The Minister approved this conservation advice and included this species in the Endangered category, effective from 15/02/2018

Conservation Advice

Synaphea sp. Pinjarra Plain (A.S. George 17182)

Summary of assessment

Conservation status

Synaphea sp. Pinjarra Plain (A.S. George 17182) 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 state/territory 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 31 business days between 11 April 2017 and 29 May 2017. 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:

Synaphea sp. Pinjarra Plain (A.S. George 17182)

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

Threatened Species Scientific Committee

13 September 2017

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

Current conservation status				
Scientific name:	*Synaphea* sp. Pinjarra Plain (A.S. George 17182)			
Common name:	None			
Family name:	Proteaceae		Fauna ☐	Flora ☒
Nomination for:	Listing ☒	Change of status/criteria ☐		Delisting ☐
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	B2ab(i,ii,iii,iv,v)
	2. WA	28/9/2016	Endangered	B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v); C2(a)(i)
	3.			

Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:	
• 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 ☒ No ☐
Comments:	
• surveys of the species were adequate to inform the assessment;	Yes ☒ No ☐
Comments:	Targeted surveys have been undertaken in 1997, 1998, 2003, 2008, 2011 and 2012, plus general surveys between 2009 and 2012. The linear range is 54km (EOO 220 km^2) and habitat largely cleared and now confined facilitating adequate survey of available habitat. Since the previous assessment, an additional survey of one subpopulation was undertaken in 2014, which increased the total known number of plants from 715 to 751.
• 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 ☒ No ☐

Comments:	2013 assessment has changed due to re-calculation of the AOO using the 2x2km grid method. No longer meets CR under criterion B2. Meets EN under criterion B1, B2 and C2(a)(i). Endorsed WA TSSC 28/9/2016.

Nominated national conservation status: category and criteria

Presumed extinct (EX) ☐ Critically endangered (CR) ☐ Endangered (EN) ☒ Vulnerable (VU) ☐

None (least concern) ☐ Data Deficient ☐ Conservation Dependent ☐

What are the IUCN Red List criteria that support the recommended conservation status category?	**B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v); C2(a)(i)**

Eligibility against the IUCN Red List criteria (A, B, C, D and E)

*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.*

A.	Population size reduction (evidence of decline)	• Insufficient information is available to reliably show rate of decline as most populations have only been fully surveyed on one occasion.
B.	Geographic range (EOO and AOO, number of locations and evidence of decline)	• Known from 12 populations, six locations, occurring in a linear band from the northernmost point at 2 km north of Mundijong (36 km SSE of Perth) to West Coolup (84 km south of Perth), over a linear range of 54 km. The locations are severely fragmented and located mostly along road and rail reserves. • The current extent of occurrence is 220 km^2. The area of occupancy using the 2x2 km^2 grid system is 44 km^2. • Continuing decline in the extent of occurrence and area of occupancy due to land clearing. • Decline in future population size is likely as surveys in 2011/12 recorded 25% of plants in poor condition. • Ongoing decline in condition of habitat due to road and rail maintenance, fire and weeds. • **Meets EN: B1ab(i,ii,iii,iv,v)+B2ab(i,ii,iii,iv,v)**
C.	Small population size and decline (population size, distribution and evidence of decline)	• Known from 751 mature individuals at six locations, south of Perth over a linear range of 54 km. • Largest single subpopulation has 207 mature individuals (refer to subpopulation data at section 4.1 in the nomination form) • **Meets EN: C2(a)(i)**
D.	Very small or restricted population (population size)	• 751 mature individuals. • **Meets VU: D1**
E.	Quantitative analysis (statistical probability of extinction)	• No data

Summary of assessment information					
EOO	220 km^2	AOO	44 km^2 using 2x2 grid method. Mapped area of subpopulations = 0.0091 km^2	Generation length	-

No. locations	6	Severely fragmented	Yes ☒ No ☐ Unknown ☐
No. subpopulations	12	No. mature individuals	751

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)*
Refer to table at end.		

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 (in prep) *Synaphea* sp. Pinjarra Plain (A.S. George 17182) Interim Recovery Plan 2016–2021. Draft Interim Recovery Plan No. #. 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.

- Liaise with road, rail and utilities managers to minimise disturbance to remnant vegetation when maintaining roads, railway and powerlines;
- Liaise with adjacent land managers to ensure herbicides used do not impact on road and rail reserve populations;
- Install markers on roads, rail reserves, firebreaks and under powerlines to protect habitat when undertaking maintenance;
- Monitor the populations for evidence of rabbits or changes in plant or site health;
- Protect the sites from fire unless required for ecological reasons, and implement early intervention in any wildfires which may threaten the sites;
- Implement of hygiene measures to protect susceptible habitat from disease introduction;
- Survey for additional populations.

