Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

Nomination *(to be completed by nominator)*

Current conservation status	
Name of ecological community:	Assemblages of Dragon Tree Soak organic mound spring
Other names:	
Description:	The community occurs in the Great Sandy Desert bioregion and is a wetland landform supporting plants and animals that are absent or scarce elsewhere in the bioregion. At its centre, the community comprises a closed sedgeland of *Baumea articulata* (jointed twig-rush) to 2.5m high and 95% cover. *Sesbania formosa* (white dragon tree) occurs as a sparse emergent and some clumps of *Typha domingensis* (bullrush) are also present in the centre of the soak. At the southern and northern ends of the wetland is a low-closed forest or scrub of *Sesbania formosa*, averaging 10m in height, with some *Typha domingensis* understorey. In wet areas on the periphery of the wetland, a grassland of *Paspalum vaginatum* (couch grass) occurs, with sparse emergent *Fimbristylis ferruginea.* The slightly higher and drier surrounding flats support *Sporobolus virginicus* (marine couch), *Acacia ampliceps* and *Melaleuca glomerata*. The priority 3 sedge species *Fimbristylis sieberiana* also occurs.
Nomination for:	Listing ☐ Change of status ☒ Delisting ☐

1. *Is the ecological community 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	**List or Act name**	**Date listed or assessed (or N/A)**	**Listing category eg. critically endangered (or none)**	**Listing criteria eg. B1ab(iii)+2ab(iii) (or none)**
National	EPBC Act			
Western Australia	Threatened list; under WA Minister ESA list in policy	23/03/2001	Endangered	B) i)
	Priority list		1 ☐ 2 ☐ 3 ☐ 4 ☐	
Other State/Territory				

Nominated conservation status: category and criteria (include recommended status for deleted ecological communities)

Critically endangered (CR) ☒ Endangered (EN) ☐ Vulnerable (VU) ☐ Collapsed (CO) ☐

Priority 1 ☐ Priority 2 ☐ Priority 3 ☐ Priority 4 ☐ None ☐

What criteria support the conservation status category for listing as a threatened ecological community or collapsed ecological community? *Refer to Section 32 of the Biodiversity Act 2016 for definition of 'Collapsed', and Appendix 3 table 'IUCN Red List Criteria for ecosystems version 2.2'.*		B1b,c; B2b,c
Eligibility against the criteria		
*Provide justification for the nominated conservation status; is the ecological community eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the ecological community no longer meets the requirements of the current conservation status.*		
A.	Reduction in geographic distribution *(evidence of decline)*	☐ **A1** ☐ **A2a** ☐ **A2b** ☐ **A3**
	Justification of assessment under Criterion A.	• For criteria A and B, the ecosystem was assumed to collapse when the mapped distribution declines to zero. • A: There is no evidence to support an inference that a minimum 30% reduction in geographic distribution has or will occur over any 50-year period, or a 50% reduction since 1750 (ie. the minimum thresholds to meet the category VU under criterion A). • **Does not meet criterion A**
B.	Restricted geographic distribution *(EOO and AOO, number of locations and evidence of decline)*	☒ **B1** (specify at least one of the following): CR ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☒ **b)** ☒ **c);** ☒ **B2** (specify at least one of the following): ☐ **a)(i)** ☐ **a)(ii)** ☐ **a)(iii)** ☒ **b)** ☒ **c);** ☐ **B3 (only for Vulnerable Listing)**
	Justification of assessment under Criterion B.	• B1: EOO is 0.06km^2 (≤2,000km^2, which is the threshold for CR). • B2: AOO is one 10x10 km grid cell (threshold for EN is 20 and for CR is 2 grid cells). • a): Inadequate data are available to indicate decline in spatial extent, environmental quality or disruption to biotic interactions to support ranking under B1 or B2a). • b): Continuing decline observed from introduced herbivores (camels) and nutrient enrichment; and from future changes to the hydrological regime associated with groundwater abstraction (see Appendix 1 for further information on threats). • c) Ecosystem exists at one threat-defined location as there is only one occurrence and it is impacted by introduced herbivores (camels) (threshold for CR is one and for EN is 5 threat-defined locations). • B3: Known from one threat-defined location and prone to impacts of introduced herbivores (camels). Community is

