

## 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 rileyi* D.L.Jones as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

### Summary of Conservation Assessment

*Caladenia rileyi* D.L.Jones was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(b)(d)(e iii).

The main reasons for this species being eligible are (1) it has highly restricted geographic distribution (EOO is 327 km<sup>2</sup> and AOO is 36 km<sup>2</sup>); (2) it is severely fragmented and has a small number of threat based locations; and (3) there is an inferred continuing decline in the area, extent and/or quality of habitat due to threats from habitat loss and destruction, forestry and recreational activities, herbivory (grazing and browsing), weed incursion, and climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Caladenia rileyi* D.L.Jones (family Orchidaceae, Jones 1997; CHAH 2025; PlantNet 2025) was most recently described by Jones (2021) as “Leaf linear-lanceolate, 40–100 x 6–8 mm. Flower stem 80–250 mm tall, wiry, 1-flowered. Flowers 40–50 mm across, yellowish-green with red central stripes; sepals and petals with thickish brown clubs 6–25 x 3 mm, petal clubs shorter than sepals. Dorsal sepal erect, 40–55 x 2–3 mm, incurved. Lateral sepals obliquely deflexed, 40–55 x 3–3.5 mm, more or less parallel. Petals obliquely deflexed, 30–40 x 1.5–2 mm. Labellum delicately hinged, 17–20 x 18–20 mm, pale green with a white central patch and maroon apex; basal margins with 4–6 pairs of erect comb-teeth to 6 mm long; midlobe margins with 5–8 pairs short blunt teeth to apex; tip recurved. Basal calli c.4 mm long. Lamina calli to 3 mm long, maroon, in 4 crowded rows onto base of maroon patch. Column 12–14 x 5.5–6.5 mm, transparent with pink to red flecks and striae; basal glands obovoid, c.3 mm long, yellow with a reddish basal stalk shiny.”
2. *Caladenia rileyi* is endemic to the southern inland plains of New South Wales (NSW) and is restricted to a small area near the town of Narrandera, at 100–200 m elevation (Copeland and Backhouse 2022). The species is currently known to exist in only four subpopulations, all located on Crown land. Two of these subpopulations are in state forests, one is a Travelling Stock Reserve north of Narrandera, and one is found along a roadside site just east of Narrandera. The species is severely fragmented because these four sites are small and isolated patches of habitat (10–55 km apart), separated from one another by cultivated farmland.

## NSW Threatened Species Scientific Committee

---

3. The total number of mature *Caladenia rileyi* individuals is estimated to be less than 1,000. In the 2024 season, after favourable flowering conditions, a total of around 856 *C. rileyi* plants were recorded, including ~153 plants in flower at the time of the survey. It is unknown what proportion of the non-flowering emergent individuals were immature. The largest subpopulation, located in a state forest, contained 572 above-ground plants with 108 plants flowering (around ~71% of the total flowering plants) (DCCEEW unpubl. data). There is uncertainty in the total population size of *C. rileyi* due to unquantified levels of emergence and immaturity. 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).
4. The geographic distribution of *Caladenia rileyi* is highly restricted. The area of occupancy (AOO) is estimated to be 36 km<sup>2</sup>, based on nine 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2024). The extent of occurrence (EOO) is estimated to be 327 km<sup>2</sup>. 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. *Caladenia rileyi* grows in woodland habitats dominated by *Callitris glaucophylla* (white cypress pine), with a sparse understory of grasses and forbs on red-brown sandy soils or sandy clay loams (Jones 2021). *Caladenia rileyi* has been recorded in *Callitris glaucophylla* – *Eucalyptus melliodora* (yellow box) woodlands, *Callitris glaucophylla* – *Allocasuarina verticillata* (drooping sheoak) woodlands and woodlands dominated by a mixture of *Callitris glaucophylla*, *E. dwyeri* (Dwyer's red gum) and *Acacia doratoxylon* (currawang) (ALA 2024; G. Robertson *in litt.* Feb 2021). These habitat associations are not definitive or exhaustive; *C. rileyi* may be associated with other biotic or abiotic conditions.
6. Little is known of the specific details of the biology of *Caladenia rileyi* 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). *Caladenia rileyi* 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. rileyi* suggest that it is likely pollinated by nectar-foraging thynnid wasps (Reiter *et al.* 2019).
7. *Caladenia* species produce tiny dust-like seeds that disperse on wind currents (Dixon and Tremblay 2009). However, as *Caladenia rileyi* 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

