

# 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 shrub *Darwinia glaucophylla* B.G.Briggs as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act and, as a consequence, to omit reference to *Darwinia glaucophylla* B.G.Briggs in Part 3 of Schedule 1 (Vulnerable Species). Listing of Endangered species is provided for by Part 4 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 NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) 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 2124.

Email submissions in Microsoft Word or PDF formats to:

[scientific.committee@environment.nsw.gov.au](mailto:scientific.committee@environment.nsw.gov.au)

Submissions close 11 January 2025

### 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 NSW DCCEEW 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](http://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.

# NSW Threatened Species Scientific Committee

---

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: 11/10/2024 - 11/01/2025**

## **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 shrub *Darwinia glaucophylla* B.G.Briggs as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act and, as a consequence, to omit reference to *Darwinia glaucophylla* B.G.Briggs in Part 3 of Schedule 1 (Vulnerable Species). Listing of Endangered species is provided for by Part 4 of the Act.

## **Summary of Conservation Assessment**

*Darwinia glaucophylla* B.G.Briggs was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(b)(d)(e i,ii,iii,iv) because: 1) it has a highly restricted geographic range with an Extent of Occurrence (EOO) of 54–88 km<sup>2</sup> and an Area of Occupancy (AOO) of 48–64 km<sup>2</sup>; 2) it occurs at five threat-defined locations; and 3) there is continuing decline observed and inferred in the EOO, AOO, area, extent and quality of habitat, number of locations and subpopulations, and number of mature individuals of *D. glaucophylla* due to the combined effects of adverse fire regimes, clearing and land degradation, and increased frequency, intensity and duration of drought due to climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Darwinia glaucophylla* B.G.Briggs (family Myrtaceae) is described in PlantNET (2022) as: “Spreading, prostrate shrub with ascending branchlets to 15 cm high. Leaves laterally compressed, 8–17 mm long, glabrous, glaucous, and often tinged red purple. Flowers mostly in clusters of 2–4; peduncles 1–1.5 mm long; bracts leaf-like, 8–12 mm long; bracteoles oblong, 4–6 mm long, red brown. Hypanthium 7–8 mm long, 0.5–1.5 mm diam., with prominent ribs. Sepals triangular, ≤ 0.5 mm long, entire or toothed; much shorter than petals. Style straight, 12–16 mm long, white.”
2. *Darwinia glaucophylla* is endemic to the New South Wales (NSW) Central Coast region. It occurs entirely within the Gosford local government area, having a small geographical range between the area of Narara and the Hawkesbury River, and extending west to Calga (Focus Flora 2018).
3. Within its narrow range, *Darwinia glaucophylla* has been recorded in four discrete areas: an area west of Mooney Mooney Creek (Mooney Mooney West), to the east of Mooney Mooney Creek (Mooney Mooney East), Strickland State Forest, and near to Patonga (Focus Flora 2018). Given these four areas are separated by a minimum distance of 2.9 km between Strickland and Mooney Mooney East and a maximum distance of 7 km between Mooney Mooney East and Patonga, there is likely to be limited genetic exchange between areas, and each is considered a separate subpopulation as defined by IUCN (2024).
4. As *Darwinia glaucophylla* often forms large dense mats, accurately determining the number of individuals present during survey efforts is difficult (Booyens 2010). As of April 2021, surveys have counted a minimum of 5,189 individuals across the population (Focus Flora 2018, 2019, 2020). These counts are based on transects

## NSW Threatened Species Scientific Committee

---

where individuals are counted when they can be distinguished, or otherwise counting a continuous mat as one individual, resulting in conservative estimates of mature individuals (Focus Flora 2018). These counts were then converted to an occupied area of the habitat searched, with this density then extrapolated across other verified but uncounted records in areas of suitable habitat. This results in a minimum current estimate of 6,860 mature individuals across the entire population (Focus Flora 2021), with over 70% of the population occurring within Brisbane Water and Popran National Parks.

