Threatened Species Assessment

Pimelea spinescens subsp. *spinescens*
Spiny Rice-flower

Taxonomy

Pimelea spinescens subsp. *spinescens* Rye

Current conservation status

Listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* as ***Pimelea spinescens*** (SAC 1996).

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

Proposed conservation status

Critically Endangered in Australia

Criteria A2abce+4ac

Pimelea spinescens subsp. *spinescens* is endemic to Victoria.

Species Information

Description and Life History

The taxon is considered to be long-lived and slow growing. It is classified as a stunted subshrub, usually forming a dense tuft of short spinescent divaricate branches (stems) and growing to between 5 and 30 centimetres in height (Walsh and Entwisle 1996). Fresh stem growth is not spiny but soft, smooth, and almost herbaceous. As the stems age the ends become hard, leafless and form a spiny tip (spinescent). The leaves are a uniform dull green colour, decussate in arrangement along the stem, have short petioles, are elliptic in shape, measure two to ten millimetres in length, and are one to three millimetres in width (Walsh and Entwisle 1996).

Recruitment is thought to be low, with germination or seedling survival an irregular event (Mueck 2000) and most populations appearing to consist of relatively mature plants with little evidence of recruitment (Mueck 2000). A recruitment level (i.e. germinants surviving the first summer) of 14 percent was reported from sites within the Volcanic Plains (Reynolds 2013), which was likely associated with optimal climatic conditions (Foreman 2012). Recruitment dynamics and requirements for successful *in situ* recruitment and persistence are not well understood (Foreman 2012), as not all seed will germinate even if conditions are optimal (Reynolds 2013). However, like most grassland taxa, the taxon is tolerant of fire and mature plants readily resprout after fire (Mueck 2000).

The flowers are produced in a terminal compact head. There are between six and twelve flowers per inflorescence. The pale-yellow to white flowers are glabrous (hairless) and have four rounded, petal-like lobes about two millimetres long. Unlike the majority of other grassland plants *P. spinescens* flowers over winter from April through to August depending on the prevailing seasonal conditions (Walsh and Entwisle 1996). The taxon is mostly dioecious. Female flowers have a protruding style which is shorter than the ovary and small non-functional anthers. Male flowers have two anthers with abundant bright orange pollen. The fruit is ellipsoid, two to three millimetre long, and has a thin, initially fleshy layer around a slightly woody 'stone' that encloses the single, oily seed.

Germination appears to be regulated partly by rainfall, with autumn drought and high rainfall both apparently preventing germination (Foreman 2011; Foreman 2012). Germinants are often found in areas close to female or bisexual plants, suggesting that dispersal distances are small (Foreman 2011). Genetic analysis of seed showed that most seed results from outcrossing via pollinators (James and Jordan 2014) but some seed appeared to result

from selfing, indicating that there is a degree of self-compatibility in the breeding system. Mixed mating systems are common in plant taxa, but outcrossing generally provides a greater level of genetic diversity which is the basis for adaptation and should be a high priority for management.

The plant produces a taproot root system which has been documented to extend up to one metre or more into the soil. Over time, the taproot contracts below the soil surface and underground stems develop which form nodes of regeneration following the loss of all above ground biomass.

Generation Length

The generation length of *Pimelea spinescens* subsp. *spinescens* is estimated to be 50 to 80 years. This is based on an estimate of longevity of up to and over 100 years, infrequent successful recruitment where there are numerous germinants but few survive through summer, and dependence on regular biomass removal of the native grassland habitat.

Distribution

Spiny Rice-flower is endemic to Victoria, where it occurs in the central west of the state (Walsh and Entwisle 1996), predominantly in the Victorian Volcanic Plain, Victorian Midlands, and Riverina IBRA Bioregions. Historically, the taxon was undoubtedly much more widespread and abundant within the region where it currently occurs (Carter and Walsh 2006), however populations are now substantially fragmented and depleted due to land clearance for settlement, industry, and agriculture. Many populations consist of a small number of plants (55 percent of sites with population counts have fewer than 100 plants), with most occurring in tiny patches of remnant habitat (59 percent of sites with extent estimates are smaller than 1ha) such as on roadsides and rail easements (Carter and Walsh 2006). Some large populations occur on private property where grazing impacts are light (Recovery Team pers. comm. 2016). The taxon database includes many old and imprecise records, and these figures are likely to be an overestimate of the actual situation.

Habitat

The taxon is predominantly associated with two nationally threatened ecological communities, 'Natural Temperate Grassland of the Victorian Volcanic Plain' and 'Natural Grasslands of the Murray Valley Plains'. It has also been reported in association with *Eucalyptus leucoxylon* (Yellow Gum) and *E. microcarpa* (Grey Box) grassy woodland in the Goldfields (Foreman 2005), and *Allocasuarina luehmannii* (Buloke) open grassy woodland in the Wimmera (Deanna Marshall pers. comm., cited in Foreman 2012). It is likely these grassy woodland habitats represent ecological communities also listed under the EPBC Act. The taxon occurs in grassland or open shrubland, usually developed on clay soils (Walsh and Entwisle 1996). Plants from more northerly populations occur on red clay complexes, while plants from southern populations occur on heavy grey-black clay loams derived from basalt. Topography is generally flat, but populations may occur on slight rises or in slight depressions prone to temporary inundation. Vegetation is often dominated by *Themeda triandra* (Kangaroo Grass), with *Austrostipa* spp. (Spear Grass) or *Rytidosperma* spp. (Wallaby Grass) commonly associated.

Threats

The primary threats to the taxon are land clearing and habitat degradation, particularly from excessive biomass from both native and exotic plants. Most of the populations are small and fragmented, and their long-term viability is doubtful without intensive site management. Reduced connectivity limits gene-flow between sites, and the taxons genetic integrity is at risk if inbreeding occurs as a result of distances between sites being greater than the travel distance of pollinators. Large populations can also experience significant declines over relatively short periods of time, especially following periods of drought (Foreman 2012).

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 240 years is estimated to be 90 to 99%, based on (a), (b), (c) and (e) above.

Historic decline is based on the loss of native grassland habitat across VVP and Riverina, and known losses of plants around Melbourne. The current distribution in multiple linear reserves indicates that it was extremely widespread prior to European settlement.

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

Future reduction is based on the ongoing loss of native grasslands, continuing development around Melbourne with inadequate management and replacement, and climate change. The taxon relies on cool autumns and winters to trigger flowering and seed production, so warm nights in autumn lead to poor condition of the plants. Increasingly hot summers will also lead to reduced survival of germinants, especially from hot winds and warm nights.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 150 to 240 year period, including both past and future (up to 100 years in the future), is inferred to be 50 to 99%, based on (a) and (c) 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 B2 as Vulnerable

The Area of Occupancy (AoO) is estimated to be 1,152 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The taxon is estimated to be severely fragmented, and has a continuing decline in (ii), (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:

Ineligible under Criterion C

It is estimated that there are 70,000 to 90,000 mature individuals, which exceeds the thresholds for criterion C.

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:

Ineligible under Criterion D

It is estimated that there are 70,000 to 90,000 mature individuals, which exceeds the thresholds for criterion D.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

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