

## Memo

To: Geoffrey Allen

From: Dr Grant Wells

Date: 29 October 2018

Subject: Targeted flora and vegetation survey of the Golden Point exploration area

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PHOENIX  
ENVIRONMENTAL SCIENCES

## 1 INTRODUCTION

This memo report has been prepared to inform the POWE for the proposed Golden Point Exploration area (study area) at the Ramelius Resources Edna May Gold operation. The study area occurs within the potential distribution of the EPBC listed TEC 'Eucalypt woodlands of the Western Australian wheatbelt' and within approximately one kilometre of a known population of the Threatened flora *Eremophila resinosa*.

Geoffrey Allen of Ramelius Resources requested a target survey to determine whether the TEC, *Eremophila resinosa* or any other significant flora occur within the study area.

### 1.1 EUCALYPT WOODLANDS OF THE WESTERN AUSTRALIAN WHEATBELT

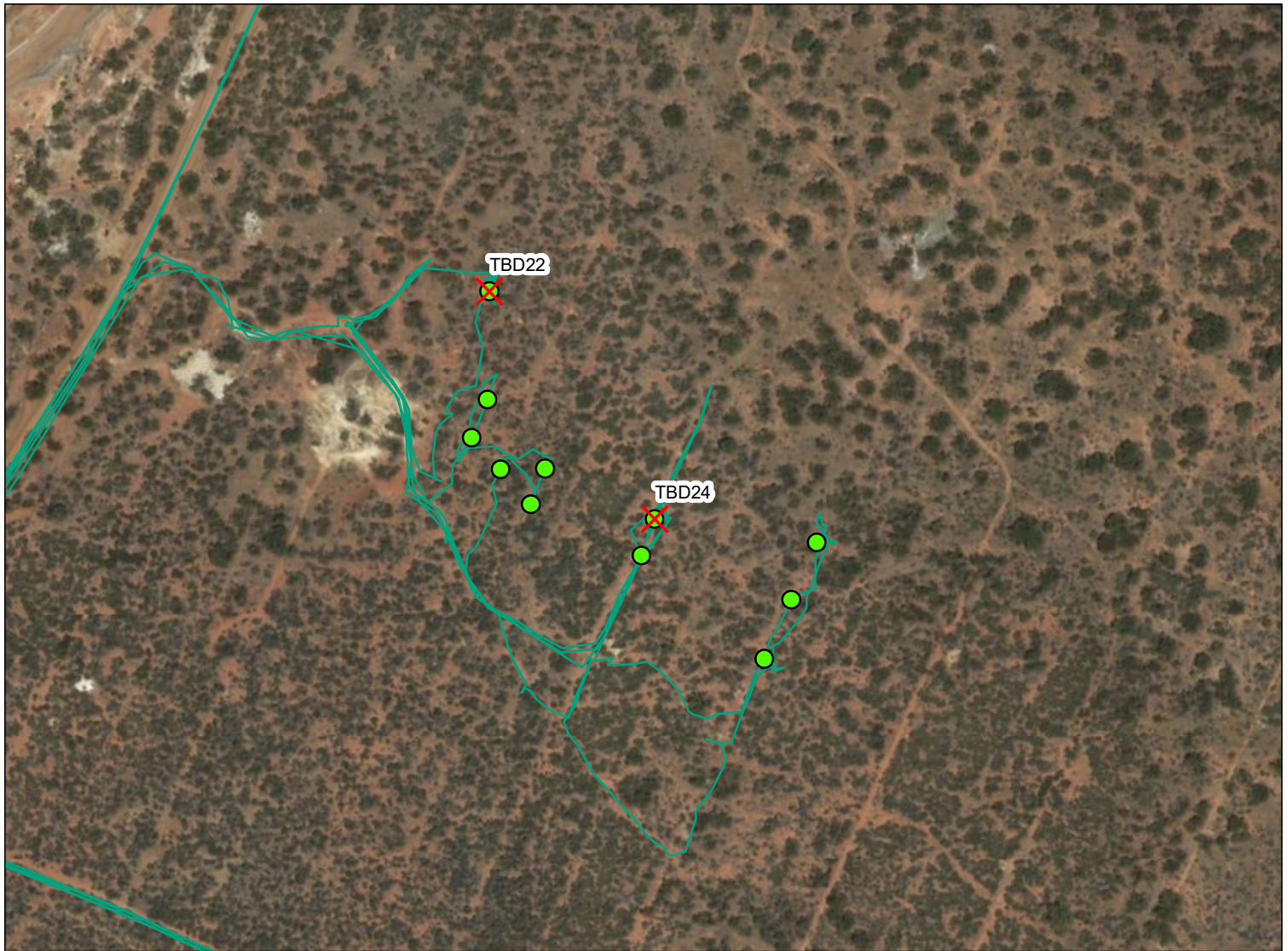
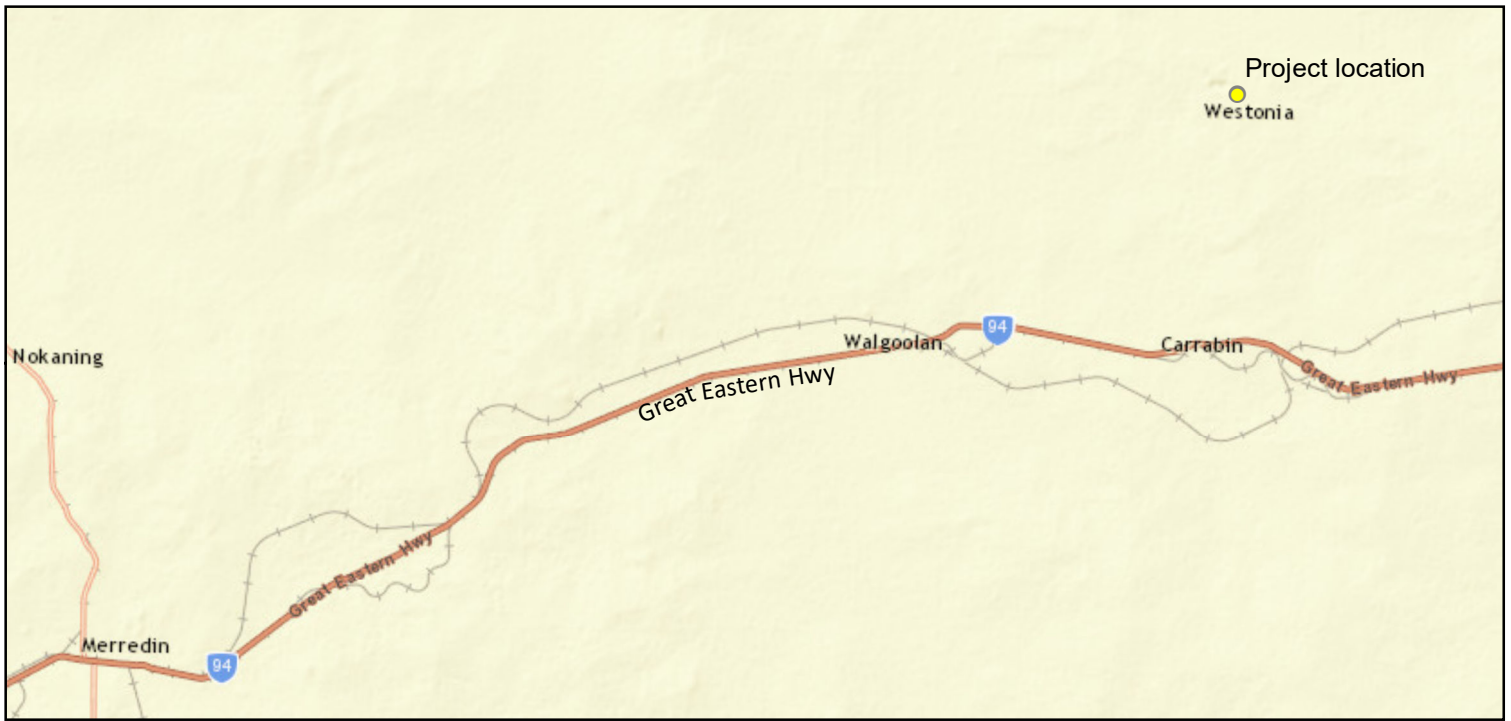
The EPBC listed TEC 'Eucalypt Woodlands of the Western Australian Wheatbelt' is defined as eucalypt woodlands dominated by a complex mosaic of eucalypt species with a single tree or mallet form over an understorey that is highly variable in structure and composition (Threatened Species Scientific Committee 2015). The community occupies a transitional zone between the wetter forests associated with the Darling Range and the southwest coast, and the low woodlands and shrublands of the semi-arid to arid interior. A more detailed description of the TEC is provided in Appendix 1 which includes a key incorporating the five main diagnostic characteristics that indicate its presence; this was derived from DoE conservation advice for the TEC (Threatened Species Scientific Committee 2015).


