

Xanthorrhoea glauca subsp. *angustifolia* Grey Grass-tree

Taxonomy

Xanthorrhoea glauca subsp. *angustifolia* D.J. Bedford

Bellette (2009) found key differences in morphology between populations of *Xanthorrhoea* inland of the Great Dividing Range compared to populations of *X. australis* in coastal Victoria. His work demonstrates that the closest affinity inland is with the published taxonomic concept of *X. glauca* subsp. *angustifolia* (SAC 2013).

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2013).

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A2abce+3bce+4abce

Species Information

Description and Life History

The taxon is stemmed and tree-like (arborescent) - growing up to six metres tall; or entirely subterranean, with only the leaves and flowering part rising from the ground. The stem is often aerially branched. The inner stem (the caudex) is surrounded and protected by tightly packed leaf-bases giving arborescent individuals the stem strength required for aerial growth. Long, linear and pointed leaves are produced from the apex of branches as a tuft of leaves. Leaves are usually quadrate-rhombic to broadly transverse-rhombic in cross section, 1.3-2.8 mm wide, 0.9-1.6 mm thick, greyish. Both vegetative and reproductive growth occurs almost entirely from the apical meristem(s). The inflorescence is a massive spike packed with dense bracts (cluster bracts with hairs (if present) mainly at margins; packing bracts acute. Outer tepals are acute and with a beak to 0.5 mm long) between the flowers that arise from the apical meristem on a woody smooth stem (called a scape which is 18-40 mm diameter; ~150 cm long). The spike is capable of producing copious amounts of seed in most species (many thousands). Dead leaves are persistent on the trunk of arborescent species and form a dense skirt. When the stem is burnt, the skirt is consumed leaving blackened trunks that are often kinked and branched. Flowers are bisexual and the perianth is persistent and hardened at maturity. The taxon has secondary meristem thickening and extrude resinous material at the leaf bases and at the apex of the stem. This resin is red in colour (SAC 2013).

Some populations in Victoria have previously been regarded as long unburnt stands of *X. australis*. These two taxa are morphologically similar, *X. glauca* can only be reliably distinguished by the longer scape (>65 cm) and acute to somewhat spatulate bracts that surround the flowers. These two taxa appear to have different flowering cues.

Xanthorrhoea glauca regularly flowers in the absence of fire. In contrast, flowering in *X. australis* is typically restricted to mass events in the year following fire (VicFlora 2014).

Generation Length

The generation length of *Xanthorrhoea glauca* subsp. *angustifolia* is inferred to be 100 to 200 years. Based on a longevity of 150-200 years or more and the high risk of recruitment failure to drought stress under pre-settlement conditions. The pre-settlement mean fire frequency was likely to have been in the 50-200 year range.

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Distribution

The distribution of the taxon in New South Wales (NSW) is contiguous with that of north-eastern Victoria. Many of the taxon locality grids are represented by small populations and in some cases just a few individuals. This is true for populations in the box-ironbark ecosystem, for instance at St Arnaud, Stuart Mill, South of Heathcote and Mia Mia, and Chiltern. In many localities such as the Rushworth Heathcote Forest Block (RHFB), populations have a core in the main forested areas on public land; however, the large connectivity of the grid squares is contributed by small outlying populations around the RHFB on private land. Extensive vehicle searches between the RHFB and St Arnaud area have found no populations of the taxon in this area. To the south-west of St Arnaud at Ararat, a few small non-reproductive plants occur in Box-ironbark vegetation. Yet given the lack of floral material, the geomorphology and vegetation of the site suggest that this small population is the most western extent of *X. glauca* subsp. *angustifolia*. To the north in NSW the population is found inland as north as the Warrumbungle area.

