

Abridged Threatened Species Nomination Form

For nominations/assessments under the Common Assessment Method (CAM) where supporting information is available, but not in a format suitable for demonstrating compliance with the CAM, and assessment against the IUCN Red List threat status.

Cover Page *(Office use only for Assessment)*

Species name (scientific and common name):	Caladenia leucochila A.P.Br. & Brockman (Collie Spider Orchid)
Nomination for (addition, deletion, change):	Addition
Nominated conservation category and criteria:	Endangered A3cd; B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)

Scientific committee assessment of eligibility against the criteria:		
This assessment is consistent with the standards set out in Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding.		Yes <input type="checkbox"/> No <input type="checkbox"/>
A.	Population size reduction	•
B.	Geographic range	•
C.	Small population size and decline	•
D.	Very small or restricted population	•
E.	Quantitative analysis	•

Outcome:			
Scientific committee Meeting date:			
Scientific committee comments:			
Recommendation:			
Ministerial approval:		Date of Gazettal/ Legislative effect:	

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

Current conservation status				
Scientific name:	<i>Caladenia leucochila</i> A.P.Br. & Brockman			
Common name:	Collie Spider Orchid			
Family name:	Orchidaceae	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	2013	Critically Endangered	A3cd; C2a(ii)
	2. WA	2016	Endangered	A3cd; B1ab(i,ii,iii,iv,v)+ B2ab(i,ii,iii,iv,v)
	3.			
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"> this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria; 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:				
<ul style="list-style-type: none"> surveys of the species were adequate to inform the assessment; 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	As at December 2015 <i>Caladenia leucochila</i> is known from 18 extant subpopulations comprising a total of 827 mature individuals. The species has been extensively searched for by competent persons for the past eight years.			
<ul style="list-style-type: none"> 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. 			Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Comments:	The species has been reassessed and the assessment supported by the WA TSSC in 2016. The species meets criteria A3cd for endangered based on a revised projected reduction of mature individuals (plants are threatened by proposed mining expansion, a further decline in habitat quality (much of its habitat is highly disturbed from prior timber extraction, soil ripping, prescribed fire and mining), future timber harvesting, changed hydrology and fire.			

<p>It is believed that on the basis of limited geographic distribution, significant threats through mining and fire, and a lack of adequate reservation that the species is in imminent threat of decline and thus meets criterion B for endangered.</p> <p>Criterion C no longer current for Critically Endangered due to increase in total population number. Meets criterion C1 and D1 for vulnerable.</p>	
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"/>	
What are the IUCN Red List criteria that support the recommended conservation status category?	A3cd; B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)
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 delisting, provide details for why the species no longer meets the requirements of the current conservation status.</i>	
A.	Population size reduction (evidence of decline)
	<ul style="list-style-type: none"> Subpopulations 3, 4, 5, 8, 12, 13, 14 (526 mature individuals) are within the Muja South Public Environmental Review (PER) footprint, and are thus subject to potential future mining. Clearing of vegetation for access tracks, power lines and other linear infrastructure corridors is also a threat. A drilling program covering 32.67 hectares has also been proposed. Projected loss of 63% mature individuals within 10 years due to mine-related impacts. Further loss may be incurred through timber extraction, prescribed fire and drought. Subpopulations 2, 5, 6 and 18 now appear extinct. Meets criterion A3cd for Endangered
B.	Geographic range (EOO and AOO, number of locations and evidence of decline)
	<ul style="list-style-type: none"> EOO has been calculated to be 52km² and AOO calculated as 28km². Located in a number of small geographically separated subpopulations. 3 locations based on subpopulations located in State Forest subject to mining, State Forest excluded from mining and Conservation Reserve. Continuing decline observed and projected. Four subpopulations are now presumed extinct. Meets criterion B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v) for Endangered
C.	Small population size and decline (population size, distribution and evidence of decline)
	<ul style="list-style-type: none"> Although 18 subpopulations are known (14 with extant plants) comprising 827 mature individuals, most (715) are found in just 5 subpopulations. All others contain 18 or less mature individuals. The largest subpopulation in an area possibly subject to future mining contains 374 mature individuals. Subject to threats from mining (direct) and other habitat degradation (indirect). Projected loss of 63% mature individuals within 10 years due to mine-related impacts, but actual loss in 5 years not able to be determined.

		<ul style="list-style-type: none"> Meets criterion C1 and C2(a)(i) for Vulnerable. May meet criterion C1 for Endangered but insufficient information to evaluate. 			
D.	Very small or restricted population (population size)	<ul style="list-style-type: none"> Currently known from 827 mature individuals. Meets criterion D1 for Vulnerable 			
E.	Quantitative analysis (statistical probability of extinction)	<ul style="list-style-type: none"> No information to assess. 			
Summary of assessment information					
EOO	52km ² calculated the minimum convex polygon method	AOO	28km ² using the 2x2km grid estimate method	Generation length	Unknown but potentially many years.
No. locations	3	Severely fragmented		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
No. subpopulations	18	No. mature individuals		827	
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 (describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)		Extent (give details of impact on whole species or specific subpopulations)		Impact (what is the level of threat to the conservation of the species)	
Future mining operations <ul style="list-style-type: none"> Subpopulations within the Muja South Public Environmental Review (PER) footprint are subject to potential future mining. Clearing of vegetation for access tracks, power lines and other linear infrastructure corridors is also a threat. A drilling program covering 32.67 hectares has also been proposed Past, current and potentially future		Subpopulations 3, 4, 5, 8, 12, 13, 14. Comprising 526 mature individuals		High	
Altered fire regimes <ul style="list-style-type: none"> Prescribed burning during winter and spring, when the leaf is present and the new tuber is being formed, may kill plants Past, current and future		Whole species		High	
Timber extraction <ul style="list-style-type: none"> This is a potential threat to <i>Caladenia leucochila</i> as it would significantly alter vegetation structure, opening the forest canopy and changing the moisture level of the soil surface 		Subpopulations 3 and 5–19. Comprising 699 mature individuals		High	