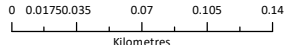
### 1.2 *EREMOPHILA RESINOSA* (T) AND SIGNIFICANT FLORA

A search for Threatened and Priority Flora within 20 km of the Edna May Gold Project conducted 26 August 2013 (Outback Ecology 2013) identified 31 conservation significant flora species within 20 km of the study area (Table 1). An earlier assessment (Armstrong & Osborne 2003) identified a further seven conservation significant species potentially occurring in the study area (Table 1).

Eleven of the species are listed at the Federal level (EPBC Act; one CR, eight EN, two VU), with slightly different categories at the State level (WA Act; two CR, five EN, four VU). In addition, 27 species are listed at the state level as Priority flora (four P1, three P2, 17 P3, and three P4 (Table 1).

Several populations of the Threatened flora *Eremophila resinosa* that surround the Edna May Gold Operation have been surveyed annually since 2006 (Phoenix 2017). The closest population occurs approximately one kilometre from the current study area and comprises approximately 50 individuals.



Edna May Operations Pty Ltd Ramelius Resources	
Date	10/29/2018
Drawn by	GW
Map author	GW
	
	
1:4,059	(at A4) GDA 1994 MGA Zone 50

- Proposed drill pads
- Vegetation description sites
- ✗ TBD22
- ✗ TBD24
- GPS tracks

**Figure 1**  
**Location of the Edna May Gold Project and study area**



**Table 1 Conservation significant flora species identified within 20 km of the Edna May Gold Project**

Family Genus and species	Current conservation status <sup>2</sup>			Reference <sup>3</sup>
	EPBC Act	WC Act	DPaW Priority list	
Asteraceae				
<i>Vittadinia cervicalaris</i> var. <i>oldfieldii</i>			P1	B
Chenopodiaceae				
<i>Roycea pycnophylloides</i>	EN	VU – S3		A
Dilleniaceae				
<i>Hibbertia chartacea</i>			P2	A
<i>Hibbertia glabriuscula</i>			P3	A, B
<i>Hibbertia graniticola</i>			P3	B
Ericaceae				
<i>Leucopogon</i> sp. <i>Ironcaps</i>			P3	A
Fabaceae				
<i>Acacia ancistrophylla</i> var. <i>perarcuata</i> <sup>1</sup>			P3	A, B
<i>Acacia crenulata</i>			P3	A, B
<i>Acacia filifolia</i>			P3	A, B
<i>Acacia formidabilis</i>			P3	B
<i>Acacia lobulata</i>	EN	VU – S3		A, B
<i>Acacia sclerophylla</i> var. <i>teretiuscula</i>			P1	B
<i>Acacia undosa</i>			P3	B
<i>Eutaxia acanthoclada</i>			P3	A
<i>Gastrolobium diabolophyllum</i>	CR	CR – S1		A
Goodeniaceae				
<i>Goodenia granitica</i>			P2	A
Haemodoraceae				
<i>Conostylis albescens</i>			P2	B
Haloragaceae				
<i>Myriophyllum petraeum</i>			P4	A, B
Lamiaceae				
<i>Dicrastylis reticulata</i>			P3	A
<i>Westringia acifolia</i>			P1	A
Malvaceae				
<i>Guichenotia impudica</i>			P3	A
Myrtaceae				
<i>Eucalyptus brevipes</i>	EN	EN – S2		A

