Threatened Species Assessment

Tasmannia xerophila subsp. *robusta*
Errinundra Pepper

Taxonomy

Tasmannia xerophila subsp. *robusta* Raleigh

A record of this taxon from Mt Gibbo (north of Benambra) is likely to be a large-leafed variant of subsp. *xerophila* (VicFlora 2017).

Current conservation status

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

Proposed conservation status

Endangered in Australia

Criteria A4ace; B1ab(iii,iv,v)+2ab(iii,iv,v)

Species Information

Description and Life History

The taxon is a bushy spreading shrub to small tree, 0.6-4 m high, usually clumped due to root suckering, stems finely tuberculate, reddish when young. Leaves oblanceolate to narrowly oblanceolate, 7-14 cm long, 20-30 mm wide, coriaceous to rigid, dark green above, pale green or glaucous below, midrib prominent to obscured and finely tuberculate; apex obtuse to subacute; margins flat to slightly recurved; petiole 3.5-6 mm long. Flowers 5-8 per inflorescence; 1 flower per bract; pedicels 7-15 mm long. Male flowers with 9-30 stamens, sterile carpels 1(-2). Female flowers with 2(-4) petals, 5-7 mm long; carpels 1-8 with 3-7 ovules per carpel. Fruits 2-6(-11) per pedicel, globose to short-ovoid, 6.5-11 mm long, 5-10 mm wide, glossy-black to glaucous at maturity; pedicels 5.5-14 mm long; seeds 2-7 per berry; aborted ovules pink. The taxon flowers from December to February (VicFlora 2017).

Generation Length

The generation length of Errinundra Pepper is estimated to be 150 to 500 years. This is based on an estimated longevity of 150-300 years or more, and a pre-settlement fire interval of 150-1000 years. The taxon is inferred to regenerate vegetatively by stem resprouting and root suckering, following low frequency fire events of moderate intensity with a low rate of adult mortality or recruitment failure. Seed recruitment is likely to be both continuous to opportunistic in response to localised disturbance events, and episodic in response to infrequent fire events. The taxon is most frequently associated with old-growth stands of Cool Temperate Mixed Forest, dominated by an emergent stratum of *Eucalyptus denticulata* (Errinundra Shining Gum) of low to moderate stocking rate or density. It is understood that these stands have been carbon-dated at >500 years, whilst still in healthy non-senescent merchantable condition, suggesting such forests can be perpetuated by fire intervals of >500 years.

Distribution

The taxon is apparently endemic to the Errinundra Plateau, south of Bendoc in East Gippsland, with a south-western outlier on the summit of Mt Ellery. Unconfirmed quadrat records in the headwaters of the Gibbo River catchment in the vicinity of Mounts Gibbo, Anderson and Hope are interpreted as large-leaved variants of *T. xerophila* subsp. *xerophila*. Unconfirmed quadrat records in the headwaters of the Rodger River are in atypically drier forest vegetation at lower altitudes, and are likely to be referable, on ecological and biogeographic grounds, to *T. lanceolata,* which is common in the area.

Habitat

Although VicFlora (2017) suggests that the taxon is found growing in wet tall open-forest, among granite outcrops, this represents only one end of the habitat range of the taxon at the highest elevations, on Mt Ellery and at Goonmirk Rocks. More commonly, the taxon is found in Cool Temperate Mixed Forest and Cool Temperate Rainforest across the Errinundra Plateau from Cobb Hill east to the Coast Range, and from Bidwell Creek in the north to the headwaters of the Errinundra River in the south. The greatest concentrations are found on both the north and south aspects of the Gunmark Range.

Threats

In the longer term, the Errinundra Pepper is threatened by the combined impact of a warmer, drier climate and associated bushfire regimes. This can increase the risk of repeat fire events at intervals below the tolerable fire interval of the taxon. Although the taxon can recruit vegetatively by resprouting and root suckering following a single fire event of moderate intensity, high intensity repeat fire events and extreme drought stress are likely to increase the risk of adult mortality and recruitment failure, resulting in a progressive decline in population density.

