

NSW Threatened Species Scientific Committee

Notice of Preliminary Determination

The NSW Threatened Species Scientific Committee (NSW TSSC), established under the *Biodiversity Conservation Act 2016* (the Act), has made a Preliminary Determination to support a proposal to list the herb *Brachyscome mittagongensis* P.S. Short (*Asteraceae*) as an ENDANGERED SPECIES in Part 1 of Schedule 1 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

Submissions close 05/07/2024.

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.

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.

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.*

NSW Threatened Species Scientific Committee

Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

NSW Threatened Species Scientific Committee

Public Exhibition period: 05/04/2024 - 05/07/2024

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 herb *Brachyscome mittagongensis* P.S. Short (*Asteraceae*) as an ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Brachyscome mittagongensis P.S. Short (*Asteraceae*) was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause

The NSW Threatened Species Scientific Committee has found that:

1. *Brachyscome mittagongensis* is a small, rhizomatous perennial forb in the Daisy family, *Asteraceae*. The species was described by Short (2009) as a “Perennial, rhizomatous herb with prostrate to ascending branches to c. 50 cm long, glabrous except for very occasional multicellular, conical glandular hairs c. 0.1–0.15 mm long. Leaves basal and cauline, alternate, lowermost leaves sometimes tapering to a petiole-like base but most leaves manifestly sessile and often subamplexicaul, somewhat narrowly oblong or narrowly elliptic or sometimes ovate-lanceolate to lanceolate or rarely a few oblanceolate, 11–38 mm long, 3.5–11 mm wide, leaf apices usually truncate and 3-dentate, the teeth of about equal length and width, rarely the apex tapering to a single point, leaf margins otherwise entire or sometimes with 1 or 2 additional short, narrow lateral lobes on each margin and these often about 1/2 way along the length of the lamina, all leaves glabrous or margins with very occasional stalked glandular hairs less than c. 0.1 mm long. Capitula c. 6 mm diam., on scapes manifestly exceeding the upper leaves. Bracts in 1 row, overlapping, ovate to lanceolate or elliptic to narrowly lanceolate, 2.2–2.5 mm long, 0.7– 0.8 mm wide, subobtusate, mainly thinly herbaceous but with very narrow hyaline margins, glabrous or almost so except for scattered, mostly glandular hairs on the margins; sterile divided. Receptacle subconical, areolate, glabrous. Ray florets c. 40 in largest capitula; corolla c. 8.5 mm long, 1.2–1.3 mm wide, white, with 4 veins converging at the apex; apex unlobed or with 2 or 3 barely discernible lobes; style c. 1.45 mm long. Disc florets perhaps c. 80 or more in largest capitula; corolla with tube 2.1–2.45 mm long, externally with scattered, long, glandular hairs, 5-lobed, yellow, lobes lacking apical hairs, veins extending into and joining at the apex of the lobes. Stamens 5; filament collar almost straight or dilating towards the base; anthers 1.25–1.36 mm long, microsporangia 1.04–1.09 mm long, apical appendages 0.2–0.27 mm long, endothelial tissue radial. Style c. 2 mm long; arms c. 0.7 mm long, the triangular appendage slightly exceeding the length of the stigmatic part. Cypselas flat, obovate, 1.3–1.5 mm long, 0.8–0.9 mm broad, lateral surfaces with two, non-swollen ridges on each lateral surface, uniformly brown; lateral surfaces of cypselas body conspicuously tuberculate, the tubercles with short, straight to

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apically curved to slightly incurled, biseriate eglandular hairs, multicellular glandular hairs uncommon and only noted on immature fruit; ribs smooth, wings absent; carpodium seemingly present and annular but inconspicuous. Pappus a whitish crown of c. 20 basally united bristles c. 0.2 mm long. Chromosome number: $n = 9$.”