Family Genus and species	Current conservation status <sup>2</sup>			Reference <sup>3</sup>
	EPBC Act	WC Act	DPaW Priority list	
<i>Eucalyptus caesia</i> <sup>1</sup>			P4	A, B
<i>Eucalyptus crucis</i> subsp. <i>crucis</i> <sup>1</sup>	VU	EN – S2		A, B
<i>Baeckea</i> sp. Baladjie			P1	A
<i>Baeckea</i> sp. Merredin			P3	A
<i>Verticordia gracilis</i>			P3	B
<i>Verticordia mitodes</i>			P3	A, B
<i>Verticordia stenopetala</i>			P3	A, B
Poaceae				
<i>Austrostipa blackii</i>			P3	B
Proteaceae				
<i>Banksia horrida</i>			P3	A
<i>Banksia rufa</i> subsp. <i>flavescens</i>			P3	A
<i>Banksia shanklandiorum</i>			P4	A, B
<i>Grevillea dryandroides</i> subsp. <i>hirsuta</i>	EN	VU – S3		A
Rutaceae				
<i>Boronia adamsiana</i> <sup>1</sup>	VU	VU – S3		A
Scrophulariaceae				
<i>Eremophila resinosa</i> <sup>1</sup>	EN	EN – S2		A, B
<i>Eremophila virens</i>	EN	EN – S2		A, B
<i>Eremophila viscida</i>	EN	EN – S2		A, B
Solanaceae				
<i>Symonanthus bancroftii</i>	EN	CR - 1		A

1 – Species recorded within 10 km of the Project

2 – CR, Critically Endangered; EN, Endangered; VU, Vulnerable

3 – A, Outback Ecology (2013); B – Armstrong and Osborne (2003)

## 2 METHODS

### 2.1 FIELD SURVEY

A field survey of the study area was conducted on 18 October 2018 by Dr Grant Wells and Alice Watt. The survey was conducted concurrently with the annual monitoring of *Eremophila resinosa* populations by the Phoenix staff.

The study area (all access tracks and drill pad locations) were traversed by foot in transect searches set no more than 10 m apart.



While traversing the access tracks and drill pads, two site locations were selected to describe the representative vegetation types encountered during the searches. Vegetation descriptions were completed at each of the sites (unbound quadrats, relevés).

## 2.2 SURVEY LIMITATIONS

No survey limitations were identified with respect to the current technical guide (EPA 2016) (Table 2).

**Table 2 Survey limitations**

Limitations	Limitation for this survey?	Comments
Availability of contextual information at a regional and local scale	No	Access to online floristic records and information including previous studies undertaken on or in close proximity to the study area provided adequate information on the vegetation of the study area.
Competency/experience of survey personnel, including taxonomy, and experience in the region surveyed	No	The field teams and report authors have extensive experience in conducting terrestrial flora and vegetation surveys within the region and across WA. The lead botanist Dr Grant Wells has conducted flora surveys at the Edna May Gold Project over a four year period including monitoring of known <i>Eremophila resinosa</i> populations and conducting searches to locate additional plants/populations.
Effort and extent; was the appropriate area fully surveyed, were all target groups sampled, were all planned survey methods implemented successfully, was the study area fully surveyed	No	The study area was fully surveyed by foot and all planned survey methods were implemented successfully.
Access throughout the survey area	No	The whole of the study area was accessible by foot.
Timing, weather, season, cycle	No	The survey was conducted in spring, at a time when most flora species are flowering, aiding identification. <i>Eremophila resinosa</i> was in bloom and conducted concurrently with the annual monitoring of <i>E. resinosa</i> populations.
Disturbance that may have affected the results of the survey	No	No disturbances occurring during the period of the field survey are considered to have impacted the results.

### 3 RESULTS

#### 3.1 VEGETATION

Two vegetation types were recorded within the area encompassed by the drill pads and interconnecting access tracks:

- Mid *Eucalyptus loxophleba* subsp. *lissophloia* mallee woodland over tall open *Melaleuca pauperiflora* shrubland over mid open *Acacia burkittii* shrubland.
- Tall *Acacia burkittii*, *A. tetragonophylla* and *Melaleuca pauperiflora* shrubland over sparse low *Amphipogon caricinus* grassland and isolated low *Waitzia acuminata* var. *acuminata* and *Schoenia cassiniana* forbs.

The main access track to the study area passed through a small area (~4 ha) of *Eucalyptus salubris* woodland in degraded condition (Figure 2) with several large areas completely devoid of native vegetation particularly a *Eucalyptus* overstorey. Disturbances included historic excavations, mining spoil, weed infestation, litter, historic clearing and evidence of feral animals. The area was bordered by the *Eucalyptus loxophleba* subsp. *lissophloia* mallee woodland, the *Acacia burkittii*, *A. tetragonophylla* and *Melaleuca pauperiflora* shrubland, and a gazetted gravel road.

The extent of the *Eucalyptus salubris* woodland (~4 ha) is below the minimum patch size of 5 ha for a degraded *Eucalyptus* woodland to be considered representative of the TEC (Department of the Environment 2015), refer Category D in Appendix 1.



Figure 2: Area of degraded *Eucalyptus salubris* woodland

### 3.2 SIGNIFICANT FLORA

None of the Threatened or Priority flora identified within the vicinity of the Edna May Gold project (Outback Ecology 2013, Armstrong & Osborne 2003) occur within the current study area.

The monitoring of *Eremophila resinosa* populations conducted concurrently with the targeted survey of the study area identified a large proportion of plants to be in full bloom (Figure 3) in the known populations nearby. This indicates that the search of the study area was conducted at a time conducive to identifying any plants of the species.

No plants of any Threatened or Priority flora were recorded during the current targeted search of the study area.





Figure 3: *Eremophila resinosa* plant in flower in populations monitored at the Edna May Gold project



## 4 DISCUSSION

The vegetation types of the study area, mallee woodland and a shrubland were not representative of the *Eucalyptus* woodlands of the Western Australian wheatbelt TEC (Appendix 1, (Department of the Environment 2015). The *Eucalyptus salubris* woodland on the main access track was also not considered representative of the TEC due to the degraded condition and extent that is less than the required minimum patch size of 5 ha (Department of the Environment 2015). In addition access will be along an existing track. Subsequently, it was considered that disturbance from exploration activities at the Golden Point study area will not impact the TEC.

No priority or Threatened flora were recorded in the study area and subsequently exploration activities will not impact any significant flora.