		considered prone to effects of human activities or stochastic events within a very short time period in an uncertain future and thus capable of collapse or becoming CR within a very short time period (meets VU as <5 threat defined locations). • **Meets criteria for critically endangered B1b,c; B2b,c**
C.	Environmental degradation of abiotic variable *(Evidence of decline over 50-year period)*	☐ **C1** ☐ **C2** ☐ **C3**
	Justification of assessment under Criterion C.	• C1, C2: The most significant abiotic variable affecting the community is considered to be nutrient enrichment. The source of nutrients is from droppings of introduced herbivores (camels). Nutrient enrichment is associated with weed invasion and other affects. There are inadequate monitoring data that would correlate levels of weed invasion and nutrient levels in this community however and extrapolation of nutrient levels and degradation to determine a likely collapse state has therefore not been completed. There is inadequate evidence, to indicate if the community meets the minimum proportion of the extent (≥30%) or proportional severity of disruption of biotic processes (≥30%) over any 50-year period to meet VU under criteria C1, C2. • C3: Inadequate data are available to indicate if the community meets the minimum proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since 1750. • **Inadequate evidence to indicate if community meets criterion C**
D.	Disruption of biotic processes or interactions *(Evidence of decline over 50-year period)*	☐ **D1** ☐ **D2** ☐ **D3**
	Justification of assessment under Criterion D.	• D1, D2: The most significant biotic variable affecting the community is considered to be physical impacts of grazing and trampling by introduced herbivores (camels). The assumption is made that degradation by camels has occurred mainly over the last 50 years. Vegetation condition is considered to reflect a combination of species richness, species composition and dominance, abundance of key species, and other biotic interactions. In this community, vegetation condition is assumed to be mainly negatively impacted by grazing and trampling by introduced herbivores (camels). In this context vegetation collapse is assumed conservatively to occur when vegetation condition reaches completely degraded (Bush Forever scales: defined as 'the structure of the vegetation is no longer intact, and the areas are completely or almost completely without native species'). 70% of this community was considered in 'Good' condition and 20% in 'Poor' condition when last surveyed in 2018 (condition ratings have been converted to IUCN scales; see summary of location information, below, for definitions of

		condition categories). It is conservatively assumed that 'good condition' (IUCN condition scales) relates to a 30% severity of degradation and 'poor' to 80% severity. It is therefore assumed that 70% of the community is affected to a severity of 30% by grazing and trampling and that 20% is affected to 80% severity. Based on the above assumptions the community does not meet the minimum thresholds for vulnerable under criterion D – ie. at least 80% of the area of the community affected to at least 30% severity of degradation over any 50-year period. • D3: Does not meet the minimum proportion of the extent (≥50%) or proportional severity of disruption of biotic processes (≥50%) since ~1750. • **Inadequate evidence to indicate community meets criterion D**
E.	Quantitative analysis *(statistical probability of ecosystem collapse)*	• No quantitative estimates of the risk of ecosystem collapse. • **Not assessed**

Reasons for change of status

Genuine change ☐ New knowledge ☐ Previous mistake ☐ Review/Other ☒

Provide details: The community was initially ranked as Endangered using ranking criteria developed in WA that differ to those in the IUCN Red List Criteria for Ecosystems (version 2.2).

Summary of assessment information *(provide detailed information in the relevant sections of the nomination form)*

EOO	0.06 km^2	AOO	One 10x10 km grid cell.
No. occurrences	1	Severely fragmented	Yes ☐ No ☒ Unknown ☐
Justification	Single occurrence known		
Current known area			5.55 ha
Pre-industrialisation extent or its former known extent (if known)			Thought to occupy most of its former extent
Estimated percentage decline			

Summary assessment against IUCN RLE Criteria

Criterion	Rank indicated	Overall conclusion
A1	-	• Available data do not indicate community meets criterion
A2a	-	• Available data do not indicate community meets criterion
A2b	-	• Available data do not indicate community meets criterion
A3	-	• Available data do not indicate community meets criterion
B1a	-	• EOO is ≤2,000km^2 • No available data indicate decline in spatial extent, environmental quality or disruption to biotic interactions that would meet minimum thresholds of the criterion (VU) • Does not meet criterion
B1b	CR	• EOO is ≤2,000km^2 • Impacts observed from grazing, trampling and increasing nutrients from introduced herbivores (camels), altered fire regimes and nutrient enrichment; and inferred from future changes to the hydrological regime • Meets criterion for CR
B1c	CR	• EOO is ≤2,000km^2 • Ecosystem exists at one threat-defined location • Meets criterion for CR
B2a	-	• AOO is one grid cell • Inadequate data available to indicate decline in spatial extent, environmental quality and disruption to biotic interactions to support ranking under B2a • Does not meet criterion
B2b	CR	• AOO is one grid cell • Observed continuing decline from grazing, trampling and increasing nutrients from introduced herbivores (camels), and altered fire regimes; and inferred from future changes to the hydrological regime • Meets criterion for CR
B2c	CR	• AOO is one grid cell • Ecosystem exists at one threat-defined location • Meets criterion for CR
B3	VU	• Known from one threat-defined location • Prone to the effects resulting from introduced herbivores (camels), nutrient enrichment, and altered fire regimes; and inferred from future changes to the hydrological regime • Meets criterion for VU
C1	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over past 50 years to meet VU.
C2	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.
C3	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥50%) or proportional severity of disruption of abiotic processes (≥50%) since 1750 to meet VU.
D1	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.
D2	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥30%) or proportional severity of degradation (≥30%) over any 50-year period to meet VU.

