

# NSW Threatened Species Scientific Committee

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Publication date: 16/12/2022

## Notice and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the fern *Antrophyum austroqueenslandicum* D.L.Jones as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Antrophyum austroqueenslandicum* D.L.Jones has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method (Department of Agriculture, Water, and the Environment (DAWE) 2020). The acceptance of this assessment is provided for by Part 4.14 of the Act.

## Summary of Conservation Assessment

The Threatened Species Scientific Committee accepts the assessment undertaken by the Commonwealth Threatened Species Scientific Committee in its Conservation Advice for *Antrophyum austroqueenslandicum* (DAWE 2020).

*Antrophyum austroqueenslandicum* D.L.Jones was found to be Critically Endangered in accordance with the following provisions. Clause: 4.2(1)(a), 4.2(2)(a)(d), 4.3(a)(d)(e, i, ii, iii, iv), 4.4(a)(d i)(e i,iiA) and 4.5(a) of the *Biodiversity Conservation Regulation 2017*. The main reasons for this species being eligible are: i) the species has undergone a very large reduction in population size; ii) the species has a very highly restricted geographic distribution; iii) there are a very low estimated number of mature individuals; and iv) there is observed continuing decline in the abundance, geographic distribution, and number of subpopulations of the species, and in the area, extent and quality of its habitat, due to impacts from historic timber harvesting, land clearing and infrastructure maintenance, weed invasion, illegal collection, and changes to habitat suitability due to climate change (DAWE 2020).

The NSW Threatened Species Scientific Committee has found that:

1. *Antrophyum austroqueenslandicum* is a fern that was first described by Jones (1998) as “ fronds with a prominent very narrowly winged stipe of 2–7 cm long. Lamina narrowly elliptic to lanceolate, 4–8 cm long, 5–9 mm wide, tapered to each end, semi-erect to pendent, slightly falcate, coriaceous, dark green and shiny above, paler beneath; margins slightly irregular; apex broadly obtuse in sterile fronds, attenuate and subobtuse in fertile fronds; venation obscure, with long narrow areoles. Sori spreading for a short distance along the main veins, sparse, absent from the central band; paraphyses branched, with elongate clavate terminal cells”.
2. *Antrophyum austroqueenslandicum* has a very highly restricted geographic distribution, occurring in a very narrow range near Tyalgum in the Border Ranges NSW and Mount Jerusalem National Park NSW (Department of the Environment

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2012; DAWE 2020). The species was previously found in Lamington National Park (Queensland) but is now presumed to be locally extinct at that site (DAWE 2020). The species occurs in lowland subtropical rainforest and represents the most southern and only sub-tropical member of the genus *Antrophyum* in Australia (DAWE 2020). The species is known to occur within the NSW listed Endangered ecological community 'Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions' and the EPBC listed Critically Endangered 'Lowland Rainforest of Subtropical Australia' ecological community (DAWE 2020).

