GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

| **Section 1 – Eligibility for Listing** | | |
|---|---|---|
| **1. Name of the ecological community** | | |
| *'Melaleuca huegelii –M. systena* shrublands of limestone ridges' (floristic community type 26a as originally described in Gibson *et al*. (1994)). | | |
| **2. Listing Category for which the ecological community is nominated** | | |
| | WA Biodiversity Conservation Act | EPBC Act (wholly or as a component) |
| Current listing category<br><br>(Please check box) | Current ranking under WA Minister ESA list in policy<br>☐ Critically endangered<br>☒ Endangered<br>☐ Vulnerable<br>☐ Priority 1-4<br>☐ Data Deficient<br>☐ None – not listed | Name:<br><br>☐ Critically endangered<br>☐ Endangered<br>☐ Vulnerable<br>☒ None – not listed |
| Proposed listing category<br><br>(Please check box) | Under WA *Biodiversity Conservation Act 2016*<br><br>☐ Collapsed<br>☒ CR: Critically endangered<br>☐ EN: Endangered<br>☐ VU: Vulnerable<br>☐ Priority 1-4 | |
| Select one or more of the following criteria under which the community is to be nominated for BC Act listing. (Please check box). For further details on these criteria please refer to the Attachment to this form. The information you provide in Section 3 should support the criteria you select here. | ☐ Criterion A – Reduction in geographic distribution<br>☒ Criterion B – Restricted geographic distribution<br>☐ Criterion C – Environmental degradation based on change in an abiotic variable<br>☐ Criterion D – Disruption of biotic processes or interactions based on change in a biotic variable<br>☐ Criterion E – Quantitative analysis that estimates the probability of ecosystem collapse | |

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

**Section 2 – Description, Condition, Threats & Recovery**

**Please answer all the questions, providing references where applicable. If no or insufficient information exists to answer a question, you must indicate this instead of leaving the question blank. The answers may be provided within this form or as attachments, ensuring that responses clearly indicate which question number they refer to.**

***Classification***

**3. What is the name of the ecological community?**

Note any other names that have been used recently, including where different names apply within different jurisdictions. For example, is it known by separate names in different States or regions?

*Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* (1994) (FCT26a). Also known as Swan Coastal Plain community 26a (SCP26a).

**4. What authorities/surveys/studies support or use the name?**

The community was originally described in a report by Gibson *et al.* (1994). The community has been recognised since the publication of that report and was endorsed for listing as an Endangered TEC by the WA Minister for Environment in 2001 under policy with the name *Melaleuca huegelii – M. systena* shrublands of limestone ridges. At that time it was ranked endangered using ranking criteria developed in WA, that do not match those used for the more recently developed IUCN RLE. The community is also referred to in the shortened form SCP26a, meaning 'Swan Coastal Plain floristic community type 26a' or FCT26a meaning 'floristic community type 26a'. Hereafter the community will be referred to as FCT26a.

The community is referred to as above name by the Department of Biodiversity, Conservation and Attractions (DBCA), and stored in the departmental TEC database under that name. The recovery plan (Department of Environment and Conservation 2005) uses the name.

**5. How does the nominated ecological community relate to other ecological communities that occur nearby or that may be similar to it?**

Does it intergrade with any other ecological communities and, if so, what are they and how wide are the intergradation zones?
Describe how you might distinguish the ecological community in areas where there is overlap (also see Description section below).

The limestone soils of the Swan Coastal Plain support a wide variety of plant communities that are floristically distinct. One such community ('type 26' as described by Gibson *et al.* 1994) is only found on shallow soils over limestone or massive limestone ridges of Tamala Limestone. There are two distinct subgroups within this community that are related to the degree of soil development. Subgroup 26a occurs on skeletal soil on ridge slopes and tops of ridges, and is dominated by *M*. *huegelii*, *M*. *systena* and *M*. aff. *systena* often over scattered limestone heath species such as *Banksia sessilis* and *Grevillea preissii* (Keighery *et al*. 2003). Subgroup 26b is found on the lower slopes or in pockets with deeper soil and is dominated by low shrubs such as *Acacia lasiocarpa*, *Trymalium ledifolium*, *Melaleuca systena*, *Hibbertia hypericoides*, and *Grevillea preissii* with overstorey of *Eucalyptus gomphocephala*, *Eucalyptus foecunda* and *Eucalyptus petrensis* on deeper soils. Species richness is similar in both subgroups (mean 50.2 and 52.7 in 100m$^2$ quadrats) as was a high mean weed frequency (8.0 and 8.4 species / quadrat). Type 26b is virtually restricted to the Cottesloe unit. Taxa typical of the limestone heaths are *Spyridium globulosum, Templetonia retusa, Stylidium maritimum, Wurmbea monantha*, and *Acacia lasiocarpa*. While on the deeper soils *Hibbertia hypericoides, Caladenia flava, Lagenophora huegelii, Sowerbaea laxiflora, Schoenus clandestinus* and *Mesomelaena pseudostygia* are common.

Another community identified on limestone by Gibson *et al*. (1994) was 'species poor mallees and shrublands on limestone (floristic community type 27). This was largely restricted to the Yalgorup area and was either shrubland or mallee heath variously dominated by *Eucalyptus decipiens, Eucalyptus foecunda, Melaleuca systena* or *Hakea prostrata*. While similar in species composition to type 26 it differs in lacking many of the annual native and weed species and by the occurrence of taxa such as *Acacia truncata, Hibbertia spicata* subsp. *leptotheca*, and

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

*Comesperma confertum*. This community has significantly lower species richness than the other two limestone community types and significantly lower average number of weeds (>1 species / quadrat).

Additional floristic community types that have similarities to FCT26a include floristic community type 24 (FCT24) northern Spearwood shrublands and woodlands, as described in Gibson *et al*. (1994). This community grades into community 26b where the heath element is richer ([redacted][1] personal communication). The FCT24 consists of heaths or heaths with scattered *Eucalyptus gomphocephala* occurring on deeper soils north from Woodmans Point. Floristic community 26a is also closely related to Southern *Eucalyptus gomphocephala – Agonis flexuosa* woodlands (floristic community type 25) that encompasses the *Eucalyptus gomphocephala - Agonis flexuosa* woodlands south of Woodmans Point.

***Description***

**6. List the main features that distinguish this ecological community from all other ecological communities.**

Characteristic (or diagnostic) features can be biological (e.g. taxa or taxonomic groups of plants and animals characteristic to the community; a type of vegetation or other biotic structure), or associated non-biological landscape characteristics (e.g. soil type or substrate, habitat feature, hydrological feature). Please limit your answer to those features that are specific to the ecological community and can be used to distinguish it from other ecological communities.

This community ('floristic community type 26' as described by Gibson *et al.* 1994) is only found on shallow soils over limestone or massive limestone ridges of Tamala Limestone. It is highly restricted and known from massive limestone ridges around Yanchep north of Perth, and south of Perth near Lake Clifton. The two distinct subgroups are related to degree of soil development. Type 26a (*Melaleuca huegelii –M. systena shrublands of limestone ridges)* is only found on the skeletal soil on ridge slopes and ridge tops heaths dominated by *Melaleuca huegelii, Melaleuca systena,* or *Banksia sessilis*. The community is often long unburnt and may be very attractive, developing mossy ground cover with numerous herbs as the understory over time. At least one unnamed *Haloragis* species may be endemic to the community. Floristic community type 26b is found on the lower slopes or in pockets where deeper soil is able to support *Eucalyptus gomphocephala, Eucalyptus foecunda* or *Eucalyptus petrensis* ms woodlands or mallee develop over a dense heath.

**7. Give a description of the biological components of the ecological community.**

For instance, what species of plants and animals commonly occur in the community; what is the typical vegetation structure (if relevant).

Flora that commonly occur in the community are listed at Table 1. The mean species richness for 11 quadrats in the community surveyed by Gibson *et al.* (1994) was 50.2 species in 100 square metres. This is slightly lower than richness recorded for subgroup 26b. An average of eight weed species were also recorded per quadrat in the Gibson *et al.* (1994) study, which is similar to that found in community type 26b, and is a relatively low level of weed invasion.

The community is characterised by species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii*, *M. systena* (previously *M. acerosa*), *Banksia sessilis* over *Grevillea preissii*, *Acacia lasiocarpa* and *Spyridium globulosum*, occurring on skeletal soil on ridge slopes and ridge tops.

