

# THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

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The Minister approved this conservation advice and included this species in the Endangered category, effective from 04/07/2019

## Conservation Advice

### *Acacia woodmaniorum*

Woodman's Wattle

#### **Summary of assessment**

##### **Conservation status**

*Acacia woodmaniorum* has been found to be eligible for listing in the Endangered category, as outlined in the attached assessment.

##### **Reason for conservation assessment by the Threatened Species Scientific Committee**

This advice follows assessment of information provided by Western Australia as part of the Common Assessment Method process, to systematically review species that are inconsistently listed under the EPBC Act and relevant Western Australian legislation or lists.

More information on the Common Assessment Method is available at:

<http://www.environment.gov.au/biodiversity/threatened/cam>

The information in this assessment has been compiled by the relevant state/territory government. In adopting this assessment under the EPBC Act, this document forms the Approved Conservation Advice for this species as required under s266B of the EPBC Act.

##### **Public consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for at least 30 business days between 14 August 2018 and 25 September 2018. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

##### **Recovery plan**

A recovery plan for this species under the EPBC Act is not recommended, because the Approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats. The relevant state/territory may decide to develop a plan under its equivalent legislation.

##### **Recommendations**

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Endangered category:

*Acacia woodmaniorum*

- (ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

26 September 2018

# Nomination/Proposal summary *(to be completed by nominator)*

Current conservation status				
Scientific name:	<i>Acacia woodmaniorum</i>			
Common name:	Woodman's wattle			
Family name:	Fabaceae	Fauna <input type="checkbox"/>	Flora <input checked="" type="checkbox"/>	
Nomination for:	Listing <input checked="" type="checkbox"/>	Change of status/criteria <input type="checkbox"/>	Delisting <input type="checkbox"/>	
1. Is the species currently on any conservation list, either in a State or Territory, Australia or Internationally? 2. Is it present in an Australian jurisdiction, but not listed?		Provide details of the occurrence and listing status for each jurisdiction in the following table		
Jurisdiction	State / Territory in which the species occurs	Date listed or assessed (or N/A)	Listing category i.e. critically endangered or 'none'	Listing criteria i.e. B1ab(iii)+2ab(iii)
International(IUCN Red List)				
National (EPBC Act)				
State/ Territory	1. WA	2007	Vulnerable	D2
		5/4/2017	Endangered	B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)
	2.			
Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:				
<ul style="list-style-type: none"> <li>this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:				
<ul style="list-style-type: none"> <li>surveys of the species were adequate to inform the assessment;</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	No new subpopulations have been located since the initial assessment in 2007. Further surveys have been undertaken, increasing the total known number of individuals from ~12,800 to ~30,000.			
<ul style="list-style-type: none"> <li>the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.</li> </ul>			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	Since the previous assessment in 2007, mining has resulted in the complete removal of Subpopulations 2 and 3 (32 and 12 individuals, respectively), as well as up to a potential 5,671 from Subpopulation 1. This equates to up to a 17.2% loss of the total known mature individuals, and two of the four subpopulations, with corresponding reduction in EOO and AOO. Future mining is planned which will result in a total cumulative loss of 37% of mature individuals. Potential secondary impacts to the remaining individuals and its habitat include habitat disturbance and dust from exploration activities. Now meets criteria Endangered B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v).			

Nominated national conservation status: category and criteria		
Presumed extinct (EX) <input type="checkbox"/> Critically endangered (CR) <input type="checkbox"/> Endangered (EN) <input checked="" type="checkbox"/> Vulnerable (VU) <input type="checkbox"/>		
None (least concern) <input type="checkbox"/> Data Deficient <input type="checkbox"/> Conservation Dependent <input type="checkbox"/>		
<b>What are the IUCN Red List criteria that support the recommended conservation status category?</b>		<b>EN: B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)</b>
Eligibility against the IUCN Red List criteria (A, B, C, D and E)		
<i>Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For <b>delisting</b>, provide details for why the species no longer meets the requirements of the current conservation status.</i>		
<b>A.</b>	Population size reduction (evidence of decline)	<ul style="list-style-type: none"> <li>A4ace. Mining has resulted in the complete removal of Subpopulation 3 (Terapod), consisting of 12 individuals. Further mining of the western end of the Mungada Ridge was given approval to proceed in 2013 and resulted in the complete removal of Subpopulation 2 (32 individuals), as well as a potential loss of up to 5,671 from Subpopulation 1 (an expected 2,745 individuals, and a further potential 2,926 from a 50m buffer area). This equates to up to a 17.2% observed and expected loss of the entire species within 3 generations (suspected generation is &gt;10 years). Future mining is planned which will result in a projected total cumulative loss of 37% within 3 generations. Potential secondary impacts to the remaining individuals and its habitat include habitat disturbance and dust.</li> <li><b>Meets criteria for VU: A4ace</b></li> </ul>
<b>B.</b>	Geographic range (EOO and AOO, number of locations and evidence of decline)	<ul style="list-style-type: none"> <li>(B1) EOO &lt;100 km<sup>2</sup>. Using Minimum Convex Polygon (MCP) the EOO is estimated as 12.1km<sup>2</sup>, which was calculated by drawing a polygon around the plants. Recalculated to 28km<sup>2</sup> to be not less than the AOO.</li> <li>(B2) AOO &lt;500km<sup>2</sup>. The estimated current AOO is 28km<sup>2</sup> using the 2km x 2km grid method.</li> <li>(a) Known from two extant locations in the Blue Hills Range, east of Morawa, but could be considered one location if mining extends to both extant sites. The species is restricted to banded ironstone formations which are highly prospective for minerals.</li> <li>(b) Continuing decline observed and projected:               <ul style="list-style-type: none"> <li>(i) EOO has declined by 46% from 22.5km<sup>2</sup> pre-mining to 12.1km<sup>2</sup>. A further decline in EOO may occur from future mining.</li> <li>(ii) Estimated AOO has declined by 12.5% from 32km<sup>2</sup> pre-mining to 28km<sup>2</sup> (calculated using the 2km x 2km grid system). A further decline in AOO is expected from future mining.</li> <li>(iii) Apart from the projected loss of habitat as a direct result of mining, a continuing decline in habitat quality at Subpopulation 1 on the Mungada Ridge is currently being observed. Habitat has been cleared for gridline and drill pad installation from mining exploration and there is a potential secondary impact to the habitat from dust.</li> </ul> </li> <li>(iv,v) Mining has resulted in the loss of two subpopulations. Mining operations commenced in 2012 and resulted in the complete removal</li> </ul>

