

Threatened Species Assessment

Eucalyptus baueriana subsp. *thalassina* Werribee Blue-box

Taxonomy

Eucalyptus baueriana subsp. *thalassina* Rule

The *Eucalyptus baueriana* complex can be distinguished morphologically from the *E. polyanthemus* complex most reliably on fruit shape (conical fruits compared with barrel-shaped fruits respectively). The typical form of *E. baueriana* is a large, umbrageous tree with a stout trunk and a lustrous, green canopy, as well as longer buds and fruits in comparison with the taxon. It is confined in Victoria to Gippsland (Rule 2005).

In the northern part of the range of the taxon, there are two other similar eucalypts, *E. polyanthemus* subsp. *vestita* and the recently described subsp. *marginalis*, both of which have been confused with *E. baueriana* (Rule 2005). *E. polyanthemus* subsp. *vestita* always occurs upslope of *E. baueriana* and features pruinose buds, leaves and branchlets and barrel-shaped fruits. *E. polyanthemus* subsp. *marginalis* occurs on ridges and features slightly glossy, green or blue-green foliage, as well as barrel-shaped fruits (Rule, 2005).

Current conservation status

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

Proposed conservation status

Endangered in Australia

Criteria A2bcde+4bcde; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C1

Species Information

Description and Life History

The taxon is an umbrageous, low-branching tree with a greyish, compact, box-type bark extending to the secondary branches and with a dense canopy. It is distinguished by its dull, blue-green, orbicular, small juvenile leaves, its dull, grey-green or sea-green, sub-orbicular or orbicular small adult leaves, its compound inflorescences, its small, yellow-orange, ovoid buds and its small, obconical, thin-walled fruits. The taxon flowers from November to December (VicFlora 2016; Rule 2011), and its fruits mature by the following summer (Rule 2005). Rarely does it retain the previous season's mature fruits in the canopy, and insects are considered to be the main pollinators. Sexual maturity is likely to be attained within 15 years following germination.

The ability of adult plants to regenerate from epicormic buds following crown damage is apparent in the field. Seedling trials demonstrate early vigorous development of a lignotuber, suggesting that the taxon can also regenerate successfully by resprouting from the lignotuber following damage to the crown by bushfire or grazing. The importance of flood events as the primary driver of recruitment is strongly implicated in riverine habitats on the volcanic plains (Rule 2005).

Generation Length

The generation length of *Eucalyptus baueriana* subsp. *thalassina* is inferred to be 50 to 200 (midpoint 100) years. This is based on the observation that remnant stands and individuals along the Werribee River appear to represent mature pre-European cohorts that are more than 180 years old, with little evidence of successful recruitment following European settlement in the 1830s. Other stands along Coimadai and Djerriwarrh Creeks and their tributaries are much younger and may have germinated only within the last 40 years, although their present age

Eucalyptus baueriana subsp. *thalassina*

Werribee Blue-box

may not be indicative of the natural turnover rate of mature individuals in the population. It is likely that stands in each of the two bioregional contexts were maintained with equally contrasting effective generation lengths (Rule 2005).

Distribution

The taxon grows close to watercourses in the Werribee River catchment, both downstream from Bacchus Marsh along the Werribee River Valley and to the north-east of Bacchus Marsh along Coimadai and Djerriwahr Creeks which feed into the Werribee River (Rule 2011; VicFlora 2016). The taxon is scattered along the watercourses that drain into the Werribee River and along the river itself where it occurs as individual trees or small, scattered stands with few larger concentrations (Rule 2005).

It is estimated that more than half the total population of the taxon (up to 400 mature individuals) occurs along Coimadai Creek, particularly in the Long Forest Nature Conservation Reserve and the Merrimu Reservoir Reserve. Slightly lesser numbers (up to 300 mature individuals) are estimated to occur along Djerriwarrh Creek and its tributaries, including the Pyrete Range extension to the Lerderderg State Park. The total population at Melton South near the Greigs Road Crossing, at Cobbleticks Ford and around Werribee is unlikely to exceed 50 mature trees (Rule 2005).