2. *Brachyscome mittagongensis* can be distinguished from other closely related *Brachyscome* species “in having the largest lower and mid-cauline leaves not tapering towards a petiole-like base but being manifestly sessile and often subamplexicaul while their apices are usually truncate and 3-dentate, with the teeth small and of about equal size.” (Short 2009).
3. *Brachyscome mittagongensis* was previously placed within *B. angustifolia*, primarily as *B. angustifolia* var. *heterophylla*. That broad taxon was accepted to occur over a large area of NSW and into other southern states. A small number of specimens of what is now *B. mittagongensis* were also historically allocated to *B. sieberi* and *B. aculeata*. *Brachyscome angustifolia* is now an invalid taxon (Short 2009).
4. *Brachyscome mittagongensis* is endemic to New South Wales where it is known from the Sydney Basin and Southeast Highlands Bioregions. It is currently known primarily from Wingecarribee Shire in the Central Tablelands (Moss Vale and Burragorang Subregions), with two collection records in Upper Lachlan Shire in the Southern Tablelands (Bungonia Subregion).
5. The western extent of the species’ currently known distribution is Tarlo River National Park; the northern extent is the locality of Soapy Flat, and Aylmerton near Mittagong; the eastern extent is Avoca / Lower Mittagong / Kangaloon; and the southern extent is Bundanoon. There are no collections or observations of the species between its western extent in Wingecarribee Shire (Canyonleigh east) and Tarlo River NP, though flora survey effort in potential habitat in that area is relatively low, and almost all of the land in that area is freehold. It is considered highly likely that the species occurs between those sightings, most likely in swampy sites, potentially associated with Paddy’s River, the Wollondilly River and their confluence (NSW OEH 2017, S. Douglas in litt.).
6. Spatial grouping of sightings describes 19 distinct sites across the species’ range. These are; Aylmerton, Soapy Flat, Berrima, Bowral, Burradoo, Diamond Fields Road, Henderson Park (Moss Vale), Berrima Road (Moss Vale Cemetery), Belanglo Road, Carters Lane (Sutton Forest), Sutton Forest (Hume Highway), Sutton Forest (Village), Exeter, Meryla State Forest, Bundanoon, Penrose State Forest, Canyonleigh Road, Tarlo River National Park, and Wilson Lane (NSW OEH 2017, S. Douglas in litt.).
7. Historically it was collected from western and south-western Sydney (Cumberland Subregion: 3 records from mid-late 1800s) and from a single, spatially unclear 1884 record at ‘Shoalhaven’ (inferred to be in the Illawarra Subregion). Populations at these historic collection sites are presumed extinct based on a combination of their age, the land use type and intensity at the named collection localities, and the lack of subsequent records.

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8. *Brachyscome mittagongensis* is associated with a variety of substrates. Records are most strongly associated with Wianamatta Group shales (primarily Bringelly and Ashfield Shales) but include clayey components of the Mittagong Formation. A small percentage of sites are influenced by Tertiary basalt, and one site is associated with a basalt/shale transition and may receive groundwater seepage. The species also occurs on Quaternary alluvium in river/creekflat forest and in the vicinity of upland swamps. Most such sites occur on or downstream of Wianamatta Group shale-dominated landscapes, however those from Tarlo River National Park are in catchments dominated by Ordovician sedimentary rock of the Abercrombie Formation, and Permian sedimentary rock in the form of Tallong Conglomerate. It is also considered likely to occur on or downslope of Jurassic microsyenite and allied intrusive substrates associated with the Mount Gibraltar complex of the Southern Highlands.
9. Contemporary records and field observations indicate that the species is associated with vegetation characterised in the canopy by *Eucalyptus macarthurii* (Endangered), *E. ovata*, *E. radiata*, *E. cypellocarpa*, *E. globoidea*, and less often with *E. viminalis*, *E. smithii*, *E. pauciflora* and *E. stellulata*. Habitat modelling suggests it may also be associated with *E. aggregata* (Vulnerable; Endangered Population in Wingecarribee Shire), *E. amplifolia* and *E. tereticornis*. Short (2009) noted associated species on herbarium records as *Solenogyne bellioides*, *Plantago varia*, *Dichondra repens*, *Hypochaeris radicata* and various grasses.
10. There are multiple records of the species from Threatened Ecological Communities (TECs) that have been extensively cleared and fragmented. These TECs include Southern Highlands Shale Woodland; Werriwa Tablelands Cool Temperate Grassy Woodlands; Montane Peatland & Swamps; and Tablelands Basalt Forest.
11. The species' distribution is likely to be severely fragmented - >50% of the remnant area occupied by the species is unlikely to be viable, and patches and subpopulations are separated by distances over which dispersal and successful recolonisation is not likely. However, uncertainty around pollination and dispersal means relative isolation and connectedness of populations has not been formally described.
12. Extent Of Occurrence (EOO) is estimated to be 1003 km² based on a minimum convex polygon enclosing all mapped occurrences of the species with sufficient spatial accuracy for this purpose as recommended by IUCN (2022). This represents an 82% reduction in EOO since the species was first collected.
13. Area Of Occupancy (AOO) is estimated to be 96 km² based on the species occupying 24 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2022). This represents a 15% reduction in AOO since the species was first collected.

