East Busselton Foreshore
City of Busselton
Flora and Vegetation Survey

Prepared for Accendo Australia

Plantecology CONSULTING

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Plantecology Consulting
ABN 18 849 210 133
50 New Cross Rd
Kingsley WA 6026
Telephone: 0429 061 094
shane@plantecology.com.au

Executive Summary

Plantecology Consulting was commissioned by Accendo Australia on behalf of the City of Busselton to undertake a reconnaissance flora and vegetation survey of vegetation n the foreshore of Geographe Bay at Geographe in the City of Busselton. The site is 3.35 ha in area. The survey was required as part of the City of Busselton's Coastal Sand Dune Resilience Works, which is part of the Storm Surge Risk Mitigation (SSRM) project.

A field survey of the site was undertaken by a botanist from Plantecology Consulting on the 7th November 2024. The site was traversed on foot and a detailed record of the vegetation was undertaken at six 100 m^2 sampling plots (10m x 10m quadrats), selected to adequately sample the flora within a stand. Plots were positioned to sample a representative and homogeneous area (i.e. not located in transitional areas between communities). The location of the NW corner of a plot was recorded with a hand-held GPS unit and a photograph of the plot taken looking inward to the quadrat. All vascular plant species were recorded and an estimate of the percentage cover was made for each species.

A total of 14 native and 20 non-native (exotic) taxa was recorded within the site, representing 16 families and 33 genera. The dominant families containing mostly native taxa were Myrtaceae (2 native taxa and one exotic taxon), Chenopodiaceae (2 native taxa and one exotic taxon) and Cyperaceae (2 native taxa).

One native plant association was identified within the site (Figures 6a-c):

Spinifex hirsutus - **Cynodon dactylon* - **Pelargonium capitatum* grassland (Plates 1:6)

Open grassland of *Spinifex hirsutus, *Pelargonium capitatum* and **Cynodon dactylon* with **Trachyandra divaricata* and *Carpobrotus virescens* on cream to grey sands.

The vegetation structure within the site is rated as being in 'Degraded' condition. The area is accessible to the public and is heavily trafficked. The area retains remnant populations of native taxa but most taxa present, including the most abundant, are exotics.

No Threatened or Priority Flora were recorded within the site, nor is the vegetation representative of any Threatened Ecological Communities. It is unlikely that any of the conservation significant flora identified in the database searches would occur in the primary coastal dune habitat.

The data analysis assigned the plots to either FCT S13 'Northern *Olearia axillaris*, *Scaevola crassifolia* shrublands' or FCT S14 '*Spinifex longifolius* grassland and low shrublands'. The *Spinifex hirsutus* grassland is most likely part of FCT 14 and the assignment to FCT S13 of Plots 1 and 3 is likely due to the presence of *Acacia cochlearis* in those plots. The site has been designed to avoid most shrubs and consists of grasslands and low shrublands with only occasional shrubs intersecting the site. Therefore, only one vegetation type has been described for the site, which is likely part of FCT S14.

None of the weed species recorded are Declared Plants.

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1 Introduction

Plantecology Consulting was commissioned by Accendo Australia on behalf of the City of Busselton to undertake a reconnaissance flora and vegetation survey of vegetation on the foreshore of Geographe Bay at Geographe in the City of Busselton (Figure 1). The site is 3.35 ha in area.

The survey was required as part of the City of Busselton's Coastal Sand Dune Resilience Works, which is part of the Storm Surge Risk Mitigation (SSRM) project.

1.1 Existing Environment

The site is located east of Busselton on the Swan Coastal Plain within the primary coastal dune zone of Geographe Bay, with residential areas to the south. The Geographe site is located approximately 2 km east of the centre of Busselton.

The site is fully accessible by the public and is dissected by beach access tracks and ad-hoc walk trails. The vegetation within the sites is quite disturbed with the understorey currently vegetated by a mix of native and exotic species. Being located on the primary coastal dunes, the sites are subject to the usual erosion and accretion processes of coastal beaches.

1.2 Climate

The Geographe Bay area experiences a dry Mediterranean climate of hot dry summers and cool wet winters. Long-term climatic averages indicate the site is located in an area of moderate to high rainfall, receiving 658 mm on average annually (data for Busselton Aero, station number 9603, the nearest currently reporting station; Bureau of Meteorology 2024) with the majority of rainfall received between May and August. The area experiences rainfall on an average of 83 days per year. Mean maximum temperatures range from 16.9 °C in July to 30.3 °C in January. Mean minimum temperatures range from 7.0 °C in July, to 14.7 °C in February.

1.3 Soils

The Atlas of Australian Soils maps the soils for the site as Map Unit A13, which are coastal dune formations backed by deposits of inlets and estuaries. The main soils are calcareous sands (Natural Resource Information Centre 1991). On a finer scale, Tille and Lantzke (1990) places the survey area within the Quindalup South Qf2 phase, which comprises relict foredunes and gently undulating plain with uniform calcareous sands. Either description is consistent with that observed within the survey sites.

1.4 Conservation Significant Flora

Under the Biodiversity Conservation Act 2016 ('BC Act'), the Minister for the Environment produces a gazetted list of Threatened Flora under three categories: Critically Endangered, Endangered and Vulnerable. The Department of Biodiversity, Conservation and Attractions (DBCA) also produces a list of Priority Flora that have not been assigned statutory protection under the BC Act but may be under some degree of threat (DBCA 2023a). The DBCA recognises four Priority Flora levels. The definitions for each category of Threatened and Priority Flora are shown in Appendix E.

As well as protection under State legislation, selected flora are also afforded statutory protection at a Federal level pursuant to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The EPBC Act provides for the protection of Threatened species, pursuant to Schedule 1 of the Act, and are defined as "Critically Endangered", "Endangered", "Vulnerable" or "Conservation Dependent" under Section 179. Definitions of these categories are shown in Appendix E. Any action

likely to have a significant impact on a species listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment.

The results for searches of the State databases (Reference Number: 56-0224) undertaken in 2024 for other sites on the foreshore of Geographe Bay (Plantecology Consulting 2024) also covered the current survey area. Those searches identified 82 conservation significant taxa with the potential to occur within the site (Table 1). Those records within approximately 10 km of the site are shown in Figure 2. Of the identified taxa, 19 are listed as Threatened under the BC Act, of which six are orchids. *Caladenia busselliana* (Bussell's Spider Orchid) occurs in winter-wet swamps and flowers from September to October. *Caladenia huegelii* (Grand Spider Orchid) occurs in low-lying grey or brown sands and clayey loams. It flowers between September and October. *Caladenia procera* (Carbanup King Spider Orchid) occurs in alluvial flats of clay loams beneath jarrah, marri and peppermint woodlands and flowers between September and October. *Caladenia viridescens* (Dunsborough Spider Orchid) occurs loams and grey sands of marri and peppermint woodlands and flowers from September to October. *Drakaea elastica* (Glossy-leafed Hammer Orchid) occurs in damp *Kunzea glabrescens* or banksia woodland. It flowers between September and October. *Drakaea micrantha* (Dwarf Hammer Orchid) occurs in white-grey sand and flowers from September to October.

The primary dune habitat within the sites is not suitable for any of the Threatened flora identified in the database searches.

1.5 Conservation Significant Communities

The DBCA defines an ecological community as "a naturally occurring assemblage that occurs in a particular type of habitat" (DBCA 2023b). A Threatened Ecological Community (TEC) is one that has declined in area or was originally limited in distribution. Uncommon ecological communities that do not strictly meet TEC defined criteria, or are inadequately defined, are listed by the DBCA as a Priority Ecological Community (PEC). Definitions of the categories of Threatened and Priority Ecological Communities are given in Appendix E.

As well as protection under State legislation, selected ecological communities are also afforded statutory protection at a Federal level pursuant to the EPBC Act. The EPBC Act provides for the protection of TECs, which are listed under section 181 of the Act, and are defined as "Critically Endangered", "Endangered" or "Vulnerable" under Section 182. Similar to flora listed under the EPBC Act, any action likely to have a significant impact on a TEC listed under the EPBC Act requires Commonwealth approval.

Five terrestrial TECs endorsed under State legislation are recorded as occurring within 25 km of the site:

- SCP10b – 'Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)', listed as Critically Endangered under State legislation and as Endangered pursuant to the EPBC Act;
- SCP 02 – 'Southern wet shrublands, Swan Coastal Plain', listed as Critically Endangered under State legislation;
- SCP 1b – '*Corymbia calophylla* woodlands on heavy soils of the southern SCP', listed as Endangered under State legislation;
- SCP 9 - Dense shrublands on clay flats', listed as Endangered under State legislation and Critically Endangered pursuant to the EPBC Act; and
- Swan Coastal Plain 7 – 'Herb rich saline shrublands in clay pans', listed as Endangered under State legislation and Critically Endangered pursuant to the EPBC Act.

Table 1: Threatened and Priority Flora potentially occurring within the survey area based on database searches. (VU = Vulnerable; EN = Endangered; CR = Critically Endangered; T = Threatened; 1 – 4 = Priority Flora Category)

Taxon	DBCA Ranking	EPBC Act Category	Flowering Period
Acacia flagelliformis	4		Jul-Sep
Acacia lateriticola var. Glabrous variant (B.R. Maslin 6765)	3		-
Acacia semitrullata	4		Jun-Aug
Amanita walpolei	2		-
Amperea micrantha	2		Sep-Oct
Andersonia barbata	2		Aug-Nov
Angianthus drummondii	3		Oct, Nov
Aponogeton hexatepalus	4		Aug-Sep
Austrostipa bronweniae	T		Oct-Nov
Banksia biterax	3		May, Jul-Oct
Banksia meisneri subsp. *ascendens*	4		Apr-Aug
Banksia nivea subsp. *uliginosa*	T	EN	Aug-Sep
Banksia squarrosa subsp. *argillacea*	T	VU	Jul-Aug
Blennospora doliiformis	3		Oct-Nov
Boronia capitata subsp. gracilis	3		Jun-Aug
Boronia tetragona	3		Oct-Dec
Caladenia busselliana	T	EN	Sep-Oct
Caladenia huegelii	T	EN	Aug-Oct
Caladenia procera	T	CR	Spe-Oct
Caladenia viridescens	T	EN	Sep-Oct
Calothamnus quadrifidus subsp. *teretifolius*	4		Sep_Dec
Calystegia sepium subsp. *roseata*	2		Oct-Dec
Cardamine paucijuga	2		Aug-Nov
Chamelaucium erythrochlorum	4		Nov-Feb
Chamelaucium roycei	T	VU	Aug - Nov
Chordifex gracilior	3		Sep-Oct
Chorizema carinatum	3		Oct-Nov
Cyanothamnus tenuis	4		-
Cyathochaeta teretifolia	3		-
Dampiera triloba	3		Aug-Dec
Daviesia elongata	T		Sep, Dec-Feb
Dillwynia sp. Capel (P.A. Jurjevich 1771)	3		Sept-Oct
Drakaea elastica	T	EN	Oct-Nov
Drakaea micrantha	T	VU	Sep-Oct
Drosera occidentalis	4		Oct-Dec
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	3		-
Eucalyptus rudis subsp. *cratyantha*	4		-
Franklandia triaristata	4		Aug-Oct
Gastrolobium argyrotrichum	T	CR	Dec
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	1		Oct
Grevillea brachystylis subsp. *brachystylis*	3		Aug-Nov
Grevillea bronweniae	3		-