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

- If viable, ensure protection from exposure, particularly from herbicide drift, through planting and maintaining adequate vegetation buffers;
- Control infestations of weeds that might impact the species and its habitat;
- Monitor groundwater at sites and seek remediation if it is a threat to the population;
- Erect barriers if recreational activities continue to threaten populations;
- Remove rubbish dumped at sites;
- Control rabbits if evidence of a rabbit population or herbivory noted;
- Identify scale insect infesting plants and determine appropriate control required;
- Collect seed for storage and *ex situ* propagation;
- Establish new populations on secure tenure through implementation of translocations.

Research

- Determine species pollination ecology, seed germination requirements and viability, and longevity;
- Determine disturbance response of the species and attempt to stimulate germination;
- Investigate genetic variation within the species to confirm its taxonomic boundaries;
- Investigate the susceptibility of the species to *Phytophthora cinnamomi*.

Nomination prepared by:	
Contact details:	
Date submitted:	28/9/2016

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 *(include coordinates)*	Land tenure	Survey information: Date of survey and No. mature individuals	Area of sub-populations	Site / habitat Condition	Threats *(note if past, present or future)*	Specific management actions
North Dandalup	Road and rail reserve	2011/12: 207	1,203m^2	Good to degraded	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds • Fragmented habitat • Herbicide spread • Active recreation • Scale insect infestation Future • Weeds • Herbicide spread • Road, rail maintenance and construction • Inappropriate fire regimes • Exposed habitat • Climate change	As above

North Dandalup	Road reserve	2012: 2	10m^2	Good	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds • Fragmented habitat Future • Weeds • Herbicide spread • Road, rail maintenance and construction • *Phytophthora* spp. • Inappropriate fire regimes • Climate change	As above
West Coolup	Shire Crown reserve	2012: 4	19m^2	Very good	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds	As above

					Future • Weeds • Herbicide spread • Bushfire mitigation operations • Climate change • Active recreation	
Keysbrook	Road, rail reserve; rail Crown reserve	2012: 37	759m^2	Degraded to good	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds • Fragmented habitat • Active recreation • Exposed habitat Future • Weeds • Herbicide spread • Road, rail maintenance and construction • *Phytophthora* spp. • Inappropriate fire regimes • Climate change • Exposed habitat	As above

Serpentine	Road, rail reserves; NR	2011/12: 394 2014: NR subpopulation mature plant count increased from 23 (2012) to 59	6,173m^2	Very good to degraded	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds • Powerline maintenance • Herbicide spread • Fragmented habitat • Rubbish dumping • Road and rail maintenance • Grazing • Active recreation • Exposed habitat • Inappropriate fire regimes Future • Weeds • Herbicide spread • Road, rail maintenance and construction • *Phytophthora* spp. • Inappropriate fire regimes • Climate change	As above

Mundijong; Cardup	Road, rail reserves; Crown reserve (Government requirements)	2012: 71	970m^2	Excellent to good	Past • Weeds • Habitat fragmentation (due to land clearing) • Road, rail construction and maintenance • Changes in hydrology (local changes to drainage systems) Current • Weeds • Powerline maintenance • Herbicide spread • Fragmented habitat • Rubbish dumping • Road and rail maintenance • Scale insect infestation • Active recreation • Exposed habitat • Inappropriate fire regimes Future • Weeds • Herbicide spread • Road, rail maintenance and construction • Inappropriate fire regimes • Climate change	As above

Department of
Environment and Conservation

Our environment, our future

Form to nominate a Western Australian species for listing as threatened, change of category or delisting 2012 (updated 2016).

NOTICE: Incomplete forms may result in delays in assessment, or rejection of the nomination. To fill out this form you must refer to the Guidelines and contact the relevant Officer in the DEC Species and Communities Branch. DEC staff can advise you on how to fill out the form and may be able to supply additional, unpublished information.

Answer all relevant sections, filling in the white boxes and indicating when there is no information available. **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".

To mark boxes with a **cross**, double click the box and select not checked or checked.