Past and potentially future		
Drought <ul style="list-style-type: none"> Poor winter rainfall is believed to coincide with a reduction of flowering plants Past, current and future	Whole species	High
Hydrological changes <ul style="list-style-type: none"> Changed hydrology due to mining has the potential to adversely alter the orchids' habitat Past, current and future	Whole species	Medium
Small subpopulation size <ul style="list-style-type: none"> <i>Caladenia leucochila</i> is known from mostly small subpopulations, many of which may be impacted by lack of recruitment and chance demographic or environmental events. Current and future	Subpopulations 2, 4, 6, 12–19. Comprising 71 mature individuals	Medium
Grazing <ul style="list-style-type: none"> Although grazing does not appear to kill plants it reduces the reproductive output of the species if flowers or fruiting capsules are eaten. Past, current and future	Whole species	Low
Road maintenance <ul style="list-style-type: none"> Threats to a road verge subpopulation include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation Current and future	Subpopulation 4. Comprising 14 mature individuals	Low
Weeds <ul style="list-style-type: none"> Weeds suppress early plant growth by competing for soil moisture, nutrients and light, and also increase the potential fire hazard due to higher fuel loads. Past, current and future	Subpopulations 1–5. Comprising 491 mature individuals	Low
Management and Recovery		
Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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). <ul style="list-style-type: none"> Department of Parks and Wildlife (2016) Collie Spider Orchid (<i>Caladenia leucochila</i>) Interim Recovery Plan 2016–2021. Interim Recovery Plan No. #. Department of Parks and Wildlife, Western Australia (in draft). 		

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

- Land managers have been notified of the location and threatened status of *Caladenia leucochila*. Notifications detail the current DRF status of the species, the associated legal obligations in regards to its protection, and contact details for management assistance.
- Seed collected from *Caladenia leucochila* by BGPA in 2008, and between 2010 and 2012, is currently stored in their orchid seed bank. Some seed was successfully germinated in 2012 and 550 seedlings have been potted out in the orchid glasshouse at BGPA. Collar slivers were collected between 2010 and 2012 and associated fungi were isolated, cleaned of contaminants, and stored at the BGPA fungal library.
- A draft proposal for a trial translocation of 50 *Caladenia leucochila* seedlings has been developed by BGPA. The trial will be used to establish the best life history stage at which to translocate terrestrial orchids by comparing seedlings planted at the beginning of their growth phase, and dormant tubers planted during summer. Plants are to be watered during the growing season and caged to exclude macropod herbivory.
- Small portions of leaf material collected from mature *Caladenia leucochila* plants by BGPA is stored in dry silica gel for future genetic analysis.
- Preliminary studies of the pollination biology of *Caladenia leucochila* have been undertaken by BGPA along with studies on the distribution of the pollinator. Research has confirmed pollination by Thynnid wasps by sexual deception and occasional visits by nectar foraging bees.
- Monitoring and surveys have been carried out to determine plant numbers and impact of threats.

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.

- Ongoing monitoring of subpopulations and their habitat should be undertaken to identify trends or potential management requirements.
- DRF markers are required at Subpopulation 4 and several newly discovered subpopulations to reduce the risk of accidental damage during road maintenance activities.
- When monitoring ascertains that the threat from herbivory is high, protective cages and/or fencing may be considered.
- *Caladenia leucochila* is thought to be killed by fire that occurs when the plant is in active growth and a fire management strategy will be developed that recommends fire frequency, intensity, seasonality, precautions to prevent bushfire and strategies for reacting to bushfire, and the need, method of construction and maintenance of firebreaks, and associated weed control measures, including actions to minimise the risk of unplanned fire.
- To guard against the extinction of natural subpopulations additional seed collections, along with samples of the orchid's symbiotic fungus, will be made and stored at the BGPA.
- Understanding the effects of changes in the water table on vegetation associated with the orchid is required and will include monthly monitoring of groundwater and surface water.
- Areas of potential habitat be surveyed for the presence of *Caladenia leucochila* during its September, October flowering period.
- Weeds are a minor threat to many subpopulations and, when deemed necessary, weed control will be implemented.
- Further research on the biology and ecology of *Caladenia leucochila* may include: identification of pollinators and their habitat requirements, seed viability, identification of the fungal symbiont associated with *Caladenia leucochila* and its distribution in the wild, conditions necessary for natural germination, response to disturbance, competition, drought, inundation and grazing, longevity of plants, time taken to reach maturity and minimum viable subpopulation size.

Nomination prepared by:

Contact details:	
Date submitted:	8/9/2016
<i>If the nomination has been refereed or reviewed by experts, please provide their names and contact details:</i>	

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Location (include coordinates)	Land tenure	Survey information: Date of survey and No. mature individuals	AOO	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
1. Muja Conservation Park (-33.5115556 116.4412778)	Conservation park	2008: 3 2009: 14 2012: 102	Unknown	Good	Fire (past, present, future) Hydrological change (past, present, future) Grazing (present, future) Weeds (present, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire.
2. S of Muja (-33.5115556 116.4412778)	Water Reserve	2008: 1 2009: 0	Unknown	Good	Fire (past, present, future) No known extant plants (present) Weeds (present, future)	Continue monitoring to confirm there are no plants present. Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire.
3. Muja State Forest (-33.4440556 116.34191667)	State Forest	2008: 6 2009: 97 2012: 374	Unknown	Moderate	Mining (future) Hydrological change (past, present, future) Small population size (present, future) Fire (past, present, future) Weeds (present, future) Grazing (present, future) Timber extraction (past, future)	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction

4. S of Muja (-33.4240833 116.3285833)	Road reserve	2008: 3 2009: 19 2015: 14	Unknown	Moderate	Mining (future) Road maintenance (past, present, future) Small subpopulation size (present, future) Fire (past, present, future)	Liaise with Collie Shire and regional Parks and Wildlife staff to put protective strategies in place including protection from roadworks and prescribed fire
5. S of Muja (-33.4668611 116.33883333)	State Forest	2008: 1	Unknown	Moderate	Mining (future) No known extant plants (present) Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
6. S of Muja (-33.4561111 116.34222222)	State Forest	2008: 1	Unknown	Healthy	No known extant plants (present) Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
7. S of Muja (-33.4318611 116.3612222)	State Forest	2012: 63	Unknown	Healthy	Hydrological change (past, present, future) Small subpopulation size (present, future) Fire (past, present, future) Weeds (present, future) Grazing (present, future) Timber extraction (past, future)	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction

8. S of Muja (33.4735693 116.2934366)	State Forest	2013: 25 2015: 98	Unknown	Moderate	Mining (future) Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
9. S of Muja (- 33.4435833 116.36025)	State Forest	2013: 22	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
10. S of Muja (- 33.4487305 116.280821989)	State Forest	2015: 78	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
11. S of Muja (- 33.4577862 116.348184653)	State Forest	2013: 18	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction

12. S of Muja (- 33.4589271 116.357666965)	Road reserve	2013: 10	Unknown	Moderate	Road maintenance (past, present, future) Small subpopulation size (present, future) Fire (past, present, future)	Liaise with Collie Shire and regional Parks and Wildlife staff to put protective strategies in place including protection from roadworks and prescribed fire
13. S of Muja (- 33.4544929 116.327689886)	State Forest	2015: 17	Unknown	Moderate	Mining (future) Hydrological change (past, present, future) Small subpopulation size (present, future) Fire (past, present, future) Weeds (present, future) Grazing (present, future) Timber extraction (past, future)	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
14. S of Muja (- 33.4542848 116.280749986)	State Forest	2014: 12	Unknown	Moderate	Mining (future) Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
15. S of Muja (- 33.4561682 116.273199986)	State Forest	2014: 9	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction



16. S of Muja (- 33.4613829 - 33.4613829)	State Forest	2012: 5	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
17. S of Muja (- 33.459701 116.280419999)	State Forest	2012: 2	Unknown	Moderate	Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction
18. S of Muja	State Forest	2012: 1	Unknown		Fire (past, present, future) Hydrological change (past, present, future) Timber extraction (past, future)	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire and timber extraction



Form to nominate a Western Australian species for listing as threatened, change of category or delisting (Updated 2016).

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

Answer all relevant sections, filling in the white boxes and indicating when there is no information available. To mark boxes with a cross ☒: on the **View** menu, point to **Toolbars**, and then click **Forms**.

Click **Protect Form** , then check the box. Unlock the form by clicking  and you will then be able to type text in the white table cells.

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 “N/A”.

SECTION 1. NOMINATION	
1.1. Nomination information	
Flora <input checked="" type="checkbox"/>	Fauna <input type="checkbox"/> Nomination for: Addition <input checked="" type="checkbox"/> Change of category <input type="checkbox"/> Delisting <input type="checkbox"/>
1.2. Scientific Name 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>Caladenia leucochila</i> A.P.Br. & Brockman	
1.3. Common Name If the species has a generally accepted common name, please show it here. This name will be used on all official documentation.	
Collie Spider Orchid	
1.4. Current Conservation Status. If none, type 'None'.	
International IUCN Red List Category and Criteria applicable to the highest rank category only e.g. Vulnerable (B1ab(iv);D(1))	None
National EPBC Act 1999 Category	None
State of WA Wildlife Conservation Notice Schedule	Critically Endangered
State of WA IUCN Category	A3cd; C2a(ii)
State of WA Priority	None
Is the species listed as ‘Threatened’ in any other Australian State or Territory? If Yes, list these States and/or Territories and the status for each.	
No <input checked="" type="checkbox"/> Yes <input type="checkbox"/>	
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? If Yes, please provide details.	
No <input checked="" type="checkbox"/> Yes <input type="checkbox"/>	

1.5. Nominated Conservation Status. Type one category for each of the fields. If none, write 'None'.	
International IUCN Red List Category and Criteria applicable to the highest rank category only e.g. Vulnerable (B1ab(iv);D(1))	
National EPBC Act 1999	Endangered: A3cd; B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)
State of WA Wildlife Conservation Notice Schedule	Endangered
State of WA IUCN Category	A3cd; B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v) (update)
State of WA Priority	
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.	
<ul style="list-style-type: none"> As at December 2015 <i>Caladenia leucochila</i> is known from 18 subpopulations comprising a total of 827 mature individuals. The species meets criteria A3cd for endangered based on a projected 63% reduction of mature individuals (plants are threatened directly by projected mining expansion, and a further decline in habitat quality (much of its habitat is highly disturbed from prior timber extraction, soil ripping, prescribed fire and mining), future timber harvesting, changed hydrology and fire. The species meets criteria B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v) for endangered based on the estimated extent of occurrence and area of occupancy, known from three locations based on the prevalent threats, and ongoing decline observed and projected, with actual loss of some subpopulations. The species may meet criterion C1 for endangered based on the population size (827) and projected decline greater than 20%, but insufficient data to evaluate. The species has been extensively searched for by competent persons for the past eight years. It is believed that on the basis of limited geographic distribution, significant threats through mining and fire, and a lack of adequate reservation that the species is in imminent threat of decline and possible extinction without formal protection as threatened flora. 	