The Errinundra Pepper may also be threatened in the short-term in parts of its range by forestry operations and associated regeneration practices; elevated evapo-transpiration rates in regrowth forests may also result in reduced soil moisture over the medium-term, although this effect is likely to occur only where substantial proportions of catchments are in a regrowth state, due to bushfires or forestry operations. Findings such as those of Vertessy et al. (2001) for Mountain Ash forests in the Central Highlands may be referable to the habitat of the Errinundra Pepper to some degree given the ecological similarities.

Spatial analysis of likely habitat for Errinundra Pepper on all land tenures indicates that 68% occurs within the Comprehensive, Adequate and Representative (CAR) reserve system, including parks, reserves and special protection zones within State forest. The Victorian Code of Practice for Timber Production 2014 (the Code) prohibits the harvesting of rainforest and requires the application of buffers around stands >0.4 ha. Other more general forestry prescriptions such as protection and buffering of old growth and waterways also provide protection from timber harvesting. Species-specific protections for Errinundra Pepper are included in the Code. The establishment of the Errinundra National Park in the late 1980s and the introduction of the Code in the early 1990s have resulted in much greater protection for this species.

Past decline of this taxon is based on the inferred loss due to land alienation and clearing post European settlement. Very little of the taxon's likely habitat persists on private land. Past decline of this taxon is also based on the inferred impacts of forestry operations over the past ~50 years. Much of the habitat of the Errinundra Pepper was available for timber harvesting in the past. Analysis of harvesting history indicates that approximately 20% of the range of the Errinundra Pepper has been harvested since the mid-1960s although this does not imply an equivalent loss of populations. In recent years, modified harvesting and forest regeneration practices have been implemented in native forest 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 Vulnerable

The population reduction over the past 450 to 1500 years is estimated to be 10 to 30%, based on (a), (c) and (e) above.

Past decline of this taxon is based on the inferred loss due to land alienation and clearing post European settlement and on the inferred impacts of forestry operations over the past ~50 years.

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

Eligible under Criterion A3 as Vulnerable

The population reduction over the next 100 years is projected to be 25 to 45%, based on (c) and (e) above.

Predicted changes to fire regimes under climate change involving more frequent, extensive and severe bushfires threaten the habitat of the Errinundra Pepper, however the degree of future decline cannot be estimated with confidence.

Eligible under Criterion A4 as Endangered

The population reduction over any 450 to 1500 year period, including both past and future (up to 100 years in the future), is estimated to be 35 to 70%, 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 Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 205 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

The taxon is considered to occur in two locations based on management history and current tenure. These are

The taxon is arguably severely fragmented at the landscape scale, with geographically isolated stands likely to be separated by spacings exceeding the dispersal range of the taxon. The taxon has fleshy fruits which are likely to be dispersed by mammal and bird vectors which operate within narrow home ranges within the tall dense old-growth forest habitat to which the taxon is largely restricted. This may limit recolonisation in the event of local extinction.

sites in production forest, and sites subject to historic forestry activities that are now included within the Errinundra National Park; and sites within old-growth forest within the Errinundra National Park, and state forest currently zoned as Special Protection Zones.

It has a continuing decline in (iii), (iv) and (v) above, based on the current and projected impact of the identified threats, especially climate change and associated drought and bushfire regimes, and in the short term forestry operations in parts of its range.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 156 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is estimated to be severely fragmented, to have 2 locations, and has 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 as Data Deficient

There is no reliable estimate of total population size available, although it is likely to be in the thousands.

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.

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)

Vertessy, R.A., Watson, F.R.G., and O'Sullivan, S.K. 2001 Factors determining relations between stand age and catchment water balance in mountain ash forests. *Forest Ecology and Management* **143:**13-26. ISSN 0378-1127, https://doi.org/10.1016/S0378-1127(00)00501-6.

VicFlora (2017). Flora of Victoria, Royal Botanic Gardens Victoria: *Tasmannia xerophila* subsp. *robusta.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/a6efcd36-370a-48b8-9a4d-8abfa891da36