		<p>of Subpopulation 3 (Terapod), consisting of 12 individuals. Further mining of the western end of the Mungada Ridge was given approval to proceed in 2013 and resulted in the complete removal of Subpopulation 2 (Blue Hills, 32 individuals), as well as an expected loss of up to a potential 5,671 from Subpopulation 1 (Mungada Ridge). This equates to up to a 17.2% loss of mature individuals. A current proposal to undertake further mining at Subpopulation 1 will result in a further 20% projected loss of mature individuals.</p> <ul style="list-style-type: none"> <li>• <b>Meets criteria for EN: B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)</b></li> </ul>
<b>C.</b>	Small population size and decline (population size, distribution and evidence of decline)	<ul style="list-style-type: none"> <li>• Known from ~12,800 to ~30,000 mature individuals.</li> <li>• C1 Mining in 2013 has resulted in a loss of up to 17.2% of the entire known population of mature individuals.</li> <li>• C2 (a) (i) &gt;1,000 individuals in each subpopulation.</li> <li>• C2 (a) (ii) 89% of mature individuals occur in Subpopulation 1.</li> <li>• <b>Does not meet criterion</b></li> </ul>
<b>D.</b>	Very small or restricted population (population size)	<ul style="list-style-type: none"> <li>• (D) The species is known from approximately ~12,800 to ~30,000 mature individuals in total.</li> <li>• <b>Does not meet criterion</b></li> </ul>
<b>E.</b>	Quantitative analysis (statistical probability of extinction)	<ul style="list-style-type: none"> <li>• No information to assess.</li> </ul>

#### Summary of assessment information

EOO	12.1km <sup>2</sup> (MCP) (pre-mining 22.5km <sup>2</sup> ). Recalculated to 28km <sup>2</sup> to be not less than the AOO	AOO	28km <sup>2</sup> (2km x 2km grid). Mapped area of subpopulations <7.76km <sup>2</sup>	Generation length	Unknown
No. locations	2	Severely fragmented		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
No. subpopulations	2	No. mature individuals		~12,800 to ~30,000	
Percentage global population within Australia				100	
Percentage population decline over 10 years or 3 generations				Unknown	

#### Threats (detail how the species is being impacted)

Threat <i>(describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)</i>	Extent <i>(give details of impact on whole species or specific subpopulations)</i>	Impact <i>(what is the level of threat to the conservation of the species)</i>
Mining <ul style="list-style-type: none"> <li>• The species occurs on Banded Ironstone Formation (BIF) which are highly prospective for iron ore. A number of mineral leases exist over its habitat and mining has occurred in the Blue Hills Range, at Terapod and at the north-west end of the Mungada</li> </ul>	Whole population	Catastrophic

<p>Ridge. The habitat at Subpopulation 3 was cleared in 2012 during mining operations. Mining operations have also commenced at Subpopulations 1 and 2 with the removal of up to ~6,000 individuals. Further mining is planned for more of the ridge in the future.</p> <p>Past, current, future</p>		
<p>Habitat disturbance</p> <ul style="list-style-type: none"> <li>Habitat disturbance during mining operations may produce secondary threats such as dust, cracking of rock faces and impacts on reproductive biology. Negative effects on pollinator activity may lead to a decline in recruitment.</li> </ul> <p>Past, current, future</p>	Whole population	Severe
<p>Grazing</p> <ul style="list-style-type: none"> <li>Feral animals including goats and rabbits may be a threat to the species and its habitat. Significant predation of seed by beetle larvae has also been observed, the majority occurring at Mungada Ridge and Terapod populations.</li> </ul> <p>Past, current and future</p>	Whole population	Severe
<p>Reduced connectivity among subpopulations</p> <ul style="list-style-type: none"> <li>Maintenance of connectivity between subpopulations through pollen movement is likely to be critical for the persistence of this species. That is, small isolated populations on BIF outliers and large BIF subpopulations are characterised by a level of connectivity that prevents inbreeding effects and reduced seed production in small subpopulations through pollen movement. Any major disruption to this connectivity will significantly impact on the small outliers and potentially on the larger BIF populations if they become severely fragmented through habitat removal. The loss of the Blue Hills and Terapod subpopulations may have already impacted on this pattern of connectivity.</li> </ul> <p>Current, future</p>	Whole population	Severe

### Management and Recovery

Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?

Yes

No

*List all relevant recovery or management plans (including draft, in-preparation, out-of-date, national and State/Territory recovery plans, recovery plans for other species or ecological communities, or other management plans that may benefit or be relevant to the nominated species).*

Department of Parks and Wildlife (2015) Woodman's wattle, *Acacia woodmaniorum* Interim Recovery Plan 2015–2020. Interim Recovery Plan No. 355. Department of Parks and Wildlife, Western Australia.

