



WESTERN
ENVIRONMENTAL

***Empodisma* peatland of
Southwestern Australia**

Targeted Vegetation Survey
Alcoa Larego Mine Site

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Executive Summary

Alcoa commissioned Western Environmental Pty Ltd (WEPL) to undertake a targeted vegetation survey across a selected area at the Alcoa Larego Mine Site, within the Northern Jarrah Forest. The Survey Area covers 35.042 ha. The objective of this survey was to identify if the threatened ecological community (TEC) '*Empodisma* Peatlands of Southwestern Australia', is present within the Survey Area.

A total of one field day of survey effort was applied during January 2025.

Survey findings were compared against the four key diagnostic characteristics listed in the Approved Conservation Advice. Based on this assessment 2.289 ha of Very Good Condition *Empodisma* peatlands of southwestern Australia was recorded as present within the Survey Area.

Acronyms and Abbreviations

Abbreviation	Full Title
BAM Act	Biosecurity and Agriculture Management Act 2007
BC Act	Biodiversity Conservation Act 2016
°C	Degree Celsius
CR	Critically Endangered
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEWHA	Department of the Environment Water Heritage and the Arts
DIIRD	Department of Primary Industries and Regional Development
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EN	Endangered
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPBC Act	Environment Protection Biodiversity and Conservation Act 1999
ESA	Environmentally Sensitive Area
FCT	Floristic Community Type
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessments
km	Kilometres
m	Metres
MA	Marine
MI	Migratory
MNES	Matters of National Environmental Significance
NVIS	National Vegetation Information System
OS	Other Specially Protected
P	Priority
PEC	Priority Ecological Community

Abbreviation	Full Title
PF	Priority Flora
PMST	Protected Matters Search Tool
RAAF	Royal Australian Air Force
T	Threatened
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TPFRF	Threatened and Priority Flora Report Forms
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium
WC Act	Wildlife Conservation Act 1950
WEPL	Western Environmental Pty Ltd
WoNS	Weeds of National Significance

Table of Contents

1.	Introduction	1
1.1	Project Background	1
1.2	Location	1
1.3	Objectives and Scope of Work	1
1.4	Limitations and Constraints.....	2
2.	Desktop Assessment	4
2.1	Modelled Distribution of <i>Empodisma</i> Peatland TEC	4
2.2	Interim Biogeographic Regionalisation for Australia	4
2.3	Geology and Soil	4
2.4	Vegetation Mapping.....	5
2.4.1	Mattiske Vegetation Mapping	5
2.5	Fire and Dieback Disturbance Mapping	6
2.6	Wetlands and Hydrology	6
3.	Methodology.....	8
3.1	Flora and Vegetation Survey	8
3.1.1	Field Survey Timing and Survey Team	8
3.1.2	<i>Empodisma</i> Peatlands Sampling.....	8
3.1.3	Vegetation Condition Assessment.....	8
3.1.4	Flora Taxonomy and Lodgement of Specimens.....	9
4.	Results.....	10
4.1	Presence Absence Assessment	10
4.2	TEC Condition Assessment	14

4.3	Recorded Flora Species	15
4.4	Disturbances Present.....	16
4.4.1	Fire 16	
4.4.2	Feral Pig Damage	16
4.4.3	Dieback and Weeds	19
4.5	Photo Monitoring Points	19
5.	Discussion and Recommendations	22
6.	References	23

Tables

Table 1: Limitations and Constraints of the Targeted Flora Survey	2
Table 2: Survey Team	8
Table 3: Summary of survey findings against key diagnostic characteristics of the <i>Empodisma</i> peatland TEC.	10
Table 4: Condition Assessment for <i>Empodisma</i> Peatland TEC.....	14
Table 5: Flora Species List	15
Table 6: Photographs of feral pig damage within <i>Empodisma</i> peatland.	17
Table 7: Photo monitoring points of the <i>Empodisma</i> peatland	19

Figures

Figure 1: Matiske Vegetation Mapping.....	7
Figure 2: <i>Empodisma</i> Peatlands TEC Occurrence.....	13

Appendices

Appendix A	Legislation
Appendix B	Definitions and Criteria

1. Introduction

1.1 Project Background

Alcoa commissioned Western Environmental Pty Ltd (WEPL) to undertake a targeted vegetation survey for the *Empodisma* Peatlands of Southwestern Australia TEC.

1.2 Location

The Survey Area covers 35.042 ha and is located in the Alcoa Larego Mine Site, within the Northern Jarrah Forest region. See Figure 1. The Survey Area was selected by Alcoa on the basis of aerial imagery and visual vegetation differences from surrounding Jarrah Forest. After desktop assessment and ground survey, most of the Survey Area was excluded from the targeted search as it consisted of unsuitable vegetation and hydrology.