D3	-	• Inadequate evidence to indicate the community meets the minimum thresholds for proportion of the extent (≥50%) or proportional severity of disruption of biotic processes (≥50%) since 1750 to meet VU.
E	NA	• No quantitative estimates of the risk of ecosystem collapse.
		Meets CR under B1b,c; B2b,c. Meets VU under B3 *The highest risk category obtained by any of the assessed criteria will be the overall risk status of the ecosystem'* (IUCN RLE Guidelines V1.1 page 42). **Meets CR under B1b,c; B2b,c.**

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Summary of location (occurrence) information *(provide detailed information in the relevant sections of the nomination form)*						
Occurrence	Land tenure	Survey information: date of survey	Condition*	Area of occurrence (ha)	Threats *(note if past, present or future)*	Specific management actions required
Dragon01	Nature reserve	2018	30% excellent 40% very good 10% good 20% degraded	5.55 ha	Introduced herbivores, nutrient enrichment, altered fire regimes (*past, present, future*), hydrological change (future)	Install and maintain fencing, control introduced herbivores, systematic monitoring

*For the purposes of relating condition to IUCN Criteria, condition categories from (Keighery (1994) Vegetation Condition Scale (Government of WA 2000)) are defined below:

Good ('Pristine', 'Excellent', 'Very Good' using Bush Forever (2000) scale): This includes vegetation ranging from 'Pristine' - with no obvious signs of disturbance, to 'Excellent' - Vegetation structure intact, with disturbance only affecting individual species, weeds are non-aggressive species and 'Very Good' - Vegetation structure altered, obvious signs of disturbance eg: from repeated fires, dieback, logging, grazing.

Medium ('Good' using Bush Forever (2000) scale): This includes vegetation categorised as 'Good' - Vegetation structure altered but retains basic vegetation structure or ability to regenerate it, obvious signs of disturbance are present, from activities including partial clearing, dieback and grazing.

Poor ('Degraded' using Bush Forever (2000) scale): This includes vegetation ranging from 'Degraded' Basic vegetation structure severely impacted by disturbance, the vegetation requires intensive management, and disturbance such as partial clearing, dieback, logging and grazing, to 'Completely Degraded' where vegetation structure is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native shrubs and trees.

Beyond recovery ('Completely degraded' using Bush Forever (2000) scale): Vegetation structure is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native shrubs and trees.

Table 1. Known condition of occurrence that has been surveyed for 'Assemblages of Dragon Tree Soak organic mound spring'

Condition Ranking (Keighery 1994) from Government of Western Australia 2000)	Hectares	IUCN Criteria condition ranking	Hectares
Pristine	0	**Good**	3.88
Excellent	1.67		
Very Good	2.22		
Good	0.55	**Medium**	0.55
Degraded	1.11	**Poor**	1.11
Completely degraded	0	**Beyond recovery**	0
Total	5.55	**Total**	5.55

APPENDIX 1 THREATS

Introduced herbivores

The community is extremely vulnerable to degradation caused by damage by large herbivores, mainly camels (see figure 1). Camels are contributing to changes in water quality through nutrification and pugging, with the water body smelling very strongly of camels when visited in 2018. Past surveys have also noted low hanging branches on Dragon trees and foliage at ~3m being pruned, the ground beneath bare with few saplings, and closed sedgelands were reduced to trampled muddy pools (ANCA 1996; [redacted][1] *pers comm.*). The site is currently not fenced.

Figure 1. Impacts of camels at Dragon Tree Soak seen in 2018.

The impact from introduced herbivores and the resulting nutrient enrichment of the soil and water are likely to result in changes in the vegetation assemblage over time. A plot of total 'cover' over time (figure 2), shows high variability exists in the vegetation with positive spikes indicating high levels of inundation and large falls indicating fires. Periods of large annual variability suggest the dominance of annual vegetation, compared to low annual variability which indicates dominance of perennial vegetation.

