

NSW Threatened Species Scientific Committee

Notice of Preliminary Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Preliminary Determination to support a proposal to list the tree *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act and, as a consequence, to omit reference to *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill in Part 2 of Schedule 1 (Endangered species) of the Act.

How to make a submission

The NSW TSSC welcomes public involvement in the assessment process and places preliminary determinations on public exhibition on the NSW TSSC pages on the Department of Planning, Industry and Environment (DPIE) website. This public exhibition provides an opportunity for the public to comment on this preliminary determination as well as provide any additional information that is relevant to the assessment.

Postal submissions regarding this Preliminary Determination may be sent to:

Secretariat
NSW Threatened Species Scientific Committee
Locked Bag 5022
Parramatta NSW 1481.

Email submissions in Microsoft Word or PDF formats may be sent to:
scientific.committee@environment.nsw.gov.au

Submissions close 28th October 2023.

What happens next?

After considering any submissions received during the public exhibition period the NSW TSSC will make a Final Determination and a notice will be placed on the DPIE website to announce the outcome of the assessment. If the Final Determination is to support a listing, then it will be added to the Schedules of the Act when the Final Determination is published on the legislation website. www.legislation.nsw.gov.au.

Privacy information

The information you provide in your submission may be used by the NSW TSSC in the assessment to determine the conservation status and listing or delisting of threatened or extinct species, threatened populations and threatened or collapsed ecological communities or to assess key threatening processes.

The NSW TSSC may be asked to share information on assessments with NSW Government agencies, the Commonwealth Government and other State and Territory governments to collaborate on national threatened species assessments using a common assessment method and to assist in the management of species and ecological communities.

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If your submission contains information relevant to the assessment it may be provided to state and territory government agencies and scientific committees as part of this collaboration.

If you wish your identity and personal information in your submission to be treated as confidential you must:

- ***request your name be treated as confidential***, and
- ***not include any of your personal information in the main text of the submission or attachments so that it can be easily removed.***

Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

NSW Threatened Species Scientific Committee

Public Exhibition period: 28/07/2023 – 28/10/2023

Preliminary Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Preliminary Determination to support a proposal to list the tree *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act and, as a consequence, to omit reference to *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill in Part 2 of Schedule 1 (Endangered species) of the Act. Listing of Vulnerable species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Eucalyptus parvula L.A.S.Johnson & K.D.Hill was found to be Vulnerable in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (c) (d) (e iii,iv) because: (i) *E. parvula* has a highly restricted extent of occurrence (EOO) of 560 km² and area of occupancy (AOO) of 92 km²; (ii) the species has seven threat-defined locations; and (iii) continuing declines are inferred in area, extent and/or quality of habitat and the number of locations or populations due to threats including livestock grazing, changes in temperature and rainfall due to climate change, and land clearing and degradation.

The NSW Threatened Species Scientific Committee has found that:

1. *Eucalyptus parvula* is described as a “tree to 15 m high; bark persistent, shedding imperfectly on lower trunk, red-brown, fibrous-flaky or platy; smooth above, grey or green, shedding in long ribbons. Juvenile leaves opposite, elliptic to obovate to broad-lanceolate, glossy green. Adult leaves disjunct or opposite, lanceolate, 4–7 cm long, 0.6–1 cm wide, green, dull, concolorous. Umbellasters 7-flowered; peduncle terete, 4–7 mm long. Buds sessile, ovoid, 3–5 mm long, 2–3 mm diam., scar present; calyptra conical, shorter than and as wide as hypanthium. Fruit cylindrical, conical or ovoid, 3–4 mm long, 3–4 mm diam.; disc raised slightly; valves enclosed or rim-level.” (PlantNET 2022). *Eucalyptus parvula* was previously known as *Eucalyptus parvifolia* (Cambage 1909) but was renamed *E. parvula* by Hill and Johnson (1991) as the original name had already been used for a fossil eucalypt species.
2. The geographic distribution of *Eucalyptus parvula* is highly restricted, occurring primarily between Badja to the north and Cathcart in the south (NSW Scientific Committee 2009). It was previously thought that it may extend to Tinderry where some old (1963 and undated), outlying records were georeferenced, however recent examination of the herbarium specimens associated with these records found them to be misidentifications (G. Phillips *in litt.* July 2022). Recent examination of another two old (1971, 1995) herbarium specimens associated with outlying records near Wadbilliga Trig, and the absence of known habitat at the described locality, support the conclusion that these records were most likely misidentified as well (G. Phillips *in litt.* July 2022; J. Miles *in litt.* July 2022). The distribution lies within the South Eastern Highlands Bioregion and may extend into

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the adjacent South East Corner Bioregion (Department of Climate Change, Energy, the Environment and Water 2020), on the traditional lands of the Yuin (Walbanga and Djiringanj), Thaua and Ngarigo First Nations people (Horton 1996; NSW NPWS 2019; Tindale 1940).