Taxon	DBCA Ranking	EPBC Act Category	Flowering Period
Grevillea manglesioides subsp. *ferricola*	3		Jul-Dec
Hakea oldfieldii	3		Sep
Isopogon formosus subsp. *dasylepis*	3		Jun, Sep-Dec
Jacksonia gracillima	3		Oct-Nov
Johnsonia inconspicua	3		Nov
Lambertia echinata subsp. *occidentalis*	T	EN	Oct-Dec
Lambertia orbifolia subsp. *vespera*	T		Jan-Dec
Lasiopetalum laxiflorum	3		Oct-Nov
Lasiopetalum membranaceum	3		Oct-Nov
Leptomeria furtiva	2		Jan, Aug-Oct
Lepyrodia extensa	2		-
Lepyrodia heleocharoides	3		Dec
Leucopogon sp. Busselton (D. Cooper 243)	2		Aug-Sep
Loxocarya magna	3		-
Meionectes tenuifolia	3		Nov-Dec
Montia australasica	2		Oct-Nov
Morelotia australiensis	T	VU	Dec
Myriophyllum echinatum	3		Oct-Nov
Netrostylis sp. Blackwood River (A.R. Annels 3043)	3		-
Olearia strigosa	3		Dec - May
Ornduffia submersa	4		Sep-Oct
Pimelea ciliata subsp. *longituba*	3		Sep-Nov
Puccinellia vassica	1		Nov
Pultenaea pinifolia	3		Oct
Schoenus benthamii	3		Oct-Nov
Schoenus natans	4		Aug-Nov
Schoenus pennisetis	3		Aug-Sep
Schoenus sp. Jindong (R.D. Royce 2485)	1		Oct-Nov
Stachystemon exilis	1		Oct-Nov
Stylidium leeuwinense	4		Feb-May
Stylidium longitubum	4		Nov
Stylidium roseonanum	3		Oct
Synaphea hians	3		Sep-Oct
Synaphea petiolaris subsp. *simplex*	3		Sep-Oct
Thysanotus glaucus	4		Nov-Feb
Verticordia attenuata	3		Jan
Verticordia densiflora var. *pedunculata*	T	EN	Dec
Verticordia lehmannii	4		Oct
Verticordia plumosa var. *ananeotes*	T	EN	Dec
Verticordia plumosa var. *vassensis*	T	EN	Oct

Nine other terrestrial FCTs listed as PECs are recorded as occurring within 25 km of the site:

- '*Eucalyptus cornuta, Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone'
- '*Eucalyptus patens, Corymbia calophylla, Agonis flexuosa* Closed Low Forest' (Priority 1)
- '*Eucalyptus rudis* (flooded gum), *Corymbia calophylla, Agonis flexuosa* Closed Low Forest (near Busselton)' (Priority 1);
- 'Swan Coastal Plain Paluslope Wetlands' (Priority 1);
- SCP 30b - 'Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands' (Priority 3);
- SCP 21b 'Southern *Banksia attenuata* woodlands' (Priority 3);
- 'Subtropical and Temperate Coastal Saltmarsh' (Priority 3);
- 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the SCP' (Priority 3); and
- 'Banksia dominated woodlands of the Swan Coastal Plain IBRA Region' (Priority 3).

The 'Banksia-dominated woodlands of the Swan Coastal Plain IBRA Region' and 'Southern *Banksia attenuata* woodlands' are listed as 'Endangered' by the Commonwealth under the EPBC Act. The 'Subtropical and Temperate Coastal Saltmarsh' is listed as Vulnerable by the Commonwealth, while the 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the SCP' is listed as Critically Endangered.

The sites are not situated within the buffer zones of any of the known occurrences of TECs or PECs (Figure 3).

1.6 Vegetation Complexes

Vegetation complexes are a series of plant communities forming a regularly repeating pattern associated with a particular soil unit (Government of Western Australia 2000). The vegetation complex mapped as occurring within the site is the Quindalup Complex, which has approximately 60.6% of its original 58 780 ha pre-European extent remaining, and 8.38% of its original extent occurs on lands with some level of protection (Government of Western Australia 2017).

1.7 Geomorphic Wetlands

Hill et al. (1996) has mapped all wetlands of the Swan Coastal Plain using the classification system of Semeniuk (1987). This classification system is based on the geomorphic setting and hydrological processes associated with a wetland. The classification allocates individual wetlands with shared characteristics to wetland suites. Table 2 below indicates the wetland types and their geomorphic setting.

Table2: Geomorphic Wetland Classification, adapted from Semeniuk (1987)

	Basin	Flat	Channel	Slope
Permanently inundated	Lake	River		
Seasonally inundated	Sumpland	Floodplain	Creek	
Seasonally waterlogged	Dampland	Palusplain		Paluslope

The Hill et al. (1996) wetland mapping was digitised by the Department of Biodiversity, Conservation and Attractions (DBCA) to create the Geomorphic Wetland Swan Coastal Plain dataset (the dataset), which is managed and maintained by the DBCA. Each classified wetland listed in the dataset has a

Unique Feature Identifier (UFI), however in the case of many large wetlands that have sustained a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values. The description and management objectives of each management category are listed in Table 3. The wetland management category is important as it categorises wetlands on their significance, based on hydrological, biological and human use features. This dynamic dataset is continually updated with site-specific wetland surveys providing new and relevant information.

The Geomorphic Wetlands of the Swan Coastal Plain (GWSCP) dataset indicates that there are no wetlands occurring within the site (Figure 4).

Table 3: Wetland Management Categories and Objectives (Western Australian Planning Commission 2005)

Management Category	Description of Wetland	Management Objectives
Conservation Category Wetland (CCW)	Wetlands that support high levels of attributes and functions.	To preserve wetland attributes and functions through reservation in national parks, crown reserves, state owned land and protection under environmental protection policies.
Resource Enhancement Wetland (REW)	Wetlands that have been partly modified but still support substantial functions and attributes.	To restore wetlands through maintenance and enhancement of wetland functions and attributes by protection in crown reserves, state or local government owned land and by environmental protection policies, or in private property by sustainable management.
Multiple Use Wetland (MUW)	Wetlands with few attributes, which still provide important wetland functions.	Use, development and management should be considered in the context of water, town and environmental planning through landcare.

1.8 Environmentally Sensitive Areas

Environmentally sensitive areas (ESAs) are classes or areas of native vegetation where the exemptions for clearing vegetation under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations) do not apply. ESAs may include World Heritage Areas, National Parks (including a 50 m buffer), and the known occurrences of Threatened Flora and Ecological Communities (also with a 50 m buffer). The ESAs within the local area are associated with wetlands of the Vasse Estuary and geomorphic wetlands categorised as CCW, none of which are mapped as occurring within either site (Figure 4).

1.9 Regional Ecological Linkages

Ecological linkages are important conservation tools that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improves the viability of those remnants by allowing greater access to breeding partners, food sources, refuge from disturbances such as fire and maintains the genetic diversity of plant communities and populations (Molloy *et al.* 2009).

The remnant vegetation within the site is not adjacent to a regional axis line and has not been assigned a proximity value in the SW Regional Ecological Linkage report (Figure 5).

1.10 Purpose

The purpose of the survey was to assess the botanical values within the sites by:

- Undertaking a reconnaissance flora and vegetation survey in accordance with the Environmental Protection Authority's (EPA) Technical Guidance: Flora and Vegetation Survey for Environmental Impact Assessment (2016).
- Identifying the presence of any Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs);
- Undertaking a systematic search for all vascular plant taxa present; and
- Recording the locations and numbers present of any Threatened Flora and Priority Flora identified at the time of the field survey.

2 Methods

2.1 Field Survey

A field survey of the site was undertaken by a botanist from Plantecology Consulting on the 7th November 2024. The site was traversed on foot and a detailed record of the vegetation was undertaken at six 100 m^2 sampling plots (10m x 10m quadrats), selected to adequately sample the flora within a stand (Figure 6a-c). Plots were positioned to sample a representative and homogeneous area (i.e. not located in transitional areas between communities). The location of the NW corner of a plot was recorded with a hand-held GPS unit and a photograph of the plot taken looking inward to the quadrat. All vascular plant species were recorded and an estimate of the percentage cover was made for each species.

Environmental data recorded included topographic position, aspect, slope, soil colour and texture class, rock outcropping, litter cover as well as the degree of disturbance and an estimate of the time since the last fire event. The condition of the vegetation of the site was assessed to assist in determining the conservation values of the site. The vegetation condition was rated according to Keighery (1994), a vegetation condition scale commonly used in the metropolitan and southwest regions. The categories are listed and defined in Table 4. Data on the vegetation structure was also recorded and included the height of the three main strata and the dominant species within each stratum. The vegetation structural description follows that of the National Vegetation Information System (Thackway et al. 2006).

Table 4: Vegetation Condition Scale (Keighery 1994)

Vegetation Condition	Definition
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

All plant specimens collected during the field survey were dried, pressed and then sorted in accordance with requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Taxonomic determinations were made using reference material at the Western Australian State Herbarium. Taxa names utilise the current terminologies from the Western Australian Herbarium

(1998-). Family names utilise the revised phylogeny of the Angiosperm Phylogeny Group - APGIII Western Australian Herbarium (1998-).

2.2 Data Analysis

To place the vegetation of the site in a regional context and determine its conservation significance, the plot data was analysed against the dataset of Keighery et al. (2012). This dataset was preferred as the Gibson et al. (1994) survey did not survey the foredunes. The Keighery et al. (2012) dataset is a compilation of data from a number of floristic studies and extended the Gibson et al. (1994) dataset. The composite dataset used in this analysis was that curated on the NatureMap website as of 2015.

The species nomenclature of the datasets was updated to be consistent with current usage. Where original names could not be matched clearly to the updated usage, those taxa were removed from the analysis. Infraspecies ranks were raised to species level when no matching rank had been used in the original datasets. Taxa that could not be identified to species level were removed.