*List current management or research actions, if any, that are being undertaken that benefit the conservation of the*

*species.*

- Monitoring and surveys have been carried out to determine plant numbers and impact of threats;
- Seed and cuttings material has been collected from the subpopulations;
- A quadrat-based survey of the flora and floristic communities of several ironstone ranges and outcrops in the Yalgoo bioregion was undertaken by Parks and Wildlife;
- An assessment of population genetic variation and structure of *Acacia woodmaniorum* and its phylogenetic relationship to other *Acacia* species was undertaken by Parks and Wildlife for Karara Mining Limited;
- Development of a translocation project to investigate translocation techniques and seed orchard establishment for future restoration;
- Mapping of habitat critical to the survival of the species by Karara Mining Limited;
- Production of a leaflet by Karara Mining Limited as part of a wider environmental education program to highlight the value of the species;
- Liaison with the mining companies and regulators has been undertaken to minimise the impact of development proposals on this species.

*List further recommended management or research actions, if any, that would benefit the conservation of the species. Please ensure that this section addresses all identified threats.*

#### Management

- Monitor subpopulations for evidence of grazing impacts, or changes in plant or site health;
- Protect plants from herbivory by undertaking baiting, trapping and shooting;
- Ensure input into regulatory processes to reduce long term impacts from mining activities to ensure viability of subpopulations;
- Liaise with mining companies to ensure protection of the species;
- Investigate the potential for the establishment of a conservation reserve to protect the species;
- Develop and implement a fire management strategy, including the need for, and method of, the construction and maintenance of firebreaks;
- Undertake surveys in areas of potentially suitable habitat.

#### Research

Research biology and ecology of the species, with a focus on:

- pollination effectiveness;
- seed viability;
- conditions required for natural germination;
- response to threats and disturbances; and
- reproductive biology.

**Nomination prepared by:**

**Contact details:**

**Date submitted:**

28/3/2017

*If the nomination has been refereed or reviewed by experts, please provide their names and contact details:*

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Location or Subpopulation (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	Area of Subpopulation	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
Subpopulation 1: Mungada Ridge, 60km south of Yalgoo	UCL (ex-pastoral lease)	2008: 25,483 2011: 30,061 (up to 5,671 individuals to be potentially mined, plus another 6,331 individuals currently proposed)	6.304km <sup>2</sup> (does not include AOO loss from drill pad clearing and buffer) (pre-mining 6.392km <sup>2</sup> )	Healthy/poor. Partly mined.	Grazing (past, present, future) Mining (past, present, future) Habitat disturbance (past, present, future) Reduced connectivity (present, future)	Undertake conservation reserve planning for Karara area  Protect plants from herbivory through baiting, trapping and shooting  Develop a fire management plan  Collect seed and test viability, conduct regeneration trials  Undertake further surveys  Liaise with mining companies
Subpopulation 2: Blue Hills (Mungada west)	UCL (ex-pastoral lease)	2008: 125 2011: 32 2015: 0	0 (AOO pre-mining 0.07km <sup>2</sup> )	Mined		
Subpopulation 3: Near old mine (Terapod), 5.5km NNE of Mulga Bore.	UCL (ex-pastoral lease)	2006: 8 2008: 9 2012: 12 2012: 0	0 (AOO pre-mining 0.000269km <sup>2</sup> )	Mined		
Subpopulation 4: Jasper Hill, north of Mungada Ridge.	UCL (ex-pastoral lease)	2008: 3,073	1.46km <sup>2</sup> (146 hectares)	Healthy	Grazing (past, present, future) Mining (future) Habitat disturbance (future) Reduced connectivity (present,	Undertake conservation reserve planning for Karara area  Protect plants from herbivory

					future)	through baiting, trapping and shooting Develop a fire management plan Collect seed and test viability, conduct regeneration trials Undertake further surveys Liaise with mining companies
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## Nomination of a Western Australian species for listing as threatened, change of status or delisting (updated 2017).

To fill out this form you **must** refer to the attached Guidelines. Incomplete forms will result in delays in assessment, or rejection of the nomination.

Answer all relevant sections, indicating when there is no information available. Mark boxes with a cross .

**Note**, this application form applies to both flora and fauna species, and hence some questions or options may not be applicable to the nominated species – for these questions, type or write “N/A”.

SECTION 1. NOMINATION	
<b>1.1. Nomination information</b>	
Flora <input checked="" type="checkbox"/>	Fauna <input type="checkbox"/> Nomination for: Addition <input checked="" type="checkbox"/> OR Change of status <input type="checkbox"/> .
<b>1.2. Scientific Name</b>	
This name will be used to identify the species on all official documentation. Use the approved name used by the Western Australian Museum or Herbarium. If this is not possible, use unpublished names or numbers of voucher specimens.	
<i>Acacia woodmaniorum</i> (formerly known as <i>Acacia</i> sp. Blue Hill Range (R.J. Cranfield 8582))	
<b>1.3. Common Name</b>	
If the species has a generally accepted common name, please show it here. This name will be used on all official documentation.	
Woodman's Wattle	
<b>1.4. Current Conservation Status</b>	
<b>International</b>	
IUCN Red List	none
Categories and Criteria applicable to the highest rank category only e.g. B1ab(iv);D	none
<b>National</b>	
EPBC Act 1999	none
<b>State of Western Australia</b>	
Wildlife Conservation Notice Schedule	Schedule 2
IUCN Ranking	Endangered B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)
Priority	none
Is the species listed as 'Threatened' in any other Australian State or Territory No <input checked="" type="checkbox"/> . Yes <input type="checkbox"/> If Yes, list these States and/or Territories and the status for each.	
Does the species have specific protection (e.g. listed on an annex or appendix) under any other legislation, inter-governmental or international arrangements e.g. CITES? No <input checked="" type="checkbox"/> . Yes <input type="checkbox"/> If yes, please provide details.	
<b>1.5. Nominated Conservation Status</b>	
Write one category for each of the fields. If none, write 'None'.	
<b>International</b>	

IUCN Red List	none
Categories and Criteria applicable to the highest rank category only e.g. B1ab(iv);D	none
<b>National</b>	
EPBC Act 1999	Endangered B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)
<b>State of Western Australia</b>	
Wildlife Conservation Notice Schedule	Schedule 2
IUCN Ranking	Endangered B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)
Priority	none

### 1.6. Reasons for the Nomination

Briefly summarise the reasons for the nomination in dot points. Please include details relevant to the IUCN Categories and Criteria where appropriate.