SECTION 1. NOMINATION					
1.1. Nomination for:					
Flora ☒ | **Fauna** ☐ | **Threatened / DRF** ☒ **Change of category** ☐ **Delisting** ☐					
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 possible.**					
Synaphea sp. Pinjarra Plain (A.S. George 17182)					
1.3. Common Name **If the species has a generally accepted common name, please show it here.**					
No common name at present.					
1.4. Current Conservation Status. If none, type 'None'.					
	IUCN Red List Category e.g. Vulnerable			**IUCN Red List Criteria e.g. B1ab(iv);D(1)**	
International IUCN Red List					
National EPBC Act 1999					
State of Western Australia	**[CR (2013)]**			**[CR: B2ab(i,ii,iii,iv,v)]**	
State of WA Priority	1☐	2☐	3☐	4☐	5☐
1.5. Nominated Conservation Status.					
	IUCN Red List Category e.g. Vulnerable			**IUCN Red List Criteria e.g. B1ab(iv);D(1)**	
State of Western Australia	**Critically Endangered**			**B2ab(i,ii,iii,iv,v)**	
State of WA Priority	1☐	2☐	3☐	4☐	5☐
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 ☒ **Yes** ☐					

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.

1. Reduction in population size (observed, inferred and projected [explanations below]).
   - Observed – dead plants were observed during the 2010-2012 surveys with substantial amounts recorded in a number of populations.
   - Inferred – plant numbers have been reduced where populations have not been re-located and also through substantial past clearing of suitable habitat adjacent to the majority of populations.
   - Projected – plant numbers will almost certainly reduce in the future, when considering the number of recorded dead and stressed plants from recent surveys, and the likelihood of repeated fires that will result in weed invasion at a number of sites.
2. Area of occupancy <10 km^2
3. Continuing decline (observed and projected) in the extent of occurrence; area of occupancy; area, extent & quality of habitat and number of locations or subpopulations.

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.

The name *Synaphea* sp. Pinjarra Plain (A.S. George 17182) was placed on the census of Western Australian plants in 2007 to account for a number of specimens from the Mundijong–Pinjarra area that were somewhat intermediate between *S. petiolaris* subsp. *petiolaris* and *S. gracillima*, and which had been left unclassified by Alex George in his treatment of the genus in 1995 (the specimens were identified only as '*Synaphea* sp.' on labels). Field investigations found these specimens to belong to an entity that is sympatric with *S. petiolaris* subsp. *petiolaris* and parapatric with *S. gracillima* at a number of localities, and which could be distinguished from these species during the flowering/fruiting stages. At some field sites *S.* sp. Pinjarra Plain was also found to be the only *Synaphea* taxon present.

Nine specimens of *S.* sp. Pinjarra Plain have been included in a morphometric study of conservation-listed *Synaphea* from the Swan Coastal Plain (Butcher & Thiele in prep.) and these specimens separated readily from *S. petiolaris* in all analyses, and from *S. gracillima* in analyses which included fruit characters. *Synaphea* sp. Pinjarra Plain is more similar to *S. gracillima* in a number of characters including flower shape, stigma shape and overall fruit shape. Formal description of *S.* sp. Pinjarra Plain as a discrete species is in progress (Butcher in prep).

Key distinguishing features of *Synaphea* sp. Pinjarra Plain (A.S. George 17182) P1

- Intermediate between *S. petiolaris* subsp. *petiolaris* and *S. gracillima* in gross morphology i.e. leaves similar to *S. petiolaris* and flowers similar to *S. gracillima*.
- Plants clumped from base.
- Leaves 2–3 x tripartite; terminal lobes often oblanceolate. Mid to dark green.
- Petioles glabrous, longer than *S. gracillima*.
- Spikes straight or gently undulating.
- Flowers large, dorsiventrally compressed, moderately to openly spaced, oriented +/- horizontally to gently ascending, glabrous.
- Stigma with broad lateral lobes (like a crescent moon).
- Fruit cylindrical to narrowly obovate with a short, thick neck at base and a raised apical 'crown' around the short beak. (Butcher 2010)

This taxon is based on voucher specimen *A.S. George* 17182 (PERTH 05125820) but no type specimen has been formally allocated yet (N.B. *R. Butcher* RB 821 has sufficient duplicates to be suitable type material and is currently regarded as the putative type (Butcher in prep.)).

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 ☐ **Yes** ☒

Voucher specimens (49) for this species are held in the WA Herbarium (PERTH). *Synaphea* species can be very difficult to distinguish from one another without experience, due to their subtle morphological differences; however, *S.* sp. Pinjarra Plain can be recognised in the field and from herbarium specimens, and separates as a discrete taxon in morphometric studies. This species is in the process of being formally described (Butcher in prep.).

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

Synaphea sp. Pinjarra Plain is not known to hybridise with other *Synaphea* taxa despite co-occurring with up to four other species at a location (e.g. *S.* sp. Serpentine, *S.* sp. Fairbridge Farm, *S. petiolaris* and *S. gracillima* in the rail reserve and adjacent nature reserve, Serpentine).