1.3 Objectives and Scope of Work

The objective of this survey was to identify if the TEC '*Empodisma* Peatlands of Southwestern Australia', is present within the Survey Area.

As per the scope of works, the survey included:

- A targeted assessment to determine the presence of *Empodisma* Peatlands of Southwestern Australia, including:
 - Mapping the presence of potential *Empodisma* peatland including quality (condition) assessment.
 - Recording of extent and gaps of potential *Empodisma* peatland.
 - Recording disturbances and general observations.
 - Taking collections of suspected *Empodisma gracillimum*.
 - Recording photo points for potential future monitoring.

This report presents the results of the field survey undertaken to support the above objectives.

1.4 Limitations and Constraints

Limitations and constraints of the targeted flora and vegetation survey as outlined in the Flora and Vegetation Survey Technical Guidance are detailed below in Table 1.

Table 1: Limitations and Constraints of the Targeted Flora Survey

Possible Limitation	Degree of Limitation (Significant, Moderate or Negligible)	Potential Constraints on Survey Outcomes
Survey Level/ Scope	Negligible	A targeted vegetation survey was considered suitable based on the specific scope of work. The level of information collected is suitable to provide information required to inform the presence or absence of the <i>Empodisma</i> peatland TEC.
Availability of contextual information at a regional and local scale	Negligible	All data required to complete the scope of works, including the desktop assessment, was provided by Alcoa.
Site Access	Negligible	The Survey Area was readily accessed by vehicle and on foot.
Survey Intensity and Extent	Negligible	A one-day field survey by a Western Environmental ecologist was deemed sufficient for proposed scope of works. The Survey Areas were adequately sampled in line with the project scope of works.
Experience	Negligible	The ecologist conducting the field survey (Taya Cherry) has botanical experience in Western Australia's in the Northern Jarrah Forest and the south coast region. Taya has previously completed surveys and research projects on <i>Empodisma</i> peatland TEC. Project supervision was provided by lead ecologist (Andrew Fry) who has been conducting flora and vegetation surveys assessments in Western Australia for over 10 years, with over 10 years' experience in the southwest bioregion.
Timing, weather, season	Negligible	As <i>Empodisma</i> identification is not restricted by season, the timing of the survey, conducted in January does not impact the result.
Proportion of the flora and fauna recorded and/or collected, and any identification issues	Negligible	Species sampling was in line with the technical guidance for targeted flora and vegetation surveys.
Mapping Reliability	Negligible	The majority of the Survey Area was traversed by foot and mapping reliability is considered high.

Possible Limitation	Degree of Limitation (Significant, Moderate or Negligible)	Potential Constraints on Survey Outcomes
Disturbances (fire, flood etc.)	Negligible	Areas of disturbance associated with pig damage and dieback were recorded but were not a constraint on the results of the survey.

2. Desktop Assessment

2.1 Modelled Distribution of *Empodisma* Peatland TEC

A clear relationship between hydrology, geomorphology, bioregion and vegetation exists in the spatial and temporal distribution of *Empodisma* peatlands in southwestern Australia (Blake, Winkle & Horwitz, 2021). Based on these factors, the predicted distribution correlate with four bioregions: the Swan Coastal Plain, Warren, Jarrah Forest, and Esperance Plains. Collectively the four bioregions form the coolest and wettest part of Beard's Southwest Botanical Province (Beard, 1980).

Mapping of confirmed *Empodisma* peatlands was previously restricted almost exclusively to the Warren region. Blake, Winkle and Horwitz's (2021) modelling effort expanded the range of understood potential occurrence of the community. The predictive modelling is preliminary and aims to set a foundation for future work. The modelling utilised previous southwestern Australian land resource assessment studies, existing spatial data sets, expert desktop inputs and newly captured site information from the Peat Project activities, to create modelled predictive outputs. Predicted mapping was based on digital sources of data including wetland geomorphology, soils, topography and slope, rainfall and evaporation, land use, developed vegetation, and preliminary ground-truthing undertaken. Estimation of probable occurrence was extracted and provided measures for predicted extent of occurrence.

The predictive modelling identified the Larego region as having a low to medium potential of the community occurring (Blake, Winkle & Horwitz, 2021). The spatial data presented in Blake, Winkle and Horwitz's (2021) is not currently publicly available, a request for the data has been sent to the authors. Across the broader Jarrah Forest region there is 310.6 km² or 0.7 % of the bioregion with a high predicted probability of *Empodisma* peatlands occurring. There is also 2914 km² or 5.6 % of land with a medium predicted probability of containing *Empodisma* peatlands (Blake, Winkle & Horwitz, 2021). Of note is 5.6 % of medium predicted probability of land cover is inclusive of the entire Jarrah Forest Region, not just Northern Jarrah Forest region.

