Threatened Species Assessment

Isopogon prostratus
Prostrate Cone-bush

Taxonomy

Isopogon prostratus McGill.

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1994).

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A2ac+4ace; B1ab(iii,v)+2ab(iii,v); C2a(i,ii)

Species Information

Description and Life History

The taxon is a prostrate, spreading shrub, to 1 m or more diam.; branchlets reddish, pubescent. Leaves variously divided into acute linear lobes, to c. 10.5 cm long overall, glabrous but minutely scabrous, flattened; petiole to c. 6 cm long. Inflorescence sessile, to c. 2 cm diam.; involucral bracts sparsely hairy, ovate, acuminate; cone scales numerous, imbricate, broad, truncate, villous to woolly, except for the deciduous tip. Flowers to c. 12 mm long, yellow, glabrous, except for tufts of hairs on the apex of each tepal; pollen presenter at base minutely papillose, slightly swollen, constricted near midway then dilated into globular region, apical part glabrous, c. 4 mm long. Cones more or less globular, to c. 2 cm diam.; nuts villous, ovoid, tapered into a persisting style base, to c. 3 mm long. The taxon flowers from October to December. Older plants usually have a substantial lignotuber or rootstock (VicFlora 2021).

Fire is probably of fundamental importance for regeneration. The taxon is adapted to regeneration following fire, both by resprouting from a basal lignotuber and from seed which is released from its cones following a fire (SAC 1994).

Generation Length

The generation length of *Isopogon prostratus* is estimated to be 50 to 100 years. This is based on the taxon's lignotuberous habit and the reported ability to resprout following fire or other site disturbance. It is also based on the likelihood that the taxon recruits episodically following fire, which is likely to have occurred prior to European settlement at intervals of 35-50 years in the Fernbank district and 45-75 years in the Howe Range.

Distribution

The taxon is very rare in Victoria. There are two disjunct occurrences. The first is near Providence Ponds Flora and Fauna Reserve, 3 km south-west of Fernbank, near Bairnsdale, in East Gippsland. The second occurred at the foot of the Wau Wauka spur on the eastern slopes of Mount Howe, approximately 15 km east-north-east of the Mallacoota Post Office.

The small Providence Ponds population has diminished due to clearing and burning in recent decades, and the taxon is now regarded as endangered in Victoria (VicFlora 2021). Even so, the Providence Ponds population is currently thought to be the largest in Victoria. It has declined from around 4,000 plants in 1969 to a total of 51

known plants in 1993 scattered over an area of less than a hectare (SAC 1994). No juvenile plants or seedlings have been observed at the Providence Ponds site since 1989. It appears that all plants in the population are old (SAC 1994).

The Howe Range population was last recorded in 1969 and was described as a "small occurrence" and although the size is unknown, it may consist of only a few plants. This population has not been relocated despite several intensive searches. In recent years a botanical survey team alerted to the possible presence of *I. prostratus*, failed to locate the plant. Neville Walsh, Senior Research Scientist (Conservation Botanist), National Herbarium of Victoria, carried out a brief search for the species at the Mallacoota site without success (SAC 1994).

Habitat

The taxon occurs mostly in heath and dry sclerophyll forest; sometimes in open grassy areas; usually on sand or sandy soils - in Gippsland on quaternary sand-dunes close to the coast. The average annual rainfall at Fernbank is between 600 and 700 mm and at the Mount Howe site is around 1000 mm (SAC 1994; VicFlora 2021).

Associated species at the Fernbank site include *Banksia marginata* (Silver Banksia), *Eucalyptus consideniana* (Yertchuk), *Eucalyptus cephalocarpa* (Silver-leaf Stringybark), *Leptospermum myrsinoides* (Heath Tea-tree), *Monotoca scoparia* (Prickly Broom-heath), *Restio* spp., *Acacia mitchellii* (Mitchell's Wattle), *Brachyloma daphnoides* (Daphne Heath), *Dillwynia sericea* (Showy Parrot-pea), *Epacris impressa* (Common Heath), *Hibbertia prostrata* (Bundled Guinea-flower), *Lomandra filiformis* (Wattle Mat-rush), and *Rhytidosporum procumbens* (White Marianth). Associated species at the Mallacoota site include *Conospermum* spp and *Darwinia* spp (SAC 1994).