- Within the next 10 years, potential for > 80% reduction in population due to levels of exploitation.
- Restricted to a single set of ironstone ranges (one general location).
- Extent of occurrence (EOO) = c. 40km<sup>2</sup> (<100km<sup>2</sup>) (Woodman Environmental 2006) (EOO currently 12.1km<sup>2</sup>).
- Area of occupancy (AOO) = c. 1.03km<sup>2</sup> (<10km<sup>2</sup>) (Woodman Environmental 2006) (AOO currently 28km<sup>2</sup>).
- Continuing decline in extent of occupancy, and all associated populations, predicted if all proposed mineral exploration and mining is carried out. Woodman Environmental Consulting (2006) located three populations (15 subpopulations) that are roughly estimated to amount to between 2,575 and 12,875. These estimates are based on a density of between 1 or 5 individuals per 20 x 20 m<sup>2</sup> quadrat, extrapolated to cover 1.03 km<sup>2</sup>.
- The species was listed in 2007 as Vulnerable under IUCN criteria D2. Since then, mining has resulted in the complete removal of Subpopulations 2 and 3, as well as an expected 2,745 individuals, and a further potential 2,926 from a 50m buffer area, from Subpopulation 1. This equates to a 17.2% loss of total mature individuals, and two of the four subpopulations, with corresponding reduction in EOO and AOO. Future mining is planned which will result in a total cumulative loss of 37% of mature individuals. Potential secondary impacts to the remaining individuals and its habitat include habitat disturbance and dust from exploration activities. Now meets criteria Endangered B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v).

## SECTION 2. SPECIES

### 2.1. Taxonomy

Describe the taxonomic history, using references, and describe the key distinguishing features that can be used to separate this taxon from closely related taxa. Include details of the type specimen, changes in taxonomy, scientific names and common names used for the species.

Initially collected in 1992 during regional survey of the Paynes Find –Yalgoo – Sandstone area and identified as *Acacia alata* var *biglandulosa* (Pringle *et al.* 1998), this entity was later recognised as a distinct species which was geographically disjunct and morphologically distinct from the latter species. It was assigned the phrase name, *Acacia* sp. Blue Hill Range (R.J. Cranfield 8582) in April 2006 and recently given the manuscript name, *Acacia woodmaniorum*.

This entity was described by Maslin and Buscumb and published in *Nuytsia* in 2007.

Closest affinities to *Acacia alata* (especially *A. alata* var *biglandulosa*), but differs from the latter by floral characters (sepals are united and very short, 4-7 flowers per head and these are white in colour and the free portion of the phyllodes bear only a single spinose point and have 2 or 3 prominent stipitate glands along the margin. Additionally, there is a single, sessile gland on the upper margin of the free portion of the phyllode. Very occasionally the stipitate glands of *Acacia alata* var. *biglandulosa* are replaced by rudimentary spinose structures but these are look very different from the long, rigid spines that characterize *A. woodmaniorum*. The pods of *A. woodmaniorum* are densely hairy and the phyllodes normally hairy, rarely glabrous.

Is this species conventionally accepted? No  Yes  If no, explain why. For example, is there any controversy about the taxonomy? For undescribed species, detail the location of voucher specimens (these should be numbered and held in a recognised institution and be available for reference purposes).

The voucher specimens for *Acacia woodmaniorum* are lodged at PERTH.

Describe any known hybridisation with other species in the wild, indicating where this occurs and how frequently.

None known nor expected to occur as *Acacia woodmaniorum* is not sympatric with closely related taxa.

### 2.2. Description

Describe the physical appearance, habit, behaviour/dispersion and life history. Include anatomy or habit (e.g. size and/or weight, sex and age variation, social structure) and dispersion (e.g. solitary, clumped or flocks etc), and life history (eg short lived, long lived, geophytic, etc).

- low, perennial shrub (1 – 2 m tall) with semi-prostrate, sprawling or tangled habit
- grows on massive ironstone outcrops and associated soils and dissected rocks
- bisexual plants, with presumed outbreeding
- fire response unknown
- presumed to be long-lived perennial
- has spinous, photosynthetic phyllodes which are decurrent on stem, giving stem winged appearance
- grows as either discrete individual shrubs or clumps of individuals within small sub-populations. occurs in densities roughly estimated to range between 1 and 5 and up to 10 plants per 400m<sup>2</sup>. These sub-populations are dispersed over the landform, where they are closely associated with exposed BIF bedrock.

### 2.3. Distribution

Describe the distribution of the species in Australia and, if possible, attach a map.

Restricted to a series of hills / ranges on Karara Station, in the midwest of Western Australia, Yalgoo IBRA Region (see map below).

*Acacia woodmaniorum*

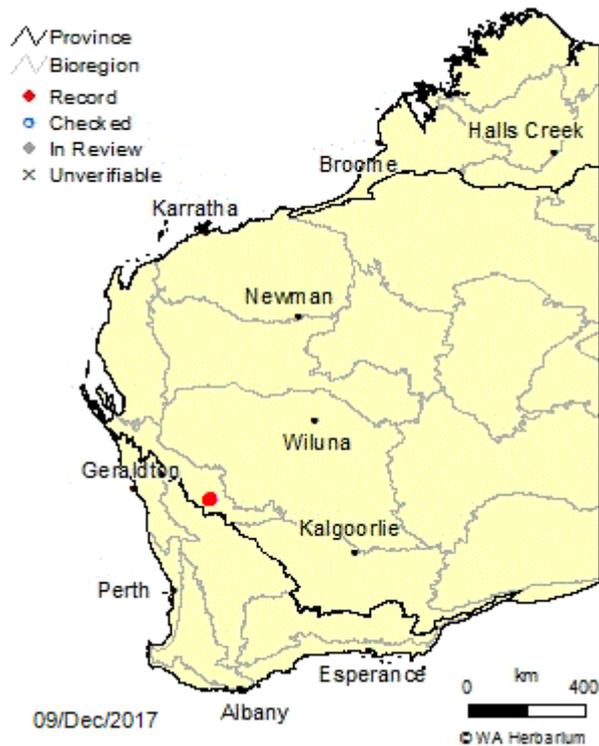


Figure 1. Location of *Acacia woodmaniorum* from Western Australian Herbarium (1998–).