**Table 1.** Typical (occurs in >75% quadrats in that community) and common (occurs in 50-75% of quadrats in that community) taxa found in quadrats (from Gibson *et al.* 1994)

| | **Taxon** |
|---|---|
| | *Acacia lasiocarpa* |

[1] [redacted]: previously Senior Research Scientist, DBCA, Kensington.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| | |
|---|---|
| * | *Aira caryophyllea* |
| * | *Lysimachia arvensis* |
| | *Crassula colorata* |
| | *Rytidosperma occidentale* |
| | *Daucus glochidiatus* |
| * | *Dischisma arenarium* |
| | *Banksia dallanneyi* |
| | *Banksia sessilis* |
| | *Eriochilus dilatatus* |
| | *Gompholobium tomentosum* |
| | *Grevillea preissii* |
| | *Hardenbergia comptoniana* |
| * | *Heliophila pusilla* |
| | *Hydrocotyle hispidula* |
| * | *Hypochaeris glabra* |
| | *Leucopogon parviflorus* |
| | *Desmocladus flexuosus* |
| | *Melaleuca systena* |
| | *Melaleuca huegelii* |
| | *Millotia tenuifolia* |
| | *Phyllangium paradoxum* |
| | *Opercularia vaginata* |
| | *Parietaria debilis* |
| | *Pterostylis* aff. *pyramidalis* |
| * | *Sonchus oleraceus* |
| | *Austrostipa compressa* |
| | *Austrostipa flavescens* |
| | *Stylidium maritimum* |
| | *Templetonia retusa* |
| | *Thysanotus manglesianus/patersonii* complex |
| | *Trachymene pilosa* |
| | *Spyridium globulosum* |
| * | *Vulpia myuros* |
| | *Wurmbea monantha* |

* Introduced

**8. Give a description of the associated non-biological landscape characteristics or components of the ecological community.**

For instance, what is the typical landscape in which the community occurs? Note if it is associated with a particular soil type or substrate; what major climatic variables drive the distribution of the ecological community (e.g. rainfall). Note particular altitudes, latitudes or geographic coordinates

Floristic community type 26a occurs on Tamala limestone ridges. This occurs intermittently as late Pleistocene ridges (1-2 million years old) that are roughly parallel to the coast on the Swan Coastal Plain. It occurs on the

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

Cottesloe and Karrakatta soil units mainly within the Spearwood system. The Cottesloe soil unit consists of low hilly landscape with shallow brown sands over limestone, and Karrakatta is yellow sands with a limestone layer, and grey surface colouring due to organic matter.

Tamala Limestone is a source of road-making material, industrial lime used mainly for cement, builders' lime and building blocks. The Cottesloe Unit is the main source of limestone for road making and building (DCE 1980).

**9. Provide information on the ecological processes by which the biological and non-biological components interact (where known).**

**10. Does the ecological community show any consistent regional or other variation across its extent, such as characteristic differences in species composition or structure?**

If so, please describe these.

Gibson *et al* (1994) recorded dense thicket, dense heath A, dense heath B, heath A, heath B, low heath C, low scrub B, open scrub and scrub, in quadrats in the community.

**11. Does the ecological community provide habitat for any listed threatened species and/or endemic species?**

If so, please note the species and whether the species is listed on State and/or national lists and the nature of their dependence on the ecological community.

Priority flora that also sometimes occur within the occurrences include *Hibbertia spicata* subsp. *leptotheca* (Priority 3), *Stylidium maritimum* (Priority 3) and *Sarcozona bicarinata* (Priority 3)**.** The flora are dependent on the habitat that supports the community. Recovery actions implemented to improve the quality or security of the community, are likely to also benefit the Priority flora populations.

**12. Identify major studies on the ecological community (authors, dates, title and publishing details where relevant).**

Department of Environment and Conservation (2005). Interim Recovery Plan 2004-2009 for *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson *et al.* 1994) Interim Recovery Plan No. 193. DEC, Perth.

Department of Environment and Conservation (2012). Parks and reserves of Yanchep and Neerabup management plan 76, Department of Environment and Conservation, Perth.

Gibson, N., Keighery, B., Keighery, G., Burbidge, A. and Lyons, M. (1994). A floristic survey of the Southern Swan Coastal Plain. Unpublished report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).

Government of Western Australia. (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Government of Western Australia (2000). Bush Forever. Department of Environmental Protection, Perth.

Griffin, E.A. (2010). FCT Analysis Nowergup Quadrat. EA Griffin and Associates. Perth, Western Australia.

Keighery, G., Gibson, N., Muir, B. and Keighery, B. (2003). Common and rare limestone communities of the Swan Coastal Plain. Summary Proceedings, Threatened Ecological Communities Symposium. Department of Conservation and Land Management, Perth.
, Perth.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Weston, A.S. and Gibson, N. (1997). Report on the limestone vegetation of Wabling Hill area, Reserves 39411 and 39412, and the Ridges extension to Yanchep National Park. Department of Conservation and Land Management, Perth.

***Distribution***

**13. Describe the distribution across WA and nationally.**

State the appropriate bioregions where the ecological community occurs. Attach or provide any maps showing its distribution with details of the source of the maps, or explain how they were created and the datasets used.

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**


The map above was created using ArcGIS version 10.6.1 and shows the extent of distribution of floristic community type 26a. This community has a range of 168km, with the southernmost occurrence at Lake Clifton and the northernmost at Wilbinga.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

The map was created from known mapped occurrences of the community contained on the corporate Threatened Ecological Community Database (TECDB), as administered by the Department of Biodiversity and Conservation (DBCA).

**14. What is the area of distribution of the ecological community?**

For answers to parts a, b, c & d: please identify whether any values represent extent of occurrence or area of occupancy (as described in the Attachment); provide details of the source(s) for the estimates and explain how they were calculated, and the datasets used.

**14 a. What is the current known area (in ha)?**

90 records of occurrences of the community are currently included in the TEC database. Six of these have been destroyed, and three require further survey. There are 81 occurrences with mapped boundaries within the TEC database with a total of 199 hectares mapped as at 8/4/2019.

**14 b. What is the pre-industrialisation extent or its former known extent (in ha)?** An ecological community is considered to be naturally restricted if it has a pre-industrialisation area of occupancy that is less than 10 000 ha or a pre-industrialisation extent of occurrence that is less than 100 000 ha (refer to the Attachment A)

Floristic community type 26a occurs on the Cottesloe and Karrakatta soil and landform units (vegetation complexes) mainly within the Spearwood system. The occurrences are within the Cottesloe - Central and South, Cottesloe – North, and Karrakatta – North soil and landform units.

The pre-1750 and current extent of these soil and landform units are outlined in table 2 (from Government of Western Australia, 2019).

**Table 2.** Historical and current extent of soil and landform units on which FCT26a occurs.

| Soil and landform unit | SCP Pre-European extent (ha) | SCP Current extent (ha) | SCP % remaining |
|---|---|---|---|
| Cottesloe - Central and South | 45299.61 | 14567.87 | 32.16 |
| Cottesloe - North | 43474.31 | 25165.42 | 57.89 |
| Karrakatta - North | 44,272.94 | 19,976.32 | 45.12 |

These data provide some indication, only, of the likely decline of the community. This community is targeted for limestone quarrying, so historical losses are likely to be greater than the losses through general land clearing of the associated soil and landform units.

**14 c. What is the estimated percentage decline of the ecological community?**

As calculated from table 2 above, the extent at which the community has declined since pre-industrialisation, ranges from approximately 42% to 68%.

**14 d. What data are there to indicate that future changes in distribution may occur?**

There is a history of clearing of this community. Occurrences 68-69 (Jindalee01 and Jindalee03) occur on private property at Jindalee and were cleared for housing and associated infrastructure. Occurrence 59 and 61 (Neerabup06 and Neerabup08) were cleared for extension of the freeway. Limestone soils have been a focus for mining in the past and a portion of the original extent of occurrences 15 (YAN12), 34 (MYWABL13), 40 (MYWABL19) and 52 (CLIFT03), and all of occurrences 36 (MYWABL15) and 37 (MYWABL16) have been cleared for limestone mining. Occurrences 34, 36 and 37 are regenerating to some extent however removal of the massive limestone substrate prevents complete regeneration of the flora. Occurrence 24 was partly cleared historically for a fire tower.

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

There is further risk of clearing reducing distribution of the community, through mineral leases and proposed housing developments. Mineral exploration and extraction leases exist over the area in which occurrences 2 (JP05), 10-17 (MYYEAL01, 02, 04, 04, 05, YAN12, MYPARROT01, 02) 34 (MYWABL13) and 36-38 (MYWABL15,16, 17) of the limestone ridges floristic community type 26a occurs. Occurrences 72 and 74 (DAYRELL01, 05) occur on previously privately owned lands in Nowergup and occur within a site previously proposed for limestone extraction. The land was recently purchased for conservation. Occurrences 18 (MYWAN01), 19 (MYWAN02), 44-49 (MYSHE03, 04, 05, 06, 07, 08) are located within reserves whose purpose is listed as a quarry, but this land is under the care, control and management of the Conservation and Parks Commission and is managed for conservation. In addition to mining, clearing is likely to be associated with developments for road works, housing or industry. A number of occurrences have already been cleared and a number are also proposed to be cleared in the future.

