i>	Austral Salt-grass
<i>Ficinia nodosa</i>	Knobby Club-rush
<i>Geranium</i> No 2	Austral Crane's-bill
<i>Gnaphalium indutum</i>	Tiny Cudweed
<i>Hemarthria uncinata</i>	Mat Grass
<i>Hydrocottle laxiflora</i>	Stinking Pennywort
<i>Hypoxis vaginata</i> var <i>brevistigmata</i>	Tiny Weatherglass
<i>Juncus kraussii</i>	Sea Rush
<i>Lachnagrostis billiardieri</i> ssp <i>billiardieri</i>	Coast Blown-grass
<i>Lachnagrostis filiformis</i>	Common Blown-grass
<i>Lepidosperma gladiatum</i>	Coast Sword-sedge
<i>Leptospermum laevigatum</i>	Coast Teatree
<i>Leucophyta brownii</i>	Cushion Bush
<i>Leucopogon parviflorus</i>	Coast Beard-heath
<i>Lobelia alata</i>	Angled Lobelia
<i>Lotus australis</i>	Austral Lotus
<i>Melaleuca lanceolata</i>	Moonah
<i>Microtis arenaria</i>	Notched Onion Orchid
<i>Myoporum insulare</i>	Boobialla
<i>Olearia axillaris</i>	Coast Daisy-bush
<i>Ozothamnus turbinatus</i>	Coast Everlasting
<i>Parietaria debilis</i>	Shade Pellatory
<i>Pimelea serpyllifolia</i>	Thyme Rice-flower
<i>Plantago varia</i>	Variable Plantain
<i>Poa billardieri</i>	Coast Fescue
<i>Poa poiformis</i>	Coast Tussock-grass



<i>Poa poiformis</i> var <i>ramifer</i>	Creeping Coast Tussock-grass
<i>Rhagodia candolleana</i>	Seaberry Saltbush
<i>Rytidosperma setaceum</i>	Bristly Wallaby-grass
<i>Samolus repens</i>	Creeping Brookweed
<i>Scavola albida</i>	Coast Fan-flower
<i>Schoenus nitens</i>	Shiny Bog-rush
<i>Senecio halophilus</i>	Salt Groundsel
<i>Senecio pinnatifolius</i>	Variable Groundsel
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Senecio spatulatus</i>	Dune Groundsel
<i>Sonchus hydrophilus</i>	Native Sow Thistle
<i>Spinifex sericeus</i>	Hairy Spinifex
<i>Sporobulus virginicus</i>	Sand Couch
<i>Swainsona lessertifolia</i>	Coast Swainson-pea
<i>Tetragonia implexicoma</i>	Bower Spinach
<i>Threlkeldia diffusa</i>	Coast Bone-fruit
<i>Veronica gracilis</i>	Slender Speedwell
<i>Zygophyllum billiardieri</i>	Coast Twin-leaf

### Exotic Plant Species Recorded for 13<sup>th</sup> Beach

<b>Botanical Name</b>	<b>Common Name</b>
<i>Acacia cupularis</i>	Coastal Umbrella Bush
<i>Acacia cyclops</i>	Red-eye Wattle
<i>Acacia longifolia</i> ssp <i>longifolia</i>	Sallow Wattle
<i>Acacia rostellifera</i>	Summer Wattle
<i>Agapanthus praecox</i>	Agapanthus
<i>Agave americana</i>	Century Plant
<i>Agonis flexuosa</i>	Willow Myrtle
<i>Aira</i> sp	Hair Grass
<i>Aloe saphonaria</i>	Aloe
<i>Ammophila arenaria</i>	Marram Grass
<i>Anagallis arvensis</i>	Pimpernel
<i>Arctotis stoechadifolia</i>	White Arctotis
<i>Argyranthemum frutescens</i>	Marguerite Daisy
<i>Asparagus asparagoides</i>	Bridal Creeper
<i>Avena fatua</i>	Wild Oat
<i>Banksia integrifolia</i>	Coast Banksia
<i>Berkheya rigida</i>	African Thistle
<i>Brassica x napus</i>	Canola
<i>Bromus catharticus</i>	Prairie Grass
<i>Bromus diandrus</i>	Great Brome
<i>Cakile maritima</i>	Sea Rocket
<i>Casaurina glauca</i>	Swamp Sheoke
<i>Catapogon rigidum</i>	Fern Grass
<i>Centaurium erythraea</i>	Common Centaury
<i>Centranthus ruber</i>	Red Valerian
<i>Cerastium glomeratum</i>	Common Chickweed

<i>Chrysanthemoides monolifera</i> ssp <i>monolifera</i>	Boneseed
<i>Cirsium vulgare</i>	Spear Thistle
<i>Clematis vitalba</i>	Old Mans Beard
<i>Conyza bonariensis</i>	Flax-leaf Fleabane
<i>Conyza canadiensis</i>	Canadian Fleabane
<i>Coprosma repens</i>	Mirror Bush
<i>Cortaderia selloana</i>	Pampas Grass
<i>Cotoneaster glaucophyllus</i>	Cotoneaster
<i>Cupressus macrocarpa</i>	Monterey Cypress
<i>Cynodon dactylon</i>	Couch Grass
<i>Dactylis glomerata</i>	Cock'sfoot
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Echium candicans</i>	Pride of Madiera
<i>Ehrharta erecta</i>	Panic Veldt Grass
<i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Enchium candicans</i>	Pride of madiera
<i>Eucalyptus diversifolia</i>	Soap Mallee
<i>Eucalyptus gomphacephala</i>	Tuart Gum
<i>Eucalyptus leucoxolon</i> x <i>rosea</i>	Yellow Gum
<i>Euphorbia paralias</i>	Sea Spurge
<i>Ferraria crispa</i>	Black Flag
<i>Foeniculum vulgare</i>	Fennel
<i>Freesia alba</i>	White Freesia
<i>Fumaria muralis</i>	Wall Fumitory
<i>Galena pubescens</i>	Blanket Weed
<i>Galium murale</i>	Bedstraw
<i>Gazania</i> sp	Gazania
<i>Hedypnois rhagadoiloides</i> ssp <i>cretica</i>	Cretan Hedypnois
<i>Helminthotheca echioides</i>	Bristly Ox Tongue
<i>Hypochaeris radicata</i>	Flatweed
<i>Lachenalia</i> sp	Mexican Soldiers
<i>Lactuca serriola</i>	Prickly Lettuce
<i>Lagurus ovatus</i>	Hare's-tail Grass
<i>Leotodon taraxacoides</i>	Hairy Hawkbit
<i>Limonium hyblaum</i>	Sea Lavender
<i>Lobularia maritime</i>	Sweet Alyssum
<i>Lolium perenne</i>	Perennial Rye-grass
<i>Lycium ferocissimum</i>	Boxthorn
<i>Malva dendromorpha</i>	Tree Mallow
<i>Marrubium vulgare</i>	Horehound
<i>Medicago polymorpha</i>	Burr Medic
<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle
<i>Melaleuca nessonophila</i>	Purple honey myrtle
<i>Melilotus indicus</i>	Sweet Melilot
<i>Minuartia mediterranea</i>	Fine-leaf Sandwort
<i>Muscari armeniacum</i>	Common Grape Hyacinth
<i>Nassella trichomata</i>	Serrated Tussock
<i>Nerium oleander</i>	Oleander
<i>Osteospermum fruticosum</i>	South African Daisy
<i>Oxalis pes-caprae</i>	Soursob
<i>Parapholis incurva</i>	Coast Barb-grass



<i>Paraserianthes lophantha</i> ssp <i>lophantha</i>	Cape Wattle
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Petrorhagia dubia</i>	Proliferous Pink
<i>Phalaris aquatica</i>	Canary Grass
<i>Pinus maritima</i>	Maritime Pine
<i>Plantago coronopus</i> ssp <i>coronopus</i>	Buck's-horn Plantain
<i>Plantago lanceolata</i>	Ribwort
<i>Polygala myrtifolia</i>	Myrtle-leaf Milkwort
<i>Rhamnus alaternus</i>	Italian Buckthorn
<i>Rumex crispus</i>	Curled Dock
<i>Salvia verbanaca</i> var <i>verbanaca</i>	Wild Sage
<i>Senecio angulatus</i>	Climbing Groundsel
<i>Senecio elegans</i>	Purple Groundsel
<i>Silybum marianum</i>	Variegated Thistle
<i>Sonchus oleraceus</i>	Common Sow Thistle
<i>Solanum linnaeanum</i>	Apple of Sodom
<i>Solanum nigrum</i>	Black Nightshade
<i>Sporobolus africanus</i>	Rat-tail Grass
<i>Stellaria media</i>	Chickweed
<i>Stenotaphrum secundatum</i>	Buffalo Grass
<i>Taraxacum officinale</i>	Dandelion
<i>Thinopyrum junceiforme</i>	Sea Wheat-grass
<i>Tragopogon porrifolius</i>	Salsify
<i>Trifolium dubium</i>	Clover
<i>Ulex europaeus</i>	Gorse
<i>Veronica hederifolia</i>	Ivy-leaf Speedwell
<i>Vicia sativa</i>	Common Vetch
<i>Vinca major</i>	Blue Periwinkle
<i>Vulpia bromoides</i>	Squirrel-tail Fescue
<i>Vulpia fasciculata</i>	Sand Fescue
<i>Yucca gloriosa</i>	Spanish Dagger

