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Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list *Epacris sparsa* R.Br. as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act and, as a consequence, to omit reference to *Epacris sparsa* R.Br. in Part 3 of Schedule 1 (Vulnerable species). Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Epacris sparsa* R.Br. has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2024), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

Epacris sparsa R.Br. was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (b)(d)(e i,iii) because: 1) the species has a highly restricted geographic distribution with an estimated extent of occurrence of 27 km² and an area of occupancy 20 km²; 2) the population occurs across four threat-defined locations; and 3) there is an inferred continuing decline in the number of mature individuals and the area, extent and quality of habitat due to changes in flood regimes, adverse fire regimes, increased drought, and disease, all of which have an increasing likelihood of frequent recurrence in the future driven by anthropogenic climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Epacris sparsa* R.Br. (family Ericaceae) is a small, erect shrub, 60–90 cm high; stems with prominent, broad, cup-shaped leaf scars; Branchlets finely pubescent. Leaves ± erect, elliptic to ovate, 11.2–17.0 mm long, 3.0–3.8 mm wide, apex acute, base cuneate, margins thickened slightly; lamina flat, ± thin; entire; petiole 1.5–2 mm long, scabrous. Flowers few, near end of branches, 4–5 mm diameter, cream; peduncle 3.5–4.5 mm long; bracts acute. Sepals 3–3.6 mm long. Corolla tube 14.8–19.2 mm long; lobes 3.3–4.0 mm long. Anthers hidden in tube (PlantNET 2021). Seeds are in a capsule 1.4–1.8mm high and 0.8 mm long (Powell and James 1993).
2. *Epacris sparsa* is restricted to four subpopulations within the Blue Mountains region of New South Wales (NSW), all in the lower Grose River region (Powell and James 1993).
3. The number of mature individuals of *Epacris sparsa* is estimated to be approximately 8,375–13,885 (Mickaill 2023a, 2023b, 2024). Monitoring in 2023 and 2024 provided a robust population size estimate, with the number of plants

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observed in 20 x 20 m plots taken every 100 m extrapolated across 16.8 km of riverbank habitat (Mickaill 2023b, 2024), giving a total estimated population size of approximately 11,130. Of this figure, 3,883 are adults (based on 772 counted), 7,171 are juveniles (based on 1,454 counted), 100 are seedlings (based on 20 counted) and 257 are dead (based on 51 counted). The estimated number of plants in the individual Grose River, Faulconbridge Point, and Brown's Ridge subpopulations was 3,005, 2,340, and 407 respectively (Mickaill 2023b).

4. The extent of occurrence (EOO) for *Epacris sparsa* is estimated to be 27 km² based on a minimum convex polygon, the method of assessment recommended by IUCN (2022). The area of occupancy (AOO) is estimated to be 20 km² based on 2 km x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2022). EOO and AOO estimates were calculated based on herbarium records, surveys, and mapping of point records from 1992-2017.
5. *Epacris sparsa* is found in shaded understorey at the base of rock faces and platforms within the riparian flood zone (PlantNET 2021). The species typically occurs within damp sandy-clay soils on or around rocky outcrops that have derived from exposed shale lenses between Hawkesbury Sandstone beds (Powell and James 1993) with conglomerate mudstone and siltstone deposited in high energy river systems (Mickaill 2023a). The habitat is frequently subject to high moisture levels from wind-driven spray and would be inundated during periods of high rainfall, with the species often occupying the base of rock faces and platforms within 5–15 m of the water's edge (Powell and James 1993). Within these rocky areas it grows in shrub vegetation dominated by *Tristaniopsis laurina*, *Gaudium trinervium*, *Allocasuarina littoralis*, *Acacia longifolia*, *Grevillea sericea* and *Lomandra fluviatilis*. When growing in wetter, more sheltered sites, typical co-occurring species include *Callicoma serratifolia*, *Backhousia myrtifolia*, *Austromyrtus tenuifolia*, *Leucopogon lanceolatus*, *Lomandra montana*, *Todea barbara*, *Sticherus flabellatus* and *Dracophyllum secundum* (OEH 2014a).
6. Little is known about the reproductive biology of *Epacris sparsa*. Flowering occurs from May to June, with capsules ripening in September (Powell and James 1993). Once pollinated, flower tubes drop readily, exposing the developing fruit. Like other species in the genus, insects are likely to be the pollinators of *E. sparsa* (Falster *et al.* 2021). Seed dispersal is likely to be passive, with plants occurring in riparian habitats having their seeds dispersed by water up to several kilometres downstream (DPIPWE 2010). Seeds are physiologically dormant and, based on other species in the genus, may respond to fire-related germination cues (Keith 1997).
7. The generation length of *Epacris sparsa* is not well understood. However, observations of similar species in the genus suggest that plants reach maturity at eight years, with plants likely to start senescing after 30 years (Keith 2004). This gives an estimated generation length of 19 years and a three-generation period of approximately 57 years.
8. The main threats to *Epacris sparsa* are changes to flooding regimes, adverse fire regimes, and increased occurrences of drought resulting from climate change, and