***Patch size***

**15. What is the typical size (in ha) for a patch of the ecological community (if known)?**

Explain how it was calculated and the datasets that are used. Relevant data includes the average patch size, the proportion of patches that are certain sizes, particularly proportions below 10 ha and below 100 ha, (but also below 1 ha and above 100 ha, for example). This could be presented as the range of patch sizes that comprise 90% of the occurrences.

Statistics for the community shown in Table 2 (calculated from the TEC database 26.04.2019) indicate an average of 2.5ha per occurrence (for those with known boundaries), with mapped patches of the occurrence ranging from 0.04ha to 17.2ha.

**Table 3.** Statistical summary of occurrences of SCP26a occurrences

| | |
|---|---|
| **Number** | 81 |
| **Minimum area** | 0.04ha |
| **Maximum area** | 17.2ha |
| **Sum** | 199.1ha |
| **Mean** | 2.5ha |
| **Standard Deviation** | 3.1ha |

**16. Quantify, if possible, the smallest percentage or area required for a patch of the ecological community to be considered viable.**

This refers to the minimum size of a remnant that can remain viable without active management. It may be determined through the requirements for dominant native species, level of species diversity, or the nature of invasive weeds.

No minimum size is specified, as future viability will depend on management.

***Functionality***

**17. Is the present distribution of the ecological community severely fragmented?**

If so, what are likely causes of fragmentation?
If fragmentation is a natural or positive characteristic of this ecological community, please explain this and state the reason.
*Severely fragmented* refers to the situation in which increased extinction risk to the ecological community results from most remnants being found in small and relatively isolated patches.

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

This ecological community occurs on naturally fragmented habitat of isolated massive limestone ridges. Fragmentation has been increased by clearing for mining, housing and road building.

**18. Has there been a loss or decline of functionally important species?**

This refers to native species that are critically important in the processes that sustain or play a major role in the ecological community and whose removal has the potential to precipitate change in community structure or function sufficient to undermine the overall viability of the community.

There are no specific data available in this regard. Further detail on weed invasion, too frequent fire and land clearing is provided in section 32.

**18 a. If yes, which species are affected?**

See section 19.

**18 b. How are the species functionally important and to what extent have they declined?**

There are no specific data available in this regard. Further detail on weed invasion, too frequent fire and land clearing is provided in section 32.

***Reduction in community integrity***

**19. Please describe any processes that have resulted in a reduction in integrity and the consequences of these processes, e.g. loss of understorey in a woodland. Include any available information on the rate of these changes.**

This recognises that an ecological community can be threatened with extinction through on-going modifications that do not necessarily lead to total destruction of all elements of the community. Changes in integrity can be measured by comparison with a benchmark state that reflects as closely as possible the natural condition of the community with respect to the composition and arrangement of its abiotic and biotic elements and the processes that sustain them. Please provide a description of the benchmark state where available. For further information please refer to the Guidelines.

Loss of species important to the community have occurred due to clearing, and through impacts on native species through competition with introduced species (weeds). Native vegetation clearing will reduce capacity of occurrences to buffer from edge effects.

Occurrences that are remote from urban areas and historical impacts of clearing, quarrying, and frequent fires are likely to be closest to the benchmark state. This includes a suite of occurrences in Yanchep National Park.

***Survey and Monitoring***

**20. Has the ecological community been reasonably well surveyed?**

Provide an overview of surveys to date, including coverage of different land tenure, and the likelihood of the ecological community's current known distribution and/or patch size being a true reflection of its actual distribution (consider area of occupancy and area of extent, including any data on number and size of patches).

The community was initially described in Gibson *et al* (1994) based on a regional survey of over 500 quadrats established across the southern Swan Coastal Plain. An additional ~1000 quadrats were established for Bush Forever (2000). There were a total of 13 quadrats in the community established for these two surveys. There have also been targeted surveys of specific areas through various levels of survey including establishing quadrats and analysis (eg Weston and Gibson 2007, Mattiske 2001). The community is considered to have been well surveyed.

**Table 4.** Survey data extracted from the TECDB (occurrence numbers are not sequential as they are taken directly from the database)

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| Site ID | Occurrence No. | Area (Ha) | Year of latest condition survey | Land managers / tenure | Reserve No. |
|---|---|---|---|---|---|
| JP05 | 2 | 2.1384 | 1999 | DBCA State Forest | - |
| MYYAN01 | 3 | 4.5662 | 1999 | DBCA Reserve | 9868 |
| MYYAN02 | 4 | 6.7344 | 1999 | DBCA Reserve | 9868 |
| MYYAN03 | 5 | 3.2828 | 1999 | DBCA Reserve | 9868 |
| MYYAN04 | 6 | 4.4247 | 1999 | DBCA Reserve | 9868 |
| MYYAN05 | 7 | 0.7435 | 1999 | DBCA Reserve | 9868 |
| MYYAN06 | 8 | 1.3475 | 1999 | DBCA Reserve | 9868 |
| MYYAN07 | 9 | 0.8394 | 1999 | DBCA Reserve | 9868 |
| MYYEAL01 | 10 | 0.4986 | 1999 | DBCA State Forest | - |
| MYYEAL02 | 11 | 3.9224 | 1999 | DBCA State Forest | - |
| MYYEAL03 | 12 | 3.2086 | 2008 | DBCA State Forest | - |
| MYYEAL04 | 13 | 2.4929 | 1999 | DBCA State Forest | - |
| MYYEAL05 | 14 | 1.6863 | 1999 | DBCA State Forest | - |
| YAN12 | 15 | 17.1831 | 2010 | DBCA State Forest | - |
| MYPARROT01 | 16 | 2.3724 | 1999 | DBCA State Forest | - |
| MYPARROT02 | 17 | 5.1286 | 1999 | DBCA State Forest | - |
| MYWAN01 | 18 | 0.8354 | 1999 | DBCA Reserve | 39412 |
| MYWAN02 | 19 | 0.9103 | 1999 | DBCA Reserve | 39412 |
| MYWAN03 | 20 | 2.0356 | 1999 | DBCA State Forest | - |
| MYWAN04 | 21 | 1.075 | 1999 | DBCA State Forest | - |
| MYWABL01 | 22 | 0.9422 | 1999 | DBCA State Forest | - |
| MYWABL10 | 23 | 0.3614 | 1999 | DBCA State Forest | - |
| MYWABL02P | 24 | 4.3613 | 2016 | DBCA State Forest | - |
| MYWABL03 | 25 | 2.4344 | 1999 | DBCA State Forest | - |
| MYWABL04 | 26 | 0.9398 | 1999 | DBCA State Forest | - |
| MYWABL05P | 27 | 0.6785 | 1999 | DBCA State Forest | - |
| MYWABL08P | 28 | 0.412 | 1999 | DBCA State Forest | - |
| MYWABL07 | 29 | 0.3229 | 1999 | DBCA State Forest | - |
| MYWABL06 | 30 | 1.1385 | 1999 | DBCA State Forest | - |
| WABL01 | 31 | 9.7677 | 1999 | DBCA State Forest | - |
| MYWABL11 | 32 | 2.3976 | 1999 | DBCA State Forest | - |
| MYWABL12 | 33 | 2.6437 | 1999 | DBCA State Forest | - |
| MYWABL13 | 34 | 0.6464 | 1999 | Department of Water and Environmental Regulation | - |
| MYWABL14P | 35 | 2.1175 | 1999 | DBCA State Forest | - |
| MYWABL17 | 38 | 0.7882 | 1999 | DBCA/Water Corporation | - |
| MYWABL18P | 39 | 8.173 | 1999 | DBCA State Forest | - |
| MYWABL19 | 40 | 2.5118 | 1999 | DBCA State Forest | - |
| SHE04 | 41 | 7.7848 | 1999 | DBCA State Forest | - |
| MYSHE01 | 42 | 1.0785 | 1999 | DBCA State Forest | - |
| MYSHE02 | 43 | 2.6661 | 1999 | DBCA State Forest | - |
| MYSHE03 | 44 | 1.3373 | 1999 | DBCA Reserve | 39411 |
| MYSHE04 | 45 | 1.8238 | 1999 | DBCA Reserve | 39411 |
| MYSHE05 | 46 | 0.9384 | 1999 | DBCA Reserve | 39411 |
| MYSHE06 | 47 | 1.2276 | 1999 | DBCA Reserve | 39411 |
| MYSHE07 | 48 | 1.5803 | 1999 | DBCA Reserve | 39411 |