### 2.4. Habitat

Describe the non-biological habitat (e.g. aspect, topography, substrate, climate) and biological habitat (e.g. forest type, associated species, sympatric species). If the species occurs in various habitats (e.g. for different activities such as breeding, feeding, roosting, dispersing, basking etc) then describe each habitat.

Non-biological habitat

- located within the semi-desert Mediterranean bioclimatic region defined by Beard (1976, 1990) of Western Australia, with an annual rainfall of 250 - 300 mm pa. Most of this falls during the winter months.
- restricted to the steep, rocky terrain of ironstone outcrops, ridges, crests and hillslopes.
- grows on skeletal – shallow, acidic, sandy-loam soils overlaying BIF rock. Often found growing out of rock crevices on steep rock faces.
- appears to be restricted to banded ironstone formation as an underlying substrate and will not occur on other metasedimentary geologies (e.g. cherts) within the region (Markey and Dillon 2008; Woodman Environmental Consulting 2006).

## Biological habitat

- found in association with shrublands and thickets of *Acacia* and / or *Allocasuarina* on banded ironstone formation.
- associated vegetation consists typically of tall shrubland or thickets dominated by *Acacia* spp., *Allocasuarina acutivalvis* and / or *Eucalyptus petraea*. Common species include: *Calycopeplus pauciflorus*, *Melaleuca nematophylla*, *Acacia* spp (*Acacia aulacophylla*, *Acacia aneura* or *Acacia* sp. Murchison B. R. Maslin 7331), over a lower shrub layer which typically (and variably) includes *Dodonaea* spp (*D. petiolaris* and *D. viscosa*), *Acacia exocarpioides*, *Philotheca* spp. (*P. sericea* or *P. brucei*), *Alyxia buxifolia*, *Gastrolobium laytonii*, *Micromyrtus* sp. *Warriedar* and *Ptilotus obovatus* var. *obovatus* particularly in more open, exposed sites. *Xanthosia bungei* in more typical of the closed vegetation under thickets of closed shrublands dominated by *Allocasuarina acutivalvis* and *Eucalyptus petraea*.
- found in Community types 2 and 4A as described by Markey and Dillon (2008), or floristic community types 9 - 14 (Woodman Environmental Consultancy 2006).

Does the (fauna) species use refuge habitat e.g. in times of fire, drought or flood? Describe this habitat.

Is the species part of, or does it rely on, a listed threatened ecological community? Is it associated with any other listed threatened species?

- is not associated with a listed TEC. Few TEC's have been identified for the Midwest as floristic surveys have only commenced within the region.
- it is associated with floristic communities which have been found to be restricted to the Mt Karara – Windaning Hills region (Markey and Dillon 2008) and / or which are of moderate or high conservation significance owing to presence of priority species (Woodman Environmental Consulting 2006).
- associated priority species include *Micromyrtus trudgenii* (P3), *Rhodanthe collina* (P3) and *Polianthion collinum* (P3).
- few DRF taxa have been identified for the mid west region, possibility owing in part to a lack of knowledge on the flora of the region.

## 2.5. Reproduction

Provide an overview of the breeding system.

For flora: When does the species flower and set fruit? Is the seed produced viable? What conditions are needed for this? What is the pollinating mechanism? If the species is capable of vegetative reproduction, a description of how this occurs, the conditions needed and when. Does the species require a disturbance regime (e.g. fire, ground disturbance) in order to reproduce?

Seed set in *Acacia woodmaniorum* was low compared to other *Acacia* species in the area with an average 68% of initially fertilised embryos developing into viable seed. The number of ovules within mature pods ranged from one to 12 (average 6.48). Seed was predated by birds or mammals and a significant amount by beetles (*Coleoptera* sp.), with the greatest amount of predation occurring at Mungada Ridge and Terapod. Seed (24%) was also lost to abortion, the reasons for which are unknown but could be due to environmental pressures such as lack of water (Millar and Coates 2012).

Correlated paternity within pods suggests that an average of two different fathers sire all seed within a pod. The taxon is predominantly outcrossing and appears to have strong selection mechanisms against selfed or inbred seed. Small population size and degree of population isolation have no impact on mating system parameters (Millar and Coates 2012).

The levels of pollen immigration into populations found by Millar and Coates (2012) varied from 13 to 61% (average 40%) for eight small groups of plants of *Acacia woodmaniorum*. The high levels of pollen immigration confirm the capacity of the pollen dispersal system to affect a high degree of dispersal into small and isolated populations. Therefore small population size and degree of isolation appeared to have no impact on the amount of pollen immigration into populations. The high levels of pollen immigration also indicate that either insect pollinator visitation occurs frequently or wind pollination is effective across the species range (Millar and Coates 2012).

Like most *Acacia* species, *A. woodmaniorum* is most likely an obligate re-seeder that is killed by fire and regenerates from soil stored seed. Germination is thought to be triggered by natural disturbance events (physical or fire), which may explain why the taxon has been observed growing on sites following mechanical disturbance (such as disturbed drill pads, road clearings, waste dumps).

Flowering of *Acacia woodmaniorum* commences in late June with some flowers persisting until August. The main flowering flush is in July. Pods with mature seeds have been collected between late October and late March (Maslin and Buscumb 2007).