## NSW Threatened Species Scientific Committee

---

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 rileyi* is not known but is likely to be similar to other species of *Caladenia*. While the time from seed germination to 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. There is an inferred continuing decline in the area, extent and/or quality of *Caladenia rileyi* habitat. The main threats to *C. rileyi* are habitat clearing fragmentation, herbivore pressure, weed incursion, recreational activities and reduced reproductive output due to the effects of a changing climate. 'Clearing of native vegetation', 'Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*', 'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa*', 'Competition and habitat degradation by Feral Goats, *Capra hircus*', 'Invasion of native plant communities by exotic perennial grasses', and 'Anthropogenic Climate Change' are listed as key threatening processes under the Act.
10. Clearing of woodlands dominated by *Callitris glaucophylla*, *Eucalyptus melliodora* and *E. microcarpa* (grey box) has been extensive in the 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 NSW South Western Slopes and Riverina regions, *Callitris 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). One of the state forest sites has been impacted by gravel extraction with areas that now contain little topsoil or organic matter (Backhouse 2020; A. Murphy *in litt.* Sept 2024) The removal and degradation of this vegetation type has very likely had a significant impact on the distribution of *C. rileyi*.
11. Forestry operations can threaten *Caladenia rileyi* by disturbing its habitat and disrupting its lifecycle, especially if conducted at inappropriate times. 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). Half of the *C. rileyi* subpopulations occur in state forests and are found growing among regrowth *Callitris glaucophylla*, which may be because individuals have been able to recover and persist *in situ* following the disturbance, or it could suggest that these areas provide suitable conditions for germination. However, harvesting of these stands may be detrimental to populations of *C. rileyi*, again, either by direct physical damage or by promoting

## NSW Threatened Species Scientific Committee

---

herbaceous competitors (NSW DEC 2004). The potential harm to *C. rileyi* 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.

12. The threat from herbivory to *Caladenia rileyi* is considered very high. The impacts of herbivores, which include both the consumption of vegetation, as well as the trampling and habitat destruction by domestic, feral and native herbivores, have the capacity to eliminate mature plants and/or disrupt reproductive processes resulting in a decrease in population numbers (NSW DEC 2004). Large quantities of herbivore scats were observed in the state forests sites in September 2024 (A. Murphy *in litt.* Sept 2024). 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*), sheep (*Ovis aries*) and cattle (*Bos taurus*), 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 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 (i.e., its primary nutrient transfer organ) at the soil surface (Dixon and Tremblay 2009). Grazing may also negatively impact the plants that pollinators rely on, or the soils where female wasps build their nests (NSW DEC 2004).
13. There are a number of introduced weed species that occur near *Caladenia rileyi* subpopulations and in the surrounding forests. These weeds can result in overshadowing and soil moisture depletion, reducing resources available for flower emergence and fruit development in the orchid. Pasture weeds like *Echium* spp., *Bartsia trixago*, *Brassica* spp. and *Trifolium* spp. have high coverage in some areas where the orchid is found. In addition, 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).
14. *Caladenia rileyi* relies on late autumn and winter rains to trigger emergence and flowering. However, rainfall is predicted to decrease on average with a substantial decline anticipated during autumn, winter and spring by 2070 under a high emissions scenario (ADAPT NSW 2024; CSIRO 2020). These changes are likely to make 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). Furthermore, the thynnid wasp pollinators of *Caladenia* species are parasitoids of scarabaeid larvae in soil. Climate change, either increased drought or increased rainfall, may negatively affect the availability of scarab larvae (Frew 2016) and therefore abundance of pollinators. 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

## NSW Threatened Species Scientific Committee

---

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).

15. Recreational activities including horse riding, mountain biking, motorbike riding, off-road vehicle use and camping, can cause destruction of, and physical damage to plants (e.g., trampling, crushing, uprooting); soil compaction; and soil disturbance, affecting soil moisture and encouraging the establishment of weeds. Populations of this species on public land close to roads, tracks, and walking trails tend to be more susceptible to these threats (Ecology Australia 2017). Over collection of plants or flowers may pose some risk to this species (NSW DEC 2004; A. Murphy *in litt.* Sept 2024).
16. Based on the most serious plausible threat of habitat clearing and modification (due to herbivore pressure and human disturbance), the four subpopulations of *Caladenia rileyi* can be considered to be four threat-defined 'locations' as per the IUCN (2024) definition. Each of these four locations have different types and levels of impact to the habitat and are unlikely to be affected by the same habitat clearing or modification event now and into the future.
17. *Caladenia rileyi* D.L.Jones is not eligible to be listed as a Critically Endangered species.
18. *Caladenia rileyi* D.L.Jones is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near 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:

*Caladenia rileyi* was found to be Endangered under Clause 4.3(b)(d)(e iii).

#### 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:			

## NSW Threatened Species Scientific Committee

	(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 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,
		(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: Data Deficient**

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,

## NSW Threatened Species Scientific Committee

	(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: Vulnerable under Clause 4.5(c)**

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
	(c)	for vulnerable species	low.

### 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.
-------------------------	--

Professor Angela Moles, FRSN  
Chairperson  
NSW Threatened Species Scientific Committee

# NSW Threatened Species Scientific Committee

---

## Supporting Documentation:

Bray C (2025) Conservation Assessment of *Caladenia rileyi* D.L.Jones (Orchidaceae). NSW Threatened Species Scientific Committee.

## References:

ADAPT NSW (2024) Murray, Murrumbidgee projections 2060-2079. Available at <https://www.climatechange.environment.nsw.gov.au/projections-map> (accessed 1 August 2024).