Yours Sincerely,

Dr Grant Wells

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## 5 REFERENCES

- Armstrong, P. & Osborne, J. 2003. *Floral components for a Notice of Intent, Westonia Gold Mine (M77/88 and M77/124 leases)*. Paul Armstrong and Associates and Department of Environmental Biology, Curtin University of Technology, Bulls Creek and Perth, WA. Unpublished report prepared for Westonia Mines Ltd.
- Department of the Environment. 2015. *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt (incl. Appendix A - species list)*. Department of the Environment, Canberra, ACT. Available at: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/128-conservation-advice.pdf>
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- Shepherd, D. P., Beeston, G. R. & Hopkins, A. J. M. 2002. *Native vegetation in Western Australia. Extent, type and status*. Department of Agriculture, South Perth, WA. Resource Management Technical Report 249.
- Threatened Species Scientific Committee. 2015. *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt (incl. Appendix A - species list)*. Department of the Environment, Canberra, ACT. Available at: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/128-conservation-advice.pdf>

**Appendix 1 Key to identify the EPBC listed Threatened Ecological community Eucalypt woodlands of the Western Australian wheatbelt (Department of the Environment 2015)**

The TEC 'Eucalypt woodlands of the Western Australian Wheatbelt' is composed of eucalypt woodlands dominated by a complex mosaic of eucalypt species with a single tree or mallet form over an understorey that is highly variable in structure and composition. A mallet habit refers to a eucalypt with a single, slender trunk and steep-angled branches that give rise to a dense crown. Many eucalypt species are considered iconic within the Wheatbelt landscape, for example, *Eucalyptus salmonophloia* (salmon gum), *E. loxophleba* subsp. *loxophleba* (York gum), *Eucalyptus rudis* subsp. *rudis*, *E. salubris* (gimlet), *E. wandoo* (wandoo) and the mallet group of species. Associated species may include *Acacia acuminata* (jam), *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah). The understorey structures are often bare to sparse, herbaceous, shrub or heath, chenopod-dominated, thickets (*Melaleuca* spp.) and saline areas with *Tecticornia* spp. The main diagnostic features include location, minimum crown cover of the tree canopy of 10% in a mature woodland, presence of key species and a minimum condition according to scale of Keighery (1994) that depends on size of a patch, weed cover and presence of mature trees. A patch is defined as a discrete and mostly continuous area of the ecological community and may include small-scale variations and disturbances, such as tracks or breaks, watercourses/drainage lines or localised changes in vegetation that do not act as a permanent barrier or significantly alter its overall functionality. Each patch of the community includes a buffer zone, an area that lies immediately outside the edge of a patch but is not part of the ecological community. The buffer zone is designed to minimise this risk to the ecological community.

Woodland vegetation with a very sparse eucalypt tree canopy and woodlands dominated by mallee forms characterised by multiple stems of similar size arising at or near ground level are not part of the ecological community. The ecological community is not likely to be present if it is dominated by non-eucalypt species in the tree canopy, for instance *Acacia acuminata* (jam) or *Allocasuarina huegeliana* (rock sheoak) even though these species may be present as an understorey or minor canopy component.

The community occupies a transitional zone between the wetter forests associated with the Darling Range and the southwest coast, and the low woodlands and shrublands of the semi-arid to arid interior. The Wheatbelt region where the ecological community occurs mostly encompasses two IBRA2 subregions: Avon Wheatbelt subregion AVW01 Merredin and Avon Wheatbelt subregion AVW02 Katanning. Patches of the ecological community may extend into adjacent areas of the primary Wheatbelt bioregions, such as the easternmost parts of the Jarrah Forest bioregion forming an extension of the Avon Wheatbelt landscape in that they comprise areas subject to similar climate, landscape and threats. A third IBRA2 subregion includes Mallee subregion MAL02 Western Mallee and is located south of Perth. The ecological community is generally associated with the flatter, undulating relief, including drainage lines and saline areas.

The WA Wheatbelt woodlands ecological community potentially corresponds to 45 Beard (Shepherd *et al.* 2002) vegetation associations. The most likely equivalents are with the 37 associations that are dominant or unique within the Wheatbelt regions.



## Diagnostic 1 Location

### Survey location occurs within one of the following three regions:

- Avon Wheatbelt bioregion - subregions AVW01 Merredin and AVW02 Katanning
- Mallee bioregion - MAL02 Western Mallee only
- Jarrah Forest bioregion – outlying patches in the eastern parts of JAF01 Northern Jarrah Forests and JAF02 Jarrah Forests adjacent to the Avon Wheatbelt, and are effectively an extension of the Avon Wheatbelt landscape. Within the Jarrah Forest bioregion, the ecological community occurs on landscapes that fall below 600 mm mean annual rainfall (Figure 1), are off the Darling Range, associated with the Yilgarn Craton geology and are generally heavily cleared. This covers the eastern to southeastern-most parts of the bioregion. The ecological community generally falls within the 300 to 600 mm average annual rainfall isohyets. The isohyets based on the latest 30-year average between 1976 to 2005 (BoM 2016) are most applicable to the current climatic regime.....2

### Survey location occurs within region:

- Jarrah Forest bioregion – outlying patches in the eastern parts of JAF01 Northern Jarrah Forests and JAF02 Jarrah Forests adjacent to the Avon Wheatbelt. Within the Jarrah Forest bioregion, the ecological community occurs on landscapes that ARE ABOVE the 600 mm isohyet, are ON the Darling Range, NOT associated with the Yilgarn Craton geology and are NOT generally heavily cleared. This covers the eastern to southeastern-most parts of the bioregion. It generally DOES NOT fall within the 300 to 600 mm average annual rainfall isohyets. The isohyets based on the latest 30-year average between 1976 to 2005 (BoM 2016) are most applicable to the current climatic regime.....**NOT TEC**