## 2.6. Population dynamics

Provide details on ages of sexual maturity, extent of breeding success, life expectancy and natural mortality. Describe population structure (presence of juveniles/seedlings, mature and senescing individuals).

- Very little has been accrued on the demographics of this species.
- Possibly long-lived perennials as senescent plants were not observed in unburnt stands.

## SECTION 3. INTERNATIONAL CONTEXT

### For species that are distributed both inside and outside Australia

#### 3.1. Distribution

Describe the global distribution.

Give an overview of the global population size, trends, threats and security of the species outside of Australia.

Explain the relationship between the Australian population and the global population. What percentage of the global population occurs in Australia? Is the Australian population distinct, geographically separate or does part, or all, of the population move in/out of Australia's jurisdiction? Do global threats affect the Australian population?

## SECTION 4. CONSERVATION STATUS AND MANAGEMENT

### 4.1. Population

What is the total population size in terms of number of mature individuals? Has there been any known reduction in the size of the population, or is this likely in the future? – give details. Are there other useful measures of population size and what are they? Or if these are unavailable, provide an estimate of abundance? (e.g. scarce, locally abundant etc).

- Was estimated to number between 7000 and 12 800 individuals (prior to 2007), based on estimates by Woodman Environmental Consulting (C. Godden, pers. comm.). These are approximate, as counts have not been conducted within the whole extent of the species.
- Currently estimated between ~12,800 to ~30,000 mature individuals currently known. Mining has resulted in the complete removal of Subpopulation 3 (Terapod), consisting of 12 individuals; removal of Subpopulation 2 (32 individuals), as well as an expected 2,745 individuals, and a further potential 2,926 from a 50m buffer area, from Subpopulation 1. This equates to up to an 17.2% loss of the entire species.
- WA Herbarium records indicate that the species ranges from ‘infrequent’ to locally ‘common’.
- A great reduction in the size of the naturally occurring population may occur given that the entire known distribution of this species occurs on highly prospective iron ore mining tenements and these areas will be cleared if further mining occurs.

Give locations of: captive/propagated occurrences or *ex situ* collections; recent re-introductions to the wild; and sites for proposed re-introductions. Have these sites been identified in recovery plans?

A translocation proposal, which aims to establish viable subpopulations of *Acacia woodmaniorum* at three sites previously disturbed by mining operations, has been submitted. These sites will be used to create a seed orchard to conserve genetic diversity and increase the availability of propagation material for potential future translocation attempts as well as assess different planting techniques to determine which method is more successful. Survival of 50% of plants initially (one year from planting) and then 40% two to ten years from planting will determine the success of each treatment type. The success of the seed orchard will be determined if plants are established from stored seed for the purpose of seed production and collection (KML 2017).

How many locations do you consider the species occurs in and why? Where a species is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.

- *Acacia woodmaniorum* was restricted to three closely-located hills/small ranges of banded ironstone formation on Karara Station, these being Windaning Hill and associated Windaning Ridge, Jasper Hill and a small hill and mine pit c. 2km west of Windaning Ridge. This latter subpopulation may have been introduced to this mine pit by mining activities (B. Maslin, pers. comm.). Currently the species is known from two extant locations, but could be considered one location if mining extends to both extant sites.
- these locations occur on unvested Crown land which had been purchased by CALM with the intention for incorporation into conservation estate.
- the main area where this species is located is currently undergoing extensive exploration drilling, which includes clearing for grid lines, roads and drill pads.

For flora, and where applicable, for fauna, detail the location, land tenure, estimated number of individuals, area of occupancy, and condition, for each known location or occurrence.

Location	Land status	Date of most recent survey	Number of individuals at location	Area of occupancy at location	Condition of site
Subpopulation 1: Mungada Ridge	UCL, mining leases (Sinosteel Midwest Corp; Karara Mining Ltd)	2011 2008 2006	30,061 (5,671 to 12,084 individuals proposed to be removed) 25,483 c. 7,000 – 13,000	6.304km <sup>2</sup> (does not include AOO loss from drill pad clearing and buffer) (pre-mining 6.392km <sup>2</sup> )	Healthy/poor. Partly mined.
Subpopulation 2: Blue Hills (Mungada west)	UCL, mining leases (Sinosteel Midwest Corporation)	2015 2011 2008	0 32 125	0 (AOO pre-mining 0.07km <sup>2</sup> )	Mined
Subpopulation 3: near old mine (Terapod)	UCL, mining leases (Karara Mining Ltd)	2012 2012 2008 2006	0 12 9 8	0 (AOO pre-mining 0.000269km <sup>2</sup> )	
Subpopulation 4: Jasper Hill	UCL, mining leases (McMahon Mining Title Services)	2008 2006	3,073 c. 1,100	1.46km <sup>2</sup> c 0.25 km <sup>2</sup>	Good, intact condition

Has the number of individuals been counted , or is this an estimate . Provide details of the method of determining the number of individuals.

- estimated to number between 7,000 and 12,800 individuals (currently estimated at 12,800 to 30,000 individuals known), based on estimates by Woodman Environmental Consulting (C. Godden, pers. comm.). These are approximate, as counts have not been conducted within the whole extent of the species. Counts were made at Jasper Hill and the mine pit west of Mungada mine.
- individual counts over the entire population have not been made, as this terrain is relatively inaccessible and searches can only be made on foot. Estimates were made from counts only on the boundaries of its distribution (C. Godden, pers. comm.).

Has there been any known reduction in the number of locations, or is this likely in the future? – give details.