3. Approximately 27% of known individuals of *Eucalyptus parvula* occur in South East Forest National Park and Wadbilliga National Park. Previous assessments suggested that the species may also occur in Tinderry Nature Reserve, Kybeyan State Conservation Area and Deua National Park, however re-examination of the location descriptions and herbarium specimens related to those records, and an absence of any recent records in these protected areas suggest that the georeferences, and/or species identifications were erroneous. The remaining occurrences of known individuals are on private property for which the predominant land use is cattle grazing.
4. The NSW Scientific Committee (2009) states “*Eucalyptus parvula* grows mainly in grassy woodlands around the edges of broad, flat headwater valleys in frost-prone areas at altitudes of 800–1200 m above sea level (Hill 2002; Miles 2008). It occurs on poorly drained humic soils derived from granite or granodiorite (Miles 2008). Associated species include *E. pauciflora* (Snow Gum), *E. stellulata* (Black Sally), and occasionally *E. viminalis* (Ribbon Gum), *E. ovata* (Swamp Gum), and *E. rubida* (Candlebark) (Miles 2008).” The NSW Scientific Committee (2009) also states “as populations of *Eucalyptus parvula* grow mainly on flats within headwater valleys separated by low ridges, its habitat is naturally patchy in the landscape (Miles 2008). However, clearing of woodlands in this habitat for grazing may also have contributed to fragmentation of the populations (Prober *et al.* 1990)”.
5. Extent of occurrence (EOO) and area of occupancy (AOO) for the species were calculated using Kew Geospatial Conservation Assessment Tool (GeoCAT; Bachman *et al.* 2011) based on a cleaned dataset with erroneous records excluded. The EOO is estimated to be 560 km² based on a minimum convex hull polygon encompassing all cleaned records of the species as recommended by IUCN (2022). The AOO is estimated to be 92 km² based on 23 2 x 2 km grid cells, the scale recommended for assessing AOO recommended by IUCN (2022). This encompasses the entire known historical and extant distribution of the species.
6. There are nine known populations of *Eucalyptus parvula* with a total of c. 3,476–4,046 mature individuals, as well as 4 outlier records which have very low accuracy and have not been formally surveyed. This estimate of the number of populations is based on several assumptions. Firstly, the two sites of occurrence at Duck Hole Creek are most likely part of one continuous population. Secondly, given the likely pollen and seed dispersal distances, it is unlikely that gene flow occurs regularly across distances greater than 1,000 m. And finally, the occurrence records at Badja have been assumed to represent a single population, due to the poor quality of information available from this area (old records with low spatial accuracy).
7. Accuracy of population counts is variable. Most stands are comprised mainly of single stemmed individuals with no evidence of resprouting, and counts are straightforward. However, at the Dragons Swamp population accurate counts are

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difficult due to the presence of many multi-stemmed plants that have resprouted from lignotubers. Dense sod grass often conceals the lignotuber surface making it difficult to determine whether closely growing stems are multiple plants or single resprouting individuals (Miles 2017). There is, therefore, some uncertainty over the total population estimate for *E. parvula*. Furthermore, some of the populations were burnt during the 2019–2020 fire season and have not been formally resurveyed since.