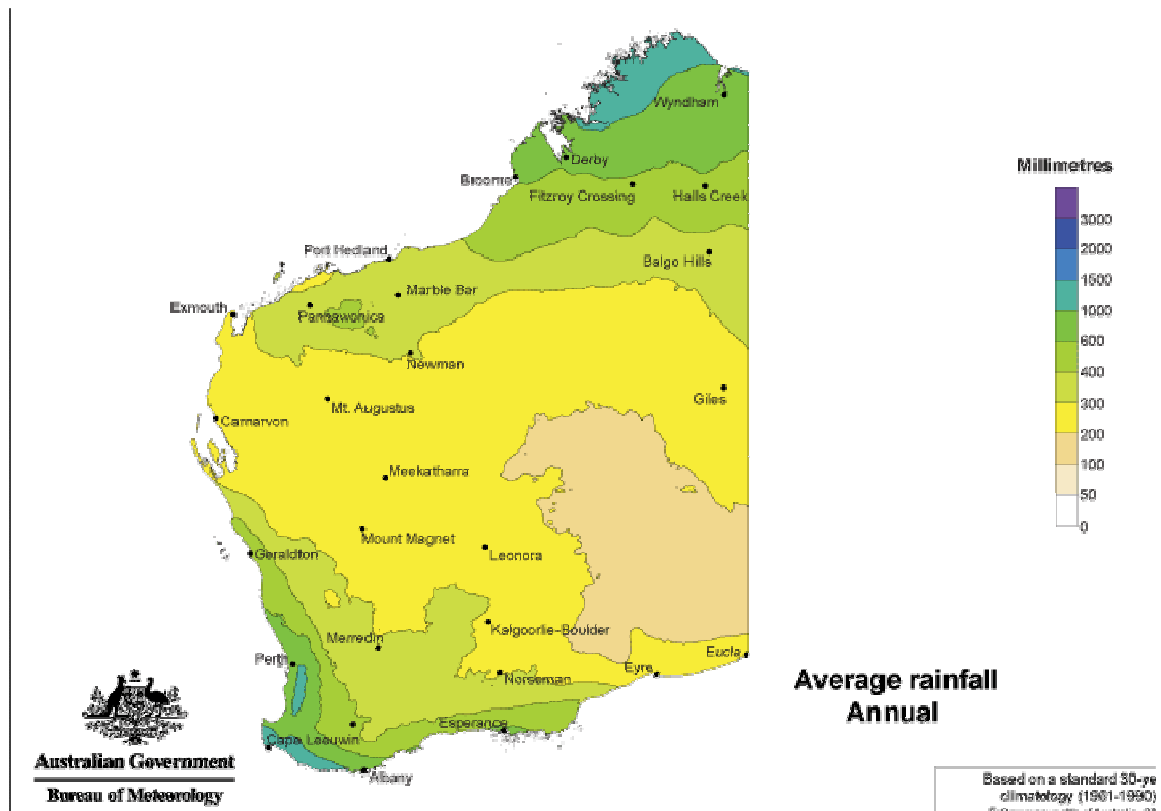


Figure 1 Isohyets of Western Australia (BoM 2016)

## Diagnostic 2 Minimum crown canopy

The structure of the ecological community is a woodland in which the minimum crown cover of the tree canopy in a mature eucalypt woodland is 10% (crowns measured as if they are opaque). The maximum tree canopy cover usually is up to 40%. It may be higher in certain circumstances, for instance trees with a mallet growth form (multi-stemmed upper canopy) may be more densely spaced, or disturbances such as fire may result in an increased cover of canopy species during regeneration.

.....3

Crown cover of trees less than 10% but area recently disturbed (e.g. fire), presence of seedlings and/or saplings.

.....3

Crown cover of trees less than 10%, no evidence of recent disturbance, no presence of seedlings or saplings.

.....NOT TEC

### Diagnostic 3 Dominant *Eucalyptus* tree canopy

One or more of the key tree species in Table 1 are dominant or co-dominant, the trees are predominantly single trunked, not mallee (multi-stemmed).

.....4

Other species are present in the tree canopy (e.g. species in Table 2 or other taxa) but these collectively do not occur as dominants in the tree canopy.

.....4

Dominant woodlands with a mallee subcanopy (lower tree layer of mallee or non-eucalypt tree species). Upper eucalypt tree canopy must be present dominated by key woodland species in Table 2 and have cover of 10% or more.

.....4

Other species are present in the tree canopy (e.g. species in Table 2 or other taxa) and these collectively do occur as dominants in the tree canopy.

.....NOT TEC

**Table 1 Key eucalypt species. One or more of these species are dominant or co-dominant within a given patch of the ecological community**

Scientific name	Common name/s
<i>Eucalyptus accedens</i>	powder-bark; powder-bark wandoo
<i>Eucalyptus aequioperta</i>	Welcome Hill gum
<i>Eucalyptus alipes</i>	Hyden mallet
<i>Eucalyptus astringens</i> subsp. <i>astringens</i>	brown mallet
<i>Eucalyptus capillosa</i>	wheatbelt wandoo
<i>Eucalyptus densa</i> subsp. <i>densa</i>	narrow-leaved blue mallet
<i>Eucalyptus extensa</i>	yellow mallet
<i>Eucalyptus falcata</i>	silver mallet
<i>Eucalyptus gardneri</i> subsp. <i>gardneri</i>	blue mallet
<i>Eucalyptus goniocarpa</i>	Lake King mallet
<i>Eucalyptus kondininensis</i>	Kondinin blackbutt
<i>Eucalyptus longicornis</i>	red morrel
<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i>	York gum
<i>Eucalyptus melanoxylon</i>	black morrel
<i>Eucalyptus mimica</i> subsp. <i>continens</i>	hooded mallet
<i>Eucalyptus mimica</i> subsp. <i>mimica</i>	Newdegate mallet
<i>Eucalyptus myriadena</i>	small-fruited gum; blackbutt
<i>Eucalyptus occidentalis</i>	flat-topped yate
<i>Eucalyptus ornata</i>	ornamental silver mallet; ornate mallet
<i>Eucalyptus recta</i>	Mt Yule silver mallet; Cadoux mallet
<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	flooded gum
<i>Eucalyptus salicola</i>	salt gum; salt salmon gum
<i>Eucalyptus salmonophloia</i>	salmon gum
<i>Eucalyptus salubris</i>	gimlet
<i>Eucalyptus sargentii</i> subsp. <i>sargentii</i>	salt river gum
<i>Eucalyptus singularis</i>	ridge-top mallet



Scientific name	Common name/s
<i>Eucalyptus spathulata</i> subsp. <i>spathulata</i>	swamp mallet
<i>Eucalyptus spathulata</i> subsp. <i>salina</i>	Salt River mallet
<i>Eucalyptus urna</i>	merrit
<i>Eucalyptus wandoo</i> subsp. <i>pulverea</i>	wandoo
<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>	wandoo

**Table 2 Associated canopy species that may be present within the ecological community but are not dominant or co-dominant<sup>1</sup>**

