

Notice of 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 orchid *Caladenia callitrophila* 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.

Summary of Conservation Assessment

Caladenia callitrophila D.L.Jones was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.4(a)(e i,ii B). The main reasons for this species being eligible are: (1) it has a very low population size (<250); (2) most mature individuals occur within one subpopulation; and (3) there is a continuing decline in the number of mature individuals due to threats from herbivory (grazing and browsing), forestry activities, habitat loss and destruction and climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Caladenia callitrophila* D.L.Jones (family Orchidaceae; Jones 1999; CHAH 2025; PlantNet 2025) was most recently described by Jones (2021) as “Leaf linear-lanceolate, 70–130 x 4–12 mm. Flower stem 200–350 mm tall, 1–2-flowered. Flowers 50–60 mm across, pale greenish-yellow with reddish markings; sepals with blackish to reddish clubs 6–13 mm long; petals lacking clubs. Dorsal sepal erect, 25–40 x 1.5–2 mm. Lateral sepals stiffly but obliquely decurved, 24–40 x 3.5–4 mm, divergent. Petals similarly arranged, 20–30 x 2–2.5 mm. Labellum stiffly hinged, 12–15 x 7–9 mm, yellowish base with red lines and maroon apex; margins with 6–9 pairs of red teeth to 1.3 mm long; tip recurved. Calli to 1 mm long, maroon, in 4 or 6 rows onto base of midlobe. Column 9.5–11.5 x 4–4.5 mm, translucent reddish; basal glands c.1.3 mm long, yellow with red basal stalk. Flowers: September to October.”
2. *Caladenia callitrophila* is endemic to the southern Riverina region of New South Wales (NSW). It is currently known to exist in three small, isolated subpopulations located within state forests between the towns of Berrigan and Balldale at altitude range of 120–170 m ASL (Copeland and Backhouse 2022). The subpopulations are separated by 16–50 km of cultivated farmland.
3. *Caladenia callitrophila* occurs in woodland of *Callitris glaucophylla* (white cypress pine), *Eucalyptus melliodora* (yellow box) and *Eucalyptus microcarpa* (western grey box), with a grassy and sparsely shrubby understorey, on red-brown sandy or sandy-loam soils. Most of the plants have been found in 3–4 m tall *Callitris glaucophylla* regrowth (G. Robertson *in litt.* Feb 2021). These habitat associations are not definitive or exhaustive; *C. callitrophila* may be associated with other biotic or abiotic conditions.

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4. The geographic distribution of *Caladenia callitrophila* is highly restricted. The area of occupancy (AOO) is estimated to be 12 km², based on three 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2024). The extent of occurrence (EOO) is estimated to be 310 km². The EOO is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2024).
5. There is a very low number of mature individuals of *Caladenia callitrophila*. The total number of *C. callitrophila* flowering plants recorded during the 2020 season, after good winter rain, was around 183 flowering plants, with the majority (>90%) of those occurring at one site (G. Robertson *in litt.* Feb 2021; DCCEEW unpubl. data). Following the much drier winter of 2023 only 14 flowering plants were recorded (DCCEEW unpubl data; L. Carrigan unpubl data; G. French unpubl data). It is difficult to estimate the current total population size of *C. callitrophila* as plants observed flowering in one season that did not re-emerge in the following season are not necessarily dead. Some may remain dormant underground, a common ecological strategy observed in orchids with a similar life history (Dixon and Tremblay 2009). Emergent numbers fluctuate primarily due to rain and soil moisture, and the underground population is probably capable of persisting for some years without emergence (Dixon and Tremblay 2009). However, given the season in 2020 was considered a year with good conditions for flowering, the population size is likely no more than 250.
6. Little is known of the specific details of the biology of *Caladenia callitrophila* however it is believed to be very similar to other spider orchids. *Caladenia* species are deciduous and die back to a dormant, fleshy tuber over summer (NSW DEC 2004; Dixon and Tremblay 2009). In *Caladenia*, tubers are generally replaced annually by a single daughter tuber on a vertical dropper, but few species appear to reproduce vegetatively by this means (Jones 2021). The tuber sprouts following sufficient late autumn/winter rains, with a single leaf developing above ground. Once the leaf is fully extended, a single flower may be produced. *Caladenia callitrophila* flowers in September to October if conditions are suitable and flowers persist for about a month depending on the seasonal conditions (NSW DEC 2004; Copeland and Backhouse 2022). The prominent calli on the labellum of *C. callitrophila* suggest that it is likely pollinated by nectar-foraging thynnid wasps (*Zaspilothynnus* sp.) (Reiter *et al.* 2019).
7. *Caladenia* species produce tiny dust-like seeds that disperse on wind currents (Dixon and Tremblay 2009), however as the plants usually grow under a dense woodland canopy, most seeds likely fall within just a few metres of the plant, indicating significant barriers to widespread dispersal, especially in fragmented populations (Machon *et al.* 2002; Brzosko *et al.* 2017). Seeds are short-lived in the soil seedbank as per other Orchidaceae, often lasting only one or two seasons (NSW DEC 2004; Dixon and Tremblay 2009). Successful germination requires sufficient moisture, adequate temperatures (usually 15–20°C) and the presence of a suitable mycorrhizal fungal symbiont at the soil surface (Batty *et al.* 2001; Ramsay and Dixon 2003; Dixon and Tremblay 2009).
8. The generation length of *Caladenia callitrophila* is not known but is likely to be similar to other species of *Caladenia*. While the time from seed germination to