The floristic data from the sites was transformed to presence/absence and was added to the matrix one plot a time to remove any effect of spatial correlation between the new plots. The new data from the current survey was added to the Keighery et al. (2012) dataset and the new dataset was then analysed calculating the Bray-Curtis distance coefficient (or resemblance measure) and the flexible beta linkage method (beta = -0.1). Assignment of the Geographe plots was to the nearest distinct group by inspection of the resulting dendrogram. All analyses were undertaken using R packages cluster (Maechler et al. 2022), Vegclust (De Cáceres et al. 2010), labdsv (Roberts 2019) and Vegan (Oksanen et al. 2020).

The nearest neighbour assignment method was also applied. This approach uses the minimum Bray-Curtis distance between a new plot and a plot from the original dataset. The comparison of individual samples is seldom useful as new plots are rarely similar to diagnostic plots from the original FCT classification. More often, the nearest neighbour is a fringe member of a FCT and may not be a 'near' neighbour, which regularly leads to misclassifications. Assignments to the nearest group (as in the clustering methods described above) are more robust.

2.3 Survey Limitations

Various factors can limit the effectiveness of a vegetation survey. Pursuant to EPA Technical Guidance: Flora and Vegetation Survey for Environmental Impact Assessment (EPA 2016), these factors have been identified and their potential impact on the effectiveness of the survey has been assessed (Table 5).

The survey was undertaken in November 2024 and would likely have intercepted the flowering period of many of the taxa of conservation concern with the potential to occur within the site, in particular the Threatened annual and geophytic taxa. The maximum temperatures over the preceding spring and summer period were approximately 1°C above average. Rainfall during the same period varied significantly from average, with 223 mm recorded in month of August, which was twice the long-term average. Rainfall in September was, however, was only 21 mm, which was over 50mm below average. Such variance in the rainfall may have had some effects on the phenology of the plant species within the site.

Table 5: Potential limitations affecting the vegetation survey.

Potential limitations	Constraint	Comment
Availability of contextual information	No	Sufficient regional and local information was available to place the survey site in its environmental context.
Competency and experience of the botanists	No	The survey was undertaken by botanists with a comprehensive knowledge of South West vegetation, with at least 20 years' experience in vegetation surveys in Western Australia.
Seasonality	Moderate	The rainfall over the 3 month period prior to the survey varied greatly from average. Maximum temperatures were around 1°C above average.
Adequate coverage and intensity of survey	No	The survey area was traversed on foot. It is considered the survey quadrats and mapping points provided adequate coverage of the site.
Proportion of Flora identified	No	As the survey area is small, it is estimated the majority of taxa present within the site at the time of the survey were observable.
Disturbance	Yes	The vegetation is accessible to the public and is highly trafficked, with past disturbance apparent from the presence of weeds.
Resources	No	Adequate resources were available to conduct the survey.
Access restrictions	No	All parts of the site were accessible.

3 Results

3.1 Flora

3.1.1 Floristic Summary

A total of 14 native and 20 non-native (exotic) taxa was recorded within the site, representing 16 families and 33 genera. The dominant families containing mostly native taxa were Myrtaceae (2 native taxa and one exotic taxon), Chenopodiaceae (2 native taxa and one exotic taxon) and Cyperaceae (2 native taxa). For a complete species list and the individual site data refer to Appendix A and Appendix B, respectively.

3.1.2 Conservation Significant Flora

No Threatened or Priority Flora pursuant to either the Biodiversity Conservation Act (2016) or the EPBC Act (1999) were recorded during the survey.

3.2 Vegetation

3.2.3 Plant Associations

One native plant association was identified within the site (Figures 6a-c):

*Spinifex hirsutus - *Cynodon dactylon - *Pelargonium capitatum* grassland (Plates 1:6)

Open grassland of *Spinifex hirsutus, *Pelargonium capitatum* and **Cynodon dactylon* with **Trachyandra divaricata* and *Carpobrotus virescens* on cream to grey sands.

This association occupies the most of the of the foredunes.

The site is also traversed by beach access tracks and ad-hoc paths. The site has been designed to avoid most of the shrubs that occupy the more consolidated dunes behind the foredunes. Individual shrubs of species such as *Acacia cochlearis, Scaevola crassifolia* and *Atriplex cinerea* were observed sporadically within or overhanging the site.

3.2.4 Vegetation Condition

The vegetation condition of the *Spinifex hirsutus* grassland is rated as 'Degraded'. The understorey in the 'Degraded' areas is dominated by exotic taxa such as **Pelargonium capitatum, *Cynodon dactylon, *Lagurus ovatus, *Trachyandra divaricata, *Tetragonia decumbens, *Ammophila arenaria* and **Cakile maritima.* Most of the taxa recorded within the site are exotics, and were also the most common and abundant. The tracks and beach areas of bare sand are rated as 'Completely Degraded'.

3.2.5 Conservation Significant Communities

The results of the cluster analysis were assigned most sites to a group from FCT S13 'Northern *Olearia axillaris*, *Scaevola crassifolia* shrublands' and FCT S14 '*Spinifex longifolius* grassland and low shrublands' (Figure 8). Plots 1 and 3 fused with a group consisting mostly of FCT S13 plots, while the remaining plots fused with FCT S14. Plots 1 and 3 lie mostly within the foredune grassland with shrubs of *Acacia cochlearis* also present. In an analysis that uses presence/absence data, this appears sufficient to alter the FCT assignment.

The cross tabulation of the Bray Curtis dissimilarities between the Swan Coastal Plain and the East Busselton plots is shown on Table 6, with most plots assigned to FCT S14. Most plot's nearest neighbour was TR02, which is a member of FCT S14. Only Plot 1 had a nearest neighbour from FCT S13.

Neither FCT S13 nor FCT S14 are listed as communities of conservation concern.

Table 6: Bray Curtis dissimilarity values for East Busselton Foreshore Plots and the closest Swan Coastal Plain plots (Keighery et al. (2012))

Swan Coastal Plain Plot (FCT)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
SW02-S13	0.579		0.6	0.647	0.647	
TR02-S14	0.6	0.619	0.556	0.565	0.524	
SW03-S13	0.636		0.6	0.586	0.586	
SW04-S13	0.636		0.6	0.655	0.655	0.778
MI12-S13	0.676	0.758	0.59			
TR03-S13	0.714					
MI14-S14		0.667				
MI15-S14		0.684				
MI11-S13		0.692	0.625	0.615	0.615	
MI16-S14		0.7		0.6	0.6	
SW01-S14						0.636
MI10-S14						0.75
MI13-S14						0.75
SANDON-1-16						0.789
PRES-1-29a						0.8
Minimum dissimilarity	**0.579**	**0.619**	**0.556**	**0.565**	**0.524**	**0.636**

3.3 Weeds

Twenty of the taxa recorded during the survey are exotics (weeds). None are Declared Pests under the Biosecurity and Agriculture Management Act 2007, with restrictions on their sale or movement.

4 Discussion

The vegetation structure within the site is rated as being in 'Degraded' condition. The area is accessible to the public and is heavily trafficked. The area retains remnant populations of native taxa but most taxa present, including the most abundant, are exotics.

No Threatened or Priority Flora were recorded within the site, nor is the vegetation representative of any Threatened Ecological Communities. It is unlikely that any of the conservation significant flora identified in the database searches would occur in the primary coastal dune habitat.

The data analysis assigned the plots to either FCT S13 'Northern *Olearia axillaris*, *Scaevola crassifolia* shrublands' or FCT S14 '*Spinifex longifolius* grassland and low shrublands'. The *Spinifex hirsutus* grassland is most likely part of FCT 14 and the assignment to FCT S13 of Plots 1 and 3 is likely due to the presence of *Acacia cochlearis* in those plots. The site has been designed to avoid most shrubs and consists of grasslands and low shrublands with only occasional shrubs intersecting the site. Therefore, only one vegetation type has been described for the site, which is likely part of FCT S14.

The Quindalup Dunes were under sampled in the Gibson et al. (1994) survey of the Swan Coastal Plain (Webb et al. 2009), and FCTs S13 and S14 have been described from the Perth Metropolitan Area. Coastal dune habitats in southwestern Australia support a similar range of flora and it is likely that the assignments to FCTs S13 and S14 are valid. Neither FCT is considered to be of conservation significance.

The vegetation within the site is not part of a regional ecological linkage.

5 Summary

The dune vegetation within the site is rated as being in either 'Degraded', with a significant presence of exotic (weed) taxa and continual anthropogenic disturbances. No conservation significant flora or communities were identified within either of the sites. None of the weed species recorded are Declared Plants.