5. *Darwinia glaucophylla* has a very highly restricted geographic distribution. The EOO is estimated as 54–88 km<sup>2</sup>, based on a minimum convex polygon containing all known occurrences, the method of assessment recommended by IUCN (2024). The AOO is estimated as 48–64 km<sup>2</sup> using 2 x 2 km grid cells, the scale recommended by IUCN (2024). Minimum figures for AOO and EOO exclude the Patonga subpopulation which has not been recorded since 2000, and the southernmost records in the Mooney Mooney East subpopulation which have not been recorded since 1978 despite intensive surveys in recent years (Focus Flora 2018), with the maximum figures inclusive of all confirmed records of the species.
6. *Darwinia glaucophylla* inhabits friable, shallow skeletal soils on Hawkesbury Sandstones (Booyens *et al.* 2014). The species is associated with sandy heath, scrub and woodlands often associated with sandstone rock platforms or near hanging swamps. Associated vegetation communities are adapted and prone to fire (OEH 2017). *Darwinia glaucophylla* appears to grow in gaps in the canopy caused by rocky outcrops, fire, and where vegetation has been cleared and maintained for easements. It is conspicuous in areas regularly slashed such as along a gas pipeline and powerline easements within Popran and Brisbane Water National Parks (Booyens *et al.* 2014). It is rarely detected in adjacent unslashed habitat, or areas long undisturbed by fire or other means (Focus Flora 2020). *Darwinia glaucophylla* is considered likely to be shade intolerant and therefore will increase in abundance and density after disturbances that improve light availability (Booyens 2010, Booyens *et al.* 2014).
7. *Darwinia glaucophylla* is often associated with species such as *Banksia ericifolia*, *Acacia terminalis*, *A. oxycedrus*, *Angophora hispida*, *Hakea teretifolia* and *Bauera rubioides* (OEH 2017). It also occurs in open woodland where it is associated with *Corymbia gummifera*, *C. eximia*, *Eucalyptus haemastoma* and *E. punctata* (OEH 2017).
8. *Darwinia glaucophylla* is a fire sensitive obligate seeder with adults being killed by fire, and germination being heat stimulated (Auld and Scott 1997, Auld and Ooi 2009). The species has an expected lifespan of 20–30 years (Booyens *et al.* 2014), rare germination outside of mass disturbance events (Focus Flora 2018, 2021), and even-aged stands where it occurs (G. Phillips pers. obs. October 2021). The soil seedbank is likely relatively short-lived. Findings in related *Darwinia* species indicate that the genus has *in situ* seedbank half-lives of less than one year, with a small portion (7–22%) of seeds remaining viable after two years (Auld *et al.* 2000). Consequently, continual seed input is required in most seasons to maintain the soil seedbank and enable seedling recruitment after fires (Auld *et al.* 2000).

## NSW Threatened Species Scientific Committee

---

9. *Darwinia glaucophylla* has physiologically dormant seeds, with germination cued by heat shock (Auld and Ooi 2009). Anywhere from 39–75% of seeds in a given crop display dormancy and are therefore available for incorporation into the soil seedbank (Auld and Ooi 2009). The non-dormant portion becomes inviable if it does not germinate soon after dispersal. Ideal temperatures for heat shock treatment to relieve dormancy in *D. glaucophylla* are typically 80–100°C, but temperatures as low as 60°C can stimulate germination in some seed crops (Auld and Ooi 2009). These temperatures are similar to conditions found at burial depths of 1–2 cm during a bushfire (Bradstock and Auld 1995). This indicates that intermittent wildfire likely plays a key role in the recruitment cycle and maintenance of *D. glaucophylla* stands. However, hotter fires producing soil temperatures above 100° C often result in seed mortality up to 100% (Auld and Ooi 2009), and the subsequent decline or loss of stands.
10. Major threats that may act across the *Darwinia glaucophylla* population include adverse fire regimes, clearing and land degradation for urban development, increased frequency and duration of drought due to climate change, and infection by myrtle rust (*Austropuccinia psidii*) (OEH 2017; Focus Flora 2018; Makinson 2018). Invasion by exotic weeds is considered a minor threat that may act locally at the site level (Focus Flora 2018). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Anthropogenic climate change', 'Clearing of native vegetation', and 'Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' are listed as Key Threatening Processes under the Act.
11. When the threats of adverse fire regimes, in particular more frequent and severe wildfires, and fragmentation and clearing due to development are considered, the population of *Darwinia glaucophylla* can be treated as 5–6 threat-defined locations. This is due to an increase of severe wildfire occurrences being the most serious plausible threat that results in the lowest number of locations for patches that exist within intact bushland, while clearing and land degradation for urban development is the most serious plausible threat for those patches occurring within and immediately adjacent to the urban matrix. The probable loss of the Patonga location results in the lower number of locations (5) being the most appropriate for this assessment.
12. Decline has been observed and is strongly inferred to continue in the EOO, AOO, area, extent and quality of habitat, number of locations and subpopulations, and number of mature individuals of *Darwinia glaucophylla*. This is due to the combined effects of adverse fire regimes, clearing and land degradation, and the increased frequency, intensity and duration of drought due to climate change. *Darwinia glaucophylla* appears to have suffered a large contraction in the south of its range since 2000, with the Patonga subpopulation (150 mature individuals) and records on the southern edge of the Mooney Mooney East subpopulation not having been re-recorded since this time despite substantial survey effort (Focus Flora 2018, 2019, 2020, 2021). These areas were affected by high severity fire in 2003 (Mooney Mooney East) and 2006 (Patonga; NSW NPWS 2006, 2022), following on from several years of intense drought (BOM 2023), and it is highly plausible that these events resulted in the loss of the Patonga subpopulation/location and the