2.2. Description

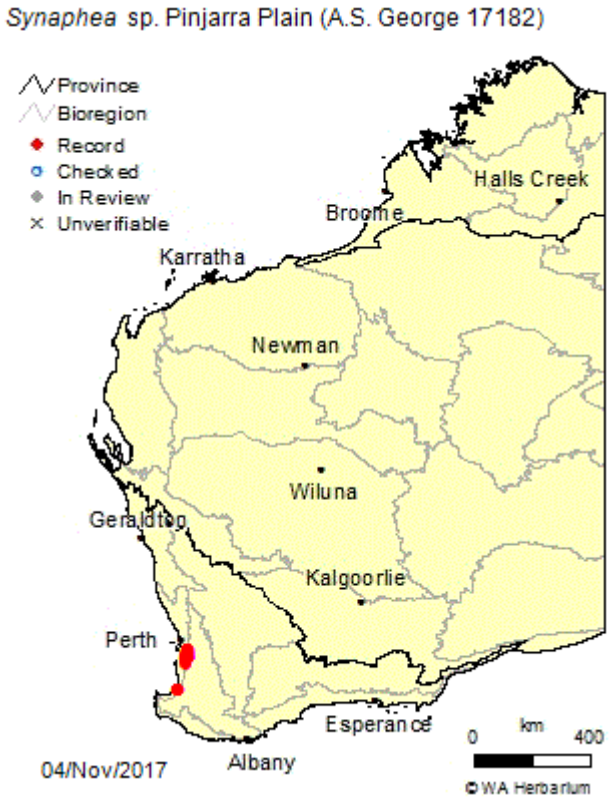
Describe the physical appearance, habit, behaviour/dispersion and life history. Include anatomy or habit (e.g. size and/or weight, sex and age variation, social structure) and dispersion (e.g. solitary, clumped or flocks etc), and life history (e.g. short lived, long lived, geophytic, etc).

Perennial erect, clumped shrub (sub-shrub), to 0.8 m high. Flowers are yellow and held on long spikes well above the leaves; September to November. Reproduces by seed. Regenerates and recruits well after fire.

2.3. Distribution
Describe the distribution of the species <u>in Australia</u> and, if possible, provide a map.

Synaphea sp. Pinjarra Plain occurs in a linear band from the northernmost point at 2km north of Mundijong (36km SSE of Perth) to West Coolup (84km S of Perth) (see map below).

There is an outlier 40km north of the northernmost location recorded in 1902 at Greenmount, east of Perth (PERTH 6601545, *C. Andrews* s.n.)). This site was difficult to relocate due to the lack of detailed description and imprecise coordinates for the location.



Location of *Synaphea* sp. Pinjarra Plain 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

Synaphea sp. Pinjarra Plain occurs predominantly on flat terrain on grey-brown sandy loams. It is also recorded in heavier brown clay-sand overlain by laterite pebbles. The species occurs more often on the boundaries of seasonal wetlands rather than within them, in soils with moderate drainage. Warm Mediterranean climate.

Biological habitat

Open Woodland of *Corymbia calophylla*, *Xanthorrhoea preissii* over Open Shrubland of *Pericalymma ellipticum*, *Kunzea micrantha*, *Hakea varia*, *Adenanthos meisneri*, *Stirlingia latifolia S. petiolaris* and *S. gracillima* over Sedgeland of *Mesomelaena tetragona* and *Tetraria octandra*.

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

Not applicable.

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

Synaphea sp. Pinjarra Plain is a part of, but does not rely on, three TECs. **1)** SCP3b - *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (VU); **2)** SCP20b - *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (EN) and **3)** SCP08 - Herb rich shrublands in clay pans (VU) that is also listed under the Commonwealth's EPBC Act 1999.

It has been recorded with *Synaphea* sp. Fairbridge Farm (D. Papenfus 696) and *Synaphea* sp. Pinjarra (R. Davis 6578), both listed under WA and Commonwealth legislation as Critically Endangered. It has also been recorded with *Tetraria australiensis* listed as Vulnerable under both WA and Commonwealth legislation, and the Priority 3 species *S.* sp. Serpentine.

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?

Flowers from late August to November and fruits through to December. Observations show that the seed produced is viable and plants regenerate from rootstock after disturbance and a fire event. Pollinator is unknown.

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).

Flowers and fruits have been recorded on small plants. Despite producing a large number of flowers per plant, only a small proportion develop into fruit and levels of seed abortion and parasitism, as well as fruit galling, are high. Each fully-formed fruit contains a single seed (R. Butcher *pers. comm*.) The life expectancy of this species has not been researched, however observations at locations where recent fire has occurred, indicate a life-span of at least 3 years. Seedlings, juveniles and mature individuals have been recorded at the majority of locations.

Questions 2.7 and 2.8 apply to fauna nominations only

2.7. Feeding
Summarise food items or sources and timing/availability.

Not applicable.