[1] Acting Nature Conservation Coordinator, West Kimberley District

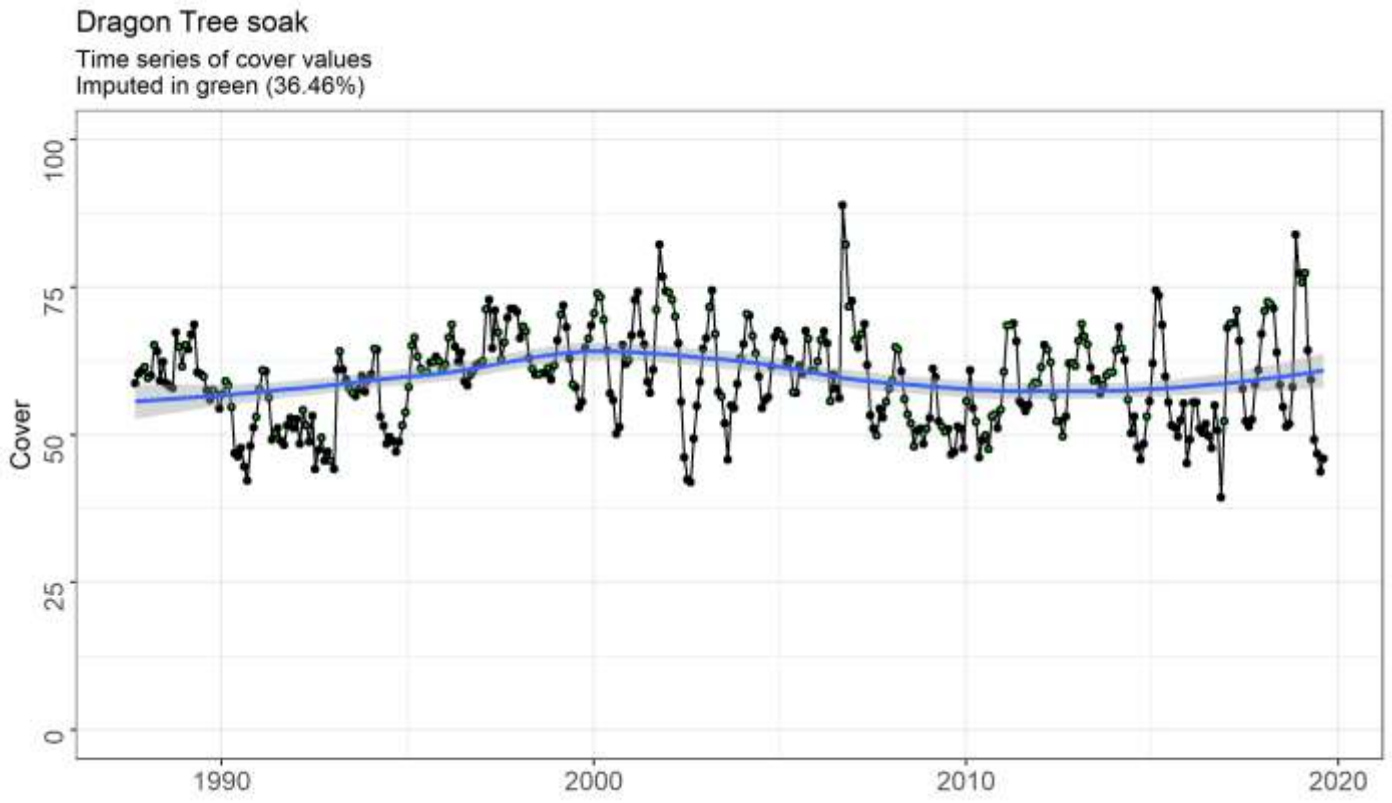

Figure 2. Time series of cover values over time for Dragon Tree soak (data provided by [redacted][2]).

Hydrological change

Continued modification of vegetation and soils is likely to affect the hydrology of the peat mound, causing it to dry out. Dragon Tree soak is dependent on a constant supply of fresh groundwater. Increasing future abstraction of groundwater for domestic and industrial use has the potential to impact the community due to drawdown. Some developments proposed for the area involve groundwater abstraction, and have potential for saltwater intrusion, interface upconing and subsequent impacts to groundwater dependent ecosystems. Where abstraction proposals do occur within the groundwater catchment additional management considerations will be required. There are no Department of Water and Environmental Regulation (DWER) bores located within the vicinity to provide long-term data on groundwater levels.

