

NSW Threatened Species Scientific Committee

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Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee (NSW TSSC), established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the tree *Syzygium paniculatum* Gaertn. as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act and, as a consequence, to omit reference to *Syzygium paniculatum* Gaertn. 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

Syzygium paniculatum Gaertn. was found to be Vulnerable in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.4 (c)(e i, ii (A III)) because: (1) the species has a moderately low number of mature individuals (2,087); (2) there is an inferred continuing decline in the number of mature individuals due to low recruitment, natural thinning and attrition within an ageing demographic, future clearing, and ongoing habitat degradation; and (3) there is a low number of mature individuals within each of the five known subpopulations.

The NSW Threatened Species Scientific Committee has found that:

1. *Syzygium paniculatum* Gaertn. (Myrtaceae), commonly called the magenta lilly pilly, is a shrub or tree to 20-30 m tall with flaky bark. Leaves lanceolate to obovate, 4.5-10 cm long, 1.5-3 cm wide, apex acuminate, base cuneate, glabrous, upper surface green and glossy, lower surface paler; lateral veins numerous, intramarginal vein usually discernible; oil glands small, rather scattered, distinct; petiole 2-10 mm long. Inflorescences cymose or paniculate, terminal and in the upper axils. Petals 4–5 mm long, free and spreading. Stamens 6–15 mm long. Petals 4-5mm long, free and spreading. Stamens 6-15 mm long. Fruit globose to ovoid, 15-25 mm diam., magenta; seed solitary, polyembryonic, cotyledons smooth. Flowers December to March (Wilson 2002; L. Foster pers. obs. March 2023).
2. Language names for lilly pillies where *Syzygium paniculatum* occurs include Burangirrbang in Gathang language from north of Newcastle to around Port Macquarie (Lissarrague 2010); Galungara in Dhurga language from the Nowra/Jervis Bay area and south to Narooma (Donovan and Boyenga 2022); Midjuburi in Dharug and Gadigal languages from around Sydney (Troy 1992); Dudagur – Dundagoor in Darkinjung language from the Central Coast (Jones 2008; Duncan April 2023); Guntu – Goontoo in Awaba language around Lake Macquarie (Duncan April 2023).
3. *Syzygium paniculatum* is endemic to New South Wales (NSW) and found along a 400 km stretch of coastal NSW from Upper Lansdowne on the mid North Coast to Conjola National Park on the South Coast (Gecko 2018). All naturally occurring mature individuals are known from five subpopulations (as per the IUCN (2022) definition) in the Jervis Bay, Illawarra, Sydney Metropolitan, Central Coast and Karuah-Manning regions. These subpopulations span the lands of the Yuin, Tharawal, Eora, Dharug, Kuring-gai, Awabakal, Darinung, Worimi, Darkinjung, Biripi, Daingatti, Wonnarua and Geawegal Aboriginal people (AIATSIS 2022).

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4. *Syzygium paniculatum* has been widely cultivated, sold commercially, planted as a popular ornamental and planted as part of bush regeneration projects (Thurlby 2010). Substantial portions of the Sydney Metropolitan, Central Coast and Karuah-Manning subpopulations are now known or suspected to be planted with *S. paniculatum* (L. Forster pers. comm. March 2023), and the species is a known food resource (Low 1991, Nash 2004, Renwick 2000, Benson and Eldershaw 2007) that likely would have been moved around by First Nations people for millennia (Silcock 2018). Without further exploration of what defines 'planted' or a re-analysis of the 'natural' distribution for this species, the precautionary approach to determining the species' distribution is to use only confirmed records from areas of typical habitat, being littoral and subtropical rainforest communities. As such, records used in this assessment included herbarium confirmed voucher specimens, field-verified records, and records sampled during genomic studies (Lu-Irving and Rossetto 2021, Lu-Irving *et al.* 2023).
5. *Syzygium paniculatum* has a moderately restricted geographic distribution. The extent of occurrence (EOO) is estimated to be 17,718 km², calculated as a minimum convex polygon containing all known occurrences, being the method of assessment recommended by IUCN (2022). The area of occupancy (AOO) is estimated to be 568 km² based on 2 x 2 km grid cells, the scale recommended by IUCN (2022).
6. The minimum estimated abundance of *Syzygium paniculatum* is 2,087 mature individuals (Gecko Environmental Management 2018; Focus Flora 2018; DPE BioNet 2023, Lu-Irving and Rossetto, 2021, DPE 2023). The majority of all counts are mature individuals, as minimal seedling recruitment has been observed. The majority of subpopulations are also small and/or isolated: Jervis Bay has 575 mature individuals, Illawarra has 6 mature individuals, Metropolitan Sydney has at least 313 mature individuals, Central Coast has 565 mature individuals, and Karuah-Manning 628 mature individuals (minimum counts).
7. Demarcation of the five subpopulations is based on them being separated by between 45 km and 135 km, as the common foraging range of the larger potential dispersal agents like the grey-headed flying-fox (*Pteropus poliocephalus*) may be about 50 km (Payne 1991; Department of Environment, Climate Change and Water NSW 2009). The involvement of Aboriginal people in long and short distance dispersal is also likely for *Syzygium paniculatum* given the food and medicinal qualities of the species and broader lilly pilli group, and the presence of cultural artefacts within stands of remnant trees as identified by Feary (2023).
8. Lilly pillis are known to have been significant to the Aboriginal people of the east coast of Australia and are highly regarded as a food resource (Bodkin 2013, Low 1991, Renwick 2000, Lampert and Sanders 1973), a medicinal resource (Duncan April 2023, Locke May 2023), a natural resource for tools and other items (Duncan April 2023), and as an important component to the broader cultural landscape. As a food resource, the flesh and possibly the seed was eaten seasonally (Lakshmi 2018, Singh and Sharma 2020, Bodkin 2013). *Syzygium paniculatum* was also one of the first documented species noted by Banks and Solander in the 1770s for its edible attributes, being observed to be eaten by Aboriginal people at Kurnell/Towra Point (Benson and Eldershaw 2007). Medicinal qualities were well-known by Aboriginal people. On Darkinjung Country on the Central Coast of NSW, "the magenta lilly pilli was considered to be one of many varieties that were collected