Briefly describe feeding behaviours, including those that may make the species vulnerable to threatening processes.

Not applicable.

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.

Not applicable.

SECTION 3. INTERNATIONAL CONTEXT

For species that are distributed both in Australia and in other countries.

3.1. Distribution
Describe the global distribution.

Not applicable.

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

Not applicable.

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?

Not applicable.

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).

The surveys undertaken in 2011 and 2012 are the first detailed plant counts for this taxon. A total of 715 mature individuals were recorded [751, 2014]. Of these, 175 individuals (24.4%) were recorded as being in 'poor' condition indicating a significant reduction in population size is most likely in the near future. In addition, a further 75 individuals (9.4%) were recorded as dead, indicating a past decline.

Provide 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?

Not applicable.

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.

For the currently known locations where plants were recorded, *Synaphea* sp. Pinjarra Plain occurs in six locations when considering fire as the most serious plausible threat at one point in time. Although, plants have been observed to regenerate and recruit post-fire for other *Synaphea* spp., this area is data deficient for this species. In addition, negative post-fire effects of habitat modification and weed invasion of aggressive species present at the majority of sites, has been noted as a cause of past decline. A real threat of too-frequent fire is also highly likely along the road and rail reserves.

It is also worth considering the (expected, predicted) decline that is highly likely to occur through the continuing effects of weed invasion within the narrow already disturbed remnants of bushland along the road and rail reserves, where all but two of the populations occur.

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 date, location or occurrence.

The following locations in the table have been compiled using the method employed for completing Threatened and Priority Report Forms according to the DEC criteria for population separation. Population identification numbers have not been assigned for this species.

The actual total area of occupancy = 9135m^2 i.e. 0.009135 km^2 which was calculated by estimating the approximate area within which the plants occur (length x width). Using the 2kmx2km IUCN method, the AOO is 44km^2. Given the narrow linear nature of much of this species available habitat, the use of the 2kmx2km IUCN method was deemed to be not appropriate as provided for under the IUCN Guidelines. AOO is taken as being <10km^2.

Date of survey	**Location**	**Land status** (DEC 2012)	**Number of individuals at location**	**Area of occupancy at location**	**Condition of site** (EPA 2000)
08/11/2011	Serpentine	Road and Rail Reserve	**53 mature** (30 poor, 23 healthy) 5 juveniles +45 dead	1200 m^2	Very Good to Degraded
3/11/2011 3/09/2012 14/09/2012	North Dandalup	Road and Rail Reserve	**207 mature** (32 poor, 175 healthy) 411 juveniles +15 dead	1203m^2	Good to Degraded. Degraded. Degraded to Good
14/09/2012	Keysbrook	Road and Rail Reserve	**7 mature** (7 healthy)	76 m^2	Degraded
14/09/2012	North Dandalup	Road Reserve	**2 mature** (2 healthy)	10 m^2	Good
21/09/2012	Keysbrook	Rail Crown Reserve	**30 mature** (5 poor, 25 healthy) +1 dead	683 m^2	Degraded to Good
5/10/2012	Serpentine	Road and Rail Reserve	**190 mature** (44 poor, 146 healthy) 1 juvenile	2888 m^2	Very Good (E of rail-line), Good to Degraded (W of rail-line)
7/10/2014 8/10/2012	Serpentine	[i]Nature Reserve [ii]Road Reserve	[i]**59** 2012: 23 mature (4 poor, 19 healthy) [ii]**25 mature** (4 poor, 21 healthy) +1 dead	400 m^2 [ii]185 m^2	[i]Very Good [ii]Very Good
9/10/2012	Mundijong	Crown Reserve (Govern-ment Require-ments)	**3 mature** (3 healthy)	40 m^2	Excellent

9/10/2012	Mardella	Rail Reserve	**103 mature** (35 poor, 68 healthy) 10 juveniles +11 dead	1500 m^2	Degraded
12 & 25/10/2012	Cardup	Road and Rail Reserve	**44 mature** (15 poor, 29 healthy) 4 juveniles	480 m^2	Very Good
21/10/2012	Mundijong	Road and Rail Reserve	**24 mature** (4 poor, 20 healthy) 2 juveniles +1 dead	450 m^2	Good
22/10/2012	West Coolup	Shire Crown Reserve	**4 mature** (2 poor, 2 healthy) 16 juveniles +1 dead	19 m^2	Very Good

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

An accurate count of individuals was made using a differential GPS to record exact locations. For each record, information on the number of plants, life-form, reproduction, condition and any other relevant comments were ascribed on a hand-held PDA. It was relatively clear to determine the habit of the majority of plants for accurate counting. Where clumps were encountered, these were separated by hand to determine whether more than one individual occurred.