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.
<p>The first specimens of <i>Caladenia leucochila</i> were collected in State Forest south-east of Collie in September 2008 by Eleanor Bennett. While initially believed to represent a range extension of the related <i>C. lodgeana</i> (also listed as Declared Rare Flora), taxonomic studies (Brown & Bockman 2015) have revealed that the Collie taxon is a species in its own right. A description is provided in appendix 3. The 2008 Bennett specimen selected as the type has been lodged at the Western Australian Herbarium.</p> <p>Like most members of the <i>Caladenia huegelii</i> complex, <i>C. leucochila</i> has sepals with prominent terminal osmophores (clubs) and shortened petals. However, it differs from the majority of these species in lacking a red labellum apex and in sometimes having lax lateral sepals, these features placing it with the related <i>C. lodgeana</i> Hopper & A.P.Br., <i>C. busselliana</i> Hopper & A.P.Br. and <i>C. interjacens</i> Hopper & A.P.Br.</p> <p><i>Caladenia leucochila</i> is distinguished from <i>C. lodgeana</i> by its pale yellow to greenish-cream floral colouration, its sepals terminating in shorter, thicker osmophores, its shortened petals, sometimes terminating in thickened osmophores and its flatter, generally more shortly fringed labellum. It also has a generally earlier flowering period and more northerly distribution. Preliminary observations suggest that <i>C. leucochila</i> attracts a male thynnine wasp by using sexual deception (N. Swarts pers. comm.) and that the wasp species is different to that which pollinates <i>C. lodgeana</i> (R. Phillips, unpublished data).</p> <p>From <i>Caladenia interjacens</i>, <i>C. leucochila</i> is distinguished by its shorter petals and sepals with shorter, thicker osmophores, smaller labellum, pale yellow to greenish-cream floral colouration and preference for jarrah forest rather than coastal sand dunes.</p> <p>Although variable in its morphology with some forms approaching <i>Caladenia busselliana</i>, <i>C. leucochila</i> is generally distinguished by its shorter, narrower petals and sepals which are horizontal to obliquely down-curved or sometimes lax, rather than always stiffly held, its shorter, thicker osmophores 10 to 12 mm long, rather than 10–20 mm long, its smaller labellum and its more northerly, inland distribution.</p> <p>Unlike most members of the <i>Caladenia huegelii</i> complex, <i>C. leucochila</i> sometimes has petals with thickened osmophores.</p>
Is this species conventionally accepted? 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).
No <input type="checkbox"/> Yes <input checked="" type="checkbox"/>
Describe any known hybridisation with other species in the wild, indicating where this occurs and how frequently.
<p><i>Caladenia leucochila</i> often hybridises with <i>C. longicauda</i> (K. Smith pers. comm.). Hybrid flowers are variable in colour and morphology but are usually paler in colour than <i>C. leucochila</i> and have longer tepals that either lack or, where present, have longer, narrower osmophores. Hybridisation is particularly common in the Hebb Block population where there is a large population of <i>C. longicauda</i>.</p> <p><i>Caladenia leucochila</i> also occasionally hybridises with <i>C. ferruginea</i> (A. Brown personal observation) with the resulting offspring producing more colourful flowers with maroon-suffused petals and sepals and a red or maroon suffused labellum apex. The hairs on the osmophores also often have a redder appearance than is found in <i>Caladenia leucochila</i>.</p>

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).
<p><i>Caladenia leucochila</i> is a geophytic herbaceous perennial which produces a single hirsute leaf from an underground tuber in late autumn and grows through winter and spring. The leaf dehisces at the end of spring and the plant spends summer and early autumn as a dormant tuber. The species is not believed to be clonal. In spring it produces a single flower stem to 40 cm high with 1-2 cream, pale yellow or more rarely greenish-yellow, maroon marked flowers 5-10 cm across. Flowers are bilaterally symmetrical. The sepals and petals are prominently displayed with pointed or, more rarely, shortly thickened tips to the lateral petals and prominently thickened tips to the sepals. The degree of thickening is variable. The broad labellum has four to six rows of lamina calli and marginal fringing hairs. The labellum lacks the red apical apex found in the majority of species in the <i>Caladenia huegelii</i> complex. There is no obvious floral odour.</p>
2.3. Distribution Describe the distribution of the species in Australia and, if possible, provide a map.
<p>The species appears to be confined to the Collie River basin south-east of Collie.</p> <p>See maps in Appendix 1 for location information.</p>
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 <p>The species occurs in podzolic sand amongst laterite. It tends to be in the lower parts of the valley between 230m and 245m above sea level and slightly upslope of seasonally damp areas.</p>
Biological habitat <p>Populations occur in open <i>Eucalyptus marginata</i>, <i>Corymbia calophylla</i> and <i>Allocasuarina fraseriana</i> forest over dwarf scrub of <i>Bossiaea ornata</i>, <i>Banksia nivea</i>, <i>Lechenaultia biloba</i> and open, low sedges. <i>Caladenia leucochila</i> individuals frequently occur under <i>Allocasuarina fraseriana</i> in leaf litter.</p>
Does the (fauna) species use refuge habitat e.g. in times of fire, drought or flood? Describe this habitat.
<p>N/A</p>
Is the species part of, or does it rely on, a listed threatened ecological community? Is it associated with any other listed threatened species?
<p>No.</p>

<p>2.5. Reproduction Provide an overview of the breeding system. For fauna: Provide an overview of the breeding system and breeding success, including: when does it breed; what conditions are needed for breeding; are there any breeding behaviours that may make it vulnerable to a threatening process? 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?</p>
<p>Flowering is from mid September to late October. The sepaline clubs on the flowers of <i>Caladenia leucochila</i> emit pheromones which deceive thynnine wasps. These wasps attempt copulation with the labellum of the flower and inadvertently deposit or remove pollen in the process. Research on <i>Caladenia</i> pollination (Stoutamire 1983; Phillips <i>et al.</i> 2009) and broad-scale surveys for the <i>C. leucochila</i> wasp (B. Newman, unpublished data), suggest that this is likely to involve a single species of wasp. Preliminary studies also suggest that nectar-foraging bee-flies may be responsible for some incidental pollination in <i>C. leucochila</i>).</p> <p>Fruit set is during October. Based on an estimate for the similarly sized <i>Caladenia arenicola</i>, seed capsules contain approximately 30,000 seeds which are wind dispersed (Batty 2000). Related species of <i>Caladenia</i> require the presence of a specific mycorrhizal fungus for germination and annual growth (Ramsay <i>et al.</i> 1986; Swarts <i>et al.</i> 2010). There are no estimates of seed viability available for <i>C. leucochila</i>. However, in other <i>Caladenia</i> species seed viability is approximately 60-90 % (Swarts 2007).</p> <p><i>Caladenia</i> species are unaffected by summer fire and in fact fire can enhance flowering of some species in the following growing season. However, winter and early spring fires, when the leaf is present and the new tuber is being formed, can be detrimental and may kill the plant. Neither fire nor disturbance is required for the flowering of this species.</p>
<p>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).</p>
<p>Based on studies of <i>Caladenia huegelii</i>, it is expected that <i>C. leucochila</i> will reach reproductive maturity about three years following germination (Swarts 2007). Estimates for other <i>Caladenia</i> species have shown that they can live in excess of 30 years (K. Dixon, unpublished observation). There are no estimates available for population structure. However, estimates of reproductive success indicated capsule set to be approximately 30% as averaged across all populations for two successive years. Natural mortality of seed capsules through herbivory is estimated at 30% as averaged across all populations for two successive years.</p>
<p>Questions 2.7 and 2.8 apply to fauna nominations only</p>
<p>2.7. Feeding Summarise food items or sources and timing/availability.</p>
<p>N/A</p>
<p>Briefly describe feeding behaviours, including those that may make the species vulnerable to a threatening processes.</p>
<p>N/A</p>
<p>2.8. Movements Describe any relevant daily or seasonal pattern of movement for the species, including relevant arrival/departure dates if migratory. Provide details of home range/territories.</p>
<p>N/A</p>
<p>SECTION 3. INTERNATIONAL CONTEXT</p>
<p>For species that are distributed both in Australia and in other countries.</p>
<p>3.1. Distribution Describe the global distribution.</p>
<p>N/A</p>
<p>Provide an overview of the global population size, trends, threats and security of the species outside of Australia.</p>
<p>N/A</p>