3. *Antrophyum austroqueenslandicum* is found at three sites in NSW. The largest subpopulations occur at Tyalgum in the Border Ranges and Mount Jerusalem National Park. In 2020, five individuals were also found 2.5 km from the Mount Jerusalem site in Huonbrook Valley (DAWE 2020).
4. *Antrophyum austroqueenslandicum* has a very highly restricted Extent of Occurrence (EOO) and Area of Occupancy (AOO). The EOO is estimated to be 8 km<sup>2</sup> using a minimum convex hull (DAWE 2020). The AOO is also estimated to be 8 km<sup>2</sup> using a 2 x 2 km grid cell method as recommended by IUCN 2019 (DAWE 2020).
5. The total number of mature individual plants of *Antrophyum austroqueenslandicum* is extremely low (DAWE 2020). The total number of plants recorded in 2020, including both mature individuals and juveniles, was 48. A count of mature individuals only is not available but is <50, with one subpopulation having only two mature plants (DAWE 2020).
6. There has been an observed continuing decline in total population size since the 1980s, equating to a 100% decline in the Lamington National Park subpopulation since 1983, a 52% decline of the Tyalgum subpopulation between 2015–2020, and an 85% decline in the Mount Jerusalem subpopulation between 2017–2020. There is currently no population trend data for the Huonbrook Valley subpopulation (DAWE 2020).
7. *Antrophyum austroqueenslandicum* is a non-flowering plant that can reproduce both sexually and asexually (DAWE 2020). Sexual reproduction occurs by spore on the underside of the leaves when the plant is mature and follows a two-stage lifecycle typical of ferns, with gametophyte and sporophyte generations. Dispersal is via spores which are easily dispersed by wind or rain due to their small size. When spores germinate, they develop into small heart-shaped plants known as prothalli (gametophyte generation), which produce both male and female cells. Following fertilisation, the prothalli develops into the adult fern (sporophyte generation). Asexual reproduction can occur through either self-fertilisation or apogamy, which is the development of a sporophyte in the absence of fertilisation (DAWE 2020).
8. The lifespan of *Antrophyum austroqueenslandicum* is estimated to be <30 years with the species generally reaching sexual maturity between 3–10 years, and rarely up to 15 years (DAWE 2020). Generation length is estimated to be between 5–15 years (DAWE 2020).

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9. The ecology of *Antrophyum austroqueenslandicum* is not well known, but it appears to require a highly specific microclimate and microhabitat, with constant high humidity and air movement (DAWE 2020). It occurs within restricted microhabitats within lowland subtropical rainforest, specifically as a lithophyte on and beside boulders and as an epiphyte on lower parts of tree trunks (DAWE 2020).
10. Threats to *Antrophyum austroqueenslandicum* include habitat loss resulting from historic timber harvesting and ongoing land clearing, damage from infrastructure maintenance activities, weed invasion by *Lantana camara* (Lantana), illegal collection of ferns, and impacts of climate change on weather conditions.
11. The extent and quality of lowland sub-tropical rainforest habitat in NSW in which *Antrophyum austroqueenslandicum* occurs has been reduced by past timber harvesting and land clearing (DAWE 2020). Ongoing habitat loss also occurs via urban expansion, weed invasion, hydrological changes, and recreation. These cumulative impacts are causing incremental declines of species in this habitat (Silcock & Fensham 2018). Infrastructure maintenance poses a current threat to the Mt Jerusalem subpopulation which occurs near a roadside and is vulnerable to herbicide drift, roadside slashing, and road widening (DAWE 2020).
12. The invasion by weeds is a documented threat to this species. *Lantana camara* (Lantana) and other weeds colonise rocks and boulders which provide habitat for this fern. These weeds negatively impact the fern by changing the light environment, competing for available habitat and nutrients, and potentially smothering ferns. The invasion of Lantana into the habitat of *Antrophyum austroqueenslandicum* alters fuel loads, increasing the likelihood of fire (DAWE 2020).
13. Illegal collection remains a potential threat to *Antrophyum austroqueenslandicum* despite all known individuals being located within a conservation area (DAWE 2020). Illegal collection is thought to be responsible for the extinction of the subpopulation at Lamington National Park (DAWE 2020).
14. Given the highly specific microclimate requirements of *Antrophyum austroqueenslandicum*, climate change is expected to limit the availability of suitable habitat and potentially exacerbate negative impacts to this species from flooding, drought, and bushfire. Average temperature, extreme rainfall events, drought severity, and fire risk are all projected to increase (CSIRO 2020). Disturbance events such as fire, floods, and drought have been documented to cause damage to *A. austroqueenslandicum* and its habitat (DAWE 2020).

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15. *Antrophyum austroqueenslandicum* (Lamington Ox Tongue Fern), D.L.Jones is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

## **Assessment against *Biodiversity Conservation Regulation 2017* criteria**

The Clauses used for assessment are listed below for reference.