8. There are seven threat-defined locations for *E. parvula* based on the most serious plausible threat of inhibited recruitment due to livestock grazing. This is considered the most serious plausible threat due its past and present contribution to population reduction and decline, as well as its role in reducing the species' resilience to all other threats. Approximately 71% of the total population size, and five of the nine verified populations, occur on properties subject to livestock grazing.
9. Continuing declines are inferred for the habitat area, extent and quality; and the number of locations or populations due to the current observed threats of inhibited recruitment, due to livestock grazing and trampling, drought stress, and higher temperatures, fewer cool nights, higher precipitation in summer, and lower precipitation in winter due to anthropogenic climate change. As a large portion of the population occurs on private property, further clearing of the species and its habitat, and interference with drainage, also pose significant threats. The senescence of mature plants without any recruitment at sites such as Steeple Road Flat, and the private property side of Mowitts Swamp Creek, is evidence that these declines are currently occurring.
10. Some observations suggest hybridisation between *Eucalyptus parvula* and *Eucalyptus viminalis* and *Eucalyptus rubida* (later suspected to be *Eucalyptus dalrympleana*) (Prober *et al.* 1990; Miles 2017). These observations mainly occur along the margins of cleared areas at Two Rivers Plain and Badja, with a small number of possible hybrids also observed at Dragon Swamp Creek and New Line Road. "Invasion by seedlings of other tree species from surrounding forests and woodlands may lead to a decrease in the competitive advantage of *E. parvula* within its habitat and possibly an increase in the frequency of hybridisation with related *Eucalyptus* species (Miles 2008)." (NSW Scientific Committee 2009).
11. In 2017 the population structure for the species primarily consisted of mature individuals, with an average of about 70% of individuals being mature across the known populations. The Dragons Creek Swamp population was primarily composed of coppiced, resprouting trees, and most sites had a handful of dead plants and plants that looked to be in poor condition (Miles 2017). This population structure is not unusual for a species with episodic recruitment driven by disturbance, and with recruitment inhibited in the majority of populations subject to livestock grazing. Following the 2019–2020 bushfires, this population structure may have changed, with approximately 20% of total occurrence records in areas mapped as having burnt at moderate to extreme severity (Wilkins and Le Breton 2023). This would have resulted in burnt individuals resprouting from their lignotubers as well as seedling germination. There also may have been some mortality due to the compounding effect of pre-fire drought.

12. The main threats to *Eucalyptus parvula* include livestock grazing and trampling leading to lack of recruitment; native vegetation clearing; changes in temperature and rainfall due to climate change; alteration of drainage; uprooting and ringbarking of individuals by feral pigs and deer; infection by *Phytophthora cinnamomi*; and recruitment suppression by invasive exotic plants 'Clearing of native vegetation', 'Anthropogenic Climate Change', 'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands', 'Herbivory and environmental degradation caused by feral deer' and 'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758', 'Infection of native plants by *Phytophthora cinnamomi*' and 'Invasion of native plant communities by exotic perennial grasses' are listed as Key Threatening Processes under the Act.
13. The variable recruitment observed among and within populations of *Eucalyptus parvula* is likely related to variation in livestock grazing regimes. At Two Rivers Plain, where livestock have some access, recruitment was observed to be quite common in some patches, while absent in others, particularly around isolated old trees (Miles 2017). A flush of regrowth observed at one of the Two Rivers Plain properties may have resulted from a change in land ownership and a decrease in stocking rates. No evidence of recruitment has been observed in the Steeple Flat population, or the western portion of the Mowitt's Swamp Creek population, which are both grazed (Miles 2017). Whilst grazing pressure can vary over time and from property to property, the smaller and more isolated populations are considered to be most threatened (Miles 2008, NSW Scientific Committee 2008). Approximately 71% of the total population size, and five of the nine verified populations, occur on lands subject to livestock grazing and trampling.
14. The damp frost-hollow valley floor habitat of *Eucalyptus parvula* is naturally patchy in the landscape (Miles 2017) and has been further fragmented and restricted to mainly marginal, edge habitat due to clearing of flats for grazing (Prober *et al.* 1990). While the majority of clearing events are likely in the past now, the species is still at risk from smaller clearing events eroding the remnant patches of the species on private land. One such event occurred at Two Rivers Plain in the mid 1990s, which appears to have resulted in prolific recruitment rather than a decline. This may be due to relatively low stocking rates of livestock in the area at the time (NSW Scientific Committee 2008). Should clearing coincide with high levels of grazing or drought, successful recruitment would be unlikely.
15. Climate change is a threat to *Eucalyptus parvula* as its relatively narrow habitat requirements and climatic niche make it vulnerable to changes in temperature and rainfall. It is restricted to tablelands above 1,000 m (Brooker & Kleinig, 2006), often in swampy areas (Briggs, 2000, pers. comm.) and frost hollows in shallow valleys. Fogs are common and up to 100 frosts a year occur, as well as snow which may persist on the ground for several days (Pryor 1981; Approved Conservation Advice 2008). Individuals of the species have been observed to die back during short-term drying conditions (Miles 2017), and increased drought severity and/or frequency may cause plant death. "As the habitat of *Eucalyptus parvula* is located in the coldest, wettest parts of the landscape within its range, under conditions of