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?					
N/A					
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? – provide 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).					
Total current population size is 827 mature individuals in 18 extant subpopulations.					
Provide locations of: captive/propagated occurrences or <i>ex situ</i> collections; recent re-introductions to the wild; and sites for proposed re-introductions. Have these sites been identified in recovery plans?					
Seed collected in 2008 by Nigel Swarts (Botanic Gardens and Parks Authority) and between 2010 and 2012 by Belinda Newman (Botanic Gardens and Parks Authority) is stored in the Botanic Gardens and Parks Authority orchid seed bank. Seed was successfully germinated in 2012 and approximately 550 seedlings have been potted out in the orchid glasshouse at the Botanic Gardens and Parks Authority by Belinda Newman.					
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.					
The species is currently known from three locations, all in the Collie area. Locations are based on subpopulations located in State Forest subject to mining, State Forest excluded from mining and Conservation Reserve.					
For <u>flora</u>, and where applicable, for <u>fauna</u>, detail the location, land tenure, estimated number of individuals, area of occupancy, and condition of site for each known location or occurrence.					
Location (Subpopulation)	Land status	Date of most recent survey	Number of mature individuals at location	Area of occupancy at location	Condition of site
1. SW Bowelling	Conservation park	2012	102	Unknown	Good
2. SW Bowelling	Water Reserve	2009	0	Unknown	Good
3. S of Muja	State Forest	2012	374	Unknown	Moderate
4. S of Muja	Road reserve	2015	14	Unknown	Moderate
5. S of Muja	State Forest	2008	1	Unknown	Moderate
6. S of Muja	State Forest	2008	1	Unknown	Moderate
7. S of Muja	State Forest	2012	63	Unknown	Moderate
8. S of Muja	State Forest	2015	98	Unknown	Moderate
9. S of Muja	State Forest	2013	22	Unknown	Moderate
10. S of Muja	State Forest	2015	78	Unknown	Moderate
11. S of Muja	State Forest	2013	18	Unknown	Moderate
12. S of Muja	Road Reserve	2013	10	Unknown	Moderate
13. S of Muja	State Forest	2015	17	Unknown	Moderate
14. S of Muja	State Forest	2014	12	Unknown	Moderate
15. S of Muja	State Forest	2014	9	Unknown	Moderate
16. S of Muja	State Forest	2012	5	Unknown	Moderate
17. S of Muja	State Forest	2012	2	Unknown	Moderate
18. S of Muja	State Forest	2012	1	Unknown	Moderate
Has the number of individuals been counted, or is this an estimate? Provide details of the method of determining the number of individuals.					

Mature individuals of <i>Caladenia leucochila</i> were most recently counted between 2013 and 2015. Surveys involved gridded transects walked at 5m apart during peak flowering times in areas occupied by known populations. In the case of the largest population in State Forest leased to Griffin Coal, surveys were within the area of the known population and also over a 100m buffer area outside the boundary of the population. Few extra individuals were found in the buffer zone, suggesting they primarily occur in the aggregations initially detected. All individuals were GPS marked.
Has there been any known reduction in the number of locations, or is this likely in the future? – provide details.
Since the discovery of <i>Caladenia leucochila</i> in 2008 the single plant found in a Water Reserve and 2 plants found in separate populations in State Forest have not been relocated.
What is the extent of occurrence (in km²) 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 of <i>Caladenia leucochila</i> has been calculated to be 52km ² . Extent of occurrence was calculated by the minimum convex polygon method. The species occurs in two disjunct areas, one containing the State Forest and Hebb Block subpopulations and one containing the Muja Conservation Park subpopulation. The area between the two has been heavily cleared for agriculture and the remaining vegetation has been deemed unsuitable habitat for the plant.
Is the distribution of the species severely fragmented? Why?
The reason for the fragmentation of subpopulations of <i>Caladenia leucochila</i> is thought to be due to the confinement of the species to forest on valley slopes above seasonal damplands. These areas are relatively rare within an area that is mainly upland woodlands and forests.
Extensive clearing for agricultural or mining purposes of once possible suitable habitat for the species has exacerbated the fragmentation of populations and is likely to be a factor in the species current rarity.
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.
All known populations of <i>Caladenia leucochila</i> need to be maintained to maximise the species' genetic diversity. Subpopulations in State Forest leased to Griffin Coal are among the largest. Large populations are less likely to suffer extinctions through stochastic or genetic processes suggesting this population has a much higher chance of long term persistence than the other populations. These subpopulations can be reliably used for conservation actions such as seed collection. Therefore continued protection of them and their associated habitat is necessary for the long-term survival of the species.

