Threatened Species Assessment

Goodenia lunata
Stiff Goodenia

Taxonomy

Goodenia lunata J.M. Black

Current conservation status

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A2bc+4bce; B1ab(iii,v)

Species Information

Description and Life History

The taxon is a decumbent to ascending perennial to 25 cm high; stems strigose. Leaves appressed-pubescent to strigose; basal leaves shortly petiolate, ascending, rosetted, linear to ovate, 4-12 cm long, 4-30 mm wide, acute, toothed to pinnatifid; cauline leaves sessile, smaller, entire. Inflorescences terminal racemes to 15 cm long, or subumbels; pedicels articulate, 1-6 cm long; bracteoles absent. Sepals lanceolate, 2.5-3.5 mm long; corolla 8-14 mm long, appressed-pubescent outside and finely pubescent near base inside, yellow, abaxial lobes 4-5 mm long, wings 2-3 mm wide; indusium broad-oblong, virtually glabrous with a curved orifice; ovules 10-20. Fruit obovoid to subglobose, 7-10 mm long, valves entire; seeds suborbicular, 5-7 mm diam., pitted, brown, wing c. 1 mm wide. The taxon flowers mainly in spring (VicFlora 2019).

Generation Length

The generation length of *Goodenia lunata* is estimated to be 20 to 40 years. It is noted to be more than 20 years, with first seed set at 2-3 years. It has the capacity to resprout after fire (TSFRD 2019).

Distribution

In Victoria, the taxon is known with certainty only by a few old collections from the Dimboola area, and recent collections from near Kerang. The taxon also occurs in Western Australia, Northern Territory, South Australia, Queensland, and New South Wales (VicFlora 2019).

Habitat

The taxon occurs on highly disturbed roadside on sandy loam soils in grassland, with other resprouting heavy soils taxa, namely *Haloragis glauca, Teucrium racemosum,* and *Cressa cretica.*

Threats

The taxon is subject to land clearing, climatic drying, and weed invasion. Given the small number of mature individuals, it seems likely that any threatening process will result in a large overall reduction.

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 60 to 120 years is estimated to be 80%, based on (b) and (c) above.

This taxon has previously been known to occur in the Dimboola area, and may have potentially occurred across much of the northern Wimmera and Mallee regions, however these areas are now largely cleared.

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

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 60 to 120 year period, including both past and future (up to 100 years in the future), is estimated to be 10 to 80%, based on (b), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

Given the very small number of individuals, it seems likely that any threatening processes will result in large overall reduction. However, it is unclear what impacts the current decline in habitat quality will have on plants as they are currently persisting in highly degraded areas.

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 B1 as Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 16 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA). The EoO has been made equal to the AoO to ensure consistency with the definition of AoO as an area within EoO.

The taxon is estimated to be severely fragmented as it is known from just a single site and subpopulation which precludes the possibility of recolonisation should this subpopulation become extinct.

It is estimated to have 1 location, and has a continuing decline in (iii) and (v) above as a result of climatic drying and exclusion by weed taxa.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 16 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

As above, the taxon is severely fragmented, has 1 location, and has a continuing decline in (iii) 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:

Eligible under Criterion C1 as Endangered

It is estimated that there are 300 to 500 mature individuals. The rhizomatous habit of this taxon makes population estimates difficult, however given the area covered (along 3 km of roadside on Quambatook - Lake Charm Rd), it is likely to consist of a few hundred plants.

There is projected to be a continuing decline of 7 to 40% within two generations.

Eligible under Criterion C2 as Endangered

It is estimated that there are 300 to 500 mature individuals. The number of mature individuals is estimated to continue to decline, and 95-100% of mature individuals occur within one subpopulation.

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 Vulnerable

It is estimated that there are 300 to 500 individuals, and the taxon is estimated to be very restricted.

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.

TSFRD (2019). Tropical Savannas Fire Response Database: *Goodenia lunata.* Retrieved from: http://www.landmanager.org.au/fire-responses-goodenia-lunata

VicFlora (2019). Flora of Victoria, Royal Botanic Gardens Victoria: *Goodenia lunata*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/1b57737a-5970-4b4e-bcda-31d3d0c5a378