### Indigenous Fauna Species Recorded for 13<sup>th</sup> Beach

<b>Mammals</b>	
Brush-tailed Possum	<i>Trichosurus vulpecula</i>
Ring-tailed Possum	<i>Pseudocheirus peregrinus</i>
Swamp Wallaby	<i>Wallabia bicolor</i>
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
Yellow-bellied Sheath-tailed Bat	<i>Saccolaimus flaviventris</i>
<b>Marine</b>	
Australian Fur Seal	<i>Arctocephalus pusillus</i>
Australian Sea Lion	<i>Neophoca cinerea</i>
<b>Reptiles</b>	
Blue-tongued Lizard	<i>Tiliqua scincoides</i>
Copperhead Snake	<i>Austrelaps superbus</i>
Eastern Brown Snake	<i>Pseudonaja textilis</i>
Garden Skink	<i>Lampropholis sp</i>
Jacky Lizard	<i>Amphobolus muncatus</i>

<b>Frogs</b>	
Brown Treefrog	<i>Litoria ewingii</i>
Spotted Marshfrog	<i>Limnodynastes tasmaniensis</i>
Striped Marshfrog	<i>Limnodynastes peronii</i>
Pobblebonk	<i>Limnodynastes dumerillii</i>
<b>Birds</b>	
Australian Magpie	<i>Gymnorhina tibicen</i>
Australian Oyster Catcher	<i>Haemalopus fuliginosus</i>
Australian White Ibis	<i>Threskiornis molucca</i>
Barn Owl	<i>Tito alba</i>
Black-faced Cuckoo Shrike	<i>Coracina novaehollandiae</i>
Black-shouldered Kite	<i>Elanus axillaris</i>
Buff Banded rail	<i>Gallirallus philippensis</i>
Cormorant Black	<i>Phalacrocorax carbo</i>
Crimson Rosella	<i>Platycerus elegans</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Eastern Rosella	<i>Platycerus eximus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Grey Butcherbird	<i>Cracticus torquatus</i>
Hooded Plover	<i>Thinornis rubicolis</i>
Letter-winged Kite	<i>Elanus scriptus</i>
Little Penguin	<i>Eudyptula minor</i>
Little Raven	<i>Corvus melliori</i>
Mudlark	<i>Grallia cyanoleuca</i>
Nankeen Kestrel	<i>Falco cenchroides</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Pacific Gull	<i>Larus pacificus</i>
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
Red Capped Plover	<i>Charadrius ruficapillus</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Ruddy Turnstone	<i>Arenaria interpres</i>
Silvereye	<i>Zosterops lateralis</i>
Silver Gull	<i>Larus novaehollandiae</i>
Singing Honeyeater	<i>Lichenostomus virescens</i>
Sooty Oyster Catcher	<i>Haemalopus longirostris</i>
Southern Boobook	<i>Ninox novaeseelandiae</i>
Striated Field Wren	<i>Calamanthus fuliginosus</i>
Superb Fairy Wren	<i>Malurus cyaneus</i>
Swamp Harrier	<i>Circus approximans</i>
Tawny Frogmouth	<i>Podargus strigoides</i>
Wedge-tailed Eagle	<i>Aquila audax</i>
Welcome Swallow	<i>Hirundo neoxena</i>
White Faced Heron	<i>Egretta novaehollandiae</i>
Willy Wagtail	<i>Rhipidura leucophrys</i>
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
<b>Insects and Spiders</b>	
Acacia Weevil	<i>Laptopius sp</i>

Antlion Adult	<i>Myrmeleon</i> sp
	<i>Anthela euryphrica</i>
Badge Huntsman	<i>Neoparassus punctatus</i>
Black Water Beetle	<i>Hydrophilus latipalpus</i>
Blue Grass Butterfly	<i>Zizina labrados</i>
Botany Bay Weevil	<i>Chrysolopus spectabilis</i>
Brine Fly	<i>Ephydridae</i> Family
Bullant	<i>Myrmecia</i> sp
Burrowing Bee	<i>Halictidae</i> family
Cicada	<i>Psaltoda moerens</i>
Common Grasshopper	<i>Macrotona australis</i>
Cotton Harlequin Bug	<i>Tectocoris diophthalmus</i>
Damselfly-Aurora Bluetail	<i>Ischnura aurora</i>
Damselfly – Common Bluetail	<i>Ischnura heterosticta</i>
Common Slantface	<i>Acrida conica</i>
Dragonfly Tau Emerald	<i>Hemicordulia tau</i>
Dragonfly Blue Skimmer	<i>Ortheum caledonicum</i>
Dragonfly Scarlet Percher	<i>Diplacodes haematodes</i>
Dragonfly Wandering Percher	<i>Diplacodes bipunctata</i>
Drone Fly	<i>Eristalinus punctulatus</i>
Eastern Brown Tigertail	<i>Archaeosynthemis orientalis</i>
Garden Spider	<i>Araneus</i> sp
Ground Beetle	<i>Euryscaphus obesus</i>
Heliotrope Moth	<i>Utetheisa pulchelloides</i>
Katydid	<i>Torbia</i> sp
Lady Bird	<i>Coccinella transversalis</i>
Leaf Curling Spider	<i>Phonognatha graeffei</i>
Longicorn Beetle	<i>Ancita antennata</i>
Looper	<i>Geometroidea</i> Family
Meat Ant	<i>Iridomyrmex purpureus</i>
Moth	<i>Epicoma melanostica</i>
Passalid Beetle	<i>Pharoichilus rugiceps</i>
Pie Dish Beetle	<i>Pterohelaeus</i> sp
Plague Soldier Beetle	<i>Chauliognathus lugubris</i>
Potter Wasp	
Praying Mantis	<i>Tenodera</i> sp
Saltbush Blue Butterfly	<i>Theclinessthes serpentata</i>
Shield Shrimp	<i>Triops australiensis</i>
Spotted Jezebel Butterfly	<i>Delias aganippe</i>
Sugar Ant	<i>Camponotus nigriceps</i>
Tiger Moth	
Water Beetle	<i>Hydrophilus latipalpus</i>
Water Beetle Larvae	<i>Hydrophilus latipalpus</i>
Wingless Blue Wasp	<i>Diamma bicolor</i>
Wolf Spider	<i>Lycosa godeffroy</i>

### Exotic Fauna Species Recorded for 13<sup>th</sup> Beach

Mark Trengove Ecological Services

Black Rat	<i>Rattus rattus</i>
Feral Cat	<i>Felis cattus</i>
House Mouse	<i>Mus musculus</i>
Rabbit	<i>Oryctolagas cuniculus</i>
Brown Hare	<i>Lepus europaeus</i>
Red Fox	<i>Vulpes vulpes</i>
Blackbird	<i>Turdus merula</i>
Common Starling	<i>Stumus vulgaris</i>
House Sparrow	<i>Passer domesticus</i>
Rock Dove	<i>Columba livia</i>
Cabbage White Butterfly	<i>Pieris rapae</i>
Leaf Hopper	<i>Zygina</i> sp

**13<sup>th</sup> Beach Quadrat and Habitat Hectare Assessments****13<sup>th</sup> Beach Q1**

The quadrat is selected to reflect typical existing conditions. Located in the west fore-dune sub-zone.

**Quadrat Location Easting/Northing**

13th MT quad 1#2 se cnr	275071.52	5759825.71
13th MT quad 1#3 sw cnr	275062.41	5759821.11
13th MT quad 1#4 nw cnr	275061.64	5759831.13
re do pt 2 quad 1 ne cnr	275070.75	5759832.46

**Quadrat**

<b>EVC 879</b>	<b>Coll MT BW BD</b>	<b>Date 2/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Actites megalocarpus</i>	1	<i>Bromus catharticus</i>	+
<i>Apium prostratum</i>	1	<i>Conzys bonariensis</i>	+
<i>Carpobrotus rossii</i>	+	<i>Euphorbia paralia</i>	+
<i>Clematis microphylla</i>	+	<i>Hypochaeris radicata</i>	+
<i>Ficinia nodosa</i>	1	<i>Leontodon taraxacoides</i>	+
<i>Lachnagrostis billardieri</i>	+	<i>Medicago polymorpha</i>	1
<i>Leucopogon parviflorus</i>	2	<i>Melilotis indicus</i>	2
<i>Olearia axillaris</i>	+	<i>Sonchus oleraceus</i>	+
<i>Poa poiformis</i>	1	<i>Thinopyrum juncieforme</i>	+
<i>Senecio pinnatifolius</i>	+	<i>Vulpia muralis</i>	2
<i>Spinefex sericeus</i>	3		
non-vascular flora	2		
organic litter	2		
bare earth	30		



**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q1</b>		<b>2/11/12</b>	<b>MT BW BD</b>
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	6
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		<b>100</b>	<b>49</b>
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 30 = 41 + 8 = 49$



13<sup>th</sup> Beach Q1 south-east corner.

**13<sup>th</sup> Beach Q2**

The quadrat is selected to reflect typical foredune existing conditions. Located in the west fore-dune sub-zone.

**Quadrat Location Easting/Northing**

13th MT quad 2#2	275296.54	5759880.64
13th MT quad 2#3 ne cnr	275306.56	5759882.05
13th MT quad 2#4 se cnr	275307.98	5759871.92
re do pt 6 quad 2 sw cnr	275296.12	5759870.79

**Quadrat**

<b>EVC 879</b>	<b>Coll MT BW BD</b>	<b>Date 2/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Conzys bonariensis</i>	+
<i>Actites megalocarpus</i>	1	<i>Leontodon taraxicoides</i>	+
<i>Carpobrotus rossii</i>	+	<i>Melilotus indicus</i>	2
<i>Clematis microphylla</i>	+	<i>Soncus oleraceus</i>	+
<i>Ficinia nodosa</i>	1	<i>Thinopyrum junceiforme</i>	1
<i>Leptospermum laevigatum</i>	+	<i>Vulpia sp</i>	1
<i>Leucopogon parviflorus</i>	+		
<i>Senecio pinnatifolius</i>	1		
<i>Spinifex sericeus</i>	3		
<i>Acaena novea-zelandiae</i>	+		
non-vascular flora	-		
organic litter	1		
bare earth	30		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q2</b>		<b>2/11/12</b>	<b>MT BW SS</b>
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	0
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	42
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 25 = 34 + 8 = 42$



13<sup>th</sup> Beach Q2 south-east corner

**13<sup>th</sup> Beach Q3**

The Quadrat location is selected to reflect typical existing conditions. Located in the west rear-dune sub-zone.