Habitat

Bellette (2009) found that the taxon is often found in association with heathy and grassy woodlands and forests, often growing with *Eucalyptus macrorhyncha* and *Brachyloma daphnoides* on sandstone, granite and metamorphic geologies, and some Tertiary sedimentary deposits where soils are severely nutrient deficient. Soil pH has been recorded as low as 4.0. It would appear that this association occurs on older geologies with a high quartz gravel and/or sand component often containing rich gold deposits, as are the Silurian sandstone deposits of areas east of the Cadell Fault in Victoria. In higher mountain terrain of the inland side of the Great Dividing Range, the taxon is found in association with communities dominated by *Eucalyptus dives*. The taxon has not been recorded on terrain transgressed by the Oligocene marine inundation. There is a rainfall limiting factor, the taxon requires at least ~450-500 mm per annum annual rainfall with no upper limit (it grows in areas of the State where rainfall exceeds 1000 mm), whereas the summer mean daily maximum temperatures occupies a narrow niche between 27-30 degrees Celsius (data from Victoria and NSW locality records, and climatic data extracted from the program BIOCLIM) (SAC 2013).

Threats

Threats include effective elimination from gully lines throughout most of the Victorian range due to landscape scale soil disturbance during the Gold Rush of the 19th century; silvicultural practices prior to WWII which were applied ubiquitously across the Box-Ironbark forests; juvenile and adult mortality in response to *Phytophthora cinnamomi* infection; browsing pressure notably by European Rabbit, inappropriate fire regimes particularly in the recent past; and recruitment failure due to severe drought.

These threats occur in the context of a species already in decline. Bellette (2009) and Curtis (1998; 2003) note that many populations are currently without sufficient juvenile and young adult demographics to be able to survive into the future. There are very few plants in the smaller size classes at many localities. Grazing pressure, notably by the European Rabbit in Victoria in the late 1850-1890s, followed by long forgotten forest management practices (including fire suppression by sweeping and burning vegetation between the 1890s-1930s) had detrimental effects on the population (Bellette 2009; Curtis 2003). The population may have had some reprieve following the introduction of the Myxomatosis Virus in 1955 when rabbits were almost wiped out and seedlings could again survive (Curtis 2003).

Threats also operate in the context that the taxon is very slow growing, and flowering and seed fall is highly sporadic. The annual stem growth rate of plants ranges from 1-2 centimetres each year dependent on the stem size (Bellette 2009; Curtis 2003).

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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%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p> <p style="text-align: center;">based on any of the following:</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>			

Evidence:

Eligible under Criterion A2 as Critically Endangered

The population reduction over the past 300 to 600 years is estimated to be 50 to 90% (likely 80%), based on (a), (b), (c) and (e) above.

Based on an estimated 72% loss of dry heathy forest in the Box-Ironbark ecosystem, with which the taxon is highly correlated, and other known threats, i.e., landscape-soil disturbance during the 19th century, silvicultural practices prior to WWI, juvenile and adult mortality in response to *Phytophthora cinnamomi* infection, browsing pressures, inappropriate fire regimes and recruitment failure due to severe drought.

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

Eligible under Criterion A3 as Critically Endangered

The population reduction over the next 100 years is projected to be 55 to 90% (likely 80%), based on (b), (c) and (e) above.

This is based on largely on the possibility of further land clearing of populations on private land, and the occurrence of known threatening processes currently acting on remaining populations. Added to this, many populations are significantly aged without adequate recruitment occurring. Two key threatening processes are the spread of *Phytophthora cinnamomi* from infected sites into parks and reserves; and inappropriate fire regimes causing disruption to sustainable ecosystem processes and resultant loss of biodiversity.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 300 to 600 year period, including both past and future (up to 100 years in the future), is estimated to be 80 to 95%, based on (a), (b), (c) and (e) above.

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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 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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 B as Endangered

The Area of Occupancy (AoO) is estimated to be 448 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

The taxon is estimated to be severely fragmented naturally at the subregional scale and anthropogenically at the landscape scale throughout the range of the taxon. All stands are isolated with no known mechanism for seed dispersal at the landscape scale with seed broadcast from adult plants in the immediate vicinity only.

It has one location, and has a continuing decline in (i), (ii), (iii), (iv) and (v) above, on the basis that the current identified threats are will continue to impact the taxon. There is an increasing risk of risk of recruitment failure due to severe and extended drought, in response to climatic drying and warming. There is also a continuing risk of incremental loss of small and isolated stands on freehold land across the range of the taxon.

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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 8,000 to 30,000 (midpoint 15,000) mature individuals, but other thresholds under this criterion have not been met.

Criterion D. Very small or restricted populations				
		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 km ² 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

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