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| | | | | | |
|---|---|---|---|---|---|
| MYSHE08 | 49 | 1.5507 | 1999 | DBCA Reserve | 39411 |
| MYSHE09 | 50 | 5.6951 | 1999 | DBCA State Forest | - |
| SVH01 | 51 | 2.2656 | 2018 | DPLH | - |
| CLIFT03 | 52 | 1.6471 | 2008 | Unvested land | - |
| YAN02 | 53 | 11.9932 | 2016 | DBCA Reserve | 9868 |
| NEERABUP01 | 54 | 0.5674 | 2001 | DBCA Reserve/Main Roads WA | 27575/49844 |
| NEERABUP02 | 55 | 0.209 | 2001 | DBCA Reserve | 27575 |
| NEERABUP03 | 56 | 0.334 | 2001 | DBCA Reserve | 27575 |
| NEERABUP04 | 57 | 0.0427 | 2001 | DBCA Reserve | 27575 |
| NEERABUP05 | 58 | 0.0382 | 2001 | Main Roads WA | 27575 |
| NEERABUP07 | 60 | 0.3127 | 2000 | Main Roads WA | - |
| coronation01 | 62 | 3.1553 | 2002 | Private | - |
| coronation07 | 63 | 0.4477 | 2002 | Private | - |
| MYHADR01 | 66 | 2.1948 | 1999 | DBCA State Forest | - |
| butler01 | 67 | 1.8148 | 2003 | City of Wanneroo | 49111 |
| SFCLIFT05 | 70 | 11.2436 | 2003 | DBCA State Forest | - |
| SFCLIFT01 | 71 | 7.4804 | 2003 | DBCA State Forest | - |
| DAYRELL01 | 72 | 7.0845 | 2018 | Acquired – planned DBCA Reserve | - |
| DAYRELL05 | 74 | 0.1677 | 2003 | Acquired – planned DBCA Reserve | - |
| ANKETELL01 | 75 | 1.7855 | 2008 | Private | - |
| Honey01 | 76 | 0.3369 | 2004 | City of Wanneroo | 47178 |
| ONETREEHILL01 | 78 | 0.6772 | 2004 | City of Wanneroo | 25253 |
| ONETREEHILL02 | 79 | 0.6048 | 2004 | City of Wanneroo/Main Roads | Portion in 25253 |
| WATTLE01 | 80 | 0.7674 | 2004 | Private | - |
| CARABOODA01 | 81 | 0.1987 | 2004 | City of Wanneroo | 22031 |
| CARABOODA02 | 82 | 1.2119 | 2004 | City of Wanneroo | 22031 |
| ONETREEHILL03 | 83 | 0.1838 | 2005 | City of Wanneroo | 25253 |
| HOPKINSRD02 | 84 | 0.8914 | 2016 | DBCA State Forest | - |
| coronation08 | 85 | 0.4178 | 2011 | Private | - |
| coronation09 | 86 | 0.3979 | 2011 | Private | - |
| coronation11 | 87 | 0.4006 | 2011 | Private | - |
| coronation10 | 88 | 0.0822 | 2011 | Private | - |
| Nowergup01 | 91 | 0.4969 | - | Private | - |
| Nowergup02 | 92 | 0.8823 | - | Private | - |
| Nowergup03 | 93 | 0.1446 | - | Private | - |
| Flynn01 | 94 | 6.8458 | - | WA Land Authority | - |

**21. Where possible, please indicate areas that haven't been surveyed but may add to the information required in determining the community's overall viability and quality.**

Include commentary on issues to do with accessing different land tenures within the area of distribution, including private property, and the likelihood that these areas may include occurrences.

Occurrences that require further survey:

1. Occurrence 20 (MYWAN03) - a 10x10m quadrat analysed by Griffin 2012. Statistical analyses indicate quadrat may occur in transitional unit between FCT26a and 26b. The inferred occurrence

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

was burnt in the summer of 2007. To avoid the burnt area the quadrat was positioned slightly off the top of the hill with a NEE aspect. Quadrat may need to be repositioned/scored in the future.

2. Occurrence 91-94 (Nowergup01, 02, 03, Flynn01) – no condition information with occurrences 91-93 occur on private land. Occurrence 89-90 (zYan4 and zYan5) – have no detailed survey information and boundary not mapped.
3. Some occurrences that have been inferred as FCT26a community type by consultants, based on habitat type, and combinations of key taxa (in particular, occurrences 54-61 (Neerabup02, 02, 03, 04, 05, 07). Ideally the community should be identified through analysis of comprehensive quadrat data. The community is quite distinctive and can generally be identified with a reasonably high level of confidence in the absence of quadrat data and statistical analysis.

**22. Is there an ongoing monitoring program? If so, please describe the extent and length of the program.**

A level of monitoring is being conducted by DBCA, with further detail specified in section 40.

***Condition Classes and Thresholds***

**23. Do you think condition classes/thresholds apply to this ecological community? If not, give reasons.**

The Committee recognises that ecological communities can exist in various condition states. In reaching its decision the Committee uses condition classes and/or thresholds to determine the patches that are included or excluded from the listed ecological community (see the Guidelines for details of the process of determining condition classes). Relevant here is recognition of different states following disturbance and the natural recovery of the occurrence towards a higher condition class.

The minimum viable condition for this community to be considered viable is Good condition. This refers to a patch in which "Vegetation structure altered but retains basic vegetation structure or ability to regenerate it. Obvious signs of disturbance, e.g. from partial clearing, dieback, logging, grazing. Presence of very aggressive weeds." (Keighery 1994 vegetation condition scale in Government of Western Australia 2000). No minimum patch size is specified, as future viability will depend on management. Very small areas are known to be able to maintain their condition if they are subject to very minimal disturbance.

**24. If so, how much of the community would you describe as in relatively <u>good condition</u>,**

i.e. likely to persist into the long-term with minimal management?

Condition categories 'Very Good to Pristine' as below (see Table 4 below) are considered to be in good condition, therefore 177.7ha or 94.4% of occurrences with known condition are considered to be in good condition, and contain high native plant species diversity, maintain integrity of vegetation structure, and minimal weed/introduced species cover. All occurrences are in rural areas and are subject to the ongoing pressures/disturbances associated with proposed clearing and agriculture, and all require substantial management to protect from pressures such as spread of introduced flora and herbivores.

**Table 5.** Vegetation condition of occurrences for which condition is known (73)

| **Condition Ranking (Keighery 1994) from Government of Western Australia 2000)** | **Hectares** |
|---|---|
| **Pristine** | 0 |
| **Excellent** | 185.5 |
| **Very Good** | 19.3 |

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| | |
|---|---|
| **Good** | 5.7 |
| **Degraded** | 1.9 |
| **Completely degraded** | 3.1 |
| **Total** | 188.4 |

**25. What features or variables do you consider to be most valuable for identifying a patch of the ecological community in relatively <u>good condition</u>?**

Variables for establishing the highest condition class may include: patch size; connectivity; native plant species composition; diversity and cover (for example in overstorey; mid-shrub and/or understorey layers); recognised faunal values; and cover of weeds or other invasive species.

See section 24.

This includes vegetation ranging from 'Pristine' - with no obvious signs of disturbance and native plant species diversity fully retained or almost so, zero or almost so weed cover/abundance, to 'Excellent' - Vegetation structure intact, with disturbance only affecting individual species, weeds are non-aggressive species, and the area contains high native plant species diversity, with less than 10% weed cover, and 'Very Good' - Vegetation structure altered, obvious signs of disturbance eg: from repeated fires, dieback, logging, grazing, aggressive weeds are present, with moderate native plant species diversity, and typical weed cover is less than 20% (5 – 20%).

**26. How much of the community would you describe as in relatively <u>medium condition</u>**, i.e. likely to persist into the long-term future with management?

For the purposes of relating condition to IUCN Criteria, medium condition relates to WA condition categories 'Very Good to Good' as below (see ^ below and Table 5 above) are considered to be in medium condition, so therefore 5.7ha or 3.0% of occurrences with known condition are considered to be in medium condition, and contain medium plant species diversity, reduced of vegetation structure, and a medium level of weed/introduced species cover.

^This includes vegetation ranging from 'Very Good-Good' and 'Good' - Vegetation structure altered but retains basic vegetation structure or ability to regenerate it, obvious signs of disturbance are present, from activities including partial clearing, dieback, logging, grazing, and very aggressive weeds are present, with low native plant diversity (5 – 50%).