**Quadrat Location Easting/Northing**

13th MT quad 3 sw cnr	275483.45	5760036.02
13th MT quad 3#2	275480.43	5760047.27
13th MT quad 3#3	275490.18	5760049.24
13th MT quad 3#4 se cnr	275492.17	5760039.40

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW BD</b>	<b>Date 2/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	2	<i>Anagallis arvensis</i>	+
<i>Adriana quadripartita</i>	3	<i>Catapodium rigidum</i>	+
<i>Austrostipa flavescens</i>	1	<i>Conzya canadensis</i>	+
<i>Carpobrotus rossii</i>	1	<i>Cupressus macrocarpus</i>	+
<i>Clematis microphylla</i>	+	<i>Euphorbia peplus</i>	+
<i>Crassula sieberiana</i>	+	<i>Fumaria muralis</i>	+
<i>Daucus glochidiatus</i>	1	<i>Galium murale</i>	+
<i>Dianella brevicaulis</i>	+	<i>Hypochaeris glabra</i>	+
<i>Ficinia nodosa</i>	1	<i>Lagurus ovatus</i>	+
<i>Leptospermum laevigatum</i>	1	<i>Leontodon taraxacoides</i>	+
<i>Leucopogon parviflorus</i>	1	<i>Melilotus indicus</i>	1
<i>Oxalis perennans</i>	+	<i>Parapholis sp</i>	+
<i>Pimelea serpyllifolia</i>	+	<i>Stelleria media</i>	+
<i>Poa poiformis</i>	+	<i>Vulpia bromoides</i>	1
<i>Rhagodia candolleana</i>	1		
<i>Rytidosperma setaceum</i>	+		
<i>Senecio pinnatifolius</i>	1		
<i>Sonchus hydrophilus</i>	+		
<i>Tetragonia implexicoma</i>	1		
non-vascular flora	5		
organic litter	10		
bare earth	25		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q3</b>		<b>2/11/12</b>	<b>MT BW BD</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	46
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 28 = 38 + 8 = 46$



13<sup>th</sup> Beach Q3 south-east corner.

**13<sup>th</sup> Beach Q4**

The quadrat is selected to reflect typical existing conditions and growth of Coast Wattle. Located in the west rear-dune sub-zone.

**Quadrat Location Easting/Northing**

13th MT quad 4 sw cnr	275307.69	5759998.68
13th MT quad 4#2	275307.91	5760008.49
13th MT quad 4#3 ne cnr	275317.65	5760008.60
13th MT quad 4#4 se cnr	275319.05	5759998.32

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW BD</b>	<b>Date 2/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	2	<i>Ammophila arenaria</i>	+
<i>Austrostipa flavescens</i>	1	<i>Anagallis arvensis</i>	+
<i>Carpobrotus rossii</i>	1	<i>Bromus diandrus</i>	+
<i>Clematis microphylla</i>	1	<i>Catapodium rigidum</i>	1
<i>Crassula sieberiana</i>	+	<i>Centaurium erythrea</i>	1
<i>Ficinia nodosa</i>	+	<i>Chrysanthemoides monilifera</i>	+
<i>Leptospermum laevigatum</i>	+	<i>Conzya canadensis</i>	+
<i>Leucopogon parviflorus</i>	2	<i>Galium murale</i>	+
<i>Rhagodia candolleana</i>	+	<i>Melilotus indicus</i>	2
<i>Senecio pinnatifolius</i>	1	<i>Plantago coronopus</i>	+
<i>Tetragonia implexicoma</i>	+	<i>Stellaria media</i>	1
non-vascular flora	20		
organic litter	30		
bare earth	10		



**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q4</b>		<b>13/11/12</b>	<b>MT BW SS</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	9
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	46
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 28 = 38 + 8 = 46$



13<sup>th</sup> Beach Q4 photo point north-east corner.

**13<sup>th</sup> Beach Q5**

The quadrat is selected to reflect typical existing conditions and population of Coast Everlasting. Located in the central fore-dune sub-zone.

**Quadrat Location Easting/Northing**

13th MT quad 5 sw cnr	276851.71	5759696.90
13th MT quad 5#2	276852.23	5759706.46
13th MT quad 5#4 se cnr	276860.98	5759694.27
re do 22 ne cnr	276861.07	5759703.02

**Quadrat**

<b>EVC 879</b>	<b>Coll MT BW BD</b>	<b>Date 2/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Coprosma repens</i>	+
<i>Actites megalocarpus</i>	+	<i>Leontodon taraxacoides</i>	+
<i>Apium prostratum</i>	+	<i>Melilotis indicatus</i>	1
<i>Carpobrotus rossii</i>	1	<i>Soncus oleraceus</i>	+
<i>Ficinia nodosa</i>	1	<i>Thinopyrum junciforme</i>	+
<i>Lachnagrostis billardieri</i>	1	<i>Vulpia bromoides</i>	1
<i>Leucophyta brownii</i>	2		
<i>Leucopogon parviflorus</i>	2		
<i>Olearia axillaris</i>	1		
<i>Ozothamnus turbinatus</i>	2		
<i>Senecio pinnatifolius</i>	1		
<i>Spinifex sericeus</i>	1		
<i>Tetragonia implexicoma</i>	+		
non-vascular flora	-		
organic litter	8		
bare earth	25		

**Habitat Hectare**

Site – 13 <sup>th</sup> Beach Q5		2/11/12	MT BW BD
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	13
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	61
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 39 = 53 + 8 = 61$



13<sup>th</sup> Beach Q5 south-east corner.

**13<sup>th</sup> Beach Q6**

The quadrat is selected to reflect typical existing conditions and Coast Wattle population. Located in the central rear-dune sub-zone.

**Quadrat Location Easting/Northing**

mt 36w east se cnr	277739.39	5759601.56
36w east	277729.73	5759603.46
36w east	277733.17	5759612.48
36w east	277742.71	5759611.30

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW CB BG</b>	<b>Date 7/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Anagallis arvensis</i>	+
<i>Carpobrotus rossii</i>	+	<i>Asparagus asparagoides</i>	+
<i>Clematis microphylla</i>	+	<i>Catapogon rigidum</i>	+
<i>Crassula sieberiana</i>	+	<i>Lagurus ovatus</i>	+
<i>Daucus glochidiatus</i>	+	<i>Medicago polymorpha</i>	+
<i>Dianella brevicaulis</i>	1	<i>Stellaria media</i>	+
<i>Ficinia nodosa</i>	+		
<i>Leptospermum laevigatum</i>	1		
<i>Leucopogon parviflorus</i>	2		
<i>Olearia axillaris</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Rhagodia candolleana</i>	+		
<i>Senecio pinnatifolius</i>	+		
<i>Swainsona lesseriifolia</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	5		
organic litter	15		
bare earth	30		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q6</b>		<b>7/11/12</b>	<b>MT BW CB</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	49
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 30 = 41 + 8 = 49$



13<sup>th</sup> Beach Q6 photo point south-west corner.



**13<sup>th</sup> Beach Q7**

The quadrat is selected to reflect typical existing conditions in a relatively diverse community. Located in the central rear-dune sub-zone.

**Quadrat Location Easting/Northing**

mt quad 35w west se cnr	277759.12	5759591.84
35w west	277749.28	5759593.21
35w west	277749.31	5759603.79
35w west	277761.29	5759601.37

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW CB</b>	<b>Date 7/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Aparagus asparagoides</i>	+
<i>Acitites megalocarpa</i>	+	<i>Lagurus ovatus</i>	1
<i>Caladenia latifolia</i>	+	<i>Medicago polymorpha</i>	+
<i>Carpobrotus rossii</i>	+	<i>Sonchus oleraceus</i>	+
<i>Crassula sieberiana</i>	+	<i>Stelleria media</i>	+
<i>Daucus glochidiatus</i>	+		
<i>Dianella brevicaulis</i>	+		
<i>Dichondra repens</i>	+		
<i>Ficinia nodosa</i>	+		
<i>Leptospermum laevigatum</i>	2		
<i>Leucopogon parviflorus</i>	2		
<i>Olearia axillaris</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Senecio pinnatifolius</i>	1		
<i>Swainsona lessertifolia</i>	+		
<i>Tetragonia implexicoma</i>	+		
non-vascular flora	5		
organic litter	10		
bare earth	35		



**Habitat Hectare**

Site – 13 <sup>th</sup> Beach Q7		7/11/12	MT BW CB
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	13
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	52
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 32 = 44 + 8 = 52$



13<sup>th</sup> Beach Q7 photo point south-east corner.

**13<sup>th</sup> Beach Q8**

The quadrat is selected to reflect typical existing conditions. Located in the central rear-dune sub-zone.