2.2 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation of Australia (IBRA) divides Australia into 89 bioregions based on major biological, geographical, and geological attributes. These bioregions are subdivided into 419 subregions as part of a refinement of the IBRA framework (Commonwealth of Australia, 2012). The Survey Area is situated within the Jarrah Forest bioregion and the Northern Jarrah Forest (JAF01) subregion.

2.3 Geology and Soil

The Survey Area intersects with the Yarragil Swamp phase and Yarragil DpYGh phase (DPIRD-027). Yarragil Swamp phase is described as " Level to very gently inclined valley floors. Swampy river flats and terraces in

granitic rocks; loamy and sandy duplex, wet soils, non-cracking clays and loams" Yarragil DpYGH phase is described as "Very gentle to moderately inclined (<20%) concave valley sideslopes. Moderately well drained yellow duplex soils and yellow and brown massive earths"

2.4 Vegetation Mapping

2.4.1 Mattiske Vegetation Mapping

Using vegetation mapping provided by Alcoa from Mattiske Consulting, the Survey Area intersects six vegetation types (Mattiske Consulting, 2023). These are:

- AC - Open Woodland of *Eucalyptus rudis* – *Melaleuca preissiana* - *Eucalyptus patens* - *Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on broad swamps and watercourses.
- TS - Open Forest of *Eucalyptus marginata* - *Corymbia calophylla* – *Banksia grandis* with scattered understorey, including *Leucopogon verticillatus*, *Pteridium esculentum*, *Clematis pubescens* and *Bossiaea aquifolium subsp. aquifolium* on sandy-loam gravelly to gravelly soils.
- W - Open Forest of *Eucalyptus megacarpa* - *Eucalyptus patens* – *Corymbia calophylla* on lower slopes with mixed low understorey species, including *Acacia extensa* and *Hypocalymma angustifolium* on seasonally moister sandy-loam gravelly soils.
- S - Open Forest of *Eucalyptus marginata* - *Banksia grandis* – *Allocasuarina fraseriana* with scattered understorey, including *Adenanthos barbiger*, *Leucopogon capitellatus* and *Styphelia tenuiflora* on gravels and sandy-gravels.
- D - Open Forest of *Eucalyptus marginata* - *Corymbia calophylla* – *Hakea prostrata* on lower slopes with mixed low understorey species, including *Babingtonia camphorosmae* and *Acacia extensa* on clay loams to gravelly clay-loams.
- PT- Open Forest of *Allocasuarina fraseriana* - *Eucalyptus marginata* - *Corymbia calophylla* - *Banksia grandis* with scattered understorey, including *Adenanthos barbiger*, *Leucopogon verticillatus*, *Pteridium esculentum* and *Bossiaea aquifolium subsp. aquifolium* on sandy-loam gravels.

The mapped occurrence of the TEC only intersects with vegetation type AC and stream mapping (Mattiske Consulting, 2023). See Figure 1.

2.5 Fire and Dieback Disturbance Mapping

Based on fire history mapping within the Survey Area, the most recent fire occurred in 2016 (DBCA-060). The fire's mapped occurrence of 'Actual burnt' enters the northern portion of the Survey Area. The most recent prescribed burn within the Survey Area occurred in 2019, likely for maintenance along the conveyor line and nearby roads. Both of these fires did not enter the mapped *Empodisma* peatland boundaries. The stream vegetation zone, including mapped TEC occurrence, was last burnt in 1992, from a controlled burn.

The entirety of the Survey Area is mapped as Dieback infested (Alcoa, 2024).

2.6 Wetlands and Hydrology

The Survey Area does not intersect with any mapped streams or hydrology displayed in the Hydrography Linear layer (DWER-031). Very small or minor drainage lines may not be included in this mapping and small features are often excluded.

The Survey Area intersects with an area mapped as Stream Vegetation zone by Mattiske Consulting for Alcoa. The vegetation type (VT) code for this zone is AC, described as "Open Woodland of *Eucalyptus rudis* – *Melaleuca preissiana* - *Eucalyptus patens* - *Banksia littoralis* with dense *Taxandria linearifolia* and *Astartea scoparia* in understorey on broad swamps and watercourses." (Mattiske Consulting, 2023).

Detailed hydrological mapping and relationship between hydrology and identified occurrences of the *Empodisma* peatlands TEC was not undertaken as part of this report. Further investigation into this relationship is required for more detailed desktop assessment. This work is being undertaken concurrently.

Figure 1: Matiske Vegetation Mapping

3. Methodology

3.1 Flora and Vegetation Survey

3.1.1 Field Survey Timing and Survey Team

The targeted vegetation survey was conducted on the 7th of January 2024 by one ecologist from Western Environmental alongside two Alcoa team members. The survey team is listed in Table 2.