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during the times leading into winter season as they were a great medicinal source” (Duncan April 2023). As a natural resource for tools and other items, it is known on Darkinjung Country that “we also used the fruit as a dye for woven baskets and mats, as they are strong in colour” (Duncan April 2023). As a broader part of the cultural landscape, Duncan (April 2023) says that for the Darkinjung people “like all nature in Aboriginal culture they (the Magenta lilly pillie) are considered as ancestral beings, the very things we as people are made of.”

9. The current distribution of *Syzygium paniculatum* along the coastal strip of NSW coincides with areas of high Aboriginal occupation by Saltwater Peoples (people whose traditional Country included the seaboard) (Fuller 2020, Sharp 2002). Comprehensive surveys of all known subpopulations of *S. paniculatum* observed the occurrence of remnant populations in areas of Aboriginal importance (i.e., documented Aboriginal places and places connected to Dreaming stories) or in areas with evidence of Aboriginal inhabitancy (i.e., presence of shell deposits, modified trees, inhabited rock shelters, and burial sites) (L. Foster pers. obs; A. Mulcahy pers. comm. May 2023). Cultural surveys with the Jerrinja community at Bundarwa (Beecroft Peninsula) in the Jervis Bay subpopulation documented Aboriginal cultural artefacts across all populations of *S. paniculatum* (Feary 2023). Evidence included middens and stone artefacts, scarred/modified *S. paniculatum* individuals, modified ‘ring-trees’ and proximity of stands of *S. paniculatum* adjacent to culturally significant places (Feary 2023, Locke May 2023). It is likely Aboriginal people that knew the medicinal and food values of lilly pillies influenced the distribution of the species through long-distance dispersal. This is the case with many other species within Australia (Clarke 2014, Silcock 2018, Rossetto *et al.*, 2017, Cock 2011, Lullfitz *et al.*, 2020, Fahey *et al.*, 2022) and globally (Balée 1989, Cowan and Smith 1993, Denevan 1992). The lack of genetic differentiation across the geographic range of the southern lineage (Lake Macquarie to Jervis Bay, approximately 250km of coastline) suggests that *Syzygium paniculatum* expanded its range recently and/or rapidly (over 75-200 years) to occupy its present-day distribution (Lu-Irving *et al.* 2023). This aligns with cultural knowledge from various Aboriginal communities (e.g., Darkinjung, Jerrinja, Worimi), and may be attributed to dispersal by Aboriginal people (Fahey 2022).
10. *Syzygium paniculatum* grows on flat to gently sloping sites, stabilised sand dunes, dune ridges, floodplains, creekbanks, and wetlands on gravels, sands, silts, and clays derived mostly from riverside sandstone (Floyd 2008; Hyland 1983; Thurlby *et al.* 2010). On the NSW South Coast *S. paniculatum* occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the Central Coast *S. paniculatum* occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.
11. While *Syzygium paniculatum* can be dominant in littoral rainforest at some sites, common co-occurring species in this vegetation type include *Ficus obliqua*, *F. rubiginosa*, *Elaeodendron australe*, *Podocarpus elatus*, *Acmena smithii*, *Glochidion ferdinandi*, *Elaeocarpus obovatus*, *Eucalyptus pilularis*, *E. botryoides*, *Livistona australis*, *Myrsine variabilis*, *Synoum glandulosum*, *Syzygium oleosum*, *Tristaniopsis laurina*, *Planchonella australis*, *Cupaniopsis anacardioides*, *Melaleuca quinquenervia* and *M. linariifolia* (OEH 2012). On the Central Coast *S.*