**Quadrat Location Easting/Northing**

mt quad 35w east se cnr	278082.35	5759617.43
35w east	278074.56	5759627.53
sw cnr	278072.52	5759617.51
35w east	278084.17	5759626.90

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW CB</b>	<b>Date 7/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	1	<i>Aparagus asparagoides</i>	1
<i>Austrostipa flavescens</i>	1	<i>Bromus catharticus</i>	+
<i>Carpobrotus rossii</i>	1	<i>Lagurus ovatus</i>	2
<i>Clematis microphylla</i>	1	<i>Leontodon taraxacoides</i>	+
<i>Crassula sieberiana</i>	+	<i>Lolium sp</i>	+
<i>Cynoglossum australe</i>	+	<i>Marrubium vulgare</i>	+
<i>Dianella brevicaulis</i>	1	<i>Melilotus indicus</i>	+
<i>Dichondra repens</i>	+	<i>Parapholis incurva</i>	+
<i>Ficinia nodosa</i>	+	<i>Polycarpon tetraphyllum</i>	+
<i>Leptospermum laevigatum</i>	+	<i>Senecio elegans</i>	+
<i>Leucopogon parviflorus</i>	+	<i>Stelleria media</i>	1
<i>Olearia axillaris</i>	+	<i>Vulpia bromoides</i>	1
<i>Oxalis perennans</i>	+		
<i>Pimelea serpyllifolia</i>	2		
<i>Rhagodia candolleana</i>	1		
<i>Senecio pinnatifolius</i>	+		
<i>Tetragonia implexicoma</i>	+		
non-vascular flora	-		
organic litter	30		
bare earth	40		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q8</b>		<b>7/11/12</b>	<b>MT BW CB</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	6
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	45
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 27 = 37 + 8 = 45$



13<sup>th</sup> Beach Q8 photo point south-east corner.

**13<sup>th</sup> Beach Q9**

The quadrat location is selected to reflect Coast Wirilda population typical existing conditions as well as populations of Coast Fan-flower and Shiny Bog-rush. Located in the central rear-dune sub-zone. Sticky Daisy-bush possibly planted ##.

**Quadrat Location Easting/Northing**

stephens nw cnr in road	279524.44	5759409.00
stephens ne cnr in road	279533.92	5759410.09
stephens	279525.46	5759400.75
stephens se cnr	279535.75	5759400.72

**Quadrat**

<b>EVC 858</b>	<b>Coll MT BW CB</b>	<b>Date 7/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Acacia longifolia</i>	1
<i>Acacia uncifolia</i>	1	<i>Asparagus asparagoides</i>	+
<i>Carpobrotus rossii</i>	+	<i>Catapodium rigidum</i>	+
<i>Clematis microphylla</i>	1	<i>Ehrharta longifolia</i>	+
<i>Correa alba</i>	+	<i>Lagurus ovatus</i>	+
<i>Dianella brevicaulis</i>	+	<i>Parapholis incurva</i>	+
<i>Dichondra repens</i>	+	<i>Petrorhagia dubia</i>	+
<i>Kennedia prostrata</i>	+	<i>Phalaris minor</i>	+
<i>Lachnagrostis billardieri</i>	+	<i>Polygala myrtifolia</i>	1
<i>Lepidosperma gladiatum</i>	+	<i>Rhamnus alaternus</i>	+
<i>Leptospermum laevigatum</i>	2	<i>Sonchus oleraceus</i>	+
<i>Leucopogon parviflorus</i>	+		
<i>Myoporum insulare</i>	+		
<i>Olearia axillaris</i>	1		
<i>Pimelea serpyllifolia</i>	2		
<i>Pultenaea tenuifolia</i>	+		
<i>Rhagodia candolleana</i>	1		
<i>Rytidosperma caespitosum</i>	+		
<i>Scaevola pallida</i>	+		
<i>Schoenus nitens</i>	1		
<i>Senecio biserratus</i>	+		
<i>Senecio quadridentatus</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Olearia glutinosa</i> ##	+		
non-vascular flora	-		
organic litter	55		
bare earth	10		

**Habitat Hectare**

Site – 13 <sup>th</sup> Beach Q9		7/11/12	MT BW CB
<b>EVC 858</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	5
	Logs	5	4
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	55
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/65) \times 41 = 47 + 8 = 55$



13<sup>th</sup> Beach Q9 photo point north-east corner.



**13<sup>th</sup> Beach Q10**

The quadrat location is selected to reflect typical existing conditions as well as Orchid populations. Located in the central rear-dune sub-zone.

**Quadrat Location Easting/Northing**

MT quad 10 sw cnr	277416.65	5759702.45
MT quad 10#2 se cnr	277425.46	5759698.95
MT quad 10#3 ne cnr	277429.64	5759707.60
MT quad 10#4	277419.96	5759713.59

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW BD</b>	<b>Date 8/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	2	<i>Asparagus asparagoides</i>	1
<i>Caladenia latifolia</i>	+	<i>Cirsium vulgare</i>	+
<i>Carpobrotus rossii</i>	1	<i>Lagurus ovatus</i>	+
<i>Clematis microphylla</i>	1	<i>Sonchu oleraceus</i>	+
<i>Daucus glochidiatus</i>	+	<i>Stellaria media</i>	+
<i>Dichondra repens</i>	+		
<i>Leptospermum laevigatum</i>	+		
<i>Leucopogon parviflorus</i>	2		
<i>Parietaria debilis</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Senecio glomeratus</i>	+		
<i>Senecio halophilus</i>	+		
<i>Swainsona lessertifolia</i>	+		
<i>Tetragonia implexicoma</i>	1		
non-vascular flora	2		
organic litter	30		
bare earth	20		



**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q10</b>		<b>13/11/12</b>	<b>MT BW SS</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	1
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	52
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 32 = 44 + 8 = 52$



13<sup>th</sup> Beach Q10 photo point south-east corner.

**13<sup>th</sup> Beach Q11**

The quadrat location is selected to reflect typical existing conditions. Located in the eastern rear-dune sub-zone.

**Quadrat Location Easting/Northing**

MT quad 11#2 se cnr	279412.60	5759234.48
MT quad 11#3	279402.27	5759233.04
MT quad 11#4	279403.10	5759242.79
re do ne cnr in leucop	279412.15	5759243.67

**Quadrat**

<b>EVC 1</b>	<b>Coll MT BW BD</b>	<b>Date 8/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	1	<i>Catapogon rigidum</i>	+
<i>Actites megalocarpus</i>	+	<i>Coprosma repens</i>	+
<i>Carpobrotus rossii</i>	+	<i>Lagurus ovatus</i>	+
<i>Ficinia nodosa</i>	1	<i>Leontodon taraxacoides</i>	+
<i>Lachnagrostis billardieri</i>	1	<i>Melilotus indicus</i>	1
<i>Leptospermum laevigatum</i>	+	<i>Vulpia muralis</i>	+
<i>Leucophyta brownii</i>	1		
<i>Leucopogon parviflorus</i>	2		
<i>Olearia axilaris</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Rhagodia candolleana</i>	1		
<i>Senecio pinnatifolius</i>	+		
<i>Spinifex sericeus</i>	+		
<i>Tetragonia implexicoma</i>	+		
non-vascular flora	5		
organic litter	20		
bare earth	25		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q11</b>		<b>8/11/12</b>	<b>MT BW BD</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	13
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	61
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 39 = 53 + 8 = 61$



13<sup>th</sup> Beach Q11 photo point south-east corner.

**13<sup>th</sup> Beach Q12**

The quadrat location is selected to to monitor *Lotus australis* population.  
Note 25m<sup>2</sup> quadrat established. Located in the eastern rear-dune sub-zone.

**Quadrat Location Easting/Northing**

MT quad 12 nw cnr	279996.59	5759233.25
MT quad 12#2	280000.67	5759232.05
MT quad 12#3 se cnr	280000.36	5759227.68
MT quad 12#4	279995.61	5759228.93

**Quadrat**

<b>EVC 879</b>	<b>Coll MT BW BD</b>	<b>Date 8/11/12</b>	<b>Size 25m<sup>2</sup> (5m x 5m)</b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Actites megalocarpus</i>	+	<i>Coprosma repens</i>	+
<i>Apium prostratum</i>	1	<i>Polycarpon tetraphyllum</i>	+
<i>Carpobrotus rossii</i>	1	<i>Thinopyrum junceaforme</i>	1
<i>Crassula sieberiana</i>	+		
<i>Ficinia nodosa</i>	+		
<i>Leucopogon parviflorus</i>	2		
<i>Lotus australis</i>	1		
<i>Olearia axillaris</i>	1		
<i>Senecio pinnatifolius</i>	+		
<i>Spinefex sericeus</i>	1		
non-vascular flora	-		
organic litter	1		
bare earth	80		

**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q12</b>		<b>8/11/12</b>	<b>MT BW BD</b>
<b>EVC 879</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	0
	Organic Matter	5	3
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	47
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 29 = 39 + 8 = 47$



13<sup>th</sup> Beach Q12 photo point south-east corner.



**13<sup>th</sup> Beach Q13**

The quadrat location is selected to reflect typical existing conditions. Located in the eastern rear-dune sub-zone.