# NSW Threatened Species Scientific Committee

---

southern edge of the Mooney Mooney subpopulation. Additionally, there has been observed dieback of adult *D. glaucophylla* cover at several sites during surveys between 2018 and 2021 that is likely attributable to the acute drought conditions experienced across the Central Coast between August 2017 and September 2019 (Focus Flora 2020).

13. The Central Coast Region is projected to become hotter, have fewer colder nights under 2°C annually, more hot days over 35°C annually and an increase in average and severe fire weather by 2079 (CSIRO and BOM 2022; AdaptNSW 2023). Additionally, fire weather is predicted to become harsher, and the time spent in drought is predicted to increase on the East Coast through the 21<sup>st</sup> century (CSIRO 2023). This may result in further extirpation of patches and/or subpopulations as has been observed at Patonga, or decline in mature individuals over time in cases where fires and/or drought become frequent enough to reduce plant cover, maturation times and soil seed bank development.
14. Inferred decline in habitat quality from clearing and land degradation due to urban development is also apparent. The loss of a number of records within the development footprint of the Somersby Industrial Park (BioNet 2023), remaining plants in the industrial area existing in small, degraded remnants (Connell Wagner 2005) and the threat of further development within the distribution of *Darwinia glaucophylla* (DPE 2022) is resulting in declines habitat quality and mature individuals. This and other aforementioned threats indicate that the EOO, AOO, area, extent and quality of habitat, number of locations and subpopulations and number of mature individuals of *D. glaucophylla* are likely to remain under pressure, and observed declines are inferred to continue into the future.
15. *Darwinia glaucophylla* B.G.Briggs is not eligible to be listed as a Critically Endangered species.
16. *Darwinia glaucophylla* B.G.Briggs 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: Endangered under Clause 4.3(b)(d)(e i,ii,iii,iv)**

### **Clause 4.2 – Reduction in population size of species**

**(Equivalent to IUCN criterion A)**

**Assessment Outcome: Data deficient**

<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

## NSW Threatened Species Scientific Committee

	(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: Endangered under Clause 4.3(b)(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,
		(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**

<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>			

## NSW Threatened Species Scientific Committee

	(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: 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**



# NSW Threatened Species Scientific Committee

---

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.
-------------------------	--

Senior Professor Kristine French  
Chairperson  
NSW Threatened Species Scientific Committee

## Supporting Documentation:

Taylor C, Phillips G (2024) Conservation Assessment of *Darwinia glaucophylla* B.G.Briggs (Myrtaceae). NSW Threatened Species Scientific Committee.

## References:

AdaptNSW (2023) Interactive climate change projections map. URL: <https://www.climatechange.environment.nsw.gov.au/projections-map> (accessed 7 November 2023).

Auld TD, Scott J (1997) Conservation of endangered plants in urban fire-prone habitats. In 'Proceedings: Fire Effects on Rare and Endangered Species and Habitats Conference, Coeur D'Alene, Idaho, November 1995' (Ed. Greenlee JM). pp. 163–171. (International Association of Wildland Fire).

Auld TD, Ooi MKJ (2009) Heat increases germination of water-permeable seeds of obligate seeding *Darwinia* species (Myrtaceae). *Plant Ecology* **200**: 117–127.

Auld TD, Keith DA, Bradstock RA (2000) Patterns in longevity of soil seedbanks in fire-prone communities of south-eastern Australia. *Australian Journal of Botany* **48**: 539–548.

BioNet (2023) Records of Plants (Species: *Darwinia glaucophylla*) recorded until 18 Oct 2023. [dataset]. NSW Department of Climate Change, Energy, the Environment and Water.

BOM (Bureau of Meteorology) (2023) Previous droughts. URL: <http://www.bom.gov.au/climate/drought/knowledge-centre/previous-droughts.shtml#pageContents> (Accessed 27 February 2023).