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

Yes. There has been a reduction in the number of locations. Three of the locations recorded on Florabase have either not been relocated or plants were not found.

1. PERTH 6601545. August 1902. Greenmount, Darling Range, E of Perth. (The coordinates are very broad and no clear site description was given).
2. PERTH 5140056. August 1997. Whitby. (Despite searching all remnant bushland in the Whitby vicinity to Serpentine, no such location was found as location description is not clear).
3. PERTH 4910559. December 1997. Rail reserve Pinjarra. (A targeted search in 2012 of a large extent of the rail reserve from the recorded coordinates was undertaken, but no plants were found. Suitable habitat along the entire length of the rail reserve was surveyed in 2010 for the Threatened species *Synaphea* sp. Fairbridge Farm, and no *S*. sp. Pinjarra Plain was observed).

A further decline is likely at seven locations due to extremely low plant numbers (<10) and/or high percentages of individuals in poor condition (34% to 56%).

What is the extent of occurrence (in km^2) 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.

Area of current extent is 220km^2. This has been calculated using the ESRI ArcMap 9.3.1 measuring tool to create one continuous polygon, with no internal angle greater than 180^o (As described in ICUN Red List version 8.0). The dataset used for this calculation was collected with a Differential GPS during 2011/2012 field surveys by DEC Swan Coastal District Conservation Officers.

It is important to note that a large proportion of this area is modified land being used for housing, farming and utilities. If the guidelines were changed to allow 'internal angle greater than 180^o' the area of extent could easily be reduced to less than 30km^2.

Area of past extent is 460km^2. This area has been calculated as for current extent but the dataset has been expanded to also include all the Florabase records (including those where plants were not relocated) [extracted November 2011)]. Where Florabase coordinates do not match their location description, the written description was used to reposition the location.

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.

To predict the likely decline over the future 10 year period, current plant numbers can be used. Results of the 2011 to 2012 surveys show that 9.4% of mature individuals were dead and a further 24.4% in poor condition. As the majority of sites are within insecure tenure with multiple threatening processes, this calculation is viewed as cautious and a higher percentage future decline is highly likely.

Is the distribution of the species severely fragmented? Why?

Within the known extent, there are populations with very mature individuals in a highly fragmented landscape. Although >50% of the total mature individuals, are concentrated in two centres (Serpentine and North Dandalup) the majority occur on small remnants separated by roads, rail-lines, maintenance tracks, firebreaks and cleared areas for utilities infrastructure.

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.

When considering the relatively small extent of occurrence the very small area of occupancy, continuing decline and identified multiple threatening processes, all populations are considered important.

Four of the 12 populations also have extremely low plant numbers (≤7 mature individuals) within restricted areas of occupancy. They are in different locations, and are therefore important for possible genetic diversity.

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.

Populations were surveyed during the appropriate season for flowering and fruiting and transects were walked covering the critical habitat for this taxon. Collections were taken from each population and verified by Ryonen Butcher (Research Scientist, WA Herbarium).

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

As stated, the various species of *Synaphea* can be difficult to differentiate without experience and generally require examination with a 10x or 20x hand-lens in the field to identify accurately. The best characters to use in the field to distinguish *S.* sp. Pinjarra Plain from other species are a combination of the following: flowering branches considerably longer than the leaves; leaves 2–3 x trilobed typically with oblanceolate lobes and a very long petiole; flowers compressed dorsiventrally and glabrous; stigma with broad lateral lobes; fruit ± cylindrical on a short neck and with a raised ridge (crown) at the apex. This species is restricted to small areas of remnant woodland (frequently seasonally wet) on the Pinjarra Plain.

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.

Yes, it has been well surveyed considering the geographical range of just over 50km and available habitat that has been largely cleared and is reasonably confined. Surveys were undertaken within the most opportune time for flowering when the taxon is identifiable, even though there are overlapping taxonomic characteristics within the genus, the species itself is readily identified.

History of surveys and collections include:

1902 – collection made by C. Andrews s.n. at Greenmount, Darling Range.

1993 – collection made by A.S. George at Mundijong.

1997 and 1999 – collections made by G.R. Brand at Whitby and Serpentine.

1997 – collection made by J. Koch and D. Papenfus on rail reserve, Pinjarra.

1998 – Rob Davis (Research Scientist). Opportunistic collections of *Synaphea* sp. Pinjarra Plain made whilst undertaking targeted surveys for the Declared Rare *Synaphea* species. Surveys concentrated on areas around Pinjarra, Serpentine and Mundijong, and extended southwards (Butcher 2004).