<p>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.</p>
<p>Surveys by Bennett Environmental Consulting, Bushland Native Seeds, Keith Smith of Formosa Flora (a consultant specialising in orchid work) and Nigel Swarts (Research Scientist at the Botanic Gardens and Parks Authority) in September and October 2008 revealed approximately 100 individuals in State Forest near Collie. Surveys by Bushland Native Seeds and Wink Lindsay (DEC) in October 2008 found a further three individuals in Muja Nature Reserve. A single plant was located in an adjacent Water Reserve by Bushland Native Seeds and Wink Lindsay in October 2008. Surveys were completed by on ground searches and using GPS to map accurate locations of individuals.</p> <p>Areas between and adjoining these locations have, over many years, been subject to survey for orchid species by members of WANOSCG (Western Australian Native Orchid Study and Conservation Group) and others. These surveys included extensive searches for <i>Caladenia</i> species during a taxonomic review of the genus undertaken between 1984 and 1996 by Andrew Brown of DEC with the assistance of WANOSCG members, <i>Caladenia leucochila</i> was not located in these areas during these surveys.</p> <p>Surveys undertaken by Belinda Newman (Botanic Gardens and Parks Authority) between 2010 and 2012 revealed approximately 150 mature plants over the three known locations. These surveys were completed in October 2012 by walking gridded transects 5m apart and searching the extent of the habitat in which plants were previously recorded.</p> <p>Staff from DEC and Ryan Phillips (Botanic Gardens and Parks Authority) also surveyed nearby reserves between 2006 and 2012 for other Declared Rare orchids and did not locate any <i>Caladenia</i> sp. Collie (E. Bennett s.n.).</p> <p>Further surveys were undertaken between 2013 and 2015 with 827 mature individuals in 18 extant subpopulations now known.</p>
<p>Provide details on the distinctiveness and detestability of the species, or the distinctiveness of its habitat, that would assist survey success.</p>
<p>When in flower the species is easily located and identified based on its distinctive floral morphology including the large size of the flowers (up to 10 cm across), the often prominently clubbed sepals, the cream, maroon marked labellum, lacking a red apex and the height of the scapes (up to 40 cm). In the Collie area the largest populations were found on a gentle slope within 100m of an ephemeral wetland. Within this area, plants tend to occur under <i>Allocasuarina fraseriana</i>. This predictability of habitat assists with survey success.</p>
<p>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.</p>

Caladenia leucochila grows over a small geographic area in a specific habitat enabling thorough searching. Due to its conspicuous flowers it is easily detectable suggesting that surveys are likely to be accurate.

2008 surveys involved searches by four different organisations through comparable habitat to the east and south-east of Collie.

Aside from targeted surveys for *Caladenia leucochila*, other orchid survey work has occurred in nearby areas. Extensive survey work has been undertaken immediately south of the distribution of *C. leucochila* for the declared rare hammer orchid species *Drakaea confluens*. In addition, noted orchid specialist Mr Eric Chapman who is well versed in the orchids of the Collie region, has searched bushland to the south of the distribution for *C. leucochila* for the past 40 years without detecting it.

Broadly similar habitat occurs closer to Collie in an area that has been repeatedly visited by Andrew Brown from Parks and Wildlife and members of the Western Australian Native Orchid Study and Conservation Group (WANOSCG).

As such, although new small populations may be detected within the species' core distribution, there is strong evidence that this species has a very limited distribution, centred on state forest largely covered by the Griffin Coal mining lease. Given its specific habitat requirements and the survey effort so far, it seems very unlikely that additional large populations will be discovered.

4.3. Threats

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

- a). how and where they impact this species
- b). what the effect of the threat(s) has been so far (indicate whether it is known or suspected
- c). present supporting information/research
- d). does it only affect certain populations?
- e). what is its expected effect in the future (is there supporting research/information; is the threat only suspected; does it only affect certain populations?).

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

Location	Past Threats	Current Threats	Potential Threats	Management Requirements (see section 4.4)
1. S of Muja	Timber extraction, altered fire regimes	Altered hydrology, altered fire regimes, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire.
2. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire

3. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
4. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
5. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
6. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire

7. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
8. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
9. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
10. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire

11. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
12. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
13. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
14. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Exclude from future mining, monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with Griffin Coal and regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire

15. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
16. SW Bowelling	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
17. SW Bowelling	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire
18. S of Muja	Timber extraction, altered fire regimes	Clearing, altered hydrology, removal of pollinator habitat, altered fire regimes, timber extraction, grazing	Loss of connectivity of pollinator habitat with State Forest	Monitor hydrological processes, maintain connectivity of pollinator and orchid habitat, protect from grazing, liaise with regional Parks and Wildlife staff to put protective strategies in place including protection from prescribed fire

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.

The high level of pollinator specificity (usually relying on a single species of wasp) exhibited by sexually deceptive orchids (Stoutamire 1983; Hopper and Brown 2007; Phillips *et al.* 2009) could potentially make *Caladenia leucochila* highly vulnerable to a decline in the abundance of its thynnine wasp pollinator. Experiments on other threatened Western Australian orchids have shown that rarity of the pollinator can be the dominant factor determining rarity in sexually deceptive species (Phillips 2010).

Other species of Western Australian *Caladenia* have been shown to use a single species of mycorrhizal fungus for germination and annual growth (Ramsay *et al.* 1986; Swarts *et al.* 2010) suggesting that it is likely that *Caladenia leucochila* is using the same strategy. While preliminary data suggests that mycorrhizal fungi have broad geographic distributions (e.g. Swarts *et al.* 2010; Phillips *et al.* 2011), the reliance on a single species would potentially limit the availability of suitable microsites for germination within otherwise suitable habitat.