**Quadrat Location Easting/Northing**

MT quad 13 se cnr	279964.15	5759316.84
MT quad 13#2	279966.77	5759324.30
MT quad 13#3 nw cnr	279956.32	5759325.13
MT quad 13#4	279955.90	5759319.85

**Quadrat**

<b>EVC 879</b>	<b>Coll MT BW BD</b>	<b>Date 8/11/12</b>	<b>Size 100m<sup>2</sup></b>
<b>Botanical Name</b>	<b>Cover value</b>	<b>Botanical Name</b>	<b>Cover value</b>
<b>Indigenous species</b>		<b>Exotic species</b>	
<i>Acacia sophorae</i>	+	<i>Asparagus asparagoides</i>	+
<i>Actites megalocarpus</i>	+	<i>Chrysanthemoides monilifera</i>	+
<i>Austrostipa flavescens</i>	+	<i>Dipogon lignosus</i>	+
<i>Carpobrotus rossii</i>	+	<i>Lagurus ovatus</i>	+
<i>Clematis microphylla</i>	+	<i>Medicago polymorpha</i>	1
<i>Crassula sieberiana</i>	+	<i>Petrorhagia dubia</i>	+
<i>Dichondra repens</i>	+	<i>Polygala myrtifolia</i>	+
<i>Ficinia nodosa</i>	+		
<i>Leptospermum laevigatum</i>	1		
<i>Leucopogon parviflorus</i>	2		
<i>Olearia axillaris</i>	+		
<i>Pimelea serpyllifolia</i>	1		
<i>Poa poiformis</i> var <i>ramifer</i>	1		
<i>Rhagodia candolleana</i>	+		
<i>Senecio pinnatifolius</i>	+		
<i>Tetragonia implexicoma</i>	+		
<i>Threlkeldia diffusa</i>	+		
non-vascular flora	15		
organic litter	30		
bare earth	40		



**Habitat Hectare**

<b>Site – 13<sup>th</sup> Beach Q13</b>		<b>8/11/12</b>	<b>MT BW BD</b>
<b>EVC 1</b>			
<b>Site Condition</b>	Large Old Trees	10	0*
	Canopy Cover	5	0*
	Lack of Weeds	25	11
	Understorey	15	15
	Recruitment	10	6
	Organic Matter	5	5
	Logs	5	0*
<b>Landscape</b>	Patch Size	10	4
	Neighbourhood	10	3
	Distance to Core	5	1
<b>Habitat Score</b>		100	58
Area of Habitat Zone (Hectares)			
<b>Habitat Hectare Score</b>			

\* Standardized due to lack of EVC benchmark  
i.e.  $(75/55) \times 37 = 50 + 8 = 58$



13<sup>th</sup> Beach Q13 photo point south-east corner.

### 13th Beach Flora



*Acacia sophorae*



*Leucopogon parviflorus*



*Adriana quadripartita*



*Leucophyta brownii*



*Scaevola albida*



*Carpobrotus rossii*



*Caladenia latifolia*



*Rytidosperma setaceum*



*Dianella brevicaulis*



*Spinifex sericeus*



*Tetragonia implexicoma*



*Clematis microphylla*



*Stereum rugosum*



*Morchella esculenta*



*Hygrocybe persistens*



### 13th Beach Fauna



Potter Wasp - *Abispa* sp.



Tiger Moth - *Amata* sp.



Australian White Ibis - *Threskiornis molucca*



Striated Field Wren - *Calamanthus fuliginosus*



Brush-tailed Possum - *Trichosurus vulpecula*



Heliotrope Moth - *Utetheisa pulchelloides*



Jacky Lizard - *Amphobolus muncatus*



Copperhead Snake - *Austrelaps superbus*

## 7 Priority Weed Distribution Maps

### Priority Weeds Profiles and Distribution Maps

Plant profiles are presented for each of the 19 priority weed species. Data provided consists of name, origin, life form, pollination/breeding system, dispersal, seed bank, response to fire, distribution and abundance within the study area, source(s) of infestation, recommendations for management, control techniques, references and notes/discussion.

Following the profiles maps are provided for the distribution of each priority species, as well as for new and emerging and persistence weed species.

<b>Species</b>	<i>Chrysanthemoides monilifera</i>
Common Name	Boneseed
Origin	South Africa
Life Form	Medium to large shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed only.
Dispersal	The seeds, surrounded by a large flesh fruit are ingested and dispersed by birds and foxes.
Seed bank	Long termed (up to 10 years) soil stored.
Response to fire	Plants are assumed to be fire sensitive. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Widespread and common within much of the study area (Map 1).
Source(s) of infestation	Possibly horticultural.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Carr <i>et al</i> (1992), DPI website I, Muyt (2001).
Notes/discussion	Dense infestations of Boneseed can virtually eliminate native understorey species and reduce the regeneration abilities of native trees and shrubs. Its presence can also severely impact on several coastal plant communities. The weed may negatively effect wildlife through the displacement of essential food plants. Works programs undertaken to date have been successful in reducing population numbers.

<b>Species</b>	<i>Lycium ferocissimum</i>
Common Name	Boxthorn
Origin	South Africa
Life Form	Medium to large shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed.
Dispersal	The seeds, surrounded by a large flesh fruit are ingested and dispersed by birds and foxes.
Seed bank	Long termed (up to 10 years) soil stored.
Response to fire	Mature plants resprout from base after fire. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Widespread and but not common within much of the study area (Map 1).
Source(s) of infestation	Possibly agricultural/horticultural.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Carr <i>et al</i> (1992), DPI website i.
Notes/discussion	Works programs undertaken to date have been successful in reducing population numbers.

<b>Species</b>	<i>Polygala myrtifolia</i>
Common Name	Myrtle-leaf Milkwort
Origin	South Africa
Life Form	Medium shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed.
Dispersal	Seeds are spread by water, ants, birds, garden waste, contaminated soil and through cultivation.
Seed bank	Soil stored seed bank. Seed remains viable for 3-5 years?
Response to fire	Plants are fire sensitive, although some mature plants are able to reshoot after fire. Abundant post fire recruitment from soil stored seed bank (up to 80% germination).
Distribution and abundance	Common and widespread within most of the study area with the exception of central 13 <sup>th</sup> Beach (Map 2).
Source(s) of infestation	Horticultural.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Carr <i>et al</i> (1992), DPI website I, (Adair <i>et al</i> 2012).
Notes/discussion	Dense infestations of Myrtle-leaf Milkwort can virtually eliminate native understorey species and reduce the regeneration abilities of native trees and shrubs. Its presence can also severely impact on several coastal plant communities. Works programs undertaken to date have been successful in reducing population numbers.



<b>Species</b>	<i>Dipogon lignosus</i>
Common Name	Dolochis Creeper
Origin	South Africa
Life Form	Creeper/climber
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed and vegetatively from suckering of stem.
Dispersal	Seed ejected from plant when ripe. Birds.
Seed bank	Medium term (up to 7 ears) viability in soil.
Response to fire	Plants are fire sensitive although mature plants may resprout from the base after mid fire. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Common and widespread within most of the study area with the exception of west and central 13 <sup>th</sup> Beach (Map 2).
Source(s) of infestation	Horticulture.
Recommendations	Eliminate from study area.
Control techniques	Herbicide.
References	Muyt (2001), DPI website I, Blood (2001).
Notes/discussion	Has increased it coer within the study area in recent wetter years.

<b>Species</b>	<i>Ammophila arenaria</i>
Common Name	Marram Grass
Origin	Europe
Life Form	Rhizomatous perennial grass
Pollination/breeding system	Probably wind pollination.
Propagation/recruitment	Mostly vegetatively from rhizomes, seed germination thought to be low.
Dispersal	Rhizomes, which can also can be transported by water, animals etc, occasionally by seed.
Seed bank	Seed set, viability and longevity is low.
Response to fire	Likely to reshoot from rhizomes.
Distribution and abundance	Widespread on foredunes and reardunes at west 13 <sup>th</sup> Beach (Map 3).
Source(s) of infestation	Introduced for dune stabilization. Possible accidental infestations.
Recommendations	Contain where appropriate. Continue trail eradication work at 13 <sup>th</sup> Beach.
Control techniques	? Herbicide
References	DPI website I, Blood (2001) Heyligers, PC (1985).
Notes/discussion	Refer to Section 4.9.

<b>Species</b>	<i>Thinopyrum junceiforme</i>
Common Name	Sea Wheat-grass
Origin	Northern Europe
Life Form	Rhizomatous perennial grass
Pollination/breeding system	Probably wind pollination.
Propagation/recruitment	Seed and vegetatively from rhizomes.
Dispersal	Seed and broken rhizomes, dispersed by water.
Seed bank	?
Response to fire	Unsure. Likely to reshoot from rhizomes.
Distribution and abundance	Widespread on foredunes (Map 3).
Source(s) of infestation	rhizomes introduced by ocean waters.
Recommendations	Contain where appropriate. Continue trail eradication work.
Control techniques	? Herbicide
References	DPI website I, Heyligers, PC (1985).
Notes/discussion	Refer to Section 4.9.

<b>Species</b>	<i>Coprosma repens</i>
Common Name	Mirror Bush
Origin	New Zealand
Life Form	Large spreading shrub.
Pollination/breeding system	Plants are dioecious and flowers are wind pollinated.
Propagation/recruitment	Seed.
Dispersal	The seeds, surrounded by a large flesh fruit are ingested and dispersed by birds, possums and foxes.
Seed bank	Soil stored seed bank thought to be short lived.
Response to fire	Respouts from base after moderately intense fires. High intensity fire may kill plants. Germination after fire unknown.
Distribution and abundance	Common on The Spit, The Bluff and east 13 <sup>th</sup> Beach (Map 4).
Source(s) of infestation	Horticulture.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Carr <i>et al</i> (1992), DPI website i.
Notes/discussion	Mirror Bush shades out ground covers, impedes natural growth and regeneration of native species in bushland. Works programs undertaken to date have been successful in reducing population numbers. Plants will continue to invade from surrounding areas.