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14. No formal population census has been undertaken for the species. Extrapolation from database records and field observations provide an estimate of 1000 – 2500 mature individuals across the species' range.
15. Generation time is estimated to be at least 10 and up to 20 years (L. Murray, pers. comm., 29 March 2019).
16. *Brachyscome mittagongensis* flowers “from about February to May” (Short, 2009). Other species in the genus are primarily wind-dispersed, and this is likely to also be true of *B. mittagongensis*. Where plants occur in very open landscapes with high exposure and significant elevation, and so some seed may disperse over considerable distances. In contrast, at sheltered sites wind dispersal is likely to be over a shorter distance. Water dispersal is also feasible, especially given the species is known to grow in swamp and riparian habitats. Uncertainty over dispersal means it is difficult to accurately define populations.
17. The main threats to *Brachyscome mittagongensis* are loss of habitat, reduction of habitat quality, fragmentation of habitat and populations, and loss of mature individuals as a result of land clearing and development, adverse land management practices, changing fire regimes, competition with invasive weeds, damage to habitat through recreational use. Of these ‘*Clearing of Native Vegetation*’, ‘*Invasion and establishment of exotic vines and scramblers*’, and ‘*Invasion of native plant communities by exotic perennial grasses*’ are Key Threatening Processes under the NSW Biodiversity Conservation Act.
18. Land clearing and development pose a significant threat to *Brachyscome mittagongensis* across its range. Much of the historical habitat for the species has been cleared for agriculture or urban development and infrastructure. Most extant records of the species are from the Southern Highlands where urbanisation continues to expand in extent and intensity, including in potential or former habitat for this species. Rural-residential land use has also spread and intensified, and manifests as subdivisions of primarily rural land into relatively smaller lots often referred to as ‘hobby farms’ or ‘lifestyle properties’. In some cases, this change from usually at least semi-commercial rural to lifestyle-based rural-residential use may benefit the species where livestock grazing intensity is reduced. However, it may be harmful where there is a conversion from grazing of native or mostly native pastures to intensive horticulture or to more intensive grazing on non-native and fertilised pasture. ‘*Clearing of Native Vegetation*’, is a Key Threatening Processes under the NSW Biodiversity Conservation Act.
19. ‘Pasture improvement’ (i.e. the replacement of native grasses and forbs with non-native grasses and legumes, often supported by fertilisers) is a significant threat to *Brachyscome mittagongensis* and is likely a major driver of its apparent widespread loss from affected former habitat. Non-native landscaping is also common in rural-residential land use, including expansive and intensively managed lawns. Such activities are likely to be detrimental to this species.