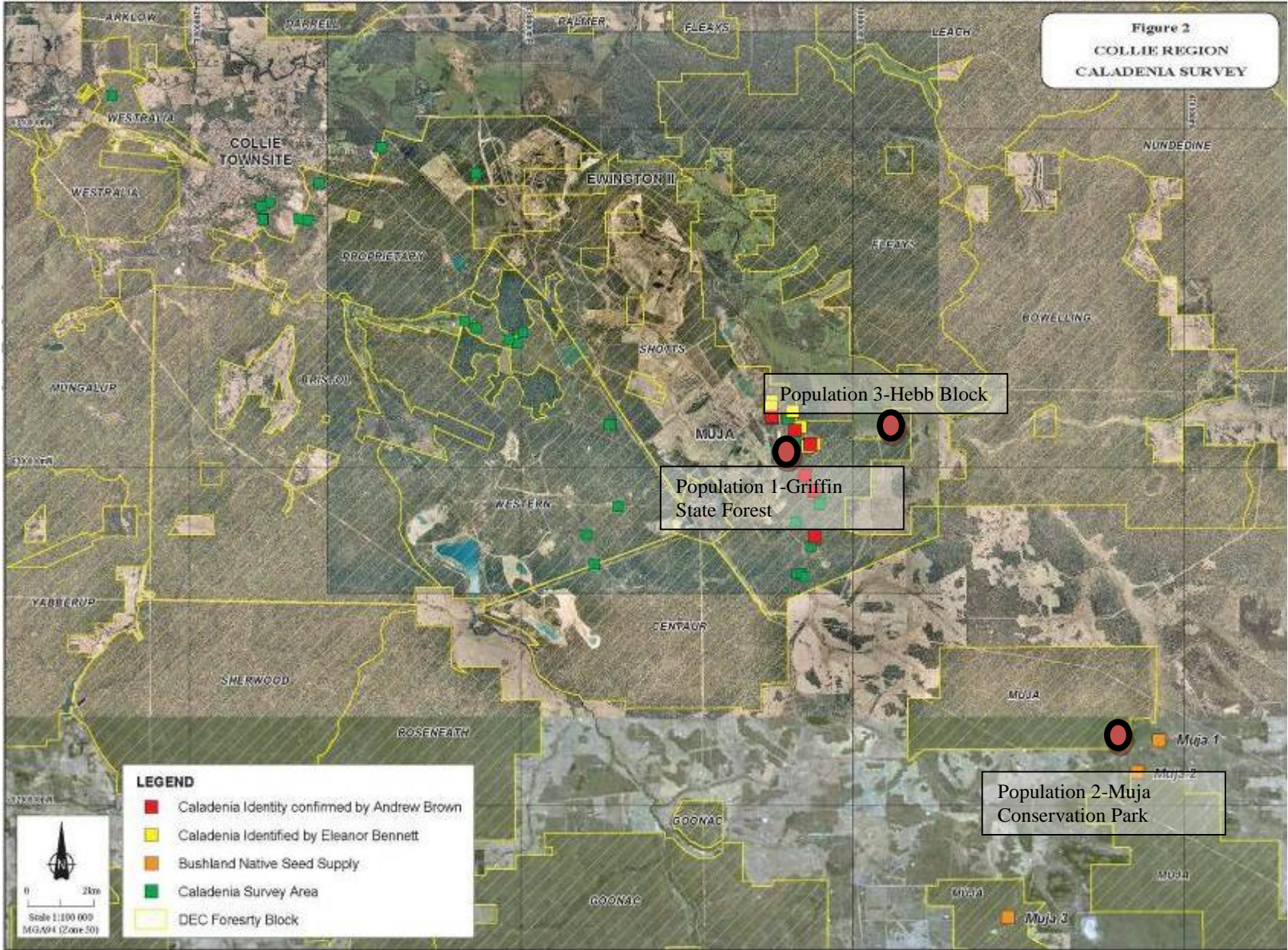
4.4. Management	
Identify key management documentation for the species e.g. recovery plans, conservation plans, threat abatement plans etc.	
Department of Parks and Wildlife (2016) Collie Spider Orchid (<i>Caladenia leucochila</i>) Interim Recovery Plan 2016–2021. Interim Recovery Plan No. #. Department of Parks and Wildlife, Western Australia (in draft).	
Does this species benefit from the management of another species or community? Explain.	
No, the species occurs in areas that are not known to contain other threatened species or ecological communities.	
How well is the species represented in conservation reserves or covenanted land? Which of these are actively managed for this species? Provide details.	
The species is poorly represented in the reserves system with only one subpopulation in a conservation park. No areas of land on which the orchid occurs are currently managed for the species.	
Are there any management or research recommendations that will assist in the conservation of the species? Provide details.	
<p>Research is required into the mechanisms underlying the rarity of <i>Caladenia leucochila</i>. Experimental baiting for pollinators and the use of seed burial trials would enable resolution of the role of pollinator and mycorrhizal ecology in the rarity of the orchid. Using the results of these experiments, effective introductions could then be implemented.</p> <p>Geophytic orchids are generally considered to be adversely affected by fire during their active growing phase. However, no specific studies have been carried out on <i>Caladenia leucochila</i>. Until these studies have been conducted fire should where possible be excluded from the habitat of the species.</p> <p>Due to the general reliance of <i>Caladenia leucochila</i> on a specific pollinators an understanding is needed of the habitat requirements of the pollinator and its relative contribution to reproductive success.</p> <p>Given its preference for moist microsites, research into the effects of dry years on plant persistence and recruitment should be investigated. The hydrology of the drainage where the largest orchid population occurs needs to be investigated, particularly in the context of mortality of <i>Allocasuarina fraseriana</i>. The propensity to grow in leaf litter at the base of <i>A. fraseriana</i> suggests that understanding the factors responsible for the mortality of this species will be critical for conserving the orchid.</p> <p>Demographics studies should be undertaken to determine the viability of populations and the part of the life cycle limiting population growth.</p>	
4.5. Other	
Is there any additional information that is relevant to consideration of the conservation status of this species?	
N/A	
SECTION 5. NOMINATOR	
Nominator(s) name(s)	
Organisation(s)	
Address(s)	
Telephone number(s)	
Email(s)	
Date	31 December 2012
If the nomination has been refereed or reviewed by experts, provide their names and contact details.	
Dr Nigel Swarts, University of Tasmania	
SECTION 6. REFERENCES	
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.	