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flowering for *Caladenia* species is largely unknown under natural habitat conditions, ex-situ plants have been observed to flower 2–3 years after germination (Swarts 2007). Based on data for closely related *Caladenia* species, these ex-situ plants likely live for at least 10–20 years (Swarts 2007, NSW DEC 2004).

9. The main threats to *Caladenia callitrophila* are from habitat clearing and fragmentation, herbivory pressure, weeds, and reduced reproductive success due to the effects of a changing climate. Clearing of woodlands dominated by *Callitris glaucophylla* has been extensive in the southern Riverina region, with an estimated loss of over 80% (Moore 1953; NSW DEC 2004; Thompson and Eldridge 2005; NSW DPE 2023). Most of the remaining vegetation has been, and continues to be, heavily modified due to a combination of grazing by domestic livestock, browsing by non-native and native animals, forestry activities, weed incursion and altered fire regimes. Currently in the Riverina, *C. glaucophylla* woodlands occur in highly fragmented remnants, with many managed as formal forestry reserves and such woodlands are very poorly represented in protected areas (Thompson and Eldridge 2005; NSW DPE 2023). The removal and degradation of this vegetation type has very likely had a significant impact on the distribution of *C. callitrophila*. 'Clearing of native vegetation' is listed as a key threatening process (KTP) under the Act.
10. Forestry operations can threaten *Caladenia callitrophila* by disturbing its habitat and disrupting its lifecycle, especially if conducted at inappropriate times or disturbing soil in areas where the plants occur. Harvesting practices, in particular, may pose a direct threat through physical damage from treefall, soil compaction, log dumps, and machinery. They can also indirectly threaten the species by facilitating the incursion of weeds following soil disturbance or opening of the canopy (NSW DEC 2004). Most *C. callitrophila* populations in state forests are found growing among regrowth *Callitris glaucophylla*, which suggests these areas provide suitable conditions for germination. However, harvesting of these stands may be detrimental to populations of *C. callitrophila*, either by direct physical damage or by promoting herbaceous competitors (NSW DEC 2004). The potential harm to *C. callitrophila* can be managed to some extent through pre-harvest surveys and appropriate harvest prescriptions, with consideration given to the potential poor detectability of the species in some years.
11. The impacts of herbivores, which includes both the consumption of vegetation, as well as the trampling and habitat destruction by domestic, feral and native herbivores, has the capacity to eliminate mature plants and/or disrupt reproductive processes resulting in a decrease in population numbers (NSW DEC 2004). The leaves and flower stems of *Caladenia* spp. are palatable and evidence of grazing by native and introduced vertebrate herbivores, including macropods, goats (*Capra hircus*) and sheep (*Ovis aries*), is frequently observed in areas accessible to these animals. Additionally, the tubers may be preyed upon by animals such as, rabbits (*Oryctolagus cuniculus*), white-winged choughs (*Corcorax melanorhamphos*) or pigs (*Sus scrofa*) (NSW DEC 2004; G. Robertson *in litt.* June 2024). Domestic livestock, particularly sheep and cattle, can also damage the habitat through pugging in wet conditions. The orchid's vulnerability to soil disturbance is increased by the positioning of the collar, its primary nutrient transfer organ, at the soil surface via the mycorrhizal associations (Dixon and Tremblay 2009). Additionally, grazing may negatively impact the plants that pollinators rely on, or the soils where female