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Figures

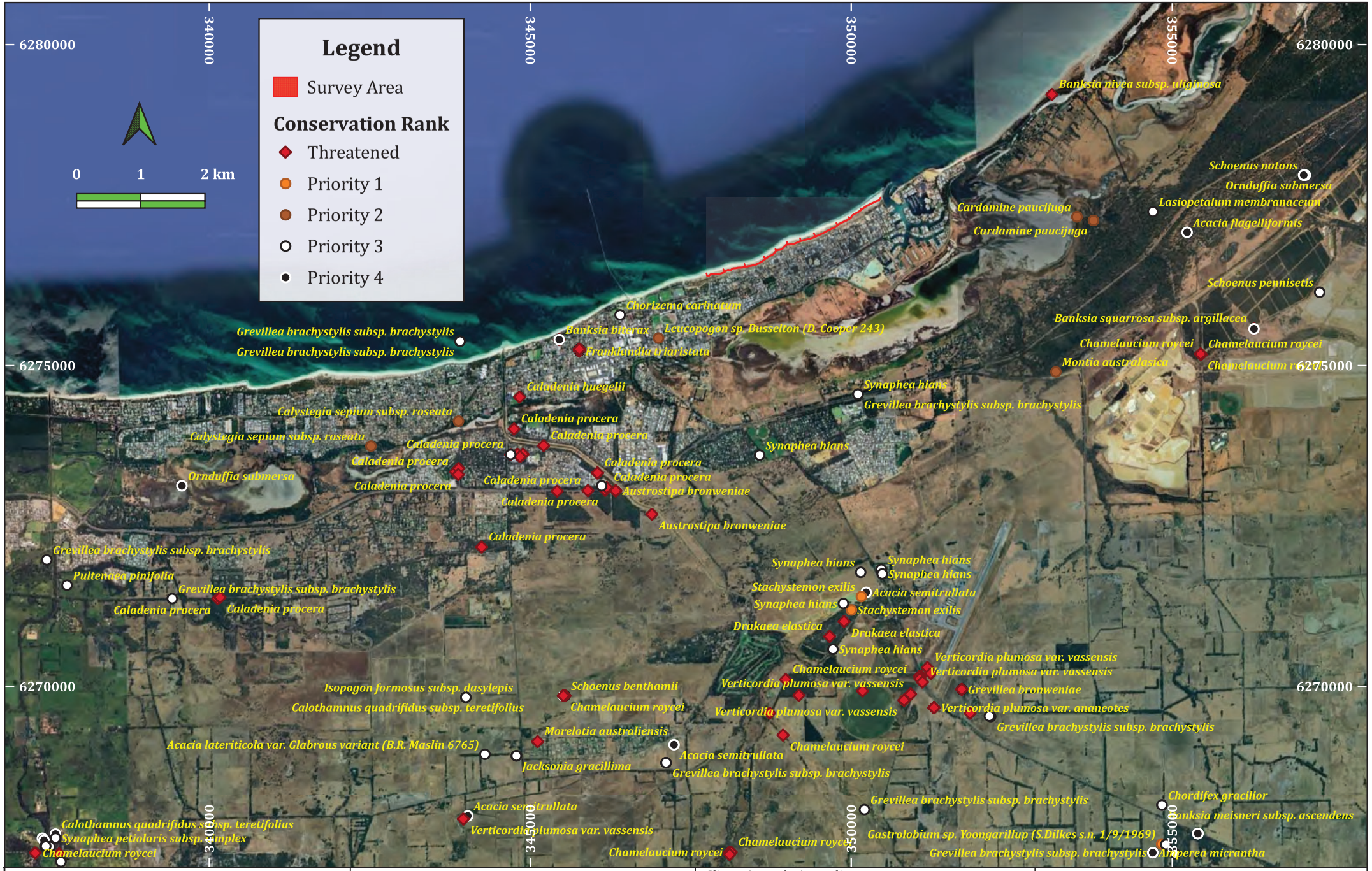
Plantecology CONSULTING

50 New Cross Rd Kingsley WA 6026

Scale: 1: 25 000
Basemap Source: Google Satellite Hybrid
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Bussleton Foreshore, City of Busselton
Author: S.T.S. Chalwell
Drawn: S.T.S. Chalwell

Figure 1: Locality Plan



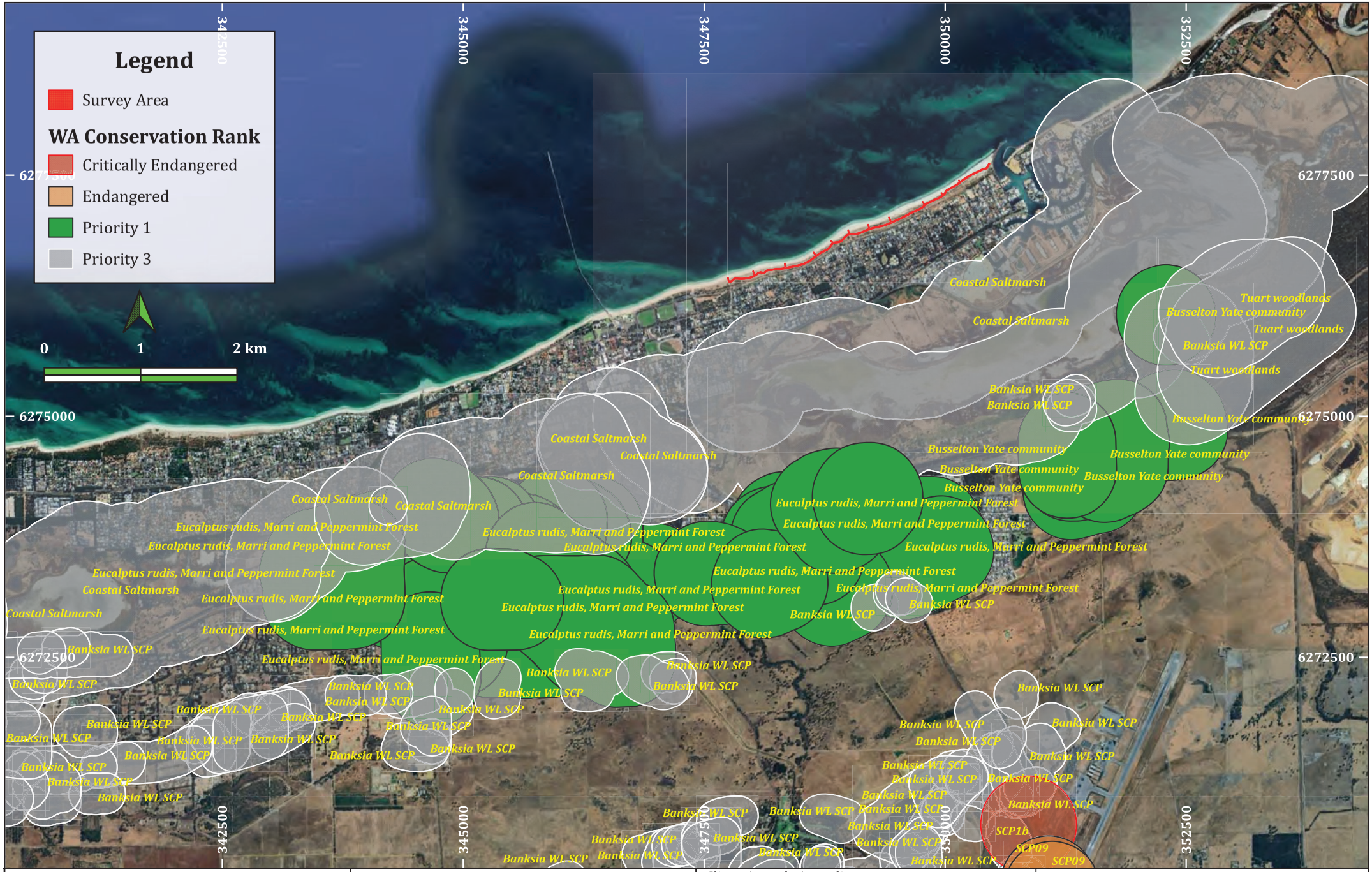
Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 75 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 2: Conservation Flora



Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 50 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 3: Conservation Communities

Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 50 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 4: Swan Coastal Plain Geomorphic Wetlands

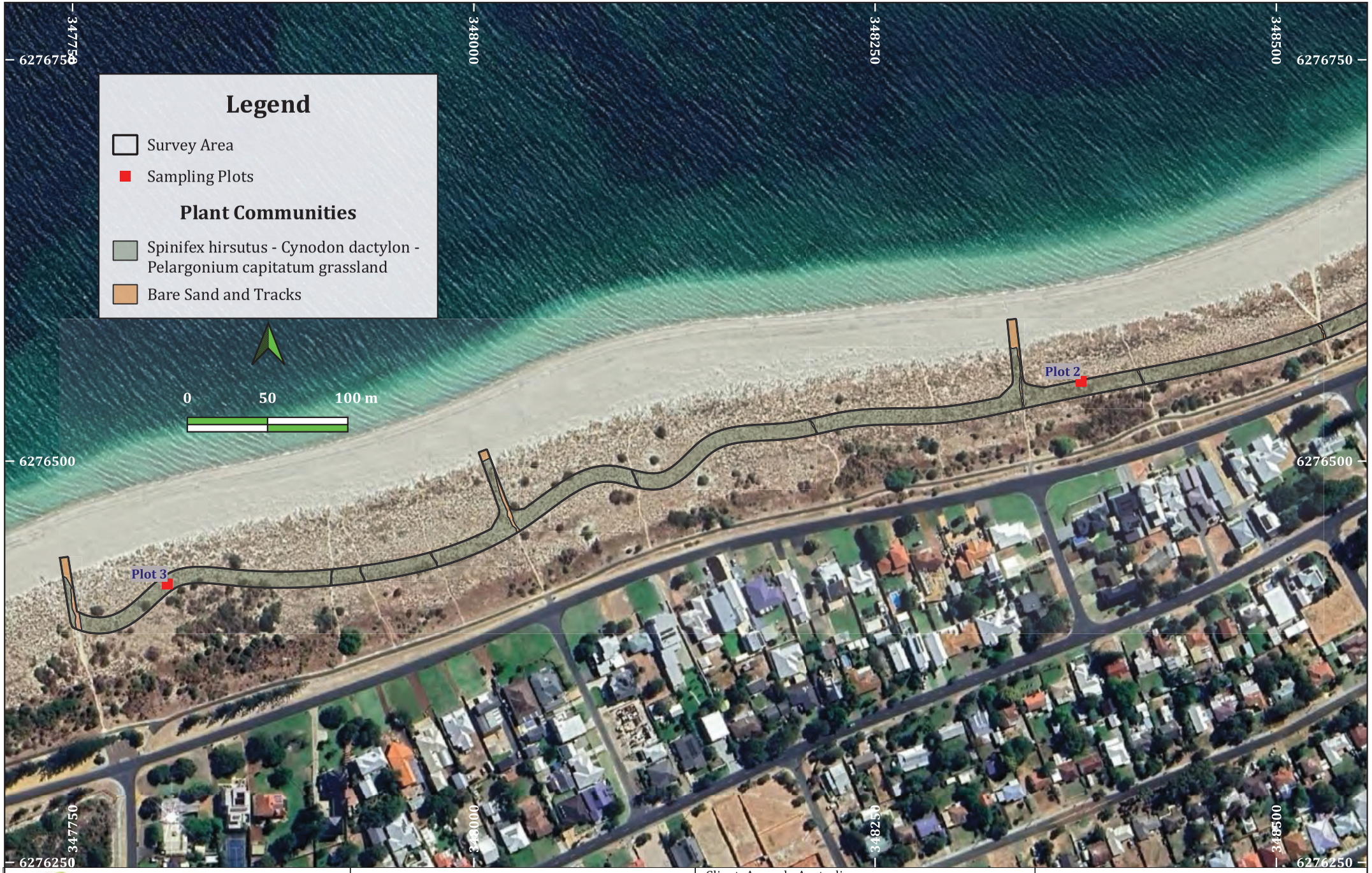
Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 50 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 5: Regional Ecological Linkages



Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 3 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 6a: Plant Communities (West Survey Area)

Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 3 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 6b: Plant Communities (Central Survey Area)

Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 4 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 6c: Plant Communities (East Survey Area)

Plantecology CONSULTING

NO Rew Cross Kd
Wingsley 6 A 3023

Scale: 1: 5 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG78NO

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 7a: Vegetation Condition (West Survey Area)

Plantecology CONSULTING

N0 Rew Cross Kd
Wingsley 6 A 3023

Scale: 1: 5 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG78N0

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 7b: Vegetation Condition (Central Survey Area)