Scientific name	Common name/s
<i>Acacia acuminata</i>	jam
<i>Allocasuarina huegeliana</i>	rock sheoak
<i>Corymbia calophylla</i>	marri
<i>Eucalyptus annulata</i>	prickly-fruited mallee
<i>Eucalyptus arachnaea</i> subsp. <i>arachnaea</i>	black-stemmed mallee
<i>Eucalyptus arachnaea</i> subsp. <i>arrecta</i>	black-stemmed mallet
<i>Eucalyptus armillata</i>	flanged mallee
<i>Eucalyptus calycogona</i> subsp. <i>calycogona</i>	square-fruited mallee
<i>Eucalyptus camaldulensis</i> subsp. <i>arida</i>	river red gum
<i>Eucalyptus celastroides</i> subsp. <i>virella</i>	wheatbelt mallee
<i>Eucalyptus cylindriflora</i>	Goldfields white mallee
<i>Eucalyptus decipiens</i>	redheart; moit
<i>Eucalyptus drummondii</i>	Drummond's mallee
<i>Eucalyptus eremophila</i>	sand mallee
<i>Eucalyptus erythronema</i> subsp. <i>erythronema</i>	red-flowered mallee
<i>Eucalyptus erythronema</i> subsp. <i>inornata</i>	yellow-flowered mallee
<i>Eucalyptus eudesmioides</i>	Kalbarri mallee
<i>Eucalyptus flocktoniae</i> subsp. <i>flocktoniae</i>	Flockton's mallee
<i>Eucalyptus gittinsii</i> subsp. <i>illucida</i>	northern sandplain mallee
<i>Eucalyptus incrassata</i>	ridge-fruited mallee
<i>Eucalyptus kochii</i> subsp. <i>plenissima</i>	Trayning mallee
<i>Eucalyptus leptopoda</i> subsp. <i>leptopoda</i>	Merredin mallee; Tammin mallee
<i>Eucalyptus loxophleba</i> subsp. <i>gratae</i>	Lake Grace mallee
<i>Eucalyptus loxophleba</i> subsp. <i>lissophloia</i>	smooth-barked York gum
<i>Eucalyptus loxophleba</i> subsp. <i>supralaevis</i>	blackbutt York gum
<i>Eucalyptus macrocarpa</i>	mottlecah
<i>Eucalyptus marginata</i>	jarrah
<i>Eucalyptus moderata</i>	redwood mallee
<i>Eucalyptus obtusiflora</i>	Dongara mallee
<i>Eucalyptus olivina</i>	olive-leaved mallee
<i>Eucalyptus orthostemon</i>	diverse mallee
<i>Eucalyptus perangusta</i>	fine-leaved mallee
<i>Eucalyptus phaenophylla</i>	common southern mallee
<i>Eucalyptus phenax</i> subsp. <i>phenax</i>	white mallee

<i>Eucalyptus pileata</i>	capped mallee
<i>Eucalyptus platypus</i> subsp. <i>platypus</i>	moort
<i>Eucalyptus polita</i>	Parker Range mallet
<i>Eucalyptus sheathiana</i>	ribbon-barked mallee
<i>Eucalyptus sporadica</i>	Burngup mallee
<i>Eucalyptus subangusta</i> subsp. <i>subangusta</i>	grey mallee

The list is not comprehensive and presents the more common taxa encountered.

### Diagnostic 4 Native understorey

**A native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs. A list of key species is summarised in Table 3. Any one of the structural understorey categories may or may not be present.**

**Bare to sparse understorey** (e.g. under some mallet woodlands).

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**Herbaceous understorey** – a ground layer of forbs and/or graminoids though a few, scattered shrubs may be present.

.....5

**Scrub or heath understorey** – comprises a mixture of diverse shrubs of variable height and cover. A ground layer of herbs and grasses is present to variable extent.

.....5

**Chenopod-dominated understorey** – a subset of the scrub category in which the prominent species present are saltbushes, bluebushes and related taxa (e.g. *Atriplex*, *Enchylaena*, *Maireana*, *Rhagodia* and *Sclerolaena*).

.....5

**Thickets** of taller shrub species understorey (e.g. *Melaleuca pauperiflora*, *M. acuminata*, *M. uncinata*, *M. lanceolata*, *M. sheathiana*, *M. adnata*, *M. cucullata* and/or *M. lateriflora*, *Allocasuarina campestris* with *Melaleuca hamata* or *M. scalena*). A range of other shrub and ground layer species may occur among or below the thickets.

.....5

**Salt tolerant species understorey** (e.g. samphire, *Tecticornia* spp.).

.....5

Shrublands or herblands in which the tree canopy layer is very sparse to absent, either naturally or maintained so through long-term disturbance. Native vegetation where a tree canopy was formerly present is often referred to as ‘derived’ or ‘secondary’ vegetation. These sites would fall below the 10 per cent minimum canopy cover threshold for a woodland.....**NOT TEC**

**Table 3 Understorey species**

Scientific name	Common name/s
<b>Shrubs</b>	
<i>Acacia acuaria</i>	
<i>Acacia colletioides</i>	wait-a-while
<i>Acacia erinacea</i>	
<i>Acacia hemiteles</i>	

Scientific name	Common name/s
<i>Acacia lasiocalyx</i>	silver wattle
<i>Acacia lasiocarpa</i>	panjang
<i>Acacia leptospermoides</i>	
<i>Acacia mackeyana</i>	
<i>Acacia merrallii</i>	
<i>Acacia microbotrya.</i>	manna wattle
<i>Acacia pulchella</i>	prickly mooses
<i>Allocasuarina acutivalvis</i>	
<i>Allocasuarina campestris</i>	
<i>Allocasuarina humilis</i>	dwarf sheoak
<i>Allocasuarina lehmanniana</i>	dune sheoak
<i>Allocasuarina microstachya</i>	
<i>Argyrolottis turbinata</i>	
<i>Astroloma epacridis</i>	
<i>Banksia armata</i>	prickly dryandra
<i>Banksia sessilis</i>	parrot bush
<i>Beyeria brevifolia</i>	
<i>Bossiaea divaricata</i>	
<i>Bossiaea eriocarpa</i>	common brown pea
<i>Bossiaea halophila</i>	
<i>Callistemon phoeniceus</i>	lesser bottlebrush
<i>Calothamnus quadrifidus</i>	one-sided bottlebrush
<i>Calothamnus quadrifidus</i> subsp. <i>asper</i>	one-sided bottlebrush
<i>Comesperma integerrimum</i>	
<i>Conostylis setigera</i>	
<i>Dampiera lavandulacea</i>	
<i>Darwinia</i> sp. <i>Karonie</i>	
<i>Daviesia nematophylla</i>	
<i>Daviesia triflora</i>	
<i>Dodonaea bursariifolia</i>	
<i>Dodonaea inaequifolia</i>	
<i>Dodonaea pinifolia</i>	
<i>Dodonaea viscosa</i>	sticky hopbush
<i>Eremophila decipiens</i>	slender fuchsia
<i>Eremophila ionantha</i>	violet-flowered eremophila
<i>Eremophila oppositifolia</i>	weeooka
<i>Eremophila scoparia</i>	broom bush
<i>Exocarpos aphyllus</i>	leafless ballart
<i>Gastrolobium microcarpum</i>	sandplain poison
<i>Gastrolobium parviflorum</i>	
<i>Gastrolobium spinosum</i>	prickly poison
<i>Gastrolobium tricuspdatum</i>	
<i>Gastrolobium trilobum</i>	bullock poison
<i>Grevillea acuaria</i>	
<i>Grevillea huegelii</i>	



