Threatened Species Assessment

Phebalium glandulosum subsp. *macrocalyx*
Glandular Phebalium

Taxonomy

Phebalium glandulosum subsp. macrocalyx R.L. Giles

Previously referred to as *Phebalium glandulosum* subsp. 1 (Mallee) (VicFlora 2016).

Current conservation status

Categorised as Endangered in the 2014 Advisory list of rare or threatened flora (DEPI 2014).

Proposed conservation status

Critically Endangered in Victoria

Criteria A2abce+4abce; D

Species Information

Description and Life History

The taxon has branchlets moderately to densely glandular-verrucose. Leaves narrow- to linear-cuneate, 1.3-2.5 mm wide, 4-11 mm long, apex retuse to obcordate, margins slightly to strongly recurved or revolute, usually glandular-verrucose; upper surface matt, glandular-verrucose, midrib flat to weakly impressed; lower surface densely silvery-lepidote, midrib not prominent, not or sparsely glandular-verrucose. Pedicels 1.9-6.0 mm long. Calyx deeply hemispherical, 0.9-1.6 mm long, 1.8-3 mm wide, silvery-lepidote (VicFlora 2016).

Generation Length

The generation length of *Phebalium glandulosum* subsp. *macrocalyx* is inferred to be 30 to 50 years. This is based on an estimated pre-settlement fire interval less than or equal to 50 years coupled with the assumption that the taxon recruits episodically following bushfire from a long-persistent soil-stored seed bank.

Distribution

The taxon is located near Swan Hill between Lake Boga, Ultima, and Lalbert, in north-west Victoria, approximating to the main eastern Australian wheatbelt (Giles et al. 2008; VicFlora 2016). The taxon was formerly more widespread through the Victorian mallee but has become seriously depleted through clearing for agriculture and is now apparently restricted to a few small (sub)populations that total fewer than 50 plants (VicFlora 2016).

Habitat

The taxon occurs mainly on sandy soils supporting heathland and mallee (VicFlora 2016; Giles et al. 2008).

Threats

Historically, the taxon has been threatened by the near complete elimination of its habitat through clearing for agriculture across its entire Victorian range. Current and future threats include incremental habitat loss and modification, and the stochastic impact of agricultural and road management activity. It is also threatened by extreme drought stress and, potentially, browsing pressure, weed invasion, and repeat fire events.

IUCN Criteria

Criterion A. Population size reduction.
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [*(a) cannot be used for A3*]

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Eligible under Criterion A2 as Critically Endangered

The population reduction over the past 90 to 150 years is inferred to be 95 to 98%, based on (a), (b), (c) and (e) above.

Past decline is based on the near complete elimination of habitat through clearing for agriculture across the entire Victorian range of the taxon. It should be noted that the last three generations encompass the entire settlement period for the Mallee and Northern Plains, where settlement prior to this period was concentrated along major river corridors. Almost all records in the Wimmera and Western Mallee are historic, providing circumstantial evidence that almost all western occurrences are now extinct.

The causes of the reduction may not have ceased, be understood or be reversible.

Ineligible under Criterion A3

The magnitude of future decline cannot be estimated with any confidence given that the exceedingly small extant subpopulations are subject to stochastic events of unpredictable intensity.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 90 to 150 year period, including both past and future (up to 100 years in the future), is inferred to be 80 to 100%, based on (a), (b), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Evidence:

Eligible under Criterion B as Endangered

The Extent of Occurrence (EoO) is estimated to be 3,082 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 24 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon is estimated to be severely fragmented, has 1 location, and has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals				

Evidence:

Ineligible under Criterion C

It is estimated that there are 10 to 45 mature individuals, but other thresholds under this criterion have not been met.

Criterion D. Very small or restricted population	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	< 50	< 250	< 1,000
D2 Only applies to the VU category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time.	-	-	D2. Typically: AoO < 20 km2 or number of locations ≤ 5

Evidence:

Eligible under Criterion D as Critically Endangered

The taxon is estimated to have 10 to 45 mature individuals.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014.* Department of Environment and Primary Industries, Melbourne. Retrieved from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0021/50448/Advisory-List-of-Rare-or-Threatened-Plants-in-Victoria-2014.pdf

Giles, R., Drinnan, A.N., and Walsh, N.G. (2008). Variation in *Phebalium glandulosum* subsp. *glandulosum*: morphometric and anatomical evidence (Rutaceae). *Australian Systematic Botany, 21*, 271-288.

VicFlora (2016). Flora of Victoria, Royal Botanic Gardens Victoria: *Phebalium glandulosum* subsp. *macrocalyx*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/e172ae27-a887-4316-9460-f18b725cb195