2003 – Ryonen Butcher (Research Scientist). Collected specimens of *Synaphea* sp. Pinjarra Plain and noted the locations of new populations whilst surveying for the Declared Rare *Synaphea* species. Area surveyed comprised a large proportion of the Pinjarra Plain between Byford and Capel, extending to Yoongarillup in the southwest, as well as inland to the lower slopes of the Darling Scarp. Some of the areas surveyed by R. Davis were resurveyed at this time (Butcher 2004).

2008 – Dave Kabay (Environmental Consultant). Targeted surveys for species of conservation significance along the gas pipeline corridor in the North Dandalup area (Kabay 2008).

2011 & 2012 – Swan Coastal District Flora Conservation Officers. Targeted surveys for *Synaphea* sp. Pinjarra Plain undertaken to obtain detailed information of each known population.

Areas of potential habitat were searched while undertaking targeted surveys for other conservation listed species within the Swan Coastal District during 2009-2012. Also, where coordinates from Florabase records were ambiguous, areas of suitable habitat in the vicinity of the records were searched.

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?).

Past threats identified by Ryonen Butcher during surveys undertaken in 2003 for the Declared Rare *Synaphea* sp. Pinjarra (R. Davis 6578) [formerly *S. trifolina* R.Butcher ms] include weed invasion, fragmented habitat due to extensive clearing for agriculture and development, road and rail construction and maintenance and changes in hydrology (e.g. local changes to drainage systems) (Butcher 2004, 2007). Although the threats referred to in the reference are not specific to *Synaphea* sp. Pinjarra Plain, they are inherently the same threats impacting upon the bushland remnants, predominantly road and rail reserves, where all but two of the *Synaphea* sp. Pinjarra Plain populations occur.

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

Location	**Past threats** (Ryonen Butcher)	**Current threats** (DEC Swan Coastal District Conservation Officers)	**Potential threats** (DEC Swan Coastal District Conservation Officers)	**Management requirements (see section 4.4)**
Serpentine	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Active recreation.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. *Phytophthora* spp. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
North Dandalup	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Active recreation. Scale insect infestation.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Repeated short-interval fires. Drying climate. Exposed habitat.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.

Keysbrook	See note above	Weed invasion. Fragmented habitat. Active recreation. Exposed habitat from past clearing.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Repeated short-interval fires. Drying climate. Exposed habitat	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
North Dandalup	See note above	Weed invasion. Fragmented habitat.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. *Phytophthora* spp. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Keysbrook	See note above	Weed invasion. Fragmented habitat. Rail management activities.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Phytophthora spp. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Serpentine	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Powerline maintenance. Exposed habitat from past clearing. Rubbish dumping. Repeated short-interval fires.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.

Serpentine	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Rubbish dumping. Road and rail maintenance. Grazing. Active recreation.	Unplanned repeated short-interval fires. Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Phytophthora spp. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Mundijong	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Powerline maintenance. Exposed habitat from past clearing. Rubbish dumping. Repeated short-interval fires.	Weed invasion. Weed control by land managers. Road and rail maintenance and construction. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Mardella	See note above	Weed invasion. Fragmented habitat. Weed control by land managers. Exposed habitat from past clearing. Repeated short-interval fires.	Weed invasion. Weed control by land managers. Rail maintenance and construction. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Cardup	See note above	Rail maintenance. Weed invasion	Weed invasion. Weed control by land managers. Rail maintenance and construction. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.
Mundijong	See note above	Weed invasion. Fragmented habitat. Active recreation. Rail maintenance. Scale insect infestation.	Weed invasion. Weed control by land managers. Rail maintenance and construction. Repeated short-interval fires. Drying climate.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.

West Coolup	See note above	Weed invasion.	Weed invasion. Weed control by land managers. Bushfire mitigation operations. Drying climate. Active recreation.	Prepare a Recovery Plan for this species to address current and potential threats specific to each location.

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.

Despite producing a large number of flowers per plant, only a small proportion develop into fruit and levels of seed abortion and parasitism, as well as fruit galling, are high. Each fully-formed fruit contains a single seed. Seed-bearing fruit do not disperse a long distance away from the parent plants leading to localised clusters of plants in the environment. While the genetic diversity of this species has not been studied, the natural habitat of this species on the Pinjarra Plain has been extensively cleared and remaining vegetation remnants are small and highly fragmented.

4.4. Management

Identify key management documentation for the species e.g. recovery plans, conservation plans, threat abatement plans etc.

No management documentation for the species has been written.

Does this species benefit from the management of another species or community? Explain.

Yes, whilst there is no specific management for *Synaphea* sp. Pinjarra Plain, where it occurs in association with a Threatened species or within a TEC that is actively managed, it does benefit. (see section 2.4 'Habitat').