- it appears likely that mining will impact on part of the range of this species, given how restricted this species is to a small region.
- a small decline may have occurred during the current clearing for exploration drilling. A greater decline is expected over 10 years of > 80% if all proposed mining projects are approved and proceed and no action is taken to conserve a portion of the population, or restore suitable habitat after mining or establish a population away from the mines footprints.
- Mining has resulted in the loss of two subpopulations. Mining operations commenced in 2012 and resulted in the complete removal of Subpopulation 3 (Terapod), consisting of 12 individuals. Further mining of the western end of the Mungada Ridge was given approval to proceed in 2013 and resulted in the complete removal of Subpopulation 2 (Blue Hills, 32 individuals), as well as an expected 2,745 individuals, and a further potential 2,926 from a 50m buffer area, from Subpopulation 1 (Mungada Ridge). This equates to up to a 17.2% loss of mature individuals. A current proposal to undertake further mining at Subpopulation 1 will result in a further 20% loss of mature individuals.

What is the extent of occurrence (in km<sup>2</sup>) for the species; explain how it was calculated and datasets used. If an accurate estimate is unavailable provide a range of values or a minimum or maximum area estimate. Include estimates of past, current and possible future extent of occurrence. If available, include data that indicates the percentage decline over 10 years or 3 generations (whichever is longer) that has occurred or is predicted to occur.

The extent of occurrence estimated to be 40km<sup>2</sup> (current EOO estimated at 12.1km<sup>2</sup> calculated by drawing a polygon around the individuals). This has been estimated from foot surveys which have targeted this species, used GPS to fix locations and some counts of individuals over this area, and subsequently mapped its distribution (Woodman Environmental Consultancy 2006).

What is the area of occupancy (in km<sup>2</sup>) for the species; explain how it was calculated and datasets used. If an accurate estimate is unavailable provide a range of values or a minimum or maximum area estimate. Include estimates of past, current and possible future area of occupancy. If available, include data that indicates the percentage decline over 10 years or 3 generations (whichever is longer) that has occurred or is predicted to occur.

- Area of occupancy estimated to be 1.03km<sup>2</sup> (Woodman Environmental Consulting 2006, C. Godden, pers. comm.) (current AOO estimated at 28km<sup>2</sup> using the 2x2km grid system).
- Up to 17.2% loss of the entire species has resulted from current and past mining. Future mining is planned which will result in a total cumulative loss of 37%. The percentage decline in over 10 years could be as high as > 80% if all proposed mining projects are approved and proceed, and no action is taken to conserve a portion of the subpopulation, or restore suitable habitat after mining or establish a subpopulation away from the mines footprints.

Is the distribution of the species severely fragmented? Why?

No

Identify important occurrences necessary for the long-term survival and recovery of the species? This may include: key breeding populations, those near the edge of the range of the species or those needed to maintain genetic diversity.

Windaning Hills and associated Windaning Ridge are the main subpopulation and contain the greatest extent of suitable habitat.

#### 4.2. Survey effort

Describe the methods to conduct surveys. For example, (e.g. season, time of day, weather conditions); length, intensity and pattern of search effort (including where species not encountered); any limitations and expert requirements.

- survey in winter months, when the species is in flower, although its distinctive morphology ensures that this species is recognisable year-around.
- foot-searches on rock outcrops offer the best means to locate species.
- target suitable habitat, this being exposed outcrops of banded iron formation (BIF) (including cliffs, ridges and low seams).

Give details on the distinctiveness and detectability of the species, or the distinctiveness of its habitat, that would assist survey success.

- this is a very distinctive species of *Acacia* which would be easily recognised by any field botanist
- it is restricted to massive banded iron formation (BIF and includes haematite)
- it is particularly conspicuous on outcrops of exposed or bare rock, including steep cliffs of haematite and ridges of exposed BIF
- it is a particularly spinescent acacia with distinctive winged stems and a distinctive tangled, sprawling, low growth form.

Has the species been reasonably well surveyed? Provide an overview of surveys to date (include surveys of known occurrences and surveys for additional occurrences) and the likelihood of its current known distribution and/or population size being its actual distribution and/or population size. Include comments on potential habitat and surveys that were conducted, but where the species was not present/found.

Estimates on population size and species distribution have been made based on observations made during several surveys conducted between 2004 and 2011 including; subpopulation census by Woodman Environmental Consulting in 2006 and 2008a; and targeted flora surveys in June, July and September 2011 by Maia Environmental Consultancy (WEC 2006, 2008; MEC 2012).

Larger, regional surveys have been conducted over the Yalgoo – Sandstone – Paynes Find area and have not located *Acacia woodmanorium* beyond Windaning Hill – Mt Jasper.

Pringle *et al.* (1998) conducted a rangeland survey of the Sandstone-Yalgoo-Paynes Find area, in which this species was collected from the “Blue Hills Range” area (this material subsequently becoming the type for the species). It was not found elsewhere within their survey.

From 2005 – 2006, quadrat-based surveys for identifying floristic communities on banded ironstone ranges have been undertaken throughout the Midwest region by DEC (as part of the biodiversity conservation initiative). In 2005, one such survey (Markey and Dillon 2008) focused on the larger region surrounding Mt Karara Station, this area being referred to as the Central Tallering Land System (*vide* Payne *et al.* 1998). This survey located more specimens from Windaning Hill, but did not locate it on any suitable BIF habitat within their survey region, which extended from Mt Karara east to Pinyalling Hill, and north to Minjar Hill (see Figure 1 in Markey and Dillon 2008).

Other surveys assessing floristic communities on BIF have been conducted by DEC throughout the northern Yilgarn during 2005 and 2006, including on the adjacent Koolanooka Hills, Mt Gibson (Meissner and Caruso 2008a,b) and within the Gullewa Region (Barnong and Murdaburia Stations) (Markey and Dillon 2010). These have not located this species within these areas of BIF.

From these surveys, it would appear that this species is restricted to a small region.