Booyens C (2010) 'The effect of disturbance regimes (fire and slashing) on populations of *Darwinia glaucophylla* on the Central Coast of NSW, Australia.' Thesis submitted in partial fulfilment of the requirements for the degree of Master of Philosophy, University of Newcastle, Australia.

Booyens C, Chalmers A, Beckers D (2014) The effect of disturbance regime on *Darwinia glaucophylla* (Myrtaceae) and its habitat. *Proceedings of the Linnean Society* **136**: 231-244.

# NSW Threatened Species Scientific Committee

---

Bradstock RA, Auld TD (1995) Soil temperatures during experimental bushfires in relation to fire intensity: consequences for legume germination and fire management in south-eastern Australia. *Journal of Applied Ecology* **32**, 76-84.

Connell Wagner (2005) DRAFT Plan of Management Somersby Industrial Park. A report prepared for the NSW Premier's Department and Gosford City Council. URL: [https://www.centralcoast.nsw.gov.au/sites/default/files/2023-05/plan\\_of\\_management\\_-\\_somersby.pdf](https://www.centralcoast.nsw.gov.au/sites/default/files/2023-05/plan_of_management_-_somersby.pdf) (accessed 31 October 2023).

CSIRO (2023) Climate Change in Australia: East Coast South projection summaries. URL: <https://www.climatechangeinaustralia.gov.au/en/projections-tools/regional-climate-change-explorer/sub-clusters/?current=ECSC&tooltip=true&popup=true> (accessed 7 November 2023).

CSIRO and the Bureau of Meteorology (BOM) (2022) State of the Climate 2022. CSIRO and the Bureau of Meteorology, Commonwealth of Australia. URL: <http://www.bom.gov.au/state-of-the-climate/2022/documents/2022-state-of-the-climate-web.pdf> (accessed 7 November 2023).

DPE (Department of Planning and Environment) (2022). Central Coast Regional Plan 2041. URL: <https://www.planning.nsw.gov.au/sites/default/files/2023-03/central-coast-regional-plan-2041.pdf> (accessed 31 October 2022).

Focus Flora (2018) Targeted Surveys and Monitoring of *Darwinia glaucophylla* at Priority Management Sites, Saving Our Species (SoS) Program. Brisbane Water National Park, Popran National Park and Strickland State Forest. A report prepared for the Office of Environment and Heritage NSW, 44 pp.

Focus Flora (2019) Post-Fire Monitoring and Additional Targeted Surveys for *Darwinia glaucophylla*, Saving Our Species (SoS) program. A report prepared for NSW National Parks and Wildlife Service and the Office of Environment and Heritage NSW 23 pp.

Focus Flora (2020) 2019-2020 Survey and Monitoring Report for *Darwinia glaucophylla*, Saving Our Species (SoS) Program. Brisbane Water National Park and Popran National Park. A report for the NSW Department of Planning, Industry and Environment, 40 pp.

Focus Flora (2021) 2020-21 Post-fire Monitoring and Additional Targeted Surveys for *Darwinia glaucophylla*, Saving Our Species (SoS) Program. Brisbane Water National Park and Popran National Park. A report for the NSW Department of Planning, Industry and Environment, 23 pp.

IUCN (2024) Guidelines for Using the IUCN Red List Categories and Criteria. Version 16 (March 2024). Standards and Petitions Committee of the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Makinson RO (2018) Myrtle Rust reviewed: The impacts of the invasive plant pathogen *Austropuccinia psidii* on the Australian environment. (Plant Biosecurity Cooperative Research Centre, Canberra).

OEH (Office of Environment and Heritage) (2017) *Darwinia glaucophylla* – profile. URL:

# NSW Threatened Species Scientific Committee

---

<https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10204> (accessed 13<sup>th</sup> October 2022).

NSW NPWS (National Parks and Wildlife Service) (2006) *Fire management strategy: Brisbane Water National Park incorporating Howe and Mooney Mooney Aboriginal Areas*. (National Parks and Wildlife Service, Gosford).

NSW NPWS (National Parks and Wildlife Service) (2022) *NSW Fire History* [spatial data set]. Accessed using ArcGIS 10.4 for desktop, Redlands, California, USA. Esri Inc. 1999-2005.

PlantNet (2022) (The NSW Plant Information Network System) Royal Botanic Gardens and Domain Trust. Available at: <https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Darwinia~glaucophylla> (accessed 15<sup>th</sup> October 2022).