Table 2: Survey Team

Name	Position and Years of Experience	DBCA Licence No.
Taya Cherry	Graduate Environmental Scientist - 1 year Previous experience in undertaking <i>Empodisma</i> peatlands research.	FB62000675
Sarah Boys	Alcoa personnel: Environmental Specialist – Biological Assessments	
Felicity Hart	Alcoa personnel: Biodiversity Specialist - WA Mining	

3.1.2 *Empodisma* Peatlands Sampling

Sampling methodology was designed as per the Approved Conservation Advice. Currently, the only reliable sampling method to confirm the presence of *Empodisma* peatlands is via on ground surveys (DCCEEW, 2023). The following was conducted during the field survey:

- A 1.8 m metal pole was used to push into the peat, providing an estimation of peat depth.
- Flora collections of potential *Empodisma gracillimum*.
- List of flora species present surrounding and within peatland.
- Recording areas of significantly higher or lower condition, gaps, condition categories and disturbance.

3.1.3 Vegetation Condition Assessment

Vegetation condition was assessed during traverses of the Survey Area using the Vegetation Condition Scale for the appropriate bioregion as per the Flora and Vegetation Technical Guidance (EPA, 2016).

3.1.4 Flora Taxonomy and Lodgement of Specimens

Where field identification of plant taxa was not possible, specimens were collected for identification using resources of the Western Australian Herbarium (WAH). Identification of flora collections, including confirmation of *Empodisma gracillimum*, was completed by senior botanist Daniel Rubick. Collection of *Empodisma gracillimum* were submitted to the Western Australian Herbarium for identification confirmation.

The finalised species list was checked against FloraBase (Western Australian Herbarium, 2024) to determine the conservation status and known distribution of each taxon.

4. Results

4.1 Presence Absence Assessment

Survey findings were assessed against the four key diagnostic characteristics listed in the Approved Conservation Advice. It was determined that there is 2.289 ha of the *Empodisma* peatlands TEC present, separated into two separate patches by the conveyor and access road. See Figure 2 below for extent of occurrence. The full assessment results are displayed below in Table 3.

Table 3: Summary of survey findings against key diagnostic characteristics of the *Empodisma* peatland TEC.

Key diagnostic characteristics (as per Approved Conservation Advice):	Survey Findings:
<p>Occurs in south-west Australia, mainly within the Warren IBRA bioregion and Southern Jarrah Forest subregion of the Jarrah Forest IBRA bioregion. Discrete occurrences may also be present in the Perth (SWA02) (Swan Coastal Plain), Northern Jarrah Forest (JAF01) (Jarrah Forest) and Fitzgerald (ESP01) (Esperance) IBRA subregions.</p>	<p>The survey area is located in the Northern Jarrah Forest subregion (JAF01).</p> <p>This requirement was met.</p>
<p>Occurs on an organosol that is typically saturated for at least a month during the year.</p>	<p>Organosol is defined in the Approved Conservation Advice as organic-rich but low nutrient acidic soils, with organosol the preferred term for describing Australian peat-accumulating soils.</p> <p>The Approved Conservation Advice give two definitions, these are:</p> <ul style="list-style-type: none"> • Soils that have more than 0.4 m of organic materials within the upper 0.8 m, with a required thickness either extending down from the surface or taken cumulatively within the upper 0.8 m; OR • Soils that have organic materials extending from the surface to a minimum depth of 0.1 m, which either overlie unconsolidated material no thicker than the organic materials above, or directly overlie rock or other hard layers <p>The area identified as <i>Empodisma</i> peatlands (2.289 ha), comprised of organosol with more than 0.4 m of organic matter. Organosol depth reached >1m in some sections.</p> <p>121 mm of rainfall was recorded by Willowdale (Station number 009893) in the three months leading up to the survey. During the field survey,</p>