Altered fire regimes

Inappropriate fire regimes are a potential risk to the Dragon Tree soak community. Historically, fires were probably only very occasional and the location is long unburnt. Buffer burns only have occurred. An increase in fire frequency within the community may alter the structure and composition, removing the vegetation and the organic soil. The peat soils require particular fire management considerations as they can be damaged or destroyed by fires that can smoulder for long periods.

[2] Remote Sensing Officer, DBCA

References

Australian Nature Conservation Agency (1996) A Directory of Important Wetlands in Australia. Second Edition. Australian Nature Conservation Agency, Canberra.

CSIRO and Bureau of Meteorology (2015) Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report, CSIRO and Bureau of Meteorology, Australia.

Department of Parks and Wildlife (2016) Parks and Reserves of the south-west Kimberley and north-west Pilbara draft joint management plan, Department of Parks and Wildlife, Perth.

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

Keighery, B.J. (1994) Bushland Plant Survey. A Guide to Plant Community Survey for the Community. Wildflower Society of Western Australia (Inc.), Nedlands, Western Australia.

APPENDIX 2 Assemblages of Dragon Tree Soak organic mound spring community (blue)

Graticule shown at 6 seconds intervals
Grid shown at 250 metre intervals

Legend

Dragon Tree Soak

N

1:5,000
(A4)

0 15 30 60 90 120
Metres

GDA94 MGA Zone 50

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APPENDIX 3 IUCN Red List Criteria for ecosystems (version 2.2) (IUCN 2017)

A. Reduction in geographic distribution over ANY of the following time periods:

		CR	EN	VU
A1	Present (over the past 50 years).	≥ 80%	≥ 50%	≥ 30%
A2a	Future (over the next 50 years).	≥ 80%	≥ 50%	≥ 30%
A2b	Future (over any 50 year period including the present and future).	≥ 80%	≥ 50%	≥ 30%
A3	Historic (since 1750).	≥ 90%	≥ 70%	≥ 50%

B. Restricted geographic distribution indicated by EITHER B1, B2 or B3:

		CR	EN	VU
B1	Extent of a minimum convex polygon enclosing all occurrences (Extent of Occurrence)	≤ 2,000 km²	≤ 20,000 km²	≤ 50,000 km²
	AND at least one of the following (a-c):			
	(a) An observed or inferred continuing decline in **EITHER**:			
	i. a measure of spatial extent appropriate to the ecosystem; **OR**			
	ii. a measure of environmental quality appropriate to characteristic biota of the ecosystem; **OR**			
	iii. a measure of disruption to biotic interactions appropriate to the characteristic biota of the ecosystem.			
	(b) Observed or inferred threatening processes that are likely to cause continuing declines in geographic distribution, environmental quality or biotic interactions within the next 20 years.			
	(c) Ecosystem exists at …	1 location	≤ 5 locations	≤ 10 locations
B2	The number of 10 × 10 km grid cells occupied (Area of Occupancy)	≤ 2	≤ 20	≤ 50
	AND at least one of a-c above (same sub-criteria as for B1).			
B3	A very small number of locations (generally fewer than 5) **AND** prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus capable of collapse or becoming Critically Endangered within a very short time period (B3 can only lead to a listing as VU).			VU

C. Environmental degradation over ANY of the following time periods:

			Relative severity (%)		
		Extent (%)	≥ 80	≥ 50	≥ 30
C1	The past 50 years based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
			≥ 80	≥ 50	≥ 30
C2	The next 50 years, or any 50-year period including the present and future, based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
			≥ 90	≥ 70	≥ 50
C3	Since 1750 based on change in an abiotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	≥ 90	CR	EN	VU
		≥ 70	EN	VU	
		≥ 50	VU		

D. Disruption of biotic processes or interactions over ANY of the following time periods:

			Relative severity (%)		
		Extent (%)	≥ 80	≥ 50	≥ 30
D1	The past 50 years based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:	≥ 80	CR	EN	VU
		≥ 50	EN	VU	

		≥ 30	VU		
D2	(D2a) The next 50 years, or (D2b) any 50-year period including the present and future, based on change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table: OR		≥ 80	≥ 50	≥ 30
		≥ 80	CR	EN	VU
		≥ 50	EN	VU	
		≥ 30	VU		
D3	Since 1750, based on a change in a biotic variable affecting a fraction of the extent of the ecosystem and with relative severity, as indicated by the following table:		≥ 90	≥ 70	≥ 50
		≥ 90	CR	EN	VU
		≥ 70	EN	VU	
		≥ 50	VU		
E. Quantitative analysis					
			CR	EN	VU
… that estimates the probability of ecosystem collapse to be:			≥ 50% within 50 years	≥ 20% within 50 years	≥ 10% within 100 years