Threatened Species Assessment

Persoonia arborea
Tree Geebung

Taxonomy

Persoonia arborea F. Muell.

Current conservation status

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

Proposed conservation status

Endangered in Australia

Criteria A2abcde+3bcde+4abcde; B1ab(iii,iv,v)+2ab(iii,iv,v)

Species Information

Description and Life History

The taxon is a large shrub or small tree to c. 10 m high; young branches densely hairy. Leaves alternate, oblanceolate, 3-10 cm long, 10-16 mm wide, flat, bright green when young, darker on ageing, smooth, minutely pubescent, particularly on under-surface. Flowers solitary in axils of leaves or scale-leaves; pedicels to c. 5 mm long, hairy. Tepals 16-20 mm long, caudate, silky, terminal spine 1-2 mm long; anthers white; ovary glabrous. Drupe ovoid, to c. 14 mm long, c. 12 mm wide, yellow green. The taxon flowers in summer (VicFlora 2018).

Generation Length

The generation length of *Persoonia arborea* is inferred to be 80-150 years. This is based on the observation that younger individuals do not produce sufficient viable seed to replenish soil-stored seed banks. It is also based on the inference that pre-settlement fire frequencies in Ash forests are likely to have been in the range of 80-800 years.

Distribution

The taxon is endemic to Victoria, where it occurs only in the Central Highlands. It is restricted to catchments of the Yarra, Thomson, La Trobe and Bunyip Rivers, including locations such as Beenak, Black's Spur, Powelltown, Mt Donna Buang, Labertouche, Mount Toorongo and Mt Baw Baw. Costermans (1986) states that it occurs from Toolangi to the Baw Baw area and rarely further east. SAC (1992) noted that it occurs in the Watts River Reference Area (Maroondah Catchment), O'Shannassy Catchment including the Deep Creek Reference Area, Quartz Creek, Acheron River, Tanjil River West Branch Catchment and also the Goulburn River catchment.

Populations in the Baw Baw National Park, Bunyip State Park, Deep Creek Reference Area and Watts River Reference Area are securely reserved appear to be secure. The long-term protection of other catchment and reserve populations is not necessarily guaranteed (SAC 1992).

Habitat

The taxon occurs on the Central Highlands of Victoria in a variety of habitat types, ranging from Cool Temperate Rainforest, Montane Wet Forest and Wet Forest to Damp Forest. However, its habitat is typically moist and its highest cover values are from wet gullies and stream sides in some locations. In other areas, it is most frequently recorded in ecotonal habitat between Cool Temperate Rainforest and Wet Forest, and in Wet Forest itself.

In Cool Temperate Rainforest, the taxon is often associated with Myrtle Beech (*Nothofagus cunninghamii)*, Southern Sassafras (*Atherosperma moschatum)*, and Silver Wattle (*Acacia dealbata)*, with or without Mountain Ash (*Eucalyptus regnans)*. Soft Tree-fern (*Dicksonia antarctica)* and Hard Water-fern (*Blechnum wattsii)* are common lower stratum species. It is often associated with Myrtle Beech. In Damp Forest communities where it has been recorded, an overstorey of Messmate (*E. obliqua)* and Narrow-leaved Peppermint (*E. radiata)* exists, with various shrubs including Wattles, Handsome Flat-pea (*Platylobium formosum)* and Dog Rose (*Bauera rubioides)*, Austral Bracken *(Pteridium esculentum)* and Forest Wire-grass (*Tetrarrhena juncea)* are also prominent species (SAC 1992).

Threats

The taxon is threatened primarily by repeat fire events at intervals below the tolerable fire interval of the taxon, which is interpreted as being in the range 80-150 years although this is subject to conjecture. Tree Geebung is a long-lived taxon; the majority of specimens in regrowth forest from the 1926 and 1939 bushfires produce seed in only small quantities. Frequent disturbance that removes older specimens may lead to a diminished soil seed bank and subsequent longer-term decline in abundance.

Tree Geebung may also be threatened by herbivory by rodents, probably Bush Rats, which are known to feed on the seed. Additionally, larvae of micro-wasps have been observed to eat the developing embryos and up to 80% of seed can be destroyed in this manner (S. Mueck pers. comm. 2020). Field observations by VicForests staff indicate that Sambar may also pose a threat to this taxon due to de-barking as a result of antler rubbing.

Clear-fell forestry operations are thought to eliminate most of the mature resident plants within the harvested coupe. Anecdotal information indicates that regeneration following timber harvesting is variable although prolific germination has been observed in some circumstances; the reasons for this are not known. Spatial analysis of likely habitat for Tree Geebung on all land tenures indicates that 44% occurs within the Comprehensive, Adequate and Representative (CAR) reserve system, including parks, reserves and special protection zones in State forest. Further areas excluded from harvesting by prescription under the Victorian Code of Practice for Timber Production 2014 (the Code). Species-specific protections for Tree Geebung are included in the Code. In recent years, modified harvesting and forest regeneration practices have been implemented in native forest that are designed to further mitigate the potential threat from forestry operations to threatened species and their habitats.

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 Endangered

The population reduction over the past 240 to 450 years is estimated to be 30 to 50%, based on (a), (b), (c), (d) and (e) above.

This is based on the extensive habitat loss and disturbance since European settlement which is likely to have reduced the number of subpopulations overall and reduced the age of many remaining subpopulations with corresponding impacts on seed production.

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 projected to be 30 to 50%, based on (b), (c) and (e) above.

Future decline is based on a continuing decline in numbers and habitat, based on current and projected elevated bushfire frequencies below the tolerable fire interval for the taxon, as a result of climate change. In the short-term, some further disturbance from timber harvesting and associated roading and forest regeneration practices is likely to occur in parts of its range.

Eligible under Criterion A4 as Endangered

The population reduction over any 240 to 450 year period, including both past and future (up to 100 years in the future), is estimated to be 50 to 75%, based on (a), (b), (c) (d) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

This is based on the above past and future declines.

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 Endangered

The Extent of Occurrence (EoO) is estimated to be 2,440 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

A single location of the taxon is based on key identified threats, namely the increasing risk of repeat fire events, which apply across the range of the taxon and can rapidly affect all individuals of the taxon present.

It has a continuing decline in (iii), (iv) and (v) above. This is based on current and projected elevated bushfire frequencies below the tolerable fire interval for the taxon as a result of climate change and, in the short-term, some further disturbance from timber harvesting and associated roading and forest regeneration practices that is likely to occur in parts of its range.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) is estimated to be 484 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it has one location and a continuing decline in (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 inferred that there are 1,000 to 5,000 mature individuals, but this qualifier is too weak to satisfy this criterion.

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

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

Costermans, L. (1986). *Native trees and shrubs of south-eastern Australia*. Rigby: Dee Why West. New South Wales.

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SAC (1992). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 258 *Persoonia arborea.* Department of Environment and Primary Industries, Victoria.

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