Key diagnostic characteristics (as per Approved Conservation Advice):	Survey Findings:
	<p>completed in January, saturated organosol was present, and is believed to be present year-round.</p> <p>This requirement was met.</p>
<p>Ground layer almost always contains evidence of <i>Empodisma gracillimum</i> unless recently disturbed, for example by fire within 12-24 months. Other sedge species from the families Cyperaceae and Restionaceae also are typically present.</p>	<p>Based on field collections, it is confirmed that <i>Empodisma gracillimum</i> is present. See Image 1.</p> <p>This identification was confirmed by the WA Herbarium. Reference number: ACC/11342/E.</p> <p>This requirement was met.</p>
<p>Other indicator species include one or more of the following: <i>Acacia hastulata</i>, <i>Callistemon glaucus</i>, <i>Gymnoschoenus anceps</i>, <i>Leptocarpus tenax</i> and <i>Schoenus multiglumis</i>.</p>	<p>Please note these indicator species are associated with south coastal peatlands. Northern Jarrah Forest indicator species will differ from the south coastal flora species. As occurrences of the TEC in the Northern Jarrah Forest have not been subject to specific study the ability to use indicator species as a diagnostic criterion has moderate limitations. The Approved Conservation Advice provides an extended list of species likely associated with peats or the TEC in Appendix A.</p> <p>As per Appendix A, Table 8 within the Approved Conservation Advice, the presence of <i>Empodisma gracillimum</i>, <i>Homalospermum firmum</i> shrublands/sedgeland and <i>Taxandria linearifolia</i>, <i>Gahnia decomposita</i>, <i>Hypocalymma cordifolium</i>, <i>Lepidosperma tetraquetrum</i> shrublands are likely indicator species within the Jarrah Forest (DCCEE, 2023).</p> <p>The field survey confirmed the presence of <i>Homalospermum firmum</i> shrublands/sedgeland and <i>Taxandria linearifolia</i>, <i>Gahnia decomposita</i> shrublands. Other sedge species from the families Cyperaceae and Restionaceae were also dominant in the vegetation complex. See Table 5 for list of dominant flora recorded.</p> <p>Based on the overlap of listed indicator species it is considered that this requirement is likely to be met. As indicator species not well researched for the Northern Jarrah Forest region further survey is required to allow confident use of this key diagnostic criteria.</p>

Image 1: *Empodisma gracillimum* (Photo credit: Felicity Hart, Alcoa)



Figure 2: Empodisma Peatlands TEC Occurrence

4.2 TEC Condition Assessment

Using the Condition Class rating from the Approved Conservation Advice, both occurrences of *Empodisma* peatland were assessed as being in Very Good Condition (DCCEEW, 2023). The occurrences had a total extent of approximately 2.289 ha. Conveyor belt infrastructure separates the two portions of peatland. The infrastructure is excluded from size of occurrence and condition rating. See Figure 2 and Table 4 for extents and condition assessment.

Table 4: Condition Assessment for *Empodisma* Peatland TEC

Condition Class	Indicative Condition Measures/Thresholds	Reasoning
<p>PRISTINE TO EXCELLENT CONDITION</p> <p>No obvious sign of disturbance</p> <p>OR</p> <p>Vegetation structure intact; Disturbance only affecting individual species</p>	<p>Vegetative cover¹ (native) is 90% or more across the occurrence</p> <p>AND</p> <p>Perennial vegetation is dominated by characteristic reed/sedge and shrub species (see section 1.2.2.2 & Appendix A)</p> <p>AND</p> <p>Peat² layer is intact (including no fire-pedestal² formation)</p>	
<p>VERY GOOD CONDITION</p> <p>Vegetation structure altered; Obvious signs of disturbance. For example, from repeated fires, dieback, grazing.</p>	<p>Vegetative cover¹ (native) is 70% or more across the occurrence</p> <p>AND</p> <p>Perennial vegetation is dominated by characteristic reed/sedge and shrub species (see section 1.2.2.2 & Appendix A)</p> <p>AND</p> <p>Peat² layer is intact or near original level with only minor fire-pedestal³ formation</p>	<p>High vegetation cover from 80 - 90%.</p> <p>Dominated vegetation is reed/sedge and shrub species.</p> <p>Peat layer is mostly intact with repeated damage from feral pigs present.</p>
<p>GOOD CONDITION</p> <p>Vegetation structure altered but retains basic vegetation structure or ability to regenerate it; Obvious signs of disturbance, e.g., from frequent fires, partial clearing, dieback, grazing.</p>	<p>Vegetative cover¹ (native) is 30% or more across the occurrence</p> <p>AND</p> <p>Characteristic reed/sedge species may not be dominant but characteristic shrubs are present and may be dominant (see section 1.2.2.2 & Appendix A).</p> <p>AND</p> <p>Loss of some peat² layer or fire-pedestal³ formation evident, possibly significant, and peat² depth is at least 0.1 m across the majority of the occurrence</p>	

Condition Class	Indicative Condition Measures/Thresholds	Reasoning
<p>DEGRADED TO COMPLETELY DEGRADED CONDITION</p> <p>Basic vegetation structure severely impacted by disturbance; Disturbance evident such as very frequent fires, partial clearing, dieback, and grazing.</p> <p>Not part of the protected ecological community</p>	<p>Vegetative cover (native) is less than 30%</p> <p>AND</p> <p>Characteristic shrubs, reeds/sedge species absent, including absence of <i>Empodisma gracillimum</i></p> <p>AND</p> <p>Loss of most or all peat material with sand/clay base exposed</p>	

Notes:

¹ Vegetative cover is living biomass. See 2.2.3 for recommendations on accessing time since fire.

² Peat – Peat layers are typically evident below the vegetation litter layer. In practice a rigid probe or stick pushed into the peat with replication will give an estimate of depth. As peat is consumed by fire, the woody lignotubers of some species remain. The position of the “crown” of the plant gives an indication of the height at which the stems had emerged from the peat substrate prior to damage by fire.

