Threatened Species Assessment

Goodenia macmillanii
Pinnate Goodenia

Taxonomy

Goodenia macmillanii F. Muell.

Current conservation status

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

Proposed conservation status

Vulnerable in Australia

Criterion D2

Species Information

Description and Life History

The taxon is an erect short-lived perennial, to c. 50 cm high; stems deeply ribbed, glandular-pubescent, viscid. Leaves ovate to elliptic in outline, pinnately lobed or lyrate, 4-8 cm long, 2-5 cm wide, acute, both surfaces glandular-hairy, margins toothed; petiole to 3 cm long. Inflorescences leafy racemes to 20 cm long; peduncles 0-20 mm long; pedicels indistinctly articulate, 15-20 mm long; bracteoles linear, 2-10 mm long. Sepals lanceolate, 6-10 mm long; corolla 18-22 mm long, densely hairy inside, scarcely auriculate, wholly mauve or blotched with purple, abaxial lobes 9-10 mm long, wings 2-2.5 mm wide; indusium broad-elliptic; ovules 40-50. Fruit cylindric to ovoid, 10-12 mm long, with bifid valves; seeds broad-elliptic, 2-5 mm long, yellow-brown, tuberculate. The taxon flowers mainly from November to February (VicFlora 2019).

Generation Length

The generation length of *Goodenia macmillanii* is estimated to be 5 to 50 years. It is difficult to estimate since it is unclear whether the taxon tends to recruit continuously or episodically in response to major bushfire events, drought-induced mortality, or small-scale localised site disturbances. Longevity is interpreted to be relatively short, although it is unclear whether the taxon can resprout, or is a strict obligate seed regenerator.

Distribution

The taxon is rare and endemic to Victoria where it is known only from the valleys of the Macalister, Snowy, and Deddick Rivers (VicFlora 2019).

Habitat

The taxon is known only from rocky, forested, or scrubby slopes in rainshadowed valleys of the Macalister, Snowy, and Deddick Rivers (VicFlora 2019).

Threats

Recently identified emerging threats to the taxon include extreme drought stress associated with climatic warming and drying. White Box Woodlands dominated by *Eucalyptus albens* in the Upper Snowy, have been recently observed to suffer heavy mortality of trees and understorey, apparently in response to extreme drought stress. The taxon is also threatened by increasing local density and browsing impacts of Sambar Deer (*Rusa unicolor*), which have targeted an unexpectedly wide range of tree and understorey taxa, particularly during their recruitment

phases. Some sites are also exposed to high levels of weed invasion, although this threat is largely restricted to subpopulations close to freehold land which are subject to stock grazing.

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:

Ineligible under Criterion A

There is insufficient evidence to determine whether there has been or will be a reduction in population sufficient to meet any threshold for Criterion A.

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:

Ineligible under Criterion B

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 6,753 km² and the Area of Occupancy (AoO) is estimated to be 100 km², but other thresholds under this criterion have not been met.

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 as Data Deficient

There is insufficient evidence to determine the number of mature individuals. Very few reports of population size are available, and range from 20-1000 mature individuals at individual sites. Most occurrences are in remote, rarely visited sites, and the total number of subpopulations is likely to greatly exceed the number of reported occurrences.

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 D2 as Vulnerable

The taxon is estimated to be very restricted. The taxon has a restricted distribution, occurring in 3 locations, such that this restriction makes the taxon capable of becoming Critically Endangered or Extinct within a time frame of one or two generations. This is in response to the impact of the identified long-term threats, notably extreme drought stress associated with climatic warming and drying, and the potential impact of targeted browsing by Sambar Deer.

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

VicFlora (2019). Flora of Victoria, Royal Botanic Gardens Victoria: *Goodenia macmillanii*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/1c2b0556-c6cc-41b8-bce0-d7220cd5d4b7