Habitat

The taxon occurs in two distinct habitats. Populations south of Bacchus Marsh and Melton fall within the Victorian Volcanic Plain bioregion and occupy riverine floodplain habitats in broad U-shaped valleys that characterise the middle reaches of the Werribee River (Rule 2005). These valleys are sharply incised within the volcanic plain and subject to brief and occasional inundation as a consequence of overbank flows. Northern populations in the Long Forest, Coimadai and Toolern Vale districts fall within the Central Victorian Uplands bioregion and occupy riparian habitats in V-shaped valleys in the catchments of Coimadai and Djerriwarrh Creeks (Rule 2005).

The taxon occurs in riparian and riverine habitats where it grows in alluvial soils derived mostly from sedimentary substrates (Cambro-Ordovician sandstones) in the Pyrete and Lerderderg Ranges (Rule 2005). In riverine habitats within the volcanic plain the taxon is generally associated with Floodplain Riparian Woodland and in riparian habitats in the headwater catchments the taxon is generally associated with Riparian Creekline Grassy Woodland. *E. camaldulensis* (River Red-gum) is a frequent associate along the lower reaches of the Werribee River whilst in the headwater catchments the taxon is often associated with *E. ovata* var. *ovata* (Swamp Gum) and *E. viminalis* subsp. *viminalis* (Manna Gum). Riparian stands in these northern catchments often abut stands of *E. leucoxylon* subsp. *connata* (Melbourne Yellow-gum), *E. microcarpa* (Grey Box) and *E. polyanthemus* (Red Box). Elevation ranges from 40 m above sea level at Cobbleticks Ford to over 200 m in the Coimadai district. Northern populations in the Bacchus Marsh district receive rainfall of 500-600 mm per annum or more whilst those in the Werribee district are in a localised rainshadow area and receive only 400-500 mm per annum (Rule 2005).

Threats

All populations are subject to weed invasion, particularly those on the fertile alluvial soils of the Werribee River floodplain, and field observations suggest that heavier infestations restrict or even prohibit seedling recruitment. Many stands in riverine settings on the volcanic plain are now enveloped in weedy landscapes dominated by perennial exotics such as *Lycium ferocissimum* (African Box-thorn), *Marrubium vulgare* (Horehound), *Nasella neesiana* (Chilean Needle-grass) and *Salix taxa* (Willow) (Rule 2005).

Many populations, particularly those in riverine habitats on the volcanic plain, are threatened by modification of the pre-European hydrological regime by the capture of floodwaters in reservoirs for irrigation and town water supplies and in numerous farm dams. Habitat preference and additional observations suggest that flooding, rather than fire, is the principal driver of recruitment (Rule 2005).

Firewood collection is likely to be an ongoing threat to remnant stands, particularly those on freehold, unless specifically regulated (Rule 2005).

High density infestations of rabbits are a particularly severe threat in riverine habitats with friable sandy or silty soils. Rabbit browsing of eucalypt seedlings and juveniles severely limits or precludes the success of seedling recruitment (Rule 2005).



Eucalyptus baueriana subsp. *thalassina* Werribee Blue-box

All remnant populations in rural landscapes are threatened by a generalised loss of vigour ('rural tree decline'). This syndrome often accompanies habitat fragmentation and degradation and the imposition of unfavourable fire, grazing or flood regimes that often inhibit or prohibit seedling recruitment. In this weakened condition many stands of mature and senescing trees are particularly vulnerable to disease or unnaturally high rates of mistletoe infestation. In the absence of recruitment, such stands can be expected to disappear from the landscape within the next century (Rule 2005).

Inappropriate fire regimes can be identified as a potential threat, which may result in a catastrophic or incremental decline or local extinction of the taxon. Populations in the northern catchments of the Werribee River are at greater risk from repeat burns at short intervals that may eliminate juveniles which have yet to reach reproductive maturity. Populations on the volcanic plain and remnants within urban precincts, from which fire is actively excluded, may be at greater risk of failing to recruit in the absence of fire which, for most eucalypts, normally promotes seedling recruitment (Rule 2005).