How well is the species represented in conservation reserves or covenanted land? Which of these are actively managed for this species? Provide details.

Synaphea sp. Pinjarra Plain is poorly represented in conservation reserves and covenanted land. For the few areas that are managed for conservation, only one reserve is actively managed through specific recovery actions for the conservation listed flora occurring within.

Are there any management or research recommendations that will assist in the conservation of the species? Provide details.

No conservation-biology studies have been conducted for *S.* sp. Pinjarra Plain and no management documents have been written. Given the similar habitat requirements and overlapping distributions of *S.* sp. Pinjarra Plain and the conservation-listed species *S.* sp. Pinjarra (DRF), *S.* sp. Fairbridge Farm (DRF), *S. stenoloba* (DRF), *S. odocoileops* (P1) and *S.* sp. Serpentine (P3; requires re-evaluation), the majority of the Interim Recovery Plan actions applicable to the first three species would also apply in this instance. Given the small size of the vegetation remnants in which all these species occur a whole-of-habitat management approach seems logical and would maximise conservation returns. Research is required on fire response for use as a recovery tool, but this would need to be carried out in conjunction with a comprehensive weed control program.

As multiple threatening processes have been identified for *S*. sp. Pinjarra Plain, the preparation of a Recovery Plan is highly recommended.

Specific management requirements include:

- Maintain liaison with road, rail and utilities managers to minimise disturbance to remnant vegetation when maintaining roads, railway and powerlines;
- Maintain liaison with adjacent land managers to ensure herbicides used do not impact on

road and rail reserve populations;
- Monitor the populations for evidence of rabbits or changes in plant or site health;
- Protect the sites from fire unless required for ecological reasons, and implement early intervention in any wildfires which may threaten the sites;
- Practice appropriate hygiene measures to protect susceptible habitat from disease introduction;
- Survey any newly identified areas of suitable habitat;
- Protect sites from exposure by planting and maintaining adequate vegetation buffers;
- Control infestations of weeds that might impact the species and its habitat;
- Manage groundwater at sites through monitoring;
- Erect barriers if recreational activities continue to threaten populations;
- Remove rubbish dumped at sites;
- Control rabbits if evidence of a rabbit population or herbivory noted;
- Identify scale insect infesting plants and determine appropriate control required;
- Collect and store seed;
- Establish new populations on secure tenure through implementation of translocations;
- Determine species pollination ecology, seed germination requirements and viability, and longevity;
- Stimulate germination of species in wild;
- Undertake morphological and genetic studies to confirm the species taxonomic boundaries**.**

4.5. Other

Is there any additional information that is relevant to consideration of the conservation status of this species?

As *Synaphea* sp. Pinjarra Plain occupies the same area as the Commonwealth listed species *S.* sp. Pinjarra (CR), *S.* sp. Fairbridge Farm (CR), *S. stenoloba* (CR), the listing of *S.* sp. Pinjarra Plain as Threatened is warranted given its highly restricted distribution and that it is endemic to the Pinjarra Plain. Furthermore, all but two populations are restricted to small rail and road reserves which are highly threatened across this region.

SECTION 5. NOMINATOR

Nominator(s) name(s)	
Organisation(s)	
Address(s)	
Telephone number(s)	
Email(s)	
Date	29 January 2013

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

Ryonen Butcher (Research Scientist, WA Herbarium)

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.

Reports

Butcher R (2004) A Survey of Gazetted and Proposed Declared Rare species of *Synaphea* (Proteaceae) occurring on the Pinjarra Plain. Report prepared for Robyn Luu (Project officer), Western Australian Threatened Species and Communities Unit. The Department of Conservation and Land Management, Woodvale.

Butcher R (2007) A report on the conservation biology of *Synaphea trifolina* R.Butcher ms. [=*Synaphea* sp. Pinjarra (R. Davis 6578)] (Proteaceae: Conospermeae), a critically endangered Pinjarra Plain endemic shrub. Report prepared for the Department of Environment and conservation Swan Region, Western Australia.

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Kabay D. (2008) Ravenswood Pipeline Report. Unpublished report for the Water Corporation, Western Australia.

Journal Articles

Butcher R (in prep.) Four new, conservation-listed species of *Synaphea* (Proteaceae: Conospermineae) from the Swan Coastal Plain of south-west Western Australia. [expected submission to *Nuytsia*]

Butcher R & Thiele KR (in prep.) A morphometric study of *Synaphea* (Proteaceae: Conospermineae) species from the Swan Coastal Plain of south-west Western Australia: an investigation of taxon boundaries and intraspecific variation in rare and range-restricted flora. [expected submission to *Australian Systematic Botany*]

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Authorities

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