**Overall Assessment Outcome:** Critically Endangered under clauses 4.2(1)(a), 4.2(2)(a)(d), 4.3(a)(d)(e, i, ii, iii, iv), 4.4(a)(d i)(e i,ii(A)(I)) and 4.5(a).

### **Clause 4.2 – Reduction in population size of species (Equivalent to IUCN criterion A)**

**Assessment Outcome:** Critically Endangered under clause 4.2(1)(a) and (2)(a)(d),

<b>(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:</b>			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
<b>(2) - The determination of that criteria is to be based on any of the following:</b>			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

### **Clause 4.3 – Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)**

**Assessment Outcome:** Critically Endangered under clause 4.3(a)(d)(e i, ii, iii, iv)

<b>The geographic distribution of the species is:</b>			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
<b>and at least 2 of the following 3 conditions apply:</b>			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,

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	(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:
	(i)	an index of abundance appropriate to the taxon,
	(ii)	the geographic distribution of the species,
	(iii)	the number of locations in which the species occur or of populations of the species.

### Clause 4.4 – Low numbers of mature individuals of species and other conditions

**(Equivalent to IUCN criterion Clause C)**

**Assessment Outcome: Critically Endangered under clause 4.4(a)(d i)(e i,ii(A)(I))**

<b>The estimated total number of mature individuals of the species is:</b>		
(a)	for critically endangered species	very low, or
(b)	for endangered species	low, or
(c)	for vulnerable species	moderately low.
<b>and either of the following 2 conditions apply:</b>		
(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
	(i)	for critically endangered species very large, or
	(ii)	for endangered species large, or
	(iii)	for vulnerable species moderate,
(e)	both of the following apply:	
	(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and
	(ii)	at least one of the following applies:
	(A)	the number of individuals in each population of the species is:
		(I) for critically endangered species extremely low, or
		(II) for endangered species very low, or
		(III) for vulnerable species low,
	(B)	all or nearly all mature individuals of the species occur within one population,
	(C)	extreme fluctuations occur in an index of abundance appropriate to the species.

### Clause 4.5 – Low total numbers of mature individuals of species

**(Equivalent to IUCN criterion D)**

**Assessment Outcome: Critically Endangered under clause 4.5(a)**

<b>The total number of mature individuals of the species is:</b>		
(a)	for critically endangered species	extremely low, or
(b)	for endangered species	very low, or
(c)	for vulnerable species	low.

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## Clause 4.6 – Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)

**Assessment Outcome:** Data Deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

## Clause 4.7 – Very highly restricted geographic distribution of species– vulnerable species

(Equivalent to IUCN criterion D2)

**Assessment Outcome:** Clause 4.7 is not met.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
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Professor Kristine French  
Chairperson  
NSW Threatened Species Scientific Committee

### Supporting Documentation:

Department of Agriculture, Water and the Environment (DAWE) (2020) Conservation advice for *Antrophyum austroqueenslandicum* (Lamington Ox Tongue Fern). Canberra: Department of Agriculture.

### References:

CSIRO (2020) Climate change in Australia Projections for Australian NRM Regions. CSIRO Department of the Environment Bureau of Meteorology. Available at: <https://www.climatechangeinaustralia.gov.au/en/climate-projections> (accessed 7th September 2020).

Department of the Environment (2012). Interim biogeographic regionalisation for Australia (regions – states and territories) v. 7 (IBRA). Commonwealth of Australia. Canberra. Available at: <https://www.environment.gov.au/land/nrs/science/ibra#ibra>.

IUCN Standards and Petitions Committee (IUCN) (2019). Guidelines for Using the IUCN Red List Categories and Criteria. Version 14. Prepared by the Standards and Petitions Committee. Downloadable from <http://www.iucnredlist.org/documents/RedListGuidelines.pdf>

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Silcock J, Collingwood T, Llorens T, Fensham R (2021) Action Plan for Australia's Imperilled Plants. NESP Threatened Species Recovery Hub, Brisbane.