**27. Please describe how you would identify areas in <u>medium condition</u> using one or a combination of indicators such as species diversity, structure, remnant size, cover of weeds or other invasive species, etc.**

See section 26.

**28. How much of the community would you describe as in relatively <u>poor condition</u>,** i.e. unlikely to be recoverable with active management?

For the purposes of relating condition to IUCN Criteria, poor condition in this instance relates to WA condition categories 'Degraded' and 'Completely Degraded', (see ^ below and Table 4 above), so 5ha or 2.6% of occurrences with known condition are considered to be in poor condition.

Poor condition is considered to be that containing minimal native flora, presence of aggressive weeds, and evidence of high level disturbance.

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

^ This includes vegetation ranging from 'Degraded' Basic vegetation structure severely impacted by disturbance, the vegetation requires intensive management, and disturbance such as partial clearing, dieback, logging and grazing are present, very aggressive weeds are present at high density, and very low native plant species diversity is observed (20 – 70%) to 'Completely Degraded' where vegetation structure is no longer intact and the area is completely or almost completely without native flora, referred to also as 'Parkland Cleared', with very low to no native species diversity (weed species greater than 70%).

**29. Please describe how you would identify areas in poor condition using one or a combination of indicators such as species diversity, structure, remnant size, cover of weeds or other invasive species, etc.**

See section 28.

***Threats***

Note: If you plan to identify climate change as a threat to the ecological community, please refer to the Guidelines for information on how this should be addressed.

**30. Identify PAST threats to the ecological community indicating whether they are *actual* or *potential*.**

The most significant threat to the community is clearing for mining, housing and road building. Too frequent fire is another major threat to the community. With some occurrences surrounded by highly urbanised and peri-urban areas and others within State forest areas and national parks, the frequency of fires, impact of recreational uses and incidence of illegal rubbish dumping are generally increased. These factors can all lead to degradation of plant communities through increasing weed invasion and alteration of structure, species composition or loss of component taxa.

**Vegetation clearing**

Limestone substrates have been a focus for mining and quarrying in the past and continue to be targeted. Mineral exploration and extraction leases exist over the area of land in which occurrences 2 (JP05), 10-17 (MYYEAL01, 02, 03, 04, 05, YAN12, MYPARROT01, 02), 34 (MYWABL13) and 38 (MYWABL17) of the limestone ridges community FCT26a occurs. A portion of occurrences 15 (YAN12) and 34 (MYWABL13), and all of the original area of occurrences 36 (MYWABL15) and 37 (MYWABL16) have been cleared for limestone mining. Some flora are regenerating to some extent on occurrences 34, 36 and 37 but the extent of regeneration is affected by the removal of the limestone substrate. A portion of occurrences 40 (MYWABL19) and 52 (CLIFT03) have also been cleared, however, no extraction leases are current for the sites. Future sand mining has been approved for the Yanchep and Nowergup region and is expected to impact occurrence 84 (HOPKINDSRD02). Occurrences 18 (MYWAN01), 19 (MYWAN02), 44 to 49 (MYSHE03, MYSHE04, MYSHE05, MYSHE06, MYSHE07, MYSHE08) are located within reserves with quarry as their purpose. This land is now under the care, control and management of the Conservation and Parks Commission and is managed for conservation.

In addition to mining, clearing is likely to be associated with developments for road works, housing or industry. A number of occurrences have already been cleared and a number are also proposed to be cleared in the future for these purposes.

Occurrence 68 and 69 (Jindalee01, 03) have been cleared for housing. The extension of the Mitchell Freeway through part of Neerabup National Park was approved and resulted in the clearing of occurrence 59 and 61 (Neerabup06, 08). Occurrences 51 (SVH01) and 54-58 (Neerabup01, 02, 03, 04, 05, 07) may be cleared for tracks. As well as destroying the vegetation and fragmenting remaining remnants, tracks also encourage weed invasion into the adjacent habitat. A small portion of occurrences 24 (MYWABL02P) and 51 (SVH01) has been cleared historically for building of a fire tower/station. This potentially may exacerbate weed invasion in the area due to

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

ongoing maintenance and use. Trig stations that involve some localised clearing and disturbance are also located on the tops of ridges within occurrences 6 (MYYAN04) and 51 (SVH01).

**Weed invasion**

Current weed levels in most occurrences are still quite low. Some occurrences are close to or surrounded by urban areas that act as weed sources and would be vulnerable to weed invasion following any disturbance. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, that are produced annually by many weed species. In occurrences 70 and 71 (SFCLIFT05 and 01), bridal creeper (*Asparagus asparagoides*) is present and has the potential for significant impact.

**Grazing and trampling**

Occurrences 62-63 (coronation01, 07), 67 (butler01) and 70-71 (SFCLIFT05, 01) have been historically grazed. There is also evidence that stock and high numbers of kangaroos are currently impacting occurrences 62 and 63 (coronation 01, 07). Grazing of the community is likely to have caused alterations to the species composition by the selective grazing of edible species, the introduction of weeds and nutrients, and trampling and general disturbance. High numbers of rabbits have also invaded a number of occurrences, selectively grazing more palatable species, and caused damage to vegetation with high densities of warrens. High kangaroo numbers are also a threat to a number of other occurrences, particularly 54-58 (Neerabup01, 02, 03, 04, 05), 60 (Neerabup07), and 67 (butler01). Kangaroos may impact on the vegetation through grazing, trampling and breaking foliage when moving through the area. Grazing would also have an impact on the establishment of young plants thereby limiting natural recruitment.

**Inappropriate fire regimes**

Fires are likely to have a significant effect on the vegetation composition in Mediterranean ecosystems such as those in the south-west of Western Australia (Abbott and Burrows 2003). A number of occurrences of this community are close to urban areas or appear to have been historically viewed as buffers for plantations, and have therefore been burnt relatively frequently in recent years. There is evidence of weed invasion and possibly increased numbers of rabbits as a consequence of historical fire regimes in some areas that have been subject to more frequent burning in recent decades ([2] [redacted] personal observation). Large fires have recently impacted occurrences at Yanchep ([3] [redacted] personal communication).

**Disturbance due to recreational use / maintenance activities**

Several occurrences occur in National Parks and State Forest where visitation is high and the impact from recreational users from trampling, rubbish and track creation is increased. Occurrence 52 (CLIFT03) is also used as an unofficial rubbish tip. Apart from being visually unappealing and damaging vegetation, rubbish and in particular garden waste, introduces weed seeds into the bushland and increases the fire hazard.

**31. Identify <u>CURRENT</u> threats to the ecological community indicating whether they are *actual* or *potential*.**

See above.

**32. Identify FUTURE threats to the ecological community indicating whether they are *actual* or *potential*.**

[2] [redacted] Principal Ecologist, DBCA Kensington
[3] [redacted] Previously Senior Principal Research Scientist, DBCA Kensington

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

**All past and current threats continue to be future threats.**

**Vegetation clearing**

A number of occurrences are proposed to be cleared in the future. Large areas of remnant bushland to the north of Perth, such as Alkimos and Eglinton Estates, are being developed. The extension of the Mitchell Freeway through part of Neerabup National Park has been approved and occurrence 59 and 61 (Neerabup06, 08) have been cleared. It is also likely to result in the clearing of occurrences 54 to 58 (Neerabup01, 02, 03, 04, 05). New occurrences of the community were located in the path of the proposed Yanchep rail extension, and are proposed for clearing.

Future resource extraction is sought in areas that slightly overlap occurrences MYWABL10(23) and SVH01(51) and wholly over HOPKINSRD02 (84).

The frequency of fires, impact of recreational users, and incidence of illegal rubbish dumping are generally increased near urban areas. These factors can all lead to degradation of plant communities through increasing weed invasion and alteration of structure, species composition or loss of component taxa.

**For <u>each</u> threat describe:**

**32 a. How the threat has impacted on this ecological community in the past.**

See section 32

**32 b. What its expected effects are in the future.** Include or reference supporting research or information.

See section 32

Summary:

1. Clearing of the community and adjacent vegetation results in direct loss of the community,and exacerbates weed invasion into the community where it occurs nearby. Urban and peri-urban areas surrounding occurrences can act as weed sources and increase fire frequency.
2. Recreational use: where visitation is high the impact from recreational users from trampling, rubbish and track creation is likely to increase. Dumping of garden waste also introduces weed seeds.
3. Grazing: causes alterations to the species composition by selective grazing of edible species, the introduction of weeds and nutrients, and trampling and general disturbance.
4. Fire: there is evidence of weed invasion and possibly increased numbers of rabbits as a consequence of historical fire regimes in some areas that have been subject to more frequent burning in recent decades.