### 4.3. Threats

Identify past, current and future threats indicating whether they are actual or potential. For each threat describe:

1. How and where they impact this species.

- past and current threats from grazing and feral animals (goats and rabbits have been observed on Windaning Ridge, and Karara Station was a pastoral lease). This is a suspected threat.
- current threats are arising from exploration drilling (small area of hillsides are being cleared for roads and drill pads).
- future threats include mining, which impact a large area of habitat. This is the most concerning threatening process given that mining tenement covers the entire range of this species.
- climate change could change rainfall regimes of the larger area, with unknown consequences for this poorly-known species.

2. What the effect of the threat(s) has been so far (indicate whether it is known or suspected; present supporting information/research, does it only affect certain populations?).

See question above.

3. What is its expected effect in the future (is there supporting research/information; is the threat only suspected; does it only affect certain populations?).

See questions above.

If possible, provide information threats for each occurrence/location:

See section above.

Location	Past threats	Current threats	Potential threats	Management requirements (see section 4.4)
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Identify and explain why additional biological characteristics particular to the species are threatening to its survival (e.g. low genetic diversity). Identify and explain any models addressing the survival of the species.

Knowledge of the genetics of this species is well advanced and the initial conclusions from this work (Millar et. al. 2013; Millar and Coates 2012) indicate that the maintenance of connectivity between populations through pollen movement is likely to be critical for the persistence of this species. That is, small isolated populations on BIF outliers and large BIF populations are characterised by a level of connectivity that prevents inbreeding effects and reduced seed production in small populations through pollen movement. Any major disruption to this connectivity, such as from mining, will significantly impact on the small outliers and potentially on the larger BIF populations if they become severely fragmented through habitat removal. The loss of the Mungada West and Terapod populations may have already impacted on this pattern of connectivity.

<b>4.4. Management</b>
<p>Identify key management documentation for the species e.g. recovery plans, conservation plans, threat abatement plans etc.</p> <p>Department of Parks and Wildlife (2015) Woodman's wattle, <i>Acacia woodmaniorum</i> Interim Recovery Plan 2015–2020. Interim Recovery Plan No. 355. Department of Parks and Wildlife, Western Australia.</p>
<p>Does this species benefit from the management of another species or community? Explain.</p> <p>This species would ultimately benefit from the recognition and protection of the unique floristic communities that have been described and found to be restricted to the ironstone landforms of Windaning Hill, Jasper Hill and adjacent ranges (Markey and Dillon 2008; Woodman Environmental Consulting 2008b). Woodman Environmental Consulting (2008b) described floristic communities on these landforms in which <i>Acacia woodmaniorum</i> occurred as of moderate – high conservation significance, owing to the number of priority taxa within these communities and their restricted regional distribution.</p>
<p>How well is the species represented in conservation reserves or covenanted land? Which of these are actively managed for this species? Give details.</p> <p>This species is not represented on either conservation estate nor covenanted land. All known populations are located on Karara Station, which is unallocated Crown land which had been purchased by CALM (now Department of Parks and Wildlife) with the intention of establishing conservation estate within the Murchison region. This land (Karara Station and adjacent Lochada and Warriedar Stations) is currently undergoing tenure review.</p>
<p>Are there any management or research recommendations that will assist in the conservation of the species? Give details.</p> <ul style="list-style-type: none"> <li>• Monitor subpopulations for evidence of grazing impacts, or changes in plant or site health;</li> <li>• Protect plants from herbivory by undertaking baiting, trapping and shooting;</li> <li>• Ensure input into regulatory processes to reduce long term impacts from mining activities to ensure viability of subpopulations;</li> <li>• Liaise with mining companies to ensure protection of the species;</li> <li>• Investigate the potential for the establishment of a conservation reserve to protect the species;</li> <li>• Develop and implement a fire management strategy, including the need for, and method of, the construction and maintenance of firebreaks;</li> <li>• Locating other subpopulations on adjacent conservation estate;</li> <li>• Improving the basic understanding of the species' biology - reproductive ecology, germination biology, population structure, responses to disturbance, regeneration modes and potential for translocation;</li> <li>• Exploring the feasibility for establishing a secure reserve on Parks and Wildlife estate which reserves this species and associated vegetation communities unique to these ironstone ranges.</li> </ul>
<b>4.5. Other</b>
<p>Is there any additional information that is relevant to consideration of the conservation status of this species?</p> <p>No</p>

<b>SECTION 5. NOMINATOR</b>	
Nominator(s) name(s)	
Signature(s)	
Organisation (s)	
Address(s)	
Telephone number(s)	
Email(s)	
Date	8th February 2007 Updated 1 May 2017 by Species and Communities Branch
If the nomination has been refereed or reviewed by experts, provide their names and contact details:	
<b>SECTION 6. REFERENCES</b>	
What references or sources did you use to prepare your nomination? Include written material, electronic sources and verbal information. Include full references, address of web pages and the names and contact details of authorities with whom you had verbal communications.	

- Maslin, Bruce R.: Senior Principal Research Scientist W.A. Herbarium. Dept. Environment and Conservation. Locked Bag 104, Bentley Delivery Centre, Western Australia 6983.
- Godden, Cathy. Woodman Environmental Consulting. PO Box 50, Applecross, WA 6953.
- Karara Mining Limited (2017) *Translocation Proposal –woodmaniorum* (Fabaceae). Draft unpublished report.
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- Western Australian Herbarium (1998–) *FloraBase—the Western Australian Flora*. Department of Environment and Conservation. <http://florabase.dpaw.wa.gov.au>.
- Woodman Environmental Consulting (2006) Flora and Vegetation of the Karara – Mungada Project Survey Area. Unpublished report prepared for Gindalbie Metals Ltd, December 2006.
- Woodman Environmental Consulting (2008a) Additional regional survey for *Acacia woodmaniorum* (DRF). Unpublished Report for Gindalbie Metals Ltd.
- Woodman Environmental Consulting (2008b) Karara–Mungada Project survey area flora and vegetation. Unpublished Report for Gindalbie Metals Ltd.
- <http://www.worldwidewattle.com/speciesgallery/species-intro.php?id=29055>