Plantecology CONSULTING

50 New Cross Rd
Kingsley WA 6026

Scale: 1: 4 000
Basemap Source: Google Satellite
Datum: GDA2020
Projection: EPSG7850

Client: Accendo Australia
Project: East Busselton Storm Surge Mitigation Flora Survey
Location: East Busselton Foreshore, City of Busselton
Author: S.T.S. Chalwell

Figure 7c: Vegetation Condition (East Survey Area)

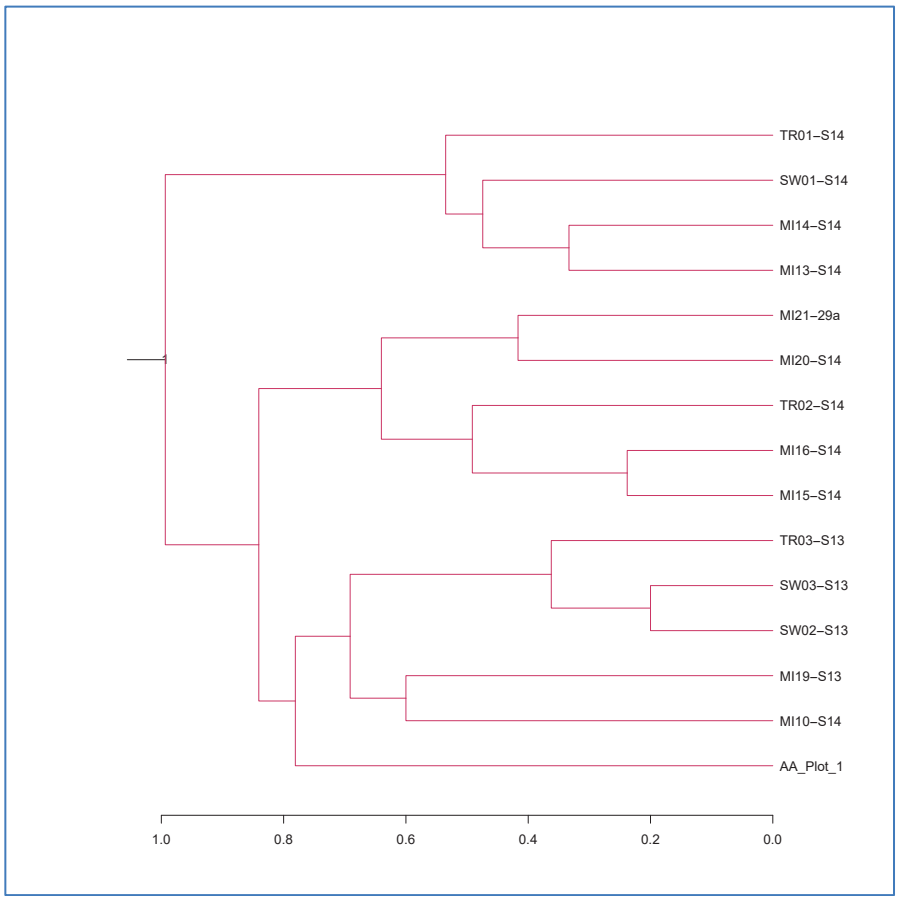


Figure 8a: Partial dendrogram of the assignment of Plot 1 to the Swan Coastal Plain floristic community types.

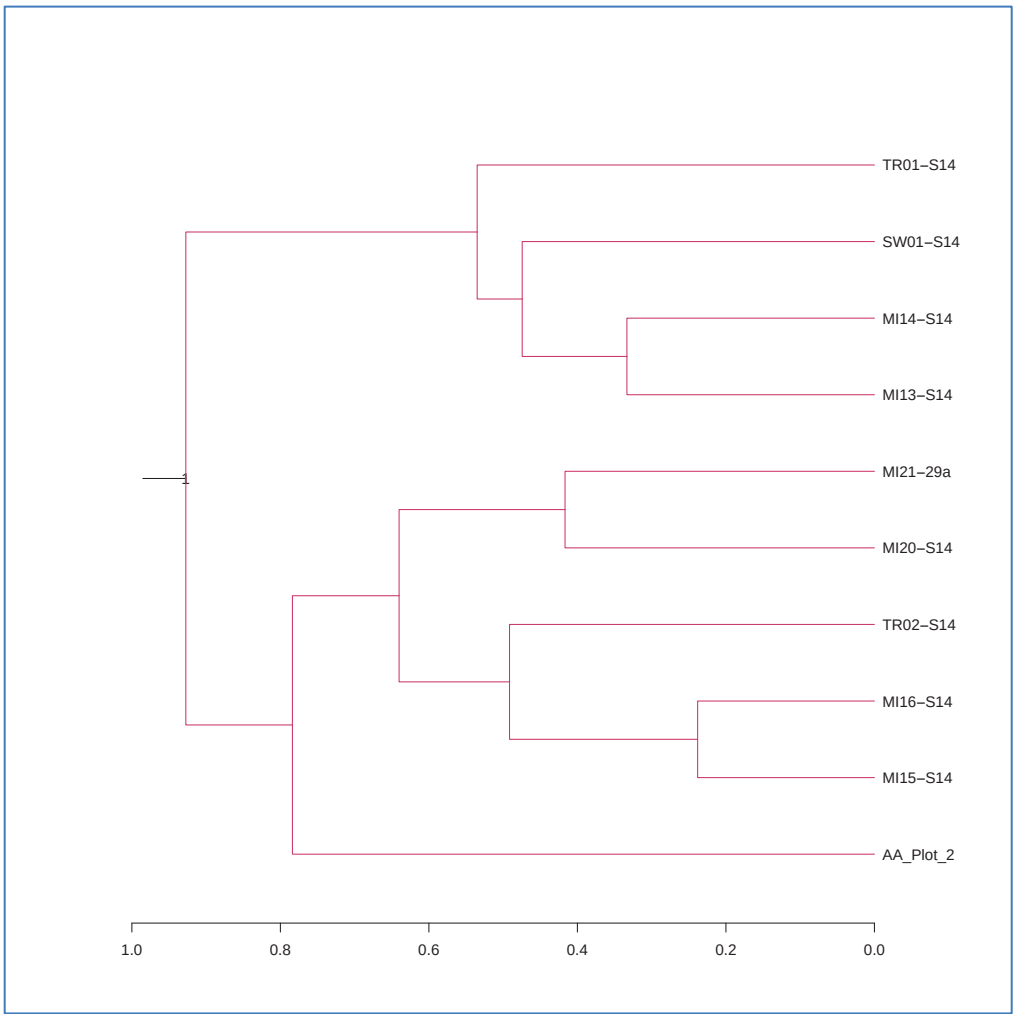


Figure 8b: Partial dendrogram of the assignment of Plot 2 to the Swan Coastal Plain floristic community types.

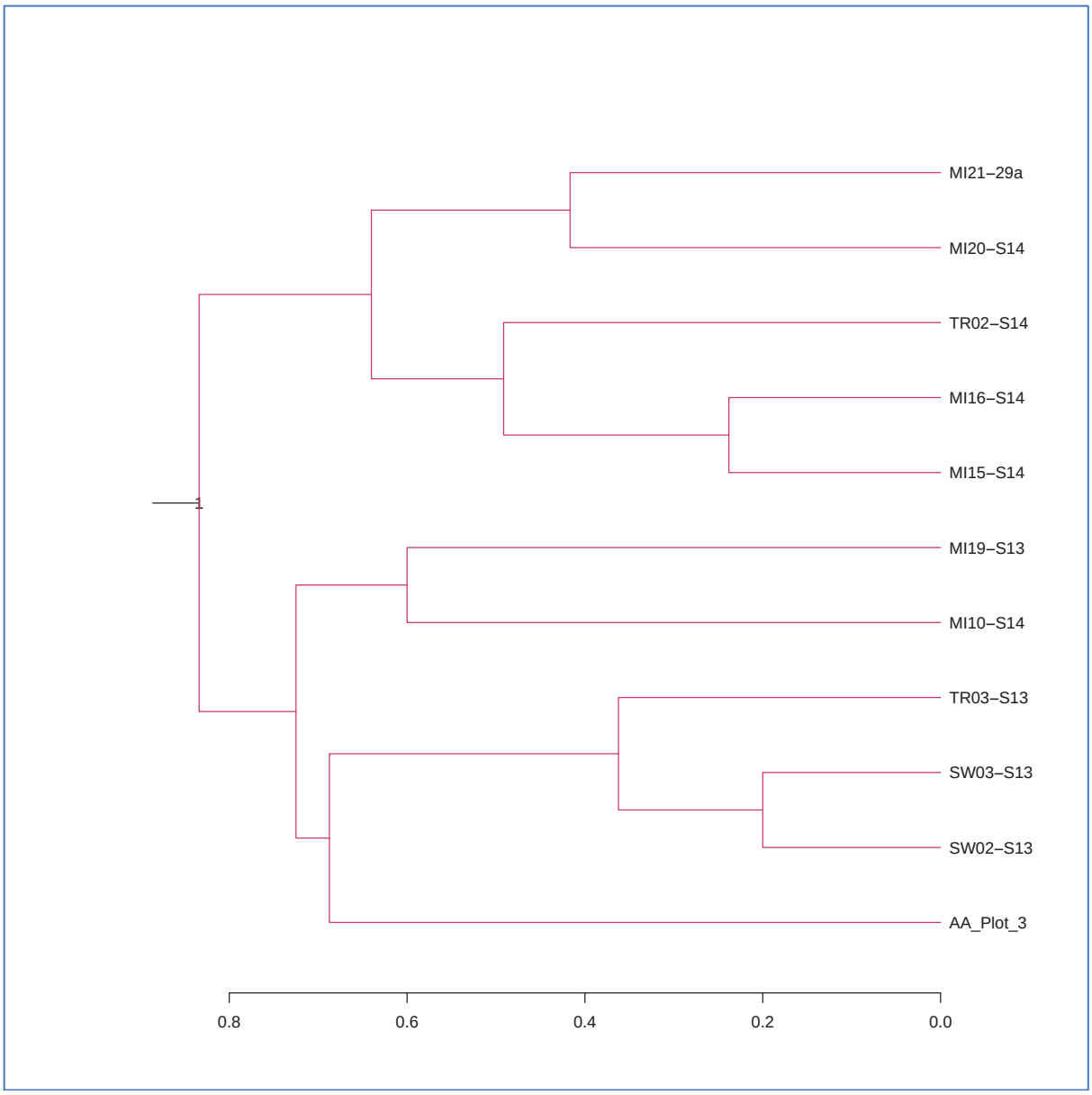


Figure 8c: Partial dendrogram of the assignment of Plot 3 to the Swan Coastal Plain floristic community types.