**32 c. Identify whether the threat only affects certain portions or occurrences. Give Details.**

Occurrences near urbanised areas are more likely to be affected by a series of threats including further clearing, too frequent fire, and impact associated with recreational use.

**33. Identify any natural catastrophic event/s**

Explain its likely impact and indicate the likelihood of it occurring (e.g. a drought/fire in the area every 100 years). Catastrophic events are those with a low predictability that are likely to severely affect the ecological community.

The incidence of more frequent and intense fires in Western Australia is likely with drying climate. (Source: Australian Government Department of Climate Change and Energy Efficiency Fact Sheet). Projections indicate that the annual average number of days above 35°C in Perth could increase from the 28 currently experienced to up to 67 days by 2070 without global action to reduce emissions. Projections also indicate an increase in the intensity and frequency of bushfires. The 2010-11 WA bushfire season

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

was one of the most devastating and destructive in the state's history, and followed the driest winter on record.

**34. Additional biological characteristics**

Identify and explain any additional biological characteristics particular to the community or species within it that are threatening to its survival (e.g. low genetic diversity). Identify and explain any models addressing survival or particular features.

**34 a. How does it respond to disturbance?**

There are few data available through which fire regimes that enhance/protect the composition of FCT26a can be elucidated so that what constitutes an appropriate fire regime will require investigation. It seems likely that fire regimes such as long periods of fire exclusion, sustained frequent burns, and post-fire grazing (eg. by rabbits) will be detrimental to the community. Several occurrences of this community are close to urban areas or appear to have been historically viewed as buffers for plantations, and have therefore been burnt relatively frequently. As mentioned there is evidence of weed invasion and possibly increased numbers of rabbits as a consequence of historical fire regimes in some areas that have been subject to more frequent burning in recent decades. Table 6 below outlines how species that commonly occur in FCT26a respond to fire.

**Table 6.** Response to fire for species commonly occurring with SCP26a

| **Species common in SCP26a** | **Response to Fire** |
|---|---|
| *Acacia lasiocarpa* | 100% scorch kills, in soil seed storage |
| *Aira caryophyllea* | 100% scorch kills, in soil seed storage |
| *Lysimachia arvensis* | 100% scorch kills, in soil seed storage |
| *Crassula colorata* | Unknown |
| *Rytidosperma occidentale* | Unknown |
| *Daucus glochidiatus* | Unknown |
| *Dischisma arenarium* | Unknown |
| *Banksia nivea* | Survives 100% scorch, soil suckers |
| *Banksia sessilis* | 100% scorch kills, on plant seed storage |
| *Eriochilus dilatatus* | Geophyte (survives 100% scorch) |
| *Gompholobium tomentosum* | 100% scorch kills, in soil seed storage |
| *Grevillea preissii* | Unknown |
| *Hardenbergia comptoniana* | Survives 100% scorch, basal sprouts |
| *Heliophila pusilla* | Unknown |
| *Hydrocotyle hispidula* | Unknown |
| *Hypochaeris glabra* | Unknown |
| *Leucopogon parviflorus* | Survives 100% scorch, basal sprouts |
| *Desmocladus flexuosus* | Survives 100% scorch, soil suckers |
| *Melaleuca systena* | Survives 100% scorch, basal sprouts |
| *Melaleuca huegelii* | Survives 100% scorch, basal sprouts |
| *Millotia tenuifolia* | Unknown |
| *Phyllangium paradoxum* | 100% scorch kills, in soil seed storage |
| *Opercularia vaginata* | 100% scorch kills, in soil seed storage |
| *Parietaria debilis* | Unknown |
| *Pterostylis aff. Pyramidalis* | Unknown |
| *Sonchus oleraceus* | 100% scorch kills, no seed storage |
| *Austrostipa compressa* | 100% scorch kills, in soil seed storage |
| *Austrostipa flavescens* | 100% scorch kills, in soil seed storage |
| *Stylidium maritimum* | Unknown |

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| | |
|---|---|
| *Templetonia retusa* | 100% scorch kills, in soil seed storage |
| *Thysanotus manglesianus/patersonii* complex | Survives 100% scorch, soil suckers |
| *Trachymene pilosa* | 100% scorch kills, in soil seed storage |
| *Spyridium globulosum* | 100% scorch kills, in soil seed storage |
| *Vulpia myuros* | Unknown |
| *Wurmbea monantha* | Survives 100% scorch, soil suckers |

**34 b. How long does it take to regenerate and/or recover?**

It is not known how long it takes for this ecological community to regenerate/recover from the various types of disturbance.

***Threat Abatement and Recovery***

**35. Identify key management documentation available for the ecological community,** e.g. recovery plans, biodiversity management programmes, or site specific management plans (e.g. for a reserve).

- Conservation Commission of Western Australia (2004). Forest Management Plan 2004-2013. Government of Western Australia. Perth, Western Australia.
- Department of Environment and Conservation (2005). Interim Recovery Plan 2004-2009 for *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson *et al.* 1994*)* Interim Recovery Plan No. 193. DEC, Perth .
- Smith, V., Briggs, A., Hales, T. Herford, I. and Orr, K. (1989). Yanchep National Park Management Plan 1989 – 1999. Management Plan No 14, Department of Conservation and Land Management.

**36. Give an overview of how threats are being/potentially abated and other recovery actions underway and/or proposed.** Identify who is undertaking these activities and how successful the activities have been to date.

- Occurrence 75 (ANKETELL01) occurs on private land in Hope Valley and the area appears to have been heavily grazed historically. In 2008 *Melaleuca huegelii* was replanted at the site.
- Threatened ecological community notification letters were sent by DBCA between 2004-2006 to land managers of occurrences 52 (CLIFT03), 62 and 63 (coronation01, 07), 67 (butler01), 70 (SFCLIFT05), 76 (Honey01), 78, 79, 83 (ONETREEHILL01, 02, 03), 80 (WATTLE01), 81 AND 82 (CARABOODA01, 02).
- Permanent photo monitoring was established for occurrence 84 (HOPKINSRD02) by DBCA
- DBCA will continue to seek to acquire land that contains occurrences 2 (JP05), 10-17 (MYYEAL01, 02, 03, 04, 05, YAN12, MYPARROT01, 02), 20 -21 (MYWAN03, 04), 24-33 (MYWABL02P, 03, 04, 05P, 08P, 07, 06, WABL01, MYWABL11, 12), 35 (MYWABL14P), 39-43 (MYWABL18P, 19, SHE04, MYSHE01, 02) and 50 (MYSHE09) for reserves for conservation as recommended in Conservation Commission of WA (now Conservation an Parks Commission) (2004).
- DBCA provides comment on development proposals with potential to affect the community, with the aim of limiting overall impacts.

Future recovery plans, outlined in DEC (2005), are explained in section 39.

**37. What portion of the current extent of the ecological community is protected in a reserve set aside for conservation purposes, and what proportions are private land, or other tenure? Give details**

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

**including the name of the reserves, and the extent the ecological community is protected within these reserves.**

Approximately 58.1 ha of the community are in Nature Reserves; and 104.8 hectares are in State Forest, most of which is proposed as national park, nature reserve or conservation park. Approximately 27.7 hectares are on lands under the care, control and management of other authorities, (mainly Local Government Authorities). Another 8.5 hectares of the community occur on private land. Areas of threatened ecological communities that occur in State Forest are proposed to be managed for their conservation or recovery.

**37 a. Which of the reserves are actively managed?**
Note which, if any, reserves have management plans and if they are being implemented.

The management plan for parks and reserves of Yanchep and Neerabup (Department of Environment and Conservation 2012) encompasses the management of a series of occurrences (YAN02, MYYAN01, 02, 03, 04, 05, 06 and 07, Neerabup01, 02, 03, 04, and 05). Excerpts include: "Tuart trees associated with threatened ecological communities, particularly those that support or with the potential to support aquatic root mat communities, and trees within the *Melaleuca huegelii–Melaleuca systena* shrublands on limestone ridges are of particular importance for monitoring and protection." and "Securing formal conservation tenure (for example, national park) for the Ridges area and Reserve 25253 will improve protection of *Melaleuca huegelii–Melaleuca systena* shrublands on limestone ridges."

**37 b. Give details of any other forms of protection, such as conservation covenants, and whether the protection mechanisms are permanent.**

**38. Indigenous interests**
**Is the nominated ecological community or parts thereof known to occur on any culturally significant sites?** If so comment on any issues with respect to aboriginal interests, in particular with regard to management of the ecological community.