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paniculatum also occurs in warm temperate rainforest gullies with *Ceratopetalum apetalum*, *Schizomeria ovata*, *Euroschinus falcatus*, *Guioa semiglauca*, *Pittosporum undulatum*, *Drypetes deplanchei*, *Diospyros pentamera* and *Sarcomelicope simplicifolia* (DPE PCT Map Data 2022).

12. The main threats to *Syzygium paniculatum* are the clearing of vegetation for development, invasion of exotic weeds such as *Lantana camara* and Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*), and adverse fire regimes. 'Clearing of native vegetation', 'Invasion, establishment and spread of *Lantana* (*Lantana camara* L. sens. lat.)', 'Invasion of native plant communities by *Chrysanthemoides monilifera*', and 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' are listed as Key Threatening Processes under the Act.
13. There is inferred continuing decline in the number of mature individuals of *Syzygium paniculatum* due to clearing of native vegetation for development and agriculture, which has further fragmented a historically discontinuous distribution of climatic and edaphic conditions required for development of littoral and subtropical rainforest along the NSW (Bale and Williams 2021). Much of the species' preferred near-coastal littoral and sub-tropical rainforests has been cleared and now exists only in small fragments, many of which remain vulnerable to further clearing and modification (Floyd 2008, OEH 2012). Habitat that is suitable to support *S. paniculatum* continues to be cleared for urban expansion and infrastructure development (OEH 2012). This is particularly evident in the Central Coast and Jervis Bay regions, where residential and associated developments are expanding rapidly. The removal of large remnant trees is a major threat to this species. With the exception of a few larger sites (e.g., Jervis Bay, Wamberal Lagoon), most sites contain small numbers of predominately mature individuals. At some sites where *S. paniculatum* occurs in riparian remnants, under-scrubbing of habitat and grazing by livestock has reduced the ability of the species to regenerate through seedling recruitment (Focus Flora 2018).
14. Weed invasion is inferred to be contributing to continuing decline in the number of mature individuals of *Syzygium paniculatum*. Sites in Wyrabalong National Park, Bouddi National Park and Wamberal Lagoon Nature Reserve have been invaded by *Lantana camara* and Bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*). Observations at these sites show small seedlings and smaller trees being smothered by *L. camara* (Focus Flora 2018). Rapid colonisation of canopy gaps by these weeds substantially reduces opportunities for native *S. paniculatum* seedlings to grow and establish, resulting in poor recruitment success. For small or isolated populations, the lack of suitable habitat for recruitment due to weed invasion represents a significant threat (Focus Flora 2018). Other significant weeds that pose a threat to the species include morning glory (*Ipomoea indica*), small-leaved privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). The small site at Abrahams Bosom near Jervis Bay is infested with asparagus fern (*Asparagus aethiopicus*), impacting on the species ability to establish seedlings (Focus Flora 2018, OEH 2012).
15. High severity fires, especially when recurrent, are inferred to be contributing to continuing decline in the number of mature individuals of *Syzygium paniculatum* now and into the future. Fire may trigger regenerative mechanisms in some mature

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individuals, with Payne (1991) observing coppicing from the bases of burnt-out main trunks of trees at North Entrance. However, fire may kill individuals (particularly medium to high intensity fire), while fires of low intensity are more likely to induce coppicing (OEH 2012). Frequent higher intensity fires are likely to kill plants, disrupt reproduction, and alter the surrounding rainforest habitat (OEH 2012). Some individuals within these subpopulations are considered to have a higher fire risk due to the relatively small size of the rainforest patches they often occupy, high abundance of fire-prone vegetation within or around habitat patches (e.g., *Lantana camara*), high recreational use, and/or close proximity to urban areas (OEH 2012).

16. *Syzygium paniculatum* Gaertn. is not eligible to be listed as an Endangered or Critically endangered species.
17. *Syzygium paniculatum* Gaertn. 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*:

BC Regulation Clauses

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Vulnerable under Clause 4.4(c)(e i,ii (A III)).

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Clause 4.2 is 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: Not met

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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 Clause C)

Assessment Outcome: Vulnerable under Clause 4.4(c)(e i,ii (A III))

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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Professor Caroline Gross
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Taylor C, Foster L (2023) Conservation Assessment of *Syzygium paniculatum* Gaertn. (Myrtaceae). NSW Threatened Species Scientific Committee.

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