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wasps build their nests (NSW DEC 2004). 'Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*', 'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa*', and 'Competition and habitat degradation by Feral Goats, *Capra hircus*' are listed as a KTPs under the Act.

12. There are a number of introduced weed species that occur near *Caladenia callitrophila* populations and in the surrounding state forest. These weeds can result in overshadowing and soil moisture depletion, reducing resources available for flower emergence and fruit development in the orchid. The invasive perennial exotic grass *Ehrharta calycina* has been identified as a direct threat to one of the populations of this species (NSW DEC 2004). Additionally, pasture weeds like *Brassica* spp. and *Trifolium* spp. have high coverage in some areas where the orchid is found. Annual grasses such as *Avena* spp., *Lolium* spp., *Bromus* spp., and *Vulpia* spp. are present in all the forests where this species has been recorded and where dense, appear to competitively exclude the terrestrial orchids (G. Robertson *in litt.* Feb 2021). 'Invasion of native plant communities by exotic perennial grasses' is listed as a KTP under the BC Act.
13. *Caladenia callitrophila* rely on late autumn and winter rains to trigger their emergence and flowering. Decreases in this seasonal rainfall as a consequence of climate change (ADAPT NSW 2024) are likely to make the habitat less suitable, reducing reproductive output for the species. In addition, the projected hotter temperatures and increase in drought frequency, severity and duration may result in a reduced flowering period for *Caladenia* species (NSW DEC 2004) and may also disrupt the critical overlap between orchid flowering times and pollinator activity, further compromising reproductive success (Brown *et al.* 2008). The highly specialized biotic relationships (with pollinators and mycorrhizal fungi) and limited reproductive resilience of *Caladenia* orchids, as evidenced by their low annual seedling recruitment, severely constrain the species' ability to migrate to new, climatically suitable sites, especially in highly fragmented landscapes. Consequently, climate change poses a significant threat to the long-term survival of the species (Dixon and Tremblay 2009). 'Anthropogenic Climate Change' is listed as a KTP under the Act.
14. *Caladenia callitrophila* occurs in 1–3 threat-defined locations as per the IUCN (2024) definition. The minimum of the range is met when considering the most serious plausible threat to be reduced reproductive output due to an increase in the occurrence and duration of droughts as a result of climate change. However, as there is some uncertainty around climate projections, habitat clearing and habitat modification (due to forestry activities or herbivore pressure) may alternatively be considered the most serious plausible threats. The result of the latter would be that the three subpopulations of *Caladenia callitrophila* equate to up to three threat-defined locations if each subpopulation has different types or temporal scales of adverse effects to the habitat.
15. *Caladenia callitrophila* 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

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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:

Caladenia callitrophila was found to be Critically Endangered under Clause 4.4(a)(e i,ii B).

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data Deficient

(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:			
	(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.
(2) - The determination of that criteria is to be based on any of the following:			
	(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: Endangered under Clause 4.3(b)(d)(e i,iii)

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(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 C)

Assessment Outcome: Critically Endangered under Clause 4.4(a)(e i,ii B)

The estimated total number of mature individuals of the species is:			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low,
and either of the following 2 conditions apply:			
	(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: Endangered under Clause 4.5(b)

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or

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	(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: Vulnerable under Clause 4.7

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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Supporting Documentation:

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