<b>Species</b>	<i>Rhamnus alaternus</i>
Common Name	Italian Buckthorn
Origin	Europe
Life Form	Medium to large shrub.
Pollination/breeding system	Plants are dioecious. Although largely pollinated by insects, it is also possibly transported by wind.
Propagation/recruitment	Seed.
Dispersal	The seeds, surrounded by a large flesh fruit are ingested and dispersed by birds, possums and foxes.
Seed bank	Seedling survival and post-dispersal seed predation, as opposed to seed viability, were considered to be the most limiting factors in the recruitment process.
Response to fire	Respouts from base after moderately intense fires. High intensity fire may kill plants. Germination after fire unknown.
Distribution and abundance	Widespread over most of the study area, except west 13 <sup>th</sup> Beach (Map 4).
Source(s) of infestation	Horticultural.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Carr <i>et al</i> (1992), DPI website i.
Notes/discussion	Buckthorn shades out ground covers, impedes natural growth and regeneration of native species in bushland. Works programs undertaken to date have been successful in reducing population numbers. Plants will continue to invade from surrounding areas.

<b>Species</b>	<i>Ehrharta calycina</i>
Common Name	Perennial Veldt-grass
Origin	South Africa
Life Form	Medium to large perennial tufted grass, shorty rhizomatous
Pollination/breeding system	Likely to be wind pollinated.
Propagation/recruitment	Seed
Dispersal	Ants and animals via seeds transported in fur etc.
Seed bank	Seed viability up to 90%. May remain viable in soil for up to 10 years.
Response to fire	Mature plants reshoot after fire. Seedling regeneration after fire.
Distribution and abundance	Confined to small population at Ocean Grove east reardunes.
Source(s) of infestation	Unsure- contaminated material?
Recommendations	Eradicate.
Control techniques	Herbicide.
References	Carr <i>et al</i> (1992), DPI website i. Muyt (201).
Notes/discussion	A potentially serious weed of dry sandy country. Works programs undertaken to date have been successful in reducing population numbers.

<b>Species</b>	<i>Nassella neesiana</i>
Common Name	Chilean Needle-grass
Origin	South America
Life Form	Medium perennial tufted grass
Pollination/breeding system	Likely to be wind pollinated.
Propagation/recruitment	Seed.
Dispersal	Ants and animals via seeds transported in fur etc.
Seed bank	Persistent (5-8 years).
Response to fire	Mature plants reshoot after fire. Seedling regeneration after fire.
Distribution and abundance	Confined to one small population at The Spit (Map 5).
Source(s) of infestation	Unsure- contaminated material?
Recommendations	Eradicate.
Control techniques	Herbicide.
References	Carr <i>et al</i> (1992), DPI website I, Muylt (2001).
Notes/discussion	WoNS. Works programs undertaken to date have been successful in reducing population numbers.

<b>Species</b>	<i>Nassella trichomata</i>
Common Name	Serrated Tussock
Origin	Central and South America
Life Form	Medium perennial tufted grass
Pollination/breeding system	Likely to be wind pollinated.
Propagation/recruitment	Seed.
Dispersal	Ants and animals via seeds transported in fur etc.
Seed bank	Persistent (5-15 years).
Response to fire	Mature plants reshoot after fire. Seedling regeneration after fire.
Distribution and abundance	Confined to two populations at 13 <sup>th</sup> Beach west and 13 <sup>th</sup> Beach east (Map 5).
Source(s) of infestation	Unsure- contaminated material?
Recommendations	Eradicate.
Control techniques	Herbicide.
References	Carr <i>et al</i> (1992), DPI website I, Muylt (2001).
Notes/discussion	WoNS. Works programs undertaken to date have been successful in reducing population numbers.

<b>Species</b>	<i>Euphorbia paralias</i>
Common Name	Sea Spurge
Origin	Northern Hemisphere
Life Form	Medium perennial herb.
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed.
Dispersal	Seeds spread by ocean waters and by attachment to objects, animals etc.
Seed bank	Viable for 5-10 years.
Response to fire	Unknown.
Distribution and abundance	Scattered along foreshore at 13 <sup>th</sup> Beach and Ocean Grove Dunes west (Map 5).
Source(s) of infestation	Seeds spread and reinvade from ocean waters.
Recommendations	Eradicate.
Control techniques	Herbicide and physical removal.
References	DPI website I , Blood (2001).
Notes/discussion	Works programs undertaken to date have been successful in reducing population numbers. Plants will continue to invade from surrounding coastal areas.

<b>Species</b>	<i>Euphorbia terracina</i>
Common Name	Terracina Spurge
Origin	Northern Hemisphere
Life Form	Medium perennial herb.
Pollination/breeding system	Probably generalist pollination by a variety of insects.
Propagation/recruitment	Seed.
Dispersal	Seed spread by animals, contaminated soil, water.
Seed bank	
Response to fire	Unknown.
Distribution and abundance	Scattered to relatively dense populations at The Spit (Map 5).
Source(s) of infestation	
Recommendations	Eradicate.
Control techniques	Herbicide and physical removal.
References	DPI website I.
Notes/discussion	



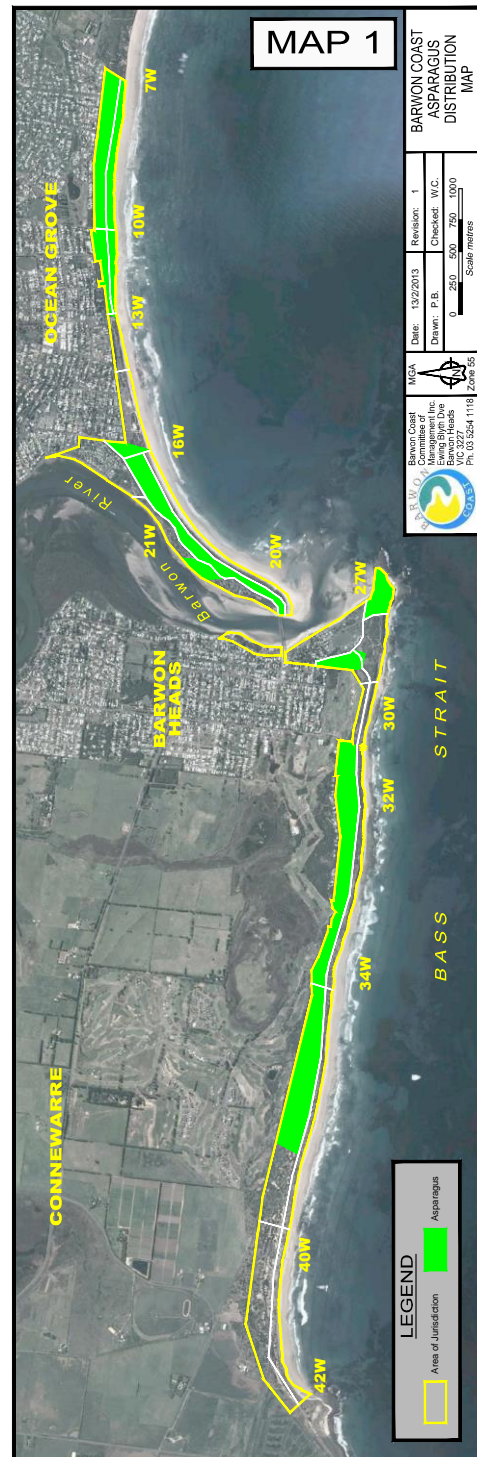
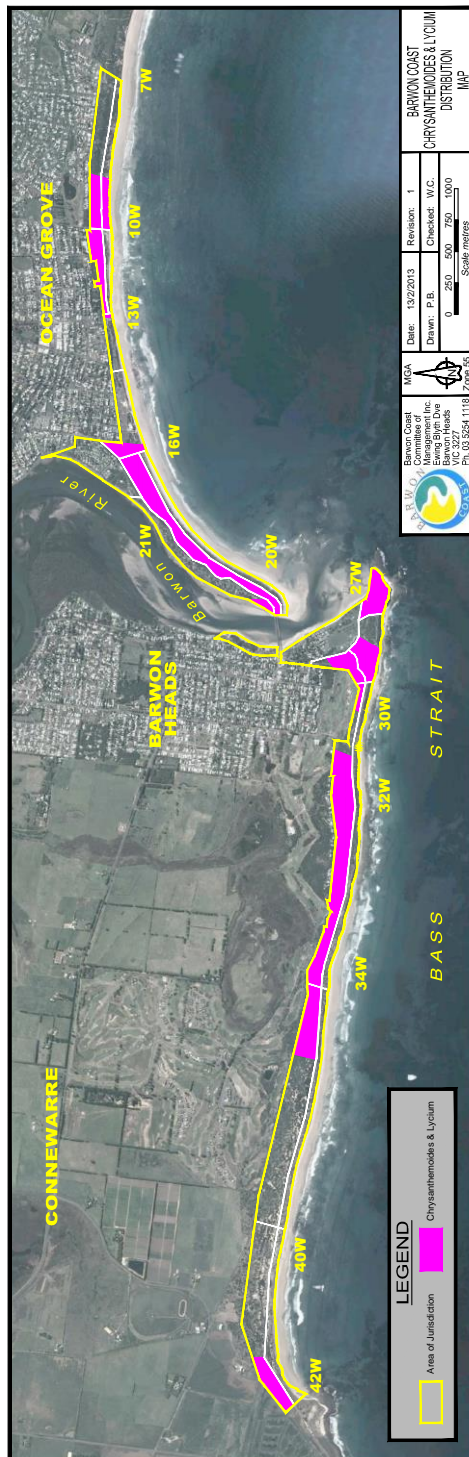
<b>Species</b>	<i>Acacia cyclops</i>
Common Name	West Coast Wattle
Origin	Western Australia
Life Form	Medium shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects and possibly birds.
Propagation/recruitment	Seed only
Dispersal	The seeds, surrounded by a large flesh aril persist on the open pod. Ingested and dispersed by birds.
Seed bank	Long termed soil stored.
Response to fire	Plants are assumed to be fire sensitive. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	The Bluff. Common (Map 6).
Source(s) of infestation	Mistakenly introduced via revegetation program.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level.
References	Reid and Murphy (2008). Carr <i>et al</i> (2011). Carr <i>et al</i> (1992).
Notes/discussion	<i>Acacia cyclops</i> has a limited distribution on Victoria. All populations originate from planted specimens. It has a very high potential as a serious invader. Works programs undertaken to date at The Bluff have been successful in reducing population numbers. Due to long term viability of seed bank, eradication efforts will be ongoing.