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20. Roadworks such as grading, widening, drainage, deposition of spoil, and inadvertent spreading of weeds through these actions are associated with habitat loss and degradation for *Brachyscome mitchellii*. Urbanisation and rural-residential land use tend to see an increase in the number of roads, greater use of formalised drainage structures, and ultimately concrete kerb and guttering. These tend to work against the survival of *B. mitchellii*, which has only been seen to survive on roadsides where management is less intense. This includes urban areas but with relatively large lot sizes, no kerb and guttering, grassed verges, patches of remnant vegetation, and relatively infrequent or at least less intensive mowing of verges.
21. Insufficiently frequent fires or severe fires threaten *Brachyscome mitchellii*, with the species disadvantaged by increased shrub cover that occurs in long unburnt areas. Infrequent or low severity fire regimes also favour invasion by some woody weed species (e.g. *Pittosporum undulatum*; Gleadow and Ashton 1981, Rose and Fairweather 1997), which compete with *B. mitchellii*. Agricultural and urban land use is likely to reduce the frequency and severity of fire across the range of *B. mitchellii*.
22. *Brachyscome mitchellii* is able to both resprout and seed following fire, and persists in burned areas, suggesting relatively frequent fire is unlikely to threaten the species, although the time required for juvenile plants to develop the ability to resprout after fire is currently unknown.
23. Weeds are a significant threat to *Brachyscome mitchellii* across its range, competing for habitat and resources, and restricting germination. Weeds are a significant concern at most sites, although the specific weed species and severity of threat differ between sites. Non-native grass species including *Paspalum dilatatum* (Paspalum), *Holcus lanatus* (Yorkshire Fog), *Anthoxanthum odoratum* (Sweet Vernal Grass), *Phalaris aquatica* (Phalaris) and *Dactylis glomerata* (Cocksfoot) are of particular concern and are found at all sites. Other weed threats include the vines/scramblers *Lonicera japonica* (Japanese Honeysuckle), *Rubus anglocandicans* (Blackberry), *Vinca major* (Greater Periwinkle); the shrubs *Berberis vulgaris* (Common Barberry), *Ligustrum sinense* (Small-leaved Privet), and the trees *Pinus radiata* (Radiata Pine), *Crataegus monogyna* (Hawthorn), and *Pittosporum undulatum* (a highly invasive native mesophyll species that readily colonises comparatively fertile sites where cattle and fire are absent or rare/low intensity). 'Invasion and establishment of exotic vines and scramblers', and 'Invasion of native plant communities by exotic perennial grasses' are Key Threatening Processes under the NSW Biodiversity Conservation Act. The strong overall association between the occurrence of *Brachyscome mitchellii* and weeds is driven by the preference of *B. mitchellii* for moist and relatively fertile landscapes, most of which are substantially disturbed by agriculture, roads and settlements across its range.
24. *Brachyscome mitchellii* P.S. Short (Asteraceae) is not eligible to be listed as a critically endangered species.

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25. *Brachyscome mittagongensis* P.S. Short (*Asteraceae*) 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 Clauses 4.3 (b)(d)(e i,ii,iii,iv) and Clause 4.4 (b)(e i,ii,A(II)).

**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,ii,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:			
	(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:	

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	(i)	an index of abundance appropriate to the taxon,
	(ii)	the geographic distribution of the species,
	(iii)	the number of locations in which the species occur or of populations of the species.

**Clause 4.4 – Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion Clause C)**

Assessment Outcome: Endangered under Clause 4.4 (b)(e i,ii,A(II)).

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: 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

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	(c)	for vulnerable species	high.
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Clause 4.7 – Very highly restricted geographic distribution of species–vulnerable species (Equivalent to IUCN criterion D2)

Assessment Outcome: Clause 4.7 is data deficient.

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:

Douglas, S. (2022) Conservation Assessment of *Brachyscome mittagongensis* P.S. *Short* (Asteraceae). NSW Threatened Species Scientific Committee.

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NSW Office of Environment & Heritage. 2014. TARLORIVNP Vegetation Survey, Data from the Atlas of NSW database: VIS flora survey module, Version 11 /2013. Persistent URL: http://aekos.org.au/collection/nsw.gov.au/nsw_atlas/vis_flora_module/TARLORIVNP

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Short PS (2009) A revision of the *Brachyscome linearifolia* group (Asteraceae) from south-eastern Australia. Muelleria 27, 3–35.

Rose S and Fairweather PG (1997) Changes in floristic composition of urban bushland invaded by *Pittosporum undulatum* in northern Sydney, Australia. Australian Journal of Botany 45, 123–149.

Expert Communications

Louisa Murray, Curator of Asteraceae at the NSW Herbarium (retired).