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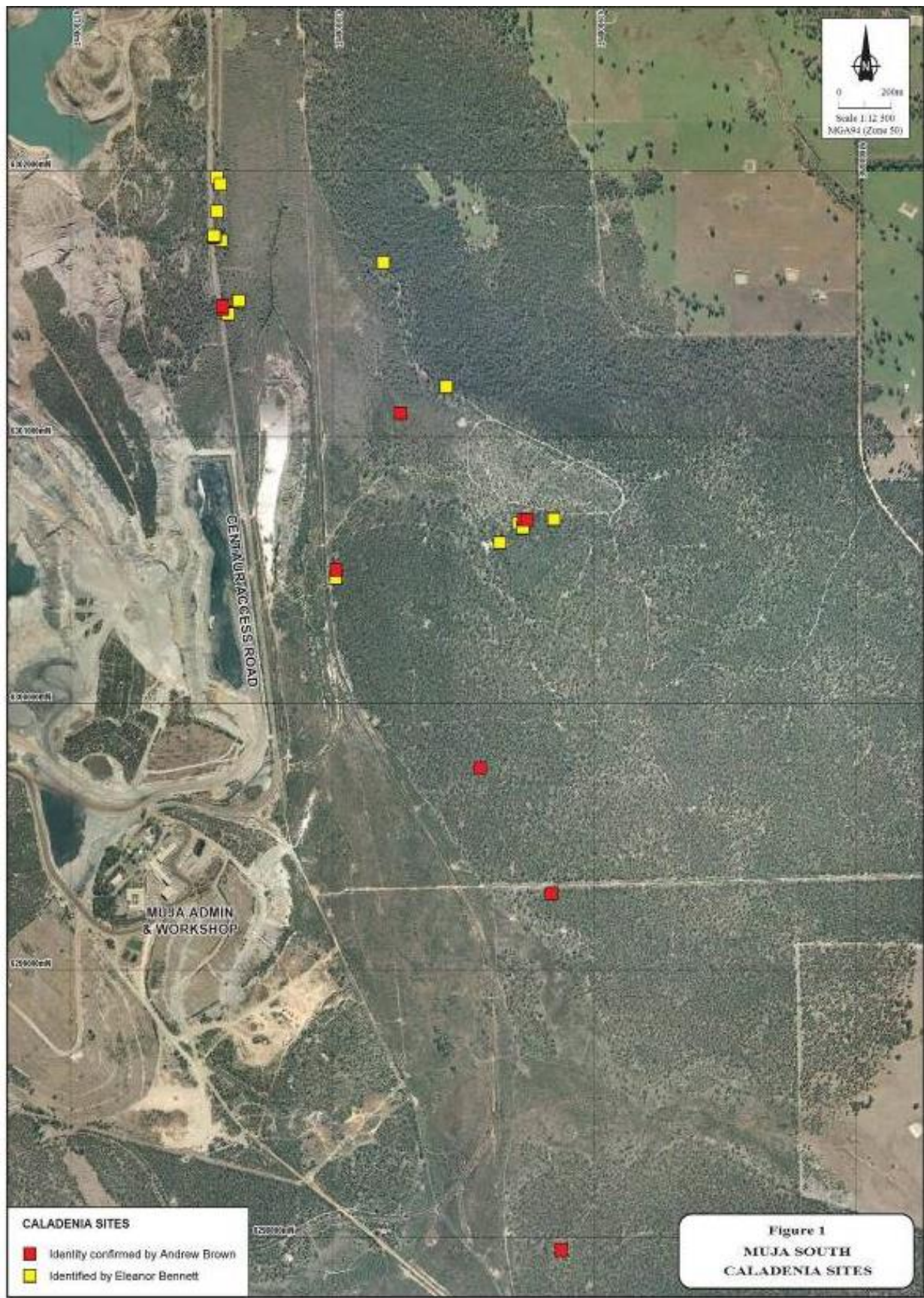
SECTION 7.

Appendix 1

Locations of Populations *Caladenia leucochila* (Eleanor Bennett)



Detailed view of Collie population (Eleanor Bennett)



Appendix 2

Photos of *Caladenia leucochila*)



Photo Ryan Phillips



Photo Belinda Newman



Photo Andrew Brown

Appendix 3

Description of *Caladenia leucochila* from “New taxa of *Caladenia* (Orchidaceae) from south-west Western Australia” Nuytsia 25: 45–123 (2015).

Caladenia leucochila A.P.Br., R.Phillips & G.Brockman, *sp. nov.*

Plants solitary. *Leaf* 12–20 cm long, 4–11 mm wide, linear, erect, incurved to flattened in cross section, pale green, the basal 1/3 irregularly blotched with red-purple. *Scape* 12–40 cm tall. *Flowers* 1(2), 4–6 cm across, pale yellow to greenish cream and white with faint to prominent dull red stripes; floral odour unknown. *Sepals and petals* linear-lanceolate in the basal 1/3 to 1/2 then abruptly narrowing before terminating in a yellowish brown apex. *Dorsal sepal* 2.5–3.5 cm long, 1.5–2 mm wide, erect and slightly incurved, terminating in a swollen osmophore which is 10–12 mm long and covered in short glandular hairs to 0.1 mm long. *Lateral sepals* 3.5–4 cm long, 2.5–3 mm wide, horizontal to down-curved, sometimes pendulous towards the apex, each terminating in a swollen osmophore which is 10–12 mm long and covered in short glandular hairs to 0.1 mm long. *Petals* 2.5–3 cm long, 1.5–2 mm wide, usually spreading horizontally or down-curved towards the apex, more rarely up-curved, usually lacking a swollen osmophore, or, when present 5–7 mm long. *Labellum* obscurely 3-lobed, white, stiffly articulated on a claw c. 2 mm wide; lamina 10–15 mm long, 7–9 mm wide, narrowly triangular in outline, erect with entire margins in the basal 1/3, nearly horizontal in middle 1/3 and apical 1/3 with a prominently recurved apex; lateral lobes with elongate, forward-facing, white to deep red, sometimes yellow-tipped marginal calli which are decrescent towards the mid lobe; lamina calli cream to yellow or red, hockey-stick shaped, the longest c. 1.5 mm tall, in 4–6 longitudinal rows extending about 2/3–3/4 the length of the labellum, decrescent towards the apex. *Column* 10–12 mm long, 3–4 mm wide, narrowly winged, opaque cream to pale yellow with pale red markings, sparsely hirsute with short glandular hairs on outer surface. *Anther* 2.5 mm long, 2.5 mm wide, greenish yellow to red. *Pollinia* 2.5 mm long, kidney-shaped, flat, yellow, mealy. *Stigma* 2.5 mm long, 2.5 mm wide. *Capsule* not seen.