ALA (Atlas of Living Australia) (2024). <https://www.ala.org.au/> (accessed April 2024).

Backhouse G (2020) 'Spider Orchids: Caladenia Orchids of Australia' (Gary Backhouse: Melbourne).

Batty AL, Dixon KW, Brundrett MC, Sivasithamparam K (2001) Constraints to symbiotic germination of terrestrial orchid seed in a mediterranean bushland. *New Phytologist* **152**, 511–52.

Brown AP, Dundas P, Dixon KW, Hopper SD (2008) 'An illustrated guide to the orchids of Western Australia.' (University of Western Australia Press: Perth)

Brzosko E, Ostrowiecka B, Katowicz J, Bolesta M, Gromotowicz A, Gromotowicz M, Orzechowska A, Orzolek J, Wojdalska M (2017) Seed dispersal in six species of terrestrial orchids in Biebrza National Park (NE Poland). *Acta Societatis Botanicorum Poloniae*, 86(3).

CHAH (2025) Australian Plant Census (APC) *Caladenia rileyi* [Online]. Council of Heads of Australasian Herbaria. Available at <https://id.biodiversity.org.au/tree/51798259/51399327> (accessed 15 April 2025) Copeland LM, Backhouse GN (2022) 'Guide to native orchids of NSW and ACT.' (CSIRO Publishing: Clayton South, Victoria)

CSIRO (2020) Climate change in Australia, Murray Basin. Available at <https://climatechangeinaustralia.gov.au/en/projections-tools/regional-climate-change-explorer/sub-clusters/?current=MBC&tooltip=true&popup=true> (accessed 1 August 2024)

Dixon K and Tremblay RL (2009) Biology and natural history of *Caladenia*. *Australian Journal of Botany* **57**, 247–258.

Ecology Australia (2017) Wild Orchids Project: Reserve prioritisation and identification of recipient sites. Report prepared for Murray Local Land Services.

Frew A (2016) How the soil environment affects root feeding scarabs with particular emphasis on the canegrub. PhD Thesis, Western Sydney University, Australia. <https://researchdirect.westernsydney.edu.au/islandora/object/uws%3A41122>



## NSW Threatened Species Scientific Committee

---

- IUCN Standards and Petitions Subcommittee (2024) Guidelines for Using the IUCN Red List Categories and Criteria. Version 16.  
[https://nc.iucnredlist.org/redlist/content/attachment\\_files/RedListGuidelines.pdf](https://nc.iucnredlist.org/redlist/content/attachment_files/RedListGuidelines.pdf)
- Jones DL (1997) Towards a revision of the *Caladenia dilatata* R.Br. (Orchidaceae) complex – 1: The *Caladenia dilatata* alliance. *The Orchadian* **12**, 157–171.
- Jones D (2021) ‘A complete guide to native orchids of Australia: Third Edition.’ (New Holland Publishers: Australia).
- Machon N, Bardin P, Mazer SJ, Moret J, Godelle B, Austerlitz F (2002) Relationship in genetic structure and seed and pollen dispersal in the endangered orchid *Spiranthes spiralis*. *New Phytologist* **157**, 677–687.
- Moore CWE (1953) The vegetation of the south-eastern Riverina, New South Wales 1: the climax communities. *Australian Journal of Botany* **1**, 485–547.
- NSW DEC (Department of Environment and Conservation) (2004) *Caladenia arenaria* Fitzg. Recovery Plan. NSW Department of Environment and Conservation. Hurstville.
- NSW DPE (Department of Planning and Environment) (2023) Updating BioNet plant community types: PCT master list C2.0 (2023), NSW Department of Planning and Environment, Parramatta. Available at <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/BioNet/Updating-bionet-PCTs-PCT-masterlistC2-0-230379.pdf> (accessed 1 August 2024)
- PlantNET (2025) The Plant Information Network System of The Royal Botanic Gardens and Domain Trust Version 2.0. Available at <https://plantnet.rbgsyd.nsw.gov.au/> (accessed 15 April 2025)
- Ramsay M, Dixon KW (2003) Propagation science, recovery and translocation of terrestrial orchids. In ‘Orchid conservation’. (Eds KW Dixon, SP Kell, RL Barrett, PJ Cribb) pp. 25–42. (Natural History Publications: Kota Kinabalu, Sabah, Malaysia)
- Reiter N, Bohman B, Freestone M, Brown G, Phillips R (2019) Pollination by nectar-foraging thynnine wasps in the endangered *Caladenia arenaria* and *Caladenia concolor* (Orchidaceae). *Australian Journal of Botany* **67**, 490–500.
- Swarts ND (2007) ‘Integrated conservation of the rare and endangered terrestrial orchid *Caladenia huegelii* H.G.Reichb.’ PhD Thesis, The University of Western Australia, Perth.
- Thompson WA, Eldridge DJ (2005) White cypress pine (*Callitris glaucophylla*): a review of its role in landscape and ecological processes in eastern Australia. *Australian Journal of Botany* **53**, 555–570.