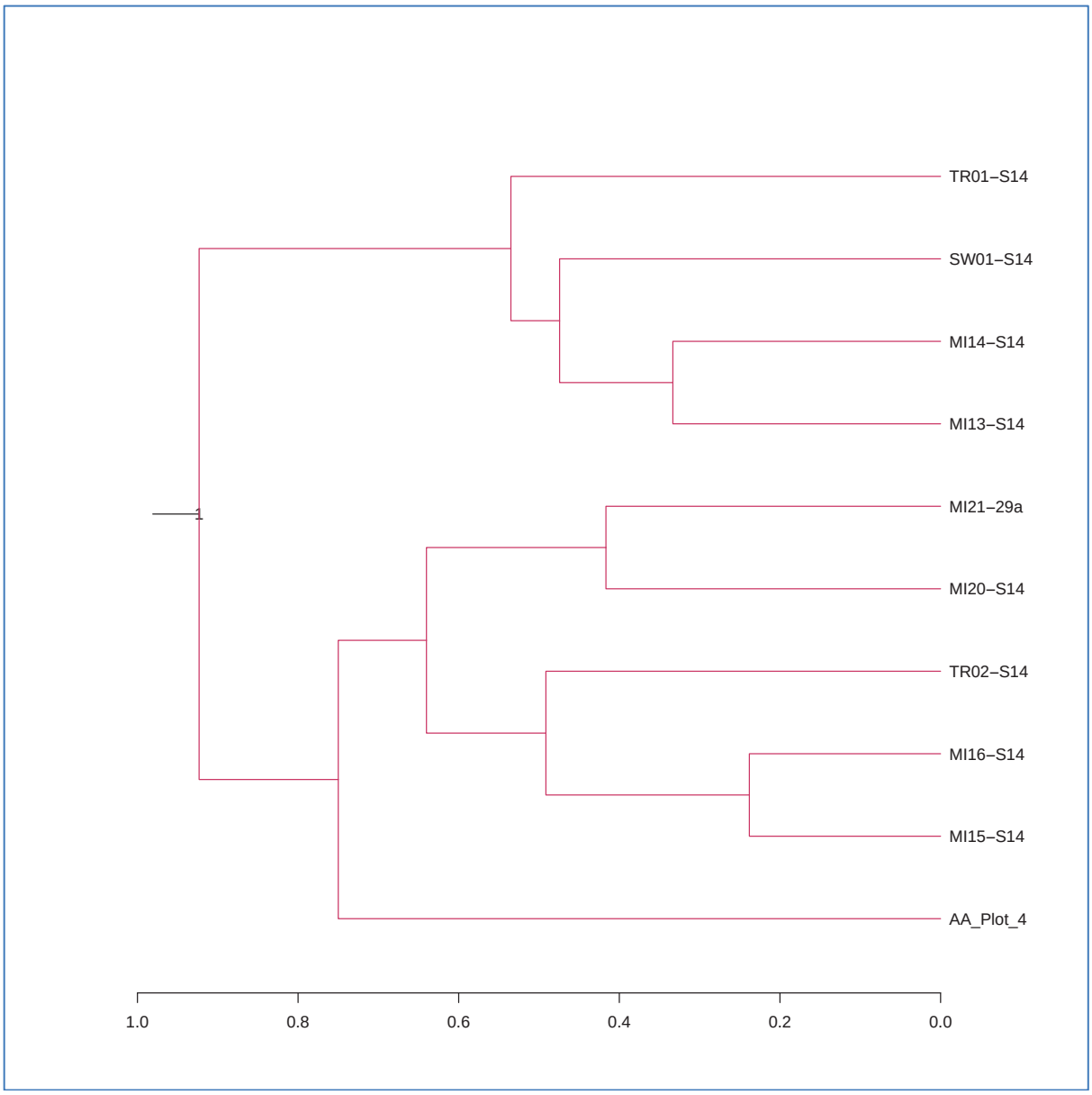


Figure 8d: Partial dendrogram of the assignment of Plot 4 to the Swan Coastal Plain floristic community types.

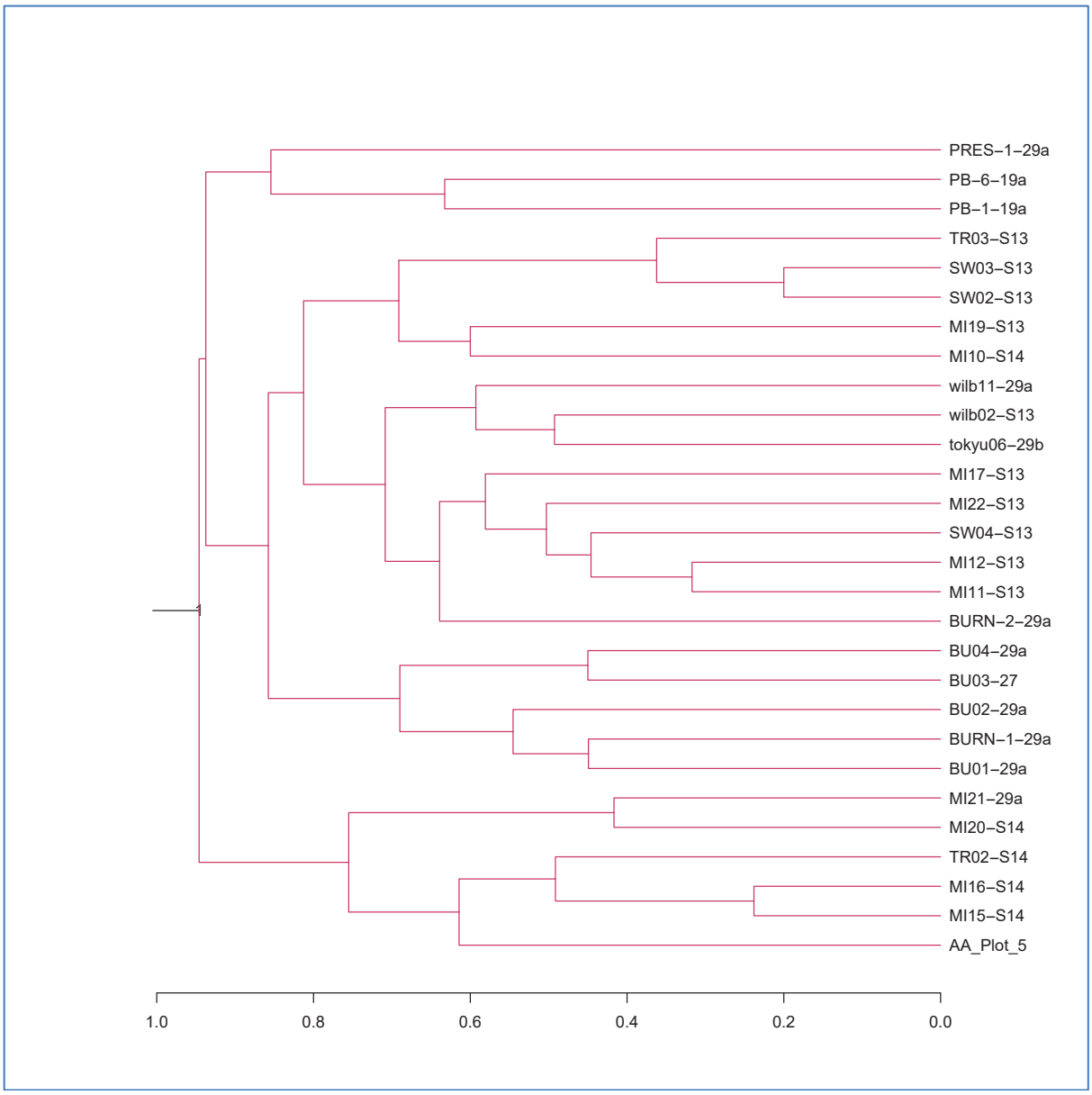


Figure 8e: Partial dendrogram of the assignment of Plot 5 to the Swan Coastal Plain floristic community types.

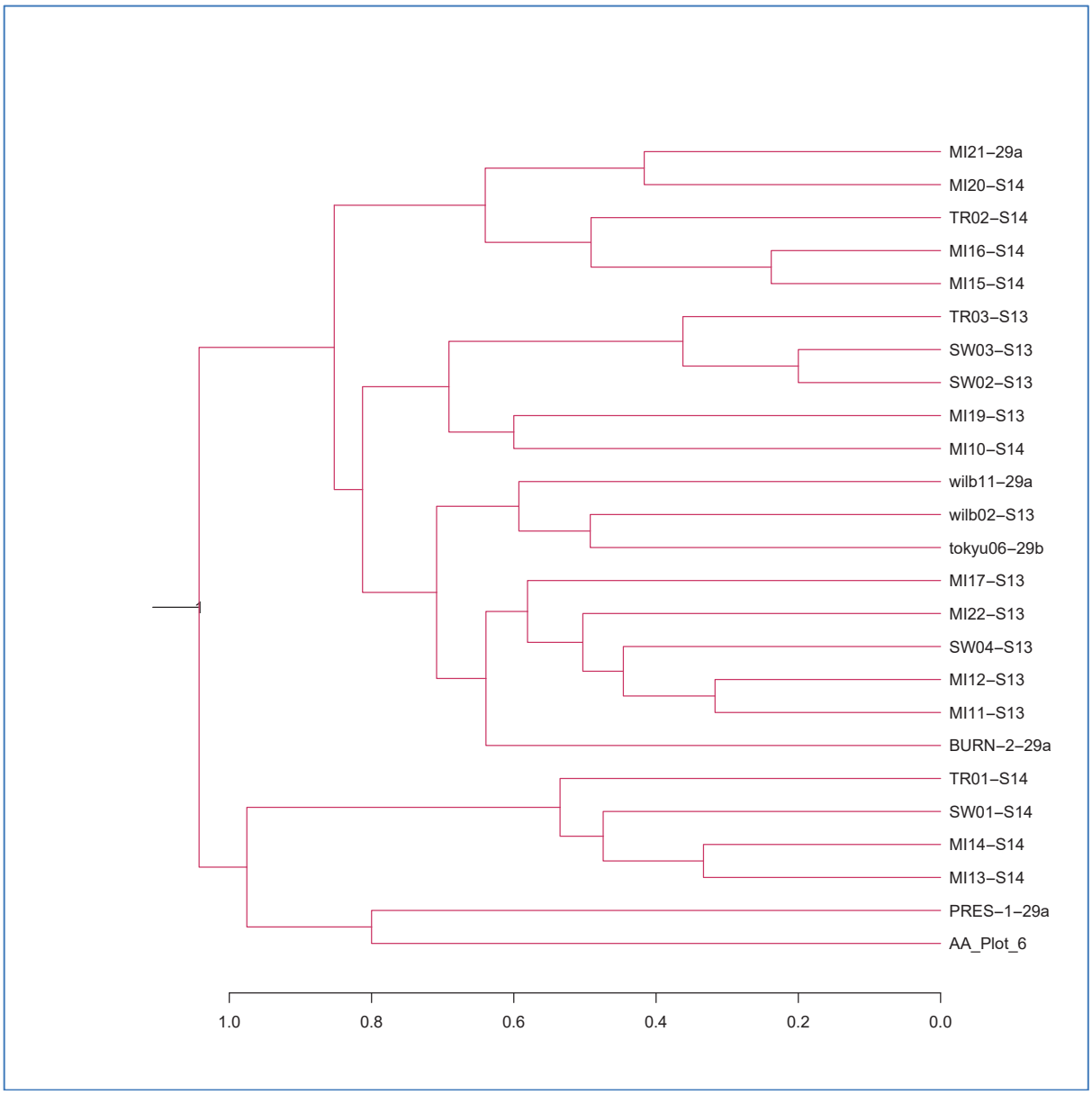


Figure 8f: Partial dendrogram of the assignment of Plot 6 to the Swan Coastal Plain floristic community types.