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disease-induced dieback potentially due to *Phytophthora cinnamomi*. 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands', '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' and 'Infection of native plants by *Phytophthora cinnamomi*' are listed as Key Threatening Processes under the Act.

9. The number of threat-defined locations that *Epacris sparsa* occurs over is not known with certainty but is estimated as less than five. Destructive floods causing mortality and habitat degradation have affected all three monitoring sites (and likely all four subpopulations) since 2019 (Mickaill 2023b, 2024), and continued flooding is the most serious plausible threat to the species based on documented observations of population decline (Mickaill 2023a, 2023b). However, though one severe flood event can affect all subpopulations, the fact that most remaining plants are healthy suggests it would take multiple flood events to negatively affect all individuals.
10. Monitoring of *Epacris sparsa* recorded a 32% decline in the total number of individuals across six 40 m x 10 m transects, from 153 to 108 during the period from 2017 to 2021–22 due to multiple severe flood events. The largest of these declines occurred at Brown's Ridge, where the number of plants declined from 87 to 18 - a reduction of almost 80%. Notably, at Avoca Vale Reserve, the number of plants decreased from 65 in 2017 to 45 in 2020 (possibly due to fires in 2019), before increasing back to 77 in 2022. Across all sites, the majority of plants were healthy, though 26% were classed as diseased/sick and 8% as dead. Further monitoring in 2023 found that 34% of plants exhibited disease symptoms and diseased plants were dominant in 17% of monitoring plots (Mickaill 2023b). Some degree of physical damage was recorded on 44% of plants (Mickaill 2023a). Many of the plants that were noted as damaged had their roots exposed to the air, likely due to erosion of the soil beneath them which is also likely to cause a decline in plant health (Mickaill 2023a).
11. The reduction in the abundance of *Epacris sparsa* is thought to be due to the severe flood events that have occurred in the area. The floods have caused sediment deposition, erosion, and disturbance to the vegetation, particularly at the Brown's Ridge site which was the most severely affected (Mickaill 2023a, 2023b) and saw the largest decline. Some recruitment is still occurring in most monitoring transects, but the majority of plants were not reproductive during the surveys, possibly due to not having yet reached reproductive maturity or due to damage from flooding. Frequent floods may be impeding the plants' ability to finish producing seed. This suggests that the decline observed after the 2019 flood events may not be a downward phase in the population size, but a permanent decline. If flood events continue, recruitment is likely to be restricted and the population is likely to decline further than the currently estimated 32%.
12. The 2019 Gaspers Mountain fire and subsequent flooding has also led to observed continuing decline in habitat quality through sediment deposition, erosion, and disturbance to the surrounding vegetation (Mickaill 2023b). Furthermore, the species is possibly prone to decline due to drought, and periods of drought have

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been shown to disrupt recruitment and kill other *Epacris* species, particularly those that live on rocky substrates (Keith and Iłowski 1999). Future climate change projections for southeast Australia in the temperate forested region include an increase in drying conditions and more frequent and severe fires as well as increased frequency of extreme rain events and associated flash flooding (CSIRO and Bureau of Meteorology 2015). This suggests that a further decline in the number of mature individuals and habitat quality of *E. sparsa* due to these factors is also likely to occur in the future.

13. *Epacris sparsa* R.Br. is not eligible to be listed as a Critically Endangered species

14. *Epacris sparsa* R.Br. 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,iii)

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Vulnerable under Clause 4.2(1 c)(2 a,c)

(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,iii)

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or

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	(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: 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.

Clause 4.5 – Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)

Assessment Outcome: Not met

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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 Angela Moles, FRSN

Chairperson

NSW Threatened Species Scientific Committee

Supporting Documentation:

Commonwealth DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2024). Conservation Advice for *Epacris sparsa* (sparse heath). Australian Government, Canberra, ACT.

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