³ Pedestal - The formation of pedestals within the peat layer is typically a function of fire severity and reduced moisture within the peat profile. Pedestal formation is typically associated with loss of structure to peat. In extreme circumstances substrate is powdery/ crumbly when dry and muddy when wet where monosulfidic black ooze discharge or pooling may be evident. Pedestal formation may also result from preferential waterflows and from the growth of vegetation, often tussocks, into a dense often cylindrical mass of stems, roots and leaf bases. These vegetative growth pedestals would be excluded from this measure as they are not formed by fire damage.

4.3 Recorded Flora Species

Dominant flora species found within the *Empodisma* peatland were recorded. Please note that due to timing of survey in January a comprehensive flora list was not collected, these species represent common/ dominant flora which were identifiable at the time of survey. See list below in Table 5.

Table 5: Flora Species List

Species List	Comments
<i>Astartea scoparia</i>	
<i>Babingtonia camphorosmae</i>	
<i>Boronia molloyae</i>	
<i>Carex sp.</i>	
<i>Cyathochaeta avenacea</i>	Approximately 45% coverage

Species List	Comments
<i>Cyperaceae sp.</i>	
<i>Empodisma gracillimum</i>	Target species
<i>Gahnia decomposita</i>	Key species for Jarrah Forest <i>Empodisma</i> peatlands vegetation complex
<i>Homalospermum firmum</i>	Key species for Jarrah Forest <i>Empodisma</i> peatlands vegetation complex
<i>Hypocalymma cordifolium</i>	Key species for <i>Empodisma</i> peatlands vegetation complex
<i>Lepidosperma tetraquetrum</i>	Key species for <i>Empodisma</i> peatlands vegetation complex
<i>Restionaceae sp.</i>	
<i>Taxandria linearifolia</i>	Key species for Jarrah Forest <i>Empodisma</i> peatlands vegetation complex

4.4 Disturbances Present

4.4.1 Fire


Based on the fire disturbance mapping intersecting the occurrence of *Empodisma* peatland TEC, the last documented fire occurred in 1992 (DBCA-060). No recent evidence of fire was recorded in the peatland.

4.4.2 Feral Pig Damage

Pig damage and disturbance was recorded (Table 6), however mostly around the edges of the peatland. Upturned soils and uprooted vegetation expose organosol to rapid oxidisation, which can result in the release of heavy metals and acids including sulphuric acid. This process can alter the ecology of the system (South Coast NRM, 2015).

Table 6: Photographs of feral pig damage within *Empodisma* peatland.

Image	Description
	<p>Upturned soil and uprooting of vegetation, large tracks and faeces.</p>
	<p>Upturned soil and uprooting of vegetation, oxidation of organosol.</p>

Image	Description
	<p>Feral pig tracks present in bottom right of image. Some pedestalling around base of trees from feral pig activity.</p>



Dry oxidised organosol, uprooted and damaged vegetation and faeces present.

4.4.3 Dieback and Weeds

No evidence of dieback impact was recorded within the peatland. Trees surrounding may be impacted by dieback.

No signs of weeds were observed within the *Empodisma* peatland.

4.5 Photo Monitoring Points

Photo monitoring point were taken in accessible points at five locations, giving an overview of the overall vegetation structure. See Figure 2 and Table 7 for locations of photo points.

Table 7: Photo monitoring points of the *Empodisma* peatland

Image	Coordinates (EPSG:4326 - WGS 84)
	<p>Photo point taken facing SE with conveyor beyond.</p> <p>-32.95748732, 116.06381775</p>





Image	Coordinates (EPSG:4326 - WGS 84)
	<p>Photo point taken facing NE.</p> <p>-32.95867740, 116.06257999</p>
	<p>Photo point taken facing NE.</p> <p>-32.9574102, 116.0635731</p>

Image	Coordinates (EPSG:4326 - WGS 84)
	<p>Photo point taken facing NW with conveyor behind.</p> <p>-32.9573296, 116.0639459</p>
	<p>Photo point taken facing SE.</p> <p>-32.9568858, 116.0636771</p>