Plates

Plate 1: View of sampling Plot 1 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Plate 2: View of sampling Plot 2 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Plate 3: View of sampling Plot 3 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Plate 4: View of sampling Plot 4 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Plate 5: View of sampling Plot 5 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Plate 6: View of sampling Plot 6 *Spinifex hirsutus-*Cynodon dactylon-*Pelargonium capitatum* grassland in 'Degraded' condition.

Appendix A

List of flora recorded within the survey area, including opportunistically observed taxa.

NB: * indicates introduced flora

Family	Taxon
Asparagaceae	*Acanthocarpus preissii*
Asphodelaceae	* *Trachyandra divaricata*
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*
Cyperaceae	*Ficinia nodosa* *Lepidosperma gladiatum*
Poaceae	* *Ammophila arenaria* * *Avena fatua* * *Bromus diandrus* * *Cynodon dactylon* * *Lagurus ovatus* * *Lolium rigidum* *Spinifex hirsutus* * *Vulpia myuros*
Crassulaceae	* *Crassula glomerata*
Fabaceae	*Acacia cochlearis*
Rhamnaceae	*Spyridium globulosum*
Euphorbiaceae	* *Euphorbia paralias*
Geraniaceae	* *Pelargonium capitatum*
Myrtaceae	*Agonis flexuosa* * *Leptospermum laevigatum* *Melaleuca lanceolata*
Brassicaceae	* *Cakile maritima*
Chenopodiaceae	*Atriplex cinerea* * *Atriplex prostrata* *Rhagodia baccata* subsp. *baccata*
Aizoaceae	*Carpobrotus virescens* * *Tetragonia decumbens*
Goodeniaceae	*Scaevola crassifolia*
Asteraceae	* *Arctotis stoechadifolia* * *Gazania linearis* * *Hypochaeris glabra* *Olearia axillaris* * *Senecio condylus* * *Sonchus oleraceus*

Appendix B

Site x species matrix of flora recorded within plots in the survey area.

Taxon	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Acacia cochlearis	0.5		30			
Acanthocarpus preissii						
Agonis flexuosa						
Ammophila arenaria		2	4	3		
Arctotis stoechadifolia						
Atriplex cinerea						
Atriplex prostrata						3
Avena fatua	0.1	0.2		0.1	0.2	
Bromus diandrus	0.1	3	1	0.5	30	0.1
Cakile maritima						20
Carpobrotus virescens	3		1			1
Conostylis candicans subsp. *calcicola*						
Crassula glomerata		0.3	0.3	0.1	0.2	
Cynodon dactylon	45	15	10	5		
Euphorbia paralias	0.3		0.1	0.1	0.3	
Ficinia nodosa						
Gazania linearis			0.2			
Hypochaeris glabra	0.1	0.1	0.1			
Lagurus ovatus	0.1		0.1	0.2	0.5	
Lepidosperma gladiatum			0.2			
Leptospermum laevigatum						
Lolium rigidum						0.1
Melaleuca lanceolata						
Olearia axillaris						
Pelargonium capitatum	3	5	0.3	30	0.2	
Rhagodia baccata subsp. *baccata*	0.3		4			5
Scaevola crassifolia						
Senecio condylus						0.2
Sonchus oleraceus					0.1	
Spinifex hirsutus		10		1		
Spyridium globulosum						
Tetragonia decumbens	0.3		1	0.3	45	
Trachyandra divaricata	0.5	1	3		10	
Vulpia myuros	0.2			0.1		

Appendix C

Sampling plot environmental data

Site Name	Latitude	Longitude	Site Type	Date	Plot Shape	Plot size (m^2)	Topography
Plot_1	-33.637741	115.370924	Quadrat	7/11/2024	Square	100	Flat
Plot_2	-33.640079	115.36508	Quadrat	7/11/2024	Square	100	Flat
Plot_3	-33.641217	115.358983	Quadrat	7/11/2024	Square	100	Flat
Plot_4	-33.636695	115.373954	Quadrat	7/11/2024	Square	100	Flat
Plot_5	-33.634367	115.380528	Quadrat	7/11/2024	Square	100	Flat
Plot_6	-33.632236	115.384655	Quadrat	7/11/2024	Square	100	Flat

Site Name	Relief	Slope (°)	Aspect	Soil Colour	Soil Depth (cm)	Texture	Fire Interval (yrs)
Plot_1	LP	0-5		Cream	>50 cm	Clayey Sand	>10 years
Plot_2	LP	0-5		Cream	>50 cm	Clayey Sand	>10 years
Plot_3	LP	0-5		Cream	>50 cm	Clayey Sand	>10 years
Plot_4	LP	0-5		Cream	>50 cm	Clayey Sand	>10 years
Plot_5	LP	0-5		Cream	>50 cm	Clayey Sand	>10 years
Plot_6	LP	0-5		White	>50 cm	Sand	>10 years

Site Name	Gravel Cover (%)	Gravel Size (mm)	Outcrop %	Rock Type	Disturbance Level	Vegetation Condition
Plot_1					High	Degraded
Plot_2					High	Degraded
Plot_3					High	Degraded
Plot_4					High	Degraded
Plot_5					High	Degraded
Plot_6					High	Degraded

Site Name	Strata 1 Cover (%)	Strata 2 Cover (%)	Strata 3 Cover (%)	Strata 1 Structure	Strata 2 Structure	Strata 3 Structure	Strata 1 Dominants	Strata 2 Dominants	Strata 3 Dominants
Plot_1		<2%	30-70%		Shrubs <1 m	Tussock grass		*Acacia cochlearis, Rhagodia baccata*	**Cynodon dactyon, *Pelargonium capitatum*
Plot_2			30-70%			Tussock grass			*Spinifex hirsutus, *Pelargonium capitatum, *Cynodon dactylon*
Plot_3		30-70%	30-70%		Shrubs 1-2 m	Tussock grass		*Acacia cochlearis, Rhagodia baccata*	**Ammophila arenaria, *Trachyandra divaricata*
Plot_4			30-70%			Herbs			**Pelargonium capitatum, *Ammophila arenaria, *Cynodon dactylon*
Plot_5			70-100%			Herbs			**Tetragonia decumbens,* Trachyandra divaricata, *Bromus diandrus*
Plot_6			30-70%			Herbs			**Cakile maritima, Rhagodia baccata, *Atriplex prostrata*

Appendix D

EPBC Protected Matters Search Results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 04-Dec-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	55
Listed Migratory Species:	51

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	72
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	10
Key Ecological Features (Marine):	None
Biologically Important Areas:	5
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Vasse-wonnerup system	Within Ramsar site

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community may occur within area
Empodisma peatlands of southwestern Australia	Endangered	Community may occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding known to occur within area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area
FISH		
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat known to occur within area
MAMMAL		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Breeding known to occur within area
PLANT		

Scientific Name	Threatened Category	Presence Text
Banksia squarrosa subsp. argillacea		
Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat may occur within area
Caladenia procera		
Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat may occur within area
Chamelaucium sp. S coastal plain (R.D.Royce 4872)		
Royce's Waxflower [87814]	Vulnerable	Species or species habitat likely to occur within area
Diuris micrantha		
Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Drakaea micrantha		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Grevillea elongata		
Ironstone Grevillea [64578]	Vulnerable	Species or species habitat may occur within area
Morelotia australiensis listed as Tetraria australiensis		
Southern Tetraria [92784]	Vulnerable	Species or species habitat may occur within area
Petrophile latericola		
Laterite Petrophile [64532]	Endangered	Species or species habitat may occur within area
Synaphea sp. Fairbridge Farm (D.Papenfus 696)		
Selena's Synaphea [82881]	Critically Endangered	Species or species habitat may occur within area
Verticordia densiflora var. pedunculata		
Long-stalked Featherflower [55689]	Endangered	Species or species habitat may occur within area
REPTILE		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharias taurus Grey Nurse Shark [64469]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Congregation or aggregation known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Species or species habitat known to occur within area
Charadrius bicinctus		
Double-banded Plover [895]		Species or species habitat known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Tringa glareola		
Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area overfly marine area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Thinornis cucullatus as Thinornis rubricollis		
Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area
Tringa glareola		
Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area
Fish		
Acentronura australe		
Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		

Scientific Name	Threatened Category	Presence Text
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area
Reptile		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Ngari Capes	Marine Park	WA
Unnamed WA41568	Nature Reserve	WA

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Vasse-Wonnerup Wetland System	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Aerial Application of Lavicide to Vasse-Wonnerup Wetlands	2010/5593	Controlled Action	Post-Approval
Busselton Foreshore Redevelopment from West Street to Ford Road	2013/6830	Controlled Action	Post-Approval
Residential Development	2007/3463	Controlled Action	Post-Approval
Upgrade of Ford Road	2005/2113	Controlled Action	Completed
Not controlled action			
Aerial application of mosquito larvicides to Vasse Wonnerup Wetlands, WA	2016/7780	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Redevelopment of Lots 3 & 4, Kent Street	2007/3243	Not Controlled Action	Completed
Not controlled action (particular manner)			
Aerial Mosquito Spraying Vasse-Wonnerup System	2005/1952	Not Controlled Action (Particular Manner)	Post-Approval
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high	Known to occur

Scientific Name	Behaviour	Presence
	numbers)	
Puffinus assimilis tunneyi		
Little Shearwater [59363]	Foraging (in high numbers)	Known to occur
Whales		
Balaenoptera musculus brevicauda		
Pygmy Blue Whale [81317]	Migration	Known to occur
Megaptera novaeangliae		
Humpback Whale [38]	Migration (south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

Department of Climate Change, Energy, the Environment and Water
GPO Box 3090
Canberra ACT 2601 Australia
+61 2 6274 1111

Appendix E

Definitions of Threatened and Priority Flora and Communities

Conservation Codes for Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such. Conservation codes have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018.*

T Threatened species – Schedules 1-4

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

- **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.
- **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife*

Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

EX Presumed extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Western Australian Ecological Communities

Threatened Ecological Communities

The BC Act provides for the statutory listing of threatened ecological communities (TECs) by the Minister.