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register there are a number of registered sites known from the vicinity of occurrences of community. In particular, the area of Yanchep and Neerabup National Parks was previously occupied by different groups of the Nyungar people. The areas were occupied and used for hunting, and have associated areas of mythological, ritual and ceremonial significance. In particular, there are namma holes associated with some occurrences of this community, as it occurs on limestone ridges. The objectives of DEC (2012) include protection of the Aboriginal heritage values of the park and encouraging greater understanding and appreciation of these values.

**38 a. Native Title**
**Do Native Title or Indigenous Protected Areas apply to any parts of the community?** If so comment on any issues with respect to exclusive possession and rights to plants and animals, in particular with regard to management of the ecological community.

The community occurs within the following Native Titles;

- GNAALA KARLA BOOJA - GNAALA KARLA BOOJA Indigenous Land Use Agreement
- WHADJUK PEOPLE - WHADJUK PEOPLE Indigenous Land Use Agreement
- YUED - Yued Indigenous Land Use Agreement

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

**39. Give details of recovery actions that are or could be carried out at the local and regional level,** e.g. develop and implement management plan for the control of specific weed species (regional), undertake weeding of known sites (local).

Actions including weed monitoring and weed control, monitoring floristic composition, and fencing can be undertaken at a local level. These actions are included in DEC (2005).

**40. Is there an existing support network for the ecological community that facilitates recovery?** e.g. an active Landcare group, Conservation Management Network.

The Swan Region Threatened Flora and Communities Recovery Team coordinates recovery actions for the FCT26a and other threatened ecological communities and flora in the region.

**41. Describe methods for identifying the ecological community including when to conduct surveys.**

For example, season, time of day, weather conditions; length, intensity and pattern of search effort; and limitations and expert acceptance; recommended methods; survey-effort guide. Include references.

10 x 10m quadrats should be established to sample the vegetation of the southern Swan Coastal Plain. This community should be sampled in peak flowering seasons (spring/late spring). Comprehensive quadrat data should be compared statistically to the original quadrat data from Gibson *et al* (1994) and the best matches determined for the floristic community type, including consideration of habitat, and key combinations of species.

**42. Are there other any aspects relating to the survival of this ecological community that you would like to address?**

No

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

## Section 3 - Justification for this nomination

In order for the nomination to be considered further, one or preferably more of the following criteria need to be fulfilled and substantiated. A clear case for why the ecological community is eligible for listing under the criteria is required, including evidence as to how it meets the requirements for listing under a particular listing category, e.g. 'David *et al*. (1999) finding of 95% decline in geographic distribution suggests it should be listed as critically endangered'. The type of data available will determine which criteria will be used to justify the application of a listing category.
At least one criterion must trigger the thresholds of a listing category as indicated in the Attachment. Criteria may be of different levels of listing category e.g. Criterion 1 = CR and Criterion 3 = VU.

**43. Provide data that demonstrates why the ecological community meets at least one of the following criteria for the nominated listing category.**

Please use data provided in previous sections to demonstrate how it specifically meets at least one of the following criteria. Advice on how to interpret the listing criteria is in Attachment A. Provide a response for every sub-criterion.

**Criterion A:** Reduction in geographic distribution.

| Criterion A | |
|---|---|
| ☐ CR<br>☐ EN<br>☒ VU<br>☐ not eligible | ☐ **A1**<br>☐ **A2a**<br>☐ **A2b**<br>☒ **A3** |

**Justification for assessment under Criterion A:**

For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero.

- FTC 26a occurs predominantly on the Cottesloe and Karrakatta soil and landform units within the Spearwood system. It is assumed that the reduction in extent of native vegetation on the land units that support the community is indicative of the level of clearing of this community. The level of clearing in the relevant soil and landform units ranges from 42% to 68% (Government of Western Australia 2019). Floristic community type 26a has historically been targeted for limestone resource, so the level of clearing of the generalised soil and landform units that support the community may be an underestimate of the historical level of clearing for this community.
- There is a range of inferred levels of clearing of the community based on clearing of the soil and landform units that support the community. The timing of the clearing is not known so is conservatively inferred to be since 1750.
- The range of inferred levels of historical clearing includes proportions that are less than the 50% to meet the thresholds for VU under A3.
- The community may plausibly meet criterion A3 as the decline in geographic distribution is inferred to range from 42%-68%.
- **Available data indicates VU is plausible under A3.**

**Criterion B:** Restricted geographic distribution.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

| Criterion B<br>☒ CR<br>☒ EN<br>☐ VU<br>☐ not eligible | ☒ **B1** (specify at least one of the following) ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☒ **b)** ☐ **c);**<br>☒ **B2** (specify at least one of the following) ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☒ **b)** ☐ **c);**<br>☐ **B3** (only for Vulnerable Listing) |
|---|---|

**Justification for assessment under Criterion B:**

- B1: EOO is 1919km$^2$ (≤ 2,000km – threshold for CR). The community's EEO is less that the 2,000km$^2$ threshold for rank CR.
- B1, B2 b): Continuing decline observed from the impacts of vegetation clearing (continued pressure from mining companies), weed invasion, too frequent fire**,** grazing by introduced herbivores and trampling from recreational activities**.** B1 c) Community is considered to occur at 25 threat defined locations, based on the identification of 25 clusters of the community that may be subject to similar threats such as those that affect a particular aquifer or bushland location. The community does not meet the thresholds to meet VU (≤10 threat-defined locations).
- B2: AOO. Community covers 9 grid cells. The community meets EN under criterion B2 for which the AOO threshold is ≤20 grid cells (threshold for CR ≤2 grid cells) (b and c of B1 are the same for B2)
- B3: community is considered to consist of 25 threat defined locations, based on the identification of 25 clusters of the community that may be subject to similar threats such as fires that may affect a particular bushland location. Does not meet VU under criterion B3, as community occurs at more than 5 threat defined locations.

- **Meets criteria for Critically Endangered B1b and Endangered under B2b.**

**Criterion C:** Environmental degradation based on change in an abiotic variable.

| Criterion C<br>☐ CR<br>☐ EN<br>☐ VU<br>☒ not eligible | ☐ **C1**<br>☐ **C2**<br>☐ **C3** |
|---|---|

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

**Justification for assessment under Criterion C:**

- Too frequent fire is an abiotic variable that is a significant threat to the community. Collapse in this context is loss of all fire sensitive taxa due to fire.
- As mentioned above, some occurrences close to urban areas appear to have been historically viewed as buffers for plantations, and as such have been burnt relatively frequently in recent years. There is evidence of weed invasion and possibly increased numbers of rabbits as a consequence of historical fire regimes in some areas that have been subject to more frequent burning in recent decades. The severity of impacts of the fires on the community's composition if not known but no available information indicates that the community is in significant decline.
- Currently there is no information that indicates the community meets thresholds for extent (≥30%) or severity (≥30%) over any 50-year period, or thresholds for extent (≥50%) and severity (≥50%) since 1750 to meet VU under criterion C.
- **No available evidence indicates the community meets criterion C**

**Criterion D:** Disruption of biotic processes or interactions based on change in a biotic variable.

| Criterion D | |
|---|---|
| ☐ CR<br>☐ EN<br>☐ VU<br>☒ not eligible | ☐ **D1**<br>☐ **D2**<br>☐ **D3** |

**Justification for assessment under Criterion D:**

- Weed invasion is a significant biotic threat to the community.
- The severity of weed invasion associated with collapse is uncertain, but it is assumed conservatively that the community reaches a collapsed state when only 10% (plausible range 0–20%) of its plant species are native.
- Currently, there are inadequate systematic collected quantitative data about weed levels to support assessment of the community against criterion D.
- **Insufficient evidence to indicate if the community meets criterion D.**

**Criterion E:** Quantitative analysis that estimates the probability of ecosystem collapse.

| Criterion E | |
|---|---|
| ☐ CR<br>☐ EN<br>☐ VU<br>☒ not eligible | |

**Justification for assessment under Criterion E:**

- No quantitative estimates of the risk of ecosystem collapse have been completed
- **Does not meet criterion**

## Section 4 – References/Standard of Scientific Evidence/Critical habitat

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

Note: The opinion of appropriate scientific experts may be cited (with their approval) in support of a nomination. If this is done the names of the experts, their qualifications and full contact details must also be provided in the reference list below. Harvard style of referencing is preferred.

**44. Please provide copies of key documentation/references used in the nomination.**

Abbott, I. and Burrows, N. (eds) (2003). *Fire in ecosystems of south-west Western Australia: impacts and management.* Bachhuys Publishers, Leiden, Netherlands.

ATA Environmental (2002) *Alkimos Eglinton Environmental Review*. ATA Environmental, Perth.