Threats

The rarity of the taxon, both in abundance and distribution, makes it susceptible to local disturbance. Diseases, including *Phytophthora cinnamomi,* and grazing are potential threats (SAC 1994).

There is evidence that the population at the Providence Ponds site has suffered a very serious decline in the past forty to fifty years. It appears that there has been no recent recruitment to the population. No juveniles have been seen since observations began in 1989 (SAC 1994).

In 1956, it was reported that a population of around 4,000 plants growing in the rail reserve at Providence Ponds, across the road from an extant population of 50 plants, was in danger of extermination from bulldozing. The railway reserve was searched in 1992 but no plants were located, and it appears that the species has been eliminated from this former stronghold.

There is a lack of both ecological and management information of the requirements of the species. Fire is probably of fundamental importance for regeneration. The Providence Ponds Flora and Fauna Reserve has not burnt for many years and this is possibly a major reason why there are no young plants present (SAC 1994).

Predation of seed by ants is another possible reason for the lack of recruitment. There are many ant nests present at the site. Lack of indigenous pollinators, through displacement by introduced honey-bees (*Apis mellifera*) or perhaps due to local clearing of large tracts of native ecosystems, may affect the site. There is a history of use of the local nectar resource by apiarists in the area. It is probable that the species was more widespread in the area before the vegetation clearance that accompanied European settlement. Native vegetation is still being cleared in the district. This activity could threaten possibly undiscovered colonies of the species on private property (SAC 1994).

Flowering has been noted at the site. Seed set, seed release and germination requirements are unknown (SAC 1994).

Another major threat to the taxon is *Phytophthora cinnamomi* (Cinnamon Root Rot Fungus). The Proteaceae family, which includes *Isopogon*, is in general very sensitive to this pathogen. This combined with the very small number of plants and small area occupied (less than 1 ha) makes the population susceptible to extinction following infection. *P. cinnamomi* is present in the nearby Holey Plains State Park (SAC 1994).

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 150 to 300 years is estimated to be 95 to 98%, based on (a) and (c) above.

Past population decline is based on a 1956 estimate of 4,000 plants in a rail reserve at Providence Ponds, which was eliminated by bulldozing operations within the railway enclosure.

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

Eligible under Criterion A3 as Endangered

The population reduction over the next 100 years is estimated to be 30 to 50%, based on (a) and (c) above.

Future decline is based on the stochastic impact of the identified threats including recruitment failure, modified fire regimes, potential lack of pollinators, predation of seed by ants, the potential impact of *Phytophthora cinnamomi* and the increasing risk of adult mortality in response to extreme drought stress.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 150 to 300 year period, including both past and future (up to 100 years in the future), is projected to be 95 to 98%, based on (a), (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 B1 as Critically Endangered

The Extent of Occurrence across the taxon's range is estimated to be 60 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas.

The taxon is estimated to be severely fragmented naturally at the regional scale and anthropogenically at the landscape scale. The two known Victorian occurrences are highly disjunct at a separation greatly exceeding the dispersal range of the taxon, which has no specialised mechanism for long-distance dispersal.

It is estimated to have a continuing decline in (iii) and (v) above.

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy across the taxon's range is estimated to be 8 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is severely fragmented, and is estimated to have 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 C2 as Critically Endangered

It is estimated that there are 50 to 60 mature individuals. This population estimate is based on a recent count of approximately 50 plants surviving in the Providence Ponds Flora and Fauna Reserve and a “small occurrence” of only one or a few plants (SAC 1994) reported in 1969 on the eastern slopes of the Howe Range.

The number of mature individuals is estimated to continue to decline. Each subpopulation contains 50 or fewer mature individuals. The percentage of mature individuals in the key remaining subpopulation is 90-100 %.

Continuing decline is based on the stochastic impact of the identified threats including recruitment failure, modified fire regimes, potential lack of pollinators, predation of seed by ants, the potential impact of *Phytophthora cinnamomi* and the increasing risk of adult mortality in response to extreme drought stress.

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 Endangered

It is estimated that there are 50 to 60 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.

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McGillivray, D.J. (1975). Australian Proteaceae: New taxa and notes. *Telopea,* 1 (1), 19-32.

SAC (1994). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 317 *Isopogon prostratus*. Department of Environment and Primary Industries, Victoria.

VicFlora (2021). Flora of Victoria: *Isopogon prostratus.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/4709cd40-1421-4aa1-a700-2de5e2fe8be6