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha).

Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;

(iii) munities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Commonwealth of Australia Conservation Codes

Threatened Flora and Fauna

Threatened fauna and flora may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in any one of the following six categories:

Extinct

A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.

Extinct in the wild

A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time:

a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.

Critically endangered

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the five criteria for the category identified in Part 7.01 of the EPBC Regulations, and it is therefore considered to be facing a high risk of extinction in the wild.

Conservation dependent

A native species is eligible to be included in the conservation dependent category at a particular time if, at that time:

a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or
b) the following subparagraphs are satisfied:
    i. the species is a species of fish;

ii. the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;
iii. the plan of management is in force under a law of the Commonwealth or of a State or Territory;
iv. cessation of the plan of management would adversely affect the conservation status of the species.

The EPBC Act does not provide for listing in a data deficient category. Where sufficient data (evidence) is unavailable to allow assessment by the Threatened Species Scientific Committee against the criteria for listing, the species are found to be ineligible. A recommendation is made to the Minister to not include the species in any category under the EPBC Act. For reasons of transparency and to inform future research, the Threatened Species Scientific Committee publishes the names of those species found to be data deficient. As data deficient is not a listing category under the EPBC Act, this has no statutory implications and the species is not considered to be listed under the EPBC Act.

Threatened Ecological Communities

Threatened Ecological communities under the EPBC Act are listed in three categories.

Critically endangered

If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).

Endangered

If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Vulnerable

If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Categories of Threatened Species pursuant to the Environment Protection and Biodiversity Conservation Act 1999

EPBC Act Category	Department of Environment and Energy Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

CONSERVATION CATEGORY DEFINITIONS

for Western Australian Ecological Communities

GENERAL DEFINITIONS

An **ecological community** is a naturally occurring assemblage of organisms that occurs in a particular habitat, as defined in the *Biodiversity Conservation Act 2016* (BC Act). Ecological communities may comprise various life forms including plants, animals and microorganisms.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A **threatened ecological community** (TEC) means an ecological community that is listed under section 27(1) of the BC Act as a critically endangered, endangered or vulnerable ecological community, or is a rediscovered ecological community to be regarded as a threatened ecological community under section 33 of the BC Act.

An **assemblage** is a defined group of biological entities.

Habitat, as defined in the BC Act, means the biophysical medium or media —

a) occupied (continuously, periodically or occasionally) by an organism or group of organisms, or
b) once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced.

An **occurrence** is a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres with, for example: a different ecological community, a sealed road, a building, a water body (for terrestrial communities), or a terrestrial body (for aquatic communities). There is no minimum size of an occurrence of a threatened or priority ecological community. By ensuring that every discrete occurrence is recognised and recorded, future changes in status can be readily monitored.

Adequately surveyed is defined as an ecological community that has been searched for thoroughly in most likely habitats, by relevant experts.

Community structure is defined as the spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage. For example, the vegetation structure (e.g., *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs) or the trophic structure in a faunal assemblage (e.g., dominance by feeders on detritus as distinct from feeders on live plants).

To **modify** an occurrence of an ecological community, as defined in section 44 of the BC Act, means to take action that results in —

(a) the modification of the occurrence of the threatened ecological community to such an extent that the occurrence is unlikely to recover —
    (i) its species composition or structure; or
    (ii) its species composition and structure; or
(b) the destruction of the occurrence of the threatened ecological community.

Destruction of an occurrence of an ecological community means modification such that reestablishment of ecological processes, species composition or community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention.

Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Refer to the document Guidance note – Modification of an occurrence of a threatened ecological community for more information on what constitutes modification and how to determine whether an action is likely to modify an occurrence of a threatened ecological community.

Threatening process means a process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community, as defined under the BC Act. Examples of some of the continuing threatening processes in Western Australia include: vegetation clearance; competition and land degradation by introduced fauna; dieback caused by the root-rot fungus (*Phytophthora cinnamomi*); competition and displacement of native plants by introduced flora; hydrological changes (declining groundwater levels); drying climate, fire regimes that cause declines in biodiversity; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

LISTED ECOLOGICAL COMMUNITIES

Assessment of the conservation status of ecological communities is carried out in accordance with the BC Act listing criteria and the requirements of Ministerial Guideline Number 1 and Ministerial Guideline Number 4 that adopt the use of the International Union for Conservation of Nature (IUCN) Red List of Ecosystems Categories and Criteria.

CO Collapsed ecological communities

An ecological community listed by order of the Minister as collapsed under section 31(1) of the BC Act. As determined by criteria set out in section 32 of the BC Act, an ecological community is eligible for listing as a collapsed ecological community at a particular time if, at that time —

(a) there is no reasonable doubt that the last occurrence of the ecological community has collapsed; or
(b) the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover —
    (i) its species composition or structure; or
    (ii) its species composition and structure.

CR Critically endangered ecological communities

A threatened ecological community listed in the category of critically endangered under section 27(1)(a) of the BC Act, as determined by criteria set out in section 28 of the BC Act and the ministerial guidelines. A critically endangered ecological community faces an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines.

Examples of use:

- ‘Assemblages of the organic springs and mound springs of the Mandora Marsh area’ is listed as a critically endangered threatened ecological community under the *Biodiversity Conservation Act 2016.*
- ‘Assemblages of the organic springs and mound springs of the Mandora Marsh area’ is listed as critically endangered under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table – column heading: BC Act; row text: CR.

EN Endangered ecological communities

A threatened ecological community listed in the category of endangered ecological community under section 27(1)(b) of the BC Act, as determined by criteria set out in section 29 of the BC Act and the ministerial guidelines. A threatened ecological community faces a very high risk of becoming eligible for listing as a collapsed ecological community in the near future, as determined in accordance with criteria set out in the ministerial guidelines.

Examples of use:

- ‘Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson *et al*. (1994))’ is listed as an endangered threatened ecological community under the *Biodiversity Conservation Act 2016.*
- ‘Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. (1994))’ is listed as endangered under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table – column heading: BC Act; row text: EN.

VU Vulnerable ecological communities

A threatened ecological community listed in the category of vulnerable ecological community under section 27(1)(c) of the BC Act, as determined by criteria set out in section 30 of the BC Act and the ministerial guidelines. A vulnerable ecological community faces a high risk of becoming eligible for listing as a collapsed ecological community in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines.

Examples of use:

- '*Calothamnus graniticus* subsp. *graniticus* heaths on south west coastal granites' is listed as a vulnerable threatened ecological community under the *Biodiversity Conservation Act 2016.*
- '*Calothamnus graniticus* subsp. *graniticus* heaths on south west coastal granites' is listed as vulnerable under the *Biodiversity Conservation Act 2016.*
- Listing reference in a table – column heading: BC Act; row text: VU.

PRIORITY ECOLOGICAL COMMUNITIES

Priority is not a listing category under the BC Act. The Priority Ecological Communities list is maintained by the department and is published on the department's website.

All fauna and flora that may be present in an ecological community are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when these species occur in an ecological community that is not listed as threatened, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).

Possible threatened ecological communities that do not meet survey criteria or are not adequately defined to enable listing are added to the department's Priority Ecological Communities for Western Australia list under priority 1, 2 or 3. Ecological communities that are adequately known and not threatened but rare, near threatened, or have recently been removed from the threatened list are placed in priority 4. Conservation dependent ecological communities are placed in priority 5.

P1 Priority 1: Poorly known ecological communities – very few occurrences, very restricted distribution

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g., within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Examples of use:

- 'Banded Ironstone Hills with *Dryandra arborea*' is listed as a Priority 1 ecological community by the Department of Biodiversity, Conservation and Attractions.
- 'Banded Ironstone Hills with *Dryandra arborea*' is listed as Priority 1 on the DBCA Priority Ecological Communities List.
- Listing reference in a table – column heading: DBCA; row text: P1.

P2 Priority 2: Poorly known ecological communities – few occurrences, restricted distribution

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Examples of use:

- 'Aquatic invertebrate communities of peat swamps' is listed as a Priority 2 ecological community by the Department of Biodiversity, Conservation and Attractions.
- 'Aquatic invertebrate communities of peat swamps' is listed as Priority 2 on the DBCA Priority Ecological Communities List.
- Listing reference in a table – column heading: DBCA; row text: P2.

P3 Priority 3: Poorly known ecological communities – inadequately surveyed or not well defined

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them. This category includes three sub-categories:

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation.

(ii) Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years).

(iii) Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change, etc.

Examples of use:

- 'Assemblages of gypsum dunes of the central and southern wheatbelt' is listed as a Priority 3(iii) ecological community by the Department of Biodiversity, Conservation and Attractions.
- 'Assemblages of gypsum dunes of the central and southern wheatbelt' is listed as Priority 3(iii) on the DBCA Priority Ecological Communities List.
- Listing reference in a table – column heading: DBCA; row text: P3(iii).

P4 Priority 4: Adequately known ecological communities – rare, near threatened, or recently removed from the threatened list

Ecological communities that are adequately known and either rare but not threatened, near threatened, or have recently been removed from the threatened list. These communities require regular monitoring.

(i) Rare: ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(ii) Near threatened: ecological communities that are considered to have been adequately surveyed and that do not qualify as conservation dependent, but that are close to qualifying for a higher threat category.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Examples of use:

- 'Nimalaica (Nimalarragun) claypan and associated wetland assemblages' is listed as a Priority 4(ii) ecological community by the Department of Biodiversity, Conservation and Attractions.
- 'Nimalaica (Nimalarragun) claypan and associated wetland assemblages' is listed as Priority 4(ii) on the DBCA Priority Ecological Communities List.
- Listing reference in a table: column heading: DBCA, row text: P4(ii).

P5 Priority 5: Conservation dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Categories of Threatened Communities pursuant to the Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Critically Endangered	(1) An ecological community is eligible to be included in the ***critically endangered*** category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	(2) An ecological community is eligible to be included in the ***endangered*** category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	(3) An ecological community is eligible to be included in the ***vulnerable*** category at a particular time if, at that time: (a) it is not critically endangered nor endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.