5. Discussion and Recommendations

- Confirmed 2.289 ha of Very Good Condition *Empodisma* peatlands of southwestern Australia is present within the Survey Area. The occurrence comprises two patches separated by the conveyor infrastructure.
- The *Empodisma* peatlands requires hydrology that allows for saturation of the peats for several months in a typical year. The Approved Conservation Advice identifies that the depth, duration and frequency of inundation of *Empodisma* peatland can be highly variable. It is recommended that Alcoa explores further studies to better understand the hydrology and soils associated with *Empodisma* peatlands in the Northern Jarrah Forest.
- As the Approved Conservation Advice is based on research from the lower southwest and south coast regions to date, key characteristic flora species are poorly sampled/defined for the Northern Jarrah Forest. Further studies to confirm characteristic flora species are recommended.
- No fire evidence was recorded, and no fire has been documented in this *Empodisma* peatland since 1992. Alcoa/DBCA management plans should consider the presence of the TEC in fire management planning. The Approved Conservation Advice identifies that inappropriate timing of fires, such as when peat substrate is dry, or too frequent fires are a degrading factor for the community.
- Pig damage and disturbance was recorded, however mostly around the edges of the peatland. Alcoa/DBCA management should consider strategies for feral pig management.
- WEPL considered that there are likely other occurrences of the community within the Larego region and the broader Northern Jarrah Forest. A regional study is recommended to understand the extent of the community within Alcoa's operational areas in the Northern Jarrah Forest. Due to this being a novel occurrence of the TEC in the region data is deficient in some respects. A staged process is suggested, firstly focusing on identifying other occurrences to provide information/data training points, then undertaking a broader regional GIS assessment to develop a likelihood of occurrence map supported by ground truthing surveys. Based on information gained during this project it is suggested that the first stage comprise:
 - Overlay areas mapped as Stream Vegetation zone (mapped by Mattiske) with hi-resolution aerial imagery and based on vegetations appearance identify likely locations.
 - Follow up with ground truthing surveys to identify presence/ absence.

6. References

Blake, D., Winkle, H., and Horwitz, P. (2021). Predictive Mapping of *Empodisma gracillimum* based peatlands of southwestern Australia - Technical Document. *Empodisma_Peatlands_Mapping_Technical_Report_final_draft.pdf*

Commonwealth of Australia. (2012) Interim Biogeographic Regionalisation for Australia, Version 7. Department of Sustainability, Environment, Water, Population and Communities.

Department of Biodiversity Conservation and Attractions (DBCA). (2023a) Methods for survey and identification of Western Australian threatened ecological communities.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2023). Approved Conservation Advice for the *Empodisma* peatlands of southwestern Australia.

Environmental Protection Authority (EPA). (2016). Technical Guidance - Flora and Vegetation surveys for Environmental Impact Assessment.

South Coast NRM. (2015). Protecting EPBC species in the Walpole Wilderness: A South Coast NRM funded project. <https://library.dbca.wa.gov.au/FullTextFiles/627659.pdf>

Western Australian Herbarium. (2024). FloraBase - The Western Australian Flora. Perth, Australia. Retrieved on 9 January 2025 from <https://florabase.dpaw.wa.gov.au>.

Datasets used

ArundelLaregoDieback. (2024). Provided by Alcoa.

Department of Biodiversity, Conservation and Attractions (DBCA). (2025). DBCA Fire History (DBCA-060) GIS Dataset. Perth, Australia. Retrieved on 9 January 2025 from <https://catalogue.data.wa.gov.au/dataset/dbca-fire-history>

Department of Primary Industries and Regional Development (DPIRD). (2018). Soil Landscape Mapping - Systems (DPIRD-064) - GIS Dataset. Perth, Australia. Retrieved on 9 January 2025 from <https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-systems>.

Department of Water and Environmental Regulation (DWER). (2018). Hydrography, Linear (Hierarchy) (DWER-031). Retrieved on 9 January 2025 from <https://catalogue.data.wa.gov.au/dataset/hydrography-linear-hierarchy>.



Mattiske Consulting. (2023). Landscape, fire history and Vegetation Mapping. Provided by Alcoa.

Appendix A

Legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of Climate Change, Energy and the Environment lists Threatened species and communities in categories determined by criteria set out in the EPBC Act.

Projects likely to cause a significant impact on MNES should be referred to the DCCEEW for assessment under the EPBC Act.

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 aims to conserve and protect biodiversity and biodiversity components within the State and to promote ecologically sustainable use of biodiversity components in the State.

Environmental Protection Act 1986

Declared Rare Flora (DRF) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is considered in the clearing principles and assessed during consideration of applications for a clearing permit.

Biosecurity and Agricultural Management Act 2007

Plants may be 'Declared' by the Minister for Agriculture and Food under the BAM Act. The Western Australian Organism List contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned in Western Australia. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties.

Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 WoNS. Four major criteria were used in determining WoNS:

- The invasiveness of a weed species.
- A weed's impacts.
- The potential for spread of a weed.
- Socio-economic and environmental values.

Each WoNS has a national strategy and a national coordinator, responsible for implementing the strategy. WoNS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.

Department of Biodiversity, Conservation and Attractions Priority Lists

DBCA lists 'Priority' flora and fauna that have not been assigned statutory protection as "Threatened" under the BC Act and are under consideration for declaration as Threatened. Flora and fauna assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora requires monitoring every 5 -10 years.