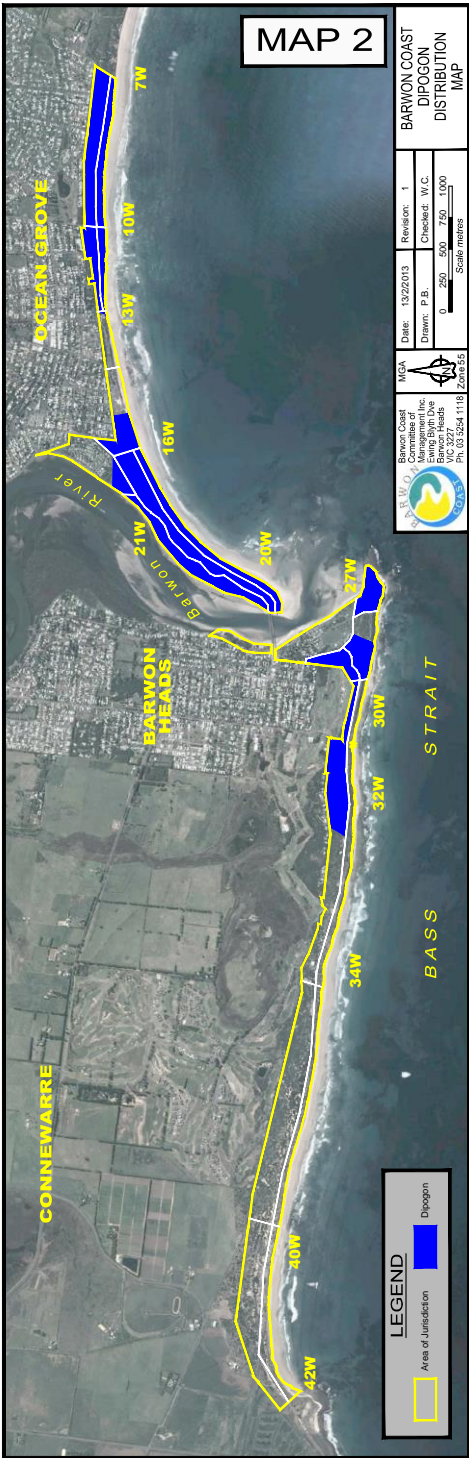
<b>Species</b>	<i>Acacia rostellifera</i>
Common Name	Summer Wattle
Origin	Western Australia
Life Form	Large shrub
Pollination/breeding system	Probably generalist pollination by a variety of insects and possibly birds.
Propagation/recruitment	Seed and suckers.
Dispersal	The seeds, surrounded by a large flesh aril persist on the open pod. Ingested and dispersed by birds.
Seed bank	Long termed soil stored.
Response to fire	Plants are assumed to be fire sensitive. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Locally abundant at 13th Beach West Rear (Map 6).
Source(s) of infestation	Introduced by Country Roads board as part of dune stabilization works.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	Reid and Murphy (2008).
Notes/discussion	<i>Acacia rostellifera</i> has a limited distribution on Victoria. All populations originate from planted specimens. It has a very high potential as a serious invader. Works programs undertaken to date at 13 <sup>th</sup> Beach have been successful in reducing population numbers. Due to long term viability of seed bank, eradication efforts will be ongoing. Mature plants sucker.

<b>Species</b>	<i>Acacia cupularis</i>
Common Name	Coastal Umbrella Bush
Origin	Western Australia
Life Form	Medium shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects and possibly birds.
Propagation/recruitment	Seed only.
Dispersal	The seeds, surrounded by a large flesh aril are ingested and dispersed by birds.
Seed bank	Long termed soil stored.
Response to fire	Plants are assumed to be fire sensitive but may resprout from the base after a moderate fire. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Locally abundant at eastern section of 13th Beach (Map 6).
Source(s) of infestation	Mistakenly introduced via revegetation program.
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level.
References	Reid and Murphy (2008). Carr <i>et al</i> (2011). Carr <i>et al</i> (1992).
Notes/discussion	<i>Acacia cupularis</i> has a limited distribution on Victoria. All populations originate from planted specimens. It has a very high potential as a serious invader. Works programs undertaken to date at 13 <sup>th</sup> Beach have been successful in reducing population numbers. Due to long term viability of seed bank, eradication efforts will be ongoing.

<b>Species</b>	<i>Acacia saligna</i>
Common Name	Golden Wreath Wattle
Origin	Western Australia
Life Form	Large shrub
Pollination/breeding system	Probably generalist pollination by a variety of insects and possibly birds.
Propagation/recruitment	Seed and suckers.
Dispersal	The seeds, are ingested and dispersed by birds.
Seed bank	Long termed soil stored (10 years plus).
Response to fire	Plants are assumed to be fire sensitive but may resprout from the base after a moderate fire. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	limited distribution at ? (Map 6).
Source(s) of infestation	?
Recommendations	Eliminate from study area.
Control techniques	Cut off at ground level and treat with herbicide.
References	DPI website i. Muylt (2001).
Notes/discussion	<i>Acacia saligna</i> has a varied distribution in Victoria including coastal and inland populations. It has a very high potential as a serious invader. Works programs undertaken to date at Ocean Grove dunes and The Spit have been successful in reducing population numbers. Due to long term viability of seed bank, eradication efforts will be ongoing. Mature plants sucker.

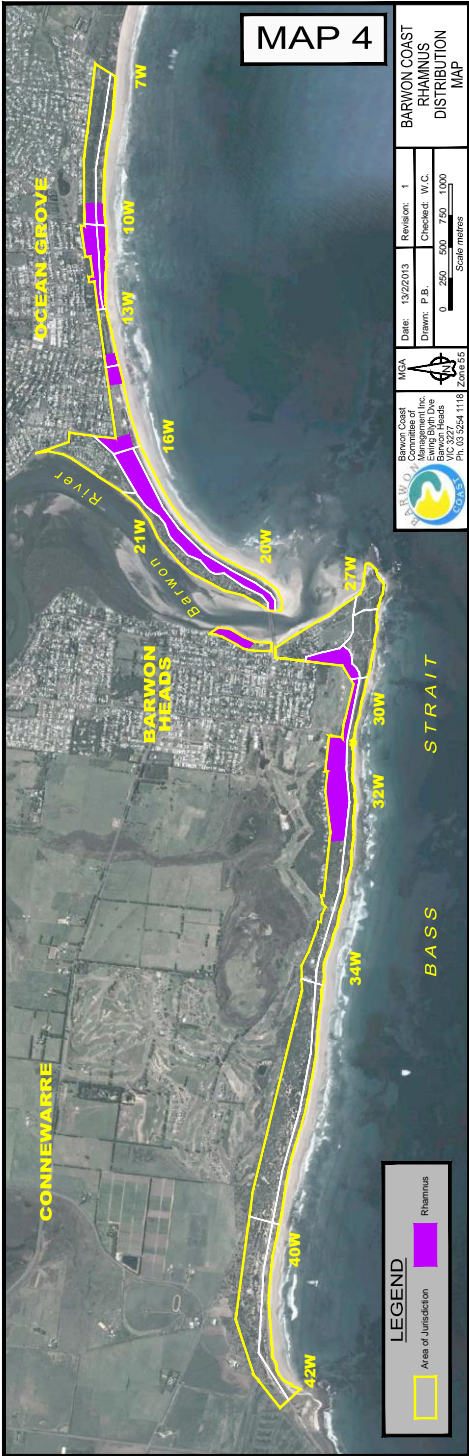
<b>Species</b>	<i>Acacia longifolia</i> ssp <i>longifolia</i>
Common Name	Sallow Wattle
Origin	New South Wales and eastern Victoria
Life Form	Large shrub.
Pollination/breeding system	Probably generalist pollination by a variety of insects and possibly birds.
Propagation/recruitment	Seed.
Dispersal	The seeds, are ingested and dispersed by birds.
Seed bank	Long termed soil stored (10 years plus).
Response to fire	Plants are assumed to be fire sensitive. Abundant post fire recruitment from soil stored seed bank.
Distribution and abundance	Distribution unsure due to difficulty identifying this species from <i>Acacia longifolia</i> ssp <i>sophorae</i> and hybrids. Probably limited distribution at Ocean Grove dunes? (Map 6).
Source(s) of infestation	?
Recommendations	? Control or eliminate from study area.
Control techniques	Cut off at ground level.
References	DPI website i. Muyt (2001).
Notes/discussion	Known to hybridize with <i>Acacia longifolia</i> ssp <i>sophorae</i> (refer to 4.7).