Scientific name	Common name/s
<i>Grevillea tenuiflora</i>	tassel grevillea
<i>Hakea laurina</i>	pincushion hakea
<i>Hakea lissocarpha</i>	honey bush
<i>Hakea multilineata</i>	grass-leaf hakea
<i>Hakea petiolaris</i>	sea urchin hakea
<i>Hakea preissii</i>	needle tree
<i>Hakea varia</i>	variable-leaved hakea
<i>Hibbertia commutata</i>	
<i>Hibbertia exasperata</i>	
<i>Hibbertia hypericoides</i>	yellow buttercups
<i>Hovea chorizemifolia</i>	holly-leaved hovea
<i>Hypocalymma angustifolium</i>	white myrtle
<i>Leptomeria preissiana</i>	
<i>Leptospermum erubescens</i>	roadside teatree
<i>Lycium australe</i>	
<i>Australian boxthorn</i>	
<i>Melaleuca acuminata</i>	
<i>Melaleuca adnata</i>	
<i>Melaleuca atroviridis</i>	
<i>Melaleuca brophyi</i>	
<i>Melaleuca cucullata</i>	
<i>Melaleuca cuticularis</i>	saltwater paperbark
<i>Melaleuca halmaturorum</i>	
<i>Melaleuca hamata</i>	
<i>Melaleuca hamulosa</i>	
<i>Melaleuca lanceolata</i>	
<i>Rottneest teatree</i>	
<i>Melaleuca lateriflora</i>	gorada
<i>Melaleuca marginata</i>	
<i>Melaleuca pauperiflora</i>	boree
<i>Melaleuca radula</i>	graceful honeymyrtle
<i>Melaleuca raphiophylla</i>	swamp paperbark
<i>Melaleuca scalena</i>	
<i>Melaleuca strobophylla</i>	
<i>Melaleuca teuthidoides</i>	
<i>Melaleuca thyoides</i>	
<i>Melaleuca uncinata group</i>	broom bush
<i>Melaleuca viminea</i>	mohan
<i>Olearia muelleri</i>	
<i>Goldfields daisy</i>	
<i>Olearia sp. Kennedy Range</i>	
<i>Petrophile divaricata</i>	
<i>Petrophile shuttleworthiana</i>	
<i>Petrophile squamata</i>	
<i>Petrophile striata</i>	

Scientific name	Common name/s
<i>Phebalium filifolium</i>	slender phebalium
<i>Phebalium lepidotum</i>	
<i>Phebalium microphyllum</i>	
<i>Phebalium tuberosum</i>	
<i>Pimelea argentea</i>	silvery-leaved pimelea
<i>Pittosporum angustifolium</i>	
<i>Platysace maxwellii</i>	karno
<i>Rhadinothamnus rudis</i>	
<i>Santalum acuminata</i>	quandong
<i>Santalum spicatum</i>	sandalwood
<i>Scaevola spinescens</i>	currant bush
<i>Senna artemisioides</i>	
<i>Styphelia tenuiflora</i>	common pinheath
<i>Templetonia sulcata</i>	centipede bush
<i>Trymalium elachophyllum</i>	
<i>Trymalium ledifolium</i>	
<i>Westringia cephalantha</i>	
<i>Xanthorrhoea drummondii</i>	
<b>Chenopods</b>	
<i>Atriplex acutibractea</i>	toothed saltbush
<i>Atriplex paludosa</i>	marsh saltbush
<i>Atriplex semibaccata</i>	berry saltbush
<i>Atriplex stipitata</i>	mallee saltbush
<i>Atriplex vesicaria</i>	bladder saltbush
<i>Enchylaena lanata / tomentosa complex</i>	barrier saltbush
<i>Maireana brevifolia</i>	small-leaf bluebush
<i>Maireana erioclada</i>	
<i>Maireana marginata</i>	
<i>Maireana trichoptera</i>	downy bluebush
<i>Rhagodia drummondii</i>	
<i>Rhagodia preissii</i>	
<i>Sclerolaena diacantha</i>	grey copperburr
<i>Tecticornia spp.</i>	samphire
<i>Threlkeldia diffusa</i>	coast bonefruit
<b>Forbs</b>	
<i>Actinobole uliginosum</i>	flannel cudweed
<i>Asteridea athrixioides</i>	
<i>Blennospora drummondii</i>	
<i>Borya nitida</i>	pincushions
<i>Borya sphaerocephala</i>	pincushions
<i>Brachyscome ciliaris</i>	
<i>Brachyscome lineariloba</i>	
<i>Caesia micrantha</i>	pale fringe-lily
<i>Caladenia flava</i>	cowslip orchid
<i>Calandrinia calypttrata</i>	pink purslane