DBCA maintains a list of Priority Ecological Communities (PECs) which identifies plant communities that require further investigation before possible nomination for TEC status. Once listed, a community becomes a PEC and, when endorsed by the WA Minister for Environment, becomes a TEC and protected as an ESA under Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

Informal Recognition of Flora and Fauna

Certain populations or communities of flora and/or fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora and may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.

Appendix B

Definitions and Criteria

EPBC Act Categories for Flora, Fauna and Ecological Communities

Category	Threatened Species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	N/A.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.	N/A.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish.	N/A.

Category	Threatened Species	Threatened Ecological Communities
	<p>(ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised.</p> <p>(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory.</p> <p>(iv) cessation of the plan of management would adversely affect the conservation status of the species.</p>	

Conservation Codes for Western Australian Flora and Fauna (DBCAs)

Conservation Codes for Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora¹ are species² which have been adequately searched for and are deemed to be, in the wild, Threatened, extinct or in need of special protection, and have been gazetted as such.

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016.

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

	<p>Threatened species</p> <p>Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as Threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).</p> <p>Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.</p> <p>Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.</p> <p>The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using International Union for Conservation of Nature (IUCN) Red List categories and criteria as detailed below.</p>
T	
CR	<p>Critically endangered species</p> <p>Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".</p> <p>Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.</p>
EN	<p>Endangered species</p> <p>Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".</p>

Conservation Codes for Western Australian Flora and Fauna

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

VU	<p>Vulnerable species</p> <p>Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.</p>
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Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX	<p>Extinct species</p> <p>Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.</p>
EW	<p>Extinct in the wild species</p> <p>Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p> <p>Currently there are no Threatened fauna or Threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.</p>

Specially protected species

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

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

MI	<p>Migratory species</p> <p>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).</p> <p>Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.</p>
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Conservation Codes for Western Australian Flora and Fauna

	<p>Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
CD	<p>Species of special conservation interest (conservation dependent fauna)</p> <p>Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as Threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).</p> <p>Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
OS	<p>Other specially protected species</p> <p>Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).</p> <p>Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
P	<p>Priority species</p> <p>Possibly Threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of Priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened fauna or flora.</p> <p>Species that are adequately known, are rare but not Threatened, or meet criteria for near Threatened, or that have been recently removed from the Threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.</p> <p>Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.</p>
1	<p>Priority 1: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>
2	<p>Priority 2: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>
3	<p>Priority 3: Poorly-known species</p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey</p>

Conservation Codes for Western Australian Flora and Fauna

requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4	<p>Priority 4: Rare, Near Threatened and other species in need of monitoring</p> <p>(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of Threatened species during the past five years for reasons other than taxonomy.</p>
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1 The definition of flora includes algae, fungi and lichens.

DBCA Definitions and Criteria for TECs and PECs

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	<p>An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.</p> <p>An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):</p> <p>A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or</p> <p>B. All occurrences recorded within the last 50 years have since been destroyed.</p>
Critically Endangered (CR)	<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.</p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):</p> <p>A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):</p> <ul style="list-style-type: none"> i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years). ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. <p>B. Current distribution is limited, and one or more of the following apply (i, ii or iii):</p>

Criteria	Definition
	<ul style="list-style-type: none"> i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years). ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes. iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. <p>C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).</p>
<p>Endangered (EN)</p>	<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.</p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):</p> <p>A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):</p> <ul style="list-style-type: none"> i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years). ii. modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. <p>B. Current distribution is limited, and one or more of the following apply (i, ii or iii):</p> <ul style="list-style-type: none"> i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years). ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes. iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. <p>The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).</p>
<p>Vulnerable (VU)</p>	<p>An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.</p>

Criteria	Definition
	<p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):</p> <p>A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.</p> <p>B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.</p> <p>C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.</p>

Priority Ecological Communities

Priority One	<p>Poorly known ecological communities</p> <p>Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
Priority Two	<p>Poorly known ecological communities</p> <p>Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities, but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</p>
Priority Three	<p>Poorly known ecological communities</p> <ul style="list-style-type: none"> i. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or. ii. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or. iii. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. <p>Communities may be included if they are comparatively well known from several localities, but do not meet adequacy of survey requirements and / or are not well defined, and known threatening processes exist that could affect them.</p>
Priority Four	<p>Ecological communities that are adequately known, rare but not Threatened or meet criteria for Near Threatened, or that have been recently removed from the Threatened list. These communities require regular monitoring.</p>

Criteria	Definition
	<p>i. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection, but could be if present circumstances change These communities are usually represented on conservation lands.</p> <p>ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>iii. Ecological communities that have been removed from the list of Threatened communities during the past five years.</p>
<p>Priority Five</p>	<p>Conservation Dependent Ecological Communities</p> <p>Ecological Communities that are not Threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming Threatened within five years.</p>