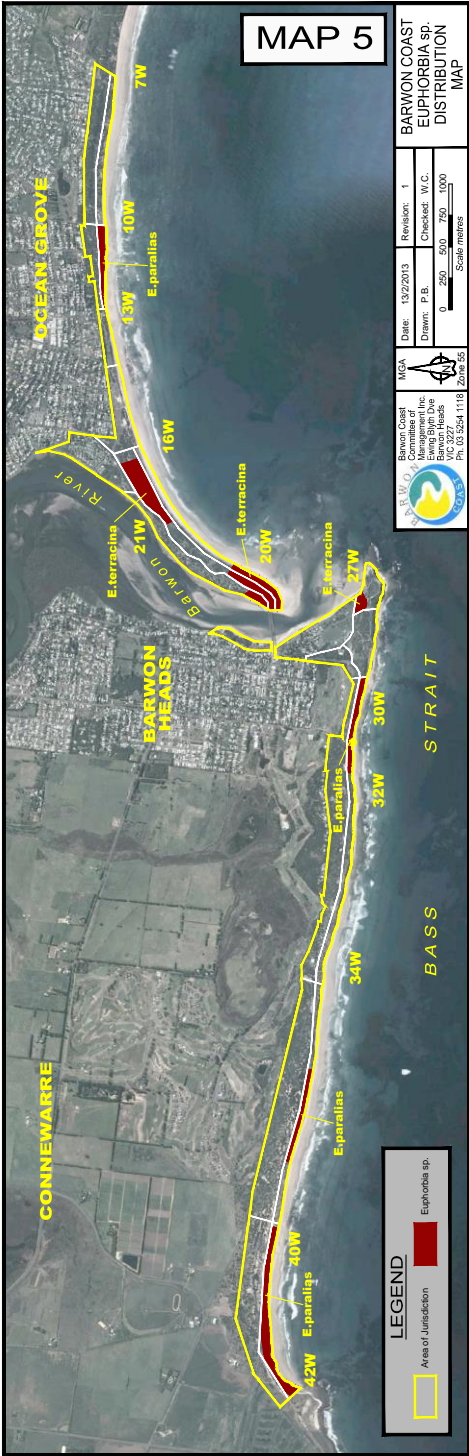




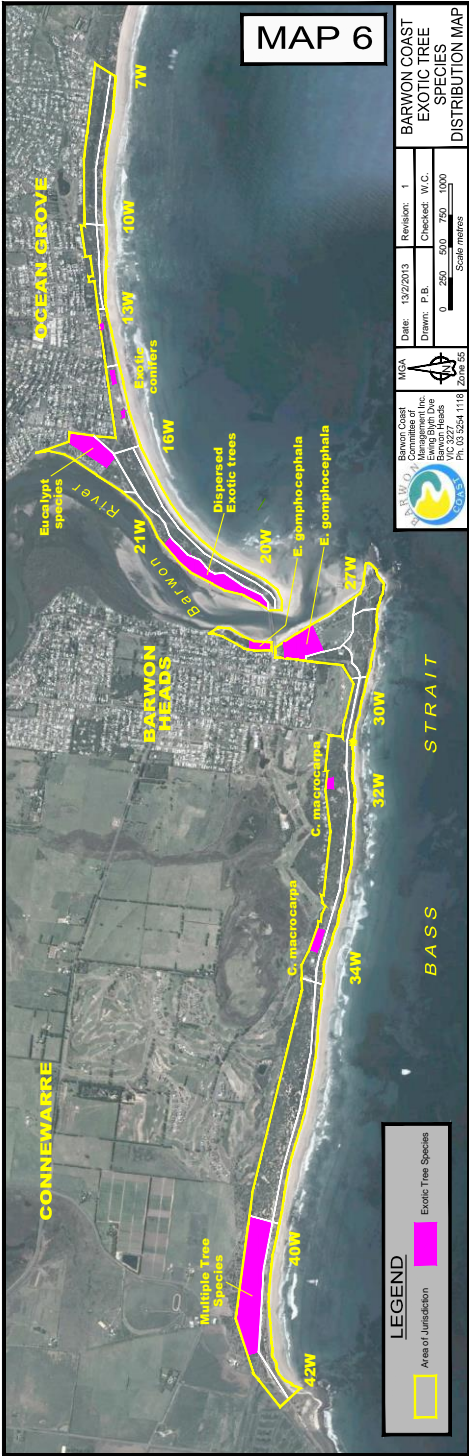
















## 8 Additional Data

### 8.1 Fungi

The following list is of the fungi records for the study area, including location by Management Zone and date of first observation.

#### Fungi Species, Location and date of observation

Species	Management Zone	Date first observed
<i>Aleuria ferruginea</i>	OG Dunes	2012
<i>Amanita xanthocephala</i>	Bluff	2012
<i>Bisporella citrina</i>	OG Dunes	2012
<i>Bolete sp</i>	Estuary	2010
<i>Bovista sp</i>	Bluff	2012
<i>Caprinellus truncorum</i>	13 <sup>th</sup> Beach	2012
<i>Clavulina sp</i>	Bluff	2010
<i>Coltricia cinnamomea</i>	Bluff/OG Dunes	2011
<i>Coprinus comatus</i>	Urban Foreshore/ OG Dunes	2012
<i>Cortinarius abnormis</i>	Bluff	2012
<i>Cortinarius sp</i>	Bluff	2009
<i>Cyathus olla</i>	Urban Foreshore/Bluff	2011
<i>Geoglossum sp</i>	13 <sup>th</sup> Beach	2009
<i>Gymnopilus sp</i>	Bluff	2012
<i>Hygrocybe persistens var persistens</i>	13 <sup>th</sup> Beach	2012
<i>Hygrocybe cheelii</i>	Bluff	2009
<i>Inocybe sp</i>	13 <sup>th</sup> Beach	2012
<i>Leucoagaricus naucinus</i>	Bluff	2007
<i>Limacella piterika</i>	Bluff	2012
<i>Lycoperdon scabrum</i>	Bluff	2007
<i>Morchella esculenta</i>	13 <sup>th</sup> Beach	2010
<i>Mycena sp</i>	Bluff	2012
<i>Panaeolina foenisecii</i>	Bluff	2012
<i>Paxina costifera</i>	OG Dunes	2012
<i>Peziza austrogeaster</i>	OG Dunes/ Spit	2012
<i>Peziza vesiculosa</i>	OG Dunes	2012
<i>Phellinus sp</i>	Bluff	2012
<i>Pisolithus arhizus</i>	Bluff/ Estuary	2007
<i>Postia pelliculosa</i>	Bluff	2012
<i>Pycnoporus coccineus</i>	OG Dunes/ Bluff	2010
<i>Schizophyllum commune</i>	13 <sup>th</sup> Beach	2010
<i>Scleroderma sp.</i>	Bluff	2012
<i>Spinellis sp (Introduced)</i>	Estuary	2009
<i>Stereum rugosum</i>	OG Dunes	2009
<i>Suillus luteus</i>	Bluff	2011
<i>Trametes versicolor</i>	13 <sup>th</sup> Beach	2012
<i>Trichoglossum hirsutum</i>	OG Dunes	2010
<i>Tricholomopsis rutilans</i>	Bluff	2009
<i>Tulostoma sp</i>	Estuary	2010
<i>Underwoodia beatonii</i>	OG Dunes	2012
<i>Valvariella speciosa</i>	13 <sup>th</sup> Beach/ Bluff	2009

## 8.2 Lichens

The following are lists of the lichen records for the study area, including location by site and date of observation. This data was collected as a component of the Moonah Project.

### **Lichens of Coastal Moonah Woodlands**

Summer 2011, identification by Kathleen Ralston

#### **Ocean Grove, 8W, Quadrat 2**

*Flavoparmelia rutidota*  
*Parmotrema chinense*  
*Phycia jackii*  
*Phycia poncinsii*  
*Ramalina unilateralis*  
*Ramalina celastri* subsp. *ovalis*  
*Ramalina glaucescens*  
*Ramalina inflata*  
*Teloschistes chrysophthalmas*  
*Xanthoria parietina*

#### **Ocean Grove, 8W Quadrat 3**

*Ramalina glaucescens*  
*Teloschistes chrysophthalmas*  
*Xanthoria parietina*

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## Appendix 1 Conservation Significance

Conservation significance is assessed at a range of scales, including global, international, national, state, regional and local. Criteria used for determining the conservation significance of flora and fauna at national to local scales are presented below for botanical and zoological conservation significance.

### Botanical Significance

**National** botanical significance applies to an area when it supports one or more of the following attributes:

A population of at least one nationally threatened plant species listed by Briggs and Leigh (1996) or plant species listed on the schedules to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

A population of at least one nationally threatened plant species listed as endangered in Australia under International Union for Nature Conservation criteria (IUNC 2001).

A nationally threatened ecological community listed on the schedules of the *Environment Protection and Biodiversity Conservation Act 1999*.

**State** botanical significance applies to an area when it supports one or more of the following attributes:

A population of at least one plant species threatened in Victoria, as listed by Gullan et al. (1990), NRE (2000a) or more recently in the unpublished records of the Flora Information System (NRE), or on the schedules to the Victorian *Flora and Fauna Guarantee Act 1988*.

An ecological community considered threatened in Victoria through its listing on the schedules of the *Flora and Fauna Guarantee Act 1988*.

**Regional** botanical significance applies to an area that supports one or more of the following attributes:

Supports a population of one or more regionally depleted species defined in a valid regional assessment of biodiversity (eg. Regional Native Vegetation Plan, Environment Conservation Council Report or Comprehensive Regional Assessment documents).

An ecological vegetation class that is considered endangered or vulnerable in a particular bioregion (based on Conn 1993 and the Regional Native Vegetation Plan), in which case the area is of **High Regional** significance.

An ecological vegetation class that is considered depleted in a particular bioregion (based on Conn 1993 and the Regional Native Vegetation Plan), in which case it is of **Regional** significance.

**Local** botanical significance applies to all remnant native vegetation that does not meet the above criteria. In much of Victoria, native vegetation has been so depleted by past clearing and disturbance that all remaining vegetation must be considered to be of at least local conservation significance. This is considered to be the case within the Otway Plains bioregion EVC 858, which is considered to be 'Endangered' (DSE 2004). Endangered is defined as an EVC where 'less than 10% of pre-european extent remains' (DNRE 2002).