Scientific name	Common name/s
<i>Calandrinia eremaea</i>	twining purslane
<i>Calotis hispidula</i>	bindy eye
<i>Carpobrotus modestus</i>	inland pigface
<i>Centipeda crateriformis</i> subsp. <i>crateriformis</i>	
<i>Chamaescilla corymbosa</i>	blue squill
<i>Chamaexeros serra</i>	little fringe-leaf
<i>Cotula coronopifolia</i>	waterbuttons
<i>Crassula colorata</i>	dense stonecrop
<i>Crassula exserta</i>	
<i>Dampiera juncea</i>	rush-like dampiera
<i>Dampiera lindleyi</i>	
<i>Daucus glochidiatus</i>	Australian carrot
<i>Dianella brevicaulis</i>	
<i>Dichopogon capillipes</i>	
<i>Disphyma crassifolium</i>	round-leaved pigface
<i>Drosera macrantha</i>	bridal rainbow
<i>Erodium cygnorum</i>	blue heronsbill
<i>Gilberta tenuifolia</i>	
<i>Gnephosis drummondii</i>	
<i>Gnephosis tenuissima</i>	
<i>Gnephosis tridens</i>	
<i>Gonocarpus nodulosus</i>	
<i>Goodenia berardiana</i>	
<i>Helichrysum leucopsideum</i>	
<i>Helichrysum luteoalbum</i>	Jersey cudweed
<i>Lagenophora huegelii</i>	
<i>Lawrencella rosea</i>	
<i>Lepidium rotundum</i>	veined peppergrass
<i>Podolepis capillaris</i>	wiry podolepis
<i>Podolepis lessonii</i>	
<i>Podotroche angustifolia</i>	sticky longheads
<i>Poranthera microphylla</i>	small poranthera
<i>Pterostylis sanguinea</i>	
<i>Ptilotus spathulatus</i>	
<i>Rhodanthe laevis</i>	
<i>Senecio glossanthus</i>	slender groundsel
<i>Spergularia marina</i>	
<i>Stylidium calcaratum</i>	book triggerplant
<i>Thysanotus patersonii</i>	
<i>Trachymene cyanopetala</i>	
<i>Trachymene ornata</i>	spongefruit
<i>Trachymene pilosa</i>	native parsnip
<i>Velleia cynopotamica</i>	
<i>Waitzia acuminata</i>	orange immortelle
<i>Zygophyllum ovatum</i>	dwarf twinleaf

Scientific name	Common name/s
<b>Graminoids</b>	
<i>Amphipogon caricinus - strictus complex</i>	greybeard grass
<i>Austrostipa elegantissima</i>	
<i>Austrostipa hemipogon</i>	
<i>Austrostipa nitida</i>	
<i>Austrostipa trichophylla</i>	
<i>Centrolepis polygyna</i>	wiry centrolepis
<i>Desmocladius asper</i>	
<i>Desmocladius flexuosus</i>	
<i>Gahnia ancistrophylla</i>	hook-leaf saw sedge
<i>Gahnia australis</i>	
<i>Harperia lateriflora</i>	
<i>Juncus bufonius</i>	toad rush
<i>Lachnagrostis filiformis</i>	blowngrass
<i>Lepidosperma leptostachyum</i>	
<i>Lepidosperma resinosum</i>	
<i>Lepidosperma sp. aff. tenue</i>	
<i>Lepidosperma tenue</i>	
<i>Lepidosperma viscidum</i>	sticky sword sedge
<i>Lomandra effusa</i>	scented matrush
<i>Lomandra micrantha</i> subsp. <i>micrantha</i>	small-flower matrush
<i>Lomandra nutans</i>	
<i>Meeboldina coangustata</i>	
<i>Mesomelaena preissii</i>	
<i>Neurachne alopecuroides</i>	foxtail mulga grass
<i>Rytidosperma caespitosum</i>	
<i>Rytidosperma setaceum</i> group	
<i>Schoenus nanus</i>	tiny bog-rush
<i>Schoenus sculptus</i>	gimlet bog-rush
<i>Schoenus subfascicularis</i>	

## Diagnostic 5 Vegetation condition

**Minimum condition for patches of the WA Wheatbelt Woodlands ecological community. For each category, both the weed cover and mature tree presence criteria must apply plus one of either patch size or patch width, depending on whether the patch is a roadside remnant or not.**

### Category A:

Patch corresponds to a condition of pristine / excellent / very good (Keighery, 1994) or a high RCV (RCC, 2014).

Exotic plant species account for 0 to 30% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Mature trees (diameter at breast height (dbh) of 30 cm or above) may be present or absent.

Patch size (non-roadside) 2 ha or more with no gap in native vegetation cover exceeding 50 m width.

.....TEC

**Patch width roadside only** (based on the native understorey component not width of the tree canopy)  
5 m or more.

.....TEC

Patch corresponds to a condition of pristine / excellent / very good (Keighery, 1994) or a high RCV (RCC, 2014).

Exotic plant species account for 0 to 30% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Mature trees (diameter at breast height (dbh) of 30 cm or above) may be present or absent.

Patch size (non-roadside) less than 2 ha.

.....NOT TEC

**Patch width roadside only** (based on the native understorey component not width of the tree canopy)  
less than 5 m.

.....NOT TEC

**Category B:**

Patch corresponds to a condition of good (Keighery, 1994) or a medium-high RCV (RCC, 2014).

Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Mature trees are present with at least 5 trees per 0.5 ha.

Patch size (non-roadside) 2 ha or more with no gap in native vegetation cover exceeding 50 m width.

.....TEC

**Patch width roadside only** (based on the native understorey component not width of the tree canopy)  
5 m or more.

.....TEC

Patch corresponds to a condition of good (Keighery, 1994) or a medium-high RCV (RCC, 2014), **AND** retains important habitat features.

Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Mature trees are present with at least 5 trees per 0.5 ha.

Patch size (non-roadside) less than 2 ha.

.....NOT TEC

**Patch width roadside only** (based on the native understorey component not width of the tree canopy)  
less than 5 m.

.....NOT TEC

**Category C:**

Patch corresponds to a condition of good (Keighery, 1994) or a medium-high RCV (RCC, 2014), **AND** retains important habitat features.

Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy).



Less than 5 mature trees per 0.5 ha are present.

Minimum patch size (non-roadside) 5 ha or more.

.....TEC

Patch size (non- roadside) less than 5 ha

.....NOT TEC

**Category D:**

Patch corresponds to a condition of degraded to good (Keighery, 1994) or a medium-Low to medium-high RCV (RCC, 2014).

Exotic plant species account for more than 50 to 70% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Mature trees are present with at least 5 trees per 0.5 ha.

Minimum patch size (non-roadside) 5 ha or more.

.....TEC

**Patch width roadside only** (based on the native understorey component not width of the tree canopy) 5 m or more

.....TEC

Patch corresponds to a condition of degraded to good (Keighery, 1994) or a medium-low to medium-high RCV (RCC, 2014).

Exotic plant species account for more than 50 to 70% of total vegetation cover in the understorey layers (i.e. below the tree canopy).

Less than 5 mature trees per 0.5 ha are present.

.....NOT TEC