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increased average temperatures and possibly lower effective rainfall, the viability of populations could be reduced if the region becomes warmer and drier, as projected under future climate scenarios (Hennessy et al. 2002)” (Approved Conservation Advice 2008). Recent climate projections suggest an increase in mean daily minimum temperature across the species’ distribution for all seasons (AdaptNSW 2022). *E. parvula* seed may require cold stratification (chilling) to break a physiological dormancy (G. Phillips *in litt.* September 2022), and projected increasing temperatures may affect germination rates. An increase in temperature and decrease in winter and spring precipitation could also result in general drying out of swampy flats and an increase in fire risk. Although the lignotuber provides some tolerance to drought, increases in frequency and duration combined with lack of recruitment, will likely lead to further reductions of mature individuals and suitable habitat.

16. Evidence of an attempt to drain the wet flats by cutting a surface drain was observed on private property at Mowitts Swamp Creek during the 2017 surveys (Miles 2017). The species is known to be susceptible to drought, and the draining of wet areas is likely to exacerbate the effects of even minor periods of reduced rainfall.
17. Feral pigs (*Sus scrofa*) are present within and around *Eucalyptus parvula* populations and pose a threat to juveniles by disturbing or uprooting them while digging and foraging. Pigs may also act as vectors for the spread of *Phytophthora* (Miles 2017). Feral deer (*Cervus* spp.) are also present in the area and pose a threat to young plants, by ringbarking them. Evidence of *E. parvula* and *Eucalyptus pauciflora* saplings being ringbarked by deer was recorded during the 2017 surveys (Miles 2017). Like pigs, deer may also act as a vector for transporting *Phytophthora* into uninfected areas.
18. The *Eucalyptus parvula* populations at Dragon Swamp Creek, New Line Road and Nunnock swamp sites were all noted as having numerous unthrifty plants with dead and dying branches in 2017, with *Phytophthora cinnamomi* being considered the most likely cause (Miles 2017). Neither Mowitts Swamp Creek nor Two Rivers Plain exhibited any indication of the presence of *P. cinnamomi*, however, nearby roads are considered potential sources of infection (Miles 2017). The susceptibility of *Eucalyptus parvula* to the pathogen *P. cinnamomi* is unknown, however 33 species of *Eucalyptus* in NSW are currently known to be susceptible to *P. cinnamomi* infection, including *E. viminalis*, which is closely related to *E. parvula*. Drought and other stressors, such as the co-occurrence of other pathogens and insects, has been found to place species which are normally tolerant, at risk of disease from *P. cinnamomi* (McDougall and Liew 2020). McDougall and Liew (2020) found that poor tree health often has a cause other than *P. cinnamomi*; largely drought which has very similar symptoms to plants affected by *P. cinnamomi*. Although eucalypts rarely die from *P. cinnamomi* infection, it can exacerbate other stressors.
19. The invasive exotic plants Blackberry (*Rubus fruticosus* species complex), Hawthorn (*Crataegus monogyna*), Yorkshire Fog (*Holcus lanatus*), Sweet Vernal Grass (*Anthoxanthum odoratum*) and Clovers (*Trifolium* species) all occur at

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various *Eucalyptus parvula* sites, and these species are likely to suppress and compete with *E. parvula* seedlings.

20. *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill is not eligible to be listed as an Endangered or Critically endangered species.

21. *Eucalyptus parvula* L.A.S.Johnson & K.D.Hill is eligible to be listed as a Vulnerable species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term 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: Vulnerable under Clause 4.3 (c) (d) (e iii,iv).

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: Vulnerable under Clause 4.3 (c) (d) (e iii,iv).

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:			

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	(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: Not met

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.

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Clause 4.5 - Low total numbers of mature individuals of species

(Equivalent to IUCN criterion D)

Assessment Outcome: Not met

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: 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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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

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