Brown, K. and Brooks, K. (2002) *Bushland weeds; a practical guide to their management*. Environmental Weeds Action Network (Inc), Western Australia.

Churchward H.M and McArthur, W.M. (1978) Darling System Landform and Soils. Department of Conservation and Environment. Perth, Western Australia.

Conservation Commission of Western Australia (2004). *Forest Management Plan 2004-2013*. Government of Western Australia. Perth, Western Australia.

Department of Conservation and Environment (1980). Atlas of Natural Resources Darling System Western Australia. Perth.

Department of Environment and Conservation (2005). Interim Recovery Plan 2004-2009 for *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson *et al.* 1994) Interim Recovery Plan No. 193. DEC, Kensington.

Department of Environment and Conservation (2012). Parks and reserves of Yanchep and Neerabup management plan 76, Department of Environment and Conservation, Perth.

English, V. and Blyth, J. (1997a) *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*. Project N702, Final Report to Environment Australia. Department of Conservation and Land Management. Perth, Western Australia.

English, V. and Blyth, J. (1997b) Development and application of procedures to identify and conserve threatened ecological communities in the South-west Botanical Province of Western Australia. *Pacific Conservation Biology* 5, 124-138.

Gibson, N., Keighery, B., Keighery, G., Burbidge, A and Lyons, M. (1994) *A floristic survey of the Southern Swan Coastal Plain*. Unpublished report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).

Government of Western Australia (2000). Bush Forever. Department of Environmental Protection, Perth.

Government of Western Australia (2019). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Keighery, G., Gibson, N., Muir, B. and Keighery, B. (2003) Common and rare limestone communities of the Swan Coastal Plain. *Summary Proceedings, Threatened Ecological Communities Symposium*. Department of Conservation and Land Management, Perth.

Mattiske Consulting Pty Ltd (2001). [redacted] Dayrell Rd, Nowergup Vegetation Mapping. Unpublished report. Kalamunda.

Semeniuk, V. (1990) The geomorphology and soils of the Yoongarillup Plain in the Mandurah – Bunbury coastal zone, south-western Australia: a critical appraisal. *Journal of the Royal Society of Western Australia*. 73: 1-7.

Smith, V., Briggs, A., Hales, T. Herford, I. and Orr, K. (1989) *Yanchep National Park Management Plan 1989 – 1999*. Management Plan No 14, Department of Conservation and Land Management.

State of Western Australia (2000) *Bush Forever*. Western Australian Planning Commission, Perth.

State of Western Australia (2003) *Metropolitan Development Program. Urban Land Release Plan 2003/2004 to 2007/2008*. Western Australian Planning Commission, Perth.

Weston, A.S. and Gibson, N. (1997) *Report on the limestone vegetation of Wabling Hill area, Reserves 39411 and 39412, and the Ridges extension to Yanchep National Park*. Department of Conservation and Land Management, Perth.

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

| **45. Statement on the Standard of Scientific Evidence** |
|---|
| Published studies on limestone communities (referenced above) when combined with unpublished information and survey data, were sufficient to apply the Red List of Ecosystem criteria.<br><br>Uncertainties exist regarding fire-response of the community and the impact of weeds. There is an urgent need for research on both these aspects to determine the implications of findings for management. |
| **46. Has this document been reviewed and/or have relevant experts been consulted?**<br>If so, indicate by whom and provide their contact details. |
| Valerie English – Principal Ecologist DBCA<br>Jill Pryde – Senior Ecologist DBCA. |
| **47. Do you wish to propose any areas of habitat for consideration as Critical Habitat for the nominated community?**<br>If so, refer to Ministerial Guideline No 5 and attached a separate nomination proposal addressing the matters required under that guideline. Indicate location/s including a map, and attached shapefiles. |
| No. |

## Section 5 - Nominator Details & Declaration

**48. Contact Details**

Note: Nominator details are subject to the provision of the *Privacy Act 1988*

| | |
|---|---|
| **Title/Full Name** | [redacted] |
| **Organisation or Company name** | DBCA |
| **Postal address** | Kensington |
| **Email** | |
| **Phone** | |
| **Fax** | |

**49. Declaration**

| | |
|---|---|
| **Signature**<br>(Or insert electronic signature) | ***I declare that the information in this nomination form and any attachments is true and correct to the best of my knowledge.*** |
| **Date signed** | |

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

## Section 6 – Completed nomination form checklist

Please check all items on this list have been completed or are included with your nomination.

- ☐ I have read and applied the further information and guidelines for completing this nomination form in Attachment A
- ☐ Nominator details including name, address contact phone number included
- ☐ Name of the EC
- ☐ Any other names it is known by
- ☐ Map included or attached
- ☐ References cited
- ☐ If questions are left unanswered, a statement indicating that insufficient information is available

A description of:

- ☐ Biological components of the ecological community
- ☐ Non biological components of the ecological community
- ☐ Key interactions and functional processes
- ☐ Characters distinguishing it from other ecological communities
- ☐ Key species (dominant, characteristic or diagnostic, threatened etc)
- ☐ Known or estimated current extent of the ecological community
- ☐ Past/current/future threats including actual/potential, how/ where, how being/how could be abated
- ☐ Which listing category/categories it should be listed under and why

**How to lodge your nomination**

Completed nominations may be lodged either:

1. by email to: **communities.data@dbca.wa.gov.au**

***If submitting by email, please also mail hard copies of attachments that cannot be emailed.***

OR

2. by mail to: Species and Communities Branch
Department of Biodiversity, Conservation and Attractions, WA Government
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983

***If submitting by mail, please include an electronic copy on memory stick or CD.***

Department of Biodiversity, Conservation and Attractions

GOVERNMENT OF WESTERN AUSTRALIA

**Summary assessment against IUCN RLE Criteria**

| Criterion | Rank indicated | Overall conclusion |
|---|---|---|
| A1 | - | • Available data do not indicate if community meets criterion |
| A2a | - | • Available data do not indicate if community meets criterion |
| A2b | - | • Available data do not indicate if community meets criterion |
| A3 | VU | • Based on available evidence, the community plausibly meets criterion A3 |
| B1a | - | • EOO is ≤2,000km$^2$<br>• Inadequate data available to indicate observed or inferred decline in a measure of spatial extent, environmental quality or disruption to biotic interactions that would meet minimum thresholds for the criterion (VU)<br>• Does not meet criterion |
| B1b | CR | • EOO is ≤2,000km$^2$<br>• Observed and inferred continuing decline from vegetation clearing (continued pressure from mining companies), weed invasion, too frequent fire, grazing by introduced herbivores and trampling from recreational activities. Meets criterion for CR |
| B1c | - | • AOO is 9 grid cells<br>• Ecosystem exists at 25 threat defined locations<br>• Does not meet criterion |
| B2a | - | • AOO is 9 grid cells<br>• Inadequate data available to indicate observed or inferred decline in a measure of spatial extent, environmental quality or disruption to biotic interactions that would meet minimum thresholds for the criterion (VU)<br>• Does not meet criterion |
| B2b | EN | • AOO is 9 grid cells<br>• Observed and inferred continuing decline from vegetation clearing (continued pressure from mining companies), weed invasion, too frequent fire, grazing by introduced herbivores and trampling from recreational activities. Meets criterion for EN |
| B2c | - | • AOO is 9 grid cells<br>• Ecosystem exists at 25 threat defined locations<br>• Does not meet criterion |
| B3 | - | • Known from 25 threat-defined locations<br>• Does not meet criterion |
| C1 | - | • No available evidence indicates the community meets minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over the past 50 years to meet VU. |
| C2 | - | • No available evidence indicates the community meets minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50 year period to meet VU. |
| C3 | - | • No available evidence indicates the community meets minimum thresholds for proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since 1750 to meet VU. |
| D1 | - | • Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥30%) or proportional severity of |

Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

| | | |
|---|---|---|
| | | disruption of biotic processes (≥30%) over the past 50 years to meet VU. |
| D2 | - | • Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥30%) or proportional severity of disruption of biotic processes (≥30%) over any 50-year period to meet VU. |
| D3 | - | • Inadequate quantitative data to indicate if the community meets the minimum proportion of the extent (≥50%) or proportional severity of disruption of biotic processes (≥50%) since 1750 to meet VU. |
| E | NA | • No quantitative estimates of the risk of ecosystem collapse. |
| | | Meets CR under B1b. Meets EN under B2b. Plausibly meets VU under A3.<br>Plausible range of rank: VU to CR.<br>*'The highest risk category obtained by any of the assessed criteria will be the overall risk status of the ecosystem'* (IUCN RLE Guidelines V1.1 page 42).<br>**Meets CR B1b.** |