The observed restriction of the proposed taxon to a very specific habitat suggests that the taxon is genetically incapable of exploiting a wide range of habitats available to other taxa with broader ecological amplitudes. This habitat specificity limits its ability to colonise new areas or recolonise areas of former habitat modified by European activity (Rule 2005).

Historically, populations on the Victorian Volcanic Plain have been severely depleted due to early European settlement and intensive grazing and cropping. The Werribee River floodplain has been intensively exploited for agricultural purposes, including market gardening, which also generated pollution from pesticide and fertiliser application, reduced water flow because of irrigation and facilitated weed invasion (Rule 2005).

In recent decades, accelerated urban development of Bacchus Marsh, Melton, Melton South and Werribee have also placed additional pressure on remnant stands of the taxon (Rule 2005). Field studies indicate that there is no seedling recruitment around the remaining scattered trees, despite their capacity to produce an abundance of fertile seed which produce hardy, vigorous seedlings in progeny trials under nursery conditions (Rule 2005).

Populations in the catchments of Coimadai and Djerriwarrh Creeks have historically suffered from habitat degradation through grazing rather than habitat loss to intensive agriculture and urban development, and, in recent decades, hobby farms and lower density residential development have resulted in further habitat degradation on freehold land and edge effects on stands in conservation reserves (Rule 2005).

Field observations suggest that some stands may have been eliminated through the establishment of the Merrimu Reservoir at Coimadai, the Melton Reservoir at Melton South and the Djerriwarrh Reservoir in the Toolern Vale district. However, it is impossible to determine the extent to which the taxon occupied the area now covered by these lakes (Rule 2005).

Eucalyptus baueriana subsp. *thalassina* Werribee Blue-box

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>based on any of the following:</p> <ul style="list-style-type: none"> (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 150 to 600 years is inferred to be 50 to 75%, based on (b), (c), (d) and (e) above.

Field observations indicate that the taxon is in decline, particularly in the southern part of the range where it consists mainly of scattered, mature remnant trees. While the extent of historic decline cannot be accurately determined, the causes of this decline are obvious in the landscape and include clearing for agriculture and urban development, pollution from agricultural and urban activity and severe weed invasion.

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 45%, based on (c), (d) and (e) above.

Future decline is based on the plausible impact of weed invasion, modified hydrological regimes, firewood collection, rabbit browsing, rural tree decline and inappropriate fire regimes. Without intervention, the remaining mature individuals on the volcanic plain are destined to senesce and die without replacement by a new generation of seedling recruits. The time scale for this projected local extinction cannot be accurately predicted (Rule 2005).

Eligible under Criterion A4 as Endangered

The population reduction over any 150 to 600 year period, including both past and future (up to 100 years in the future), is inferred to be 50 to 75%, based on (b), (c), (d) and (e) above. The causes of the reduction may not have ceased, be understood or be reversible.

Eucalyptus baueriana subsp. *thalassina* Werribee Blue-box

| 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 B1 as Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 299 km², based on accepted, post-1970 records from the VBA.

The taxon is estimated to be severely fragmented, largely as a result of extensive habitat loss and the failure of remnant stands to recruit as a result of habitat degradation (Rule 2005). Without adequate intervention it is likely that the taxon will become locally extinct at most sites south of Bacchus Marsh and Melton in the near future (Rule 2005).

It is estimated to have 2 locations, and has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the identified threats.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 112 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

As above, the taxon is severely fragmented, has 2 locations, and has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

Eucalyptus baueriana subsp. thalassina

Werribee Blue-box

| 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 C1 as Endangered

It is estimated that there are 700 to 900 mature individuals. A continuing decline of 30 to 45% is estimated to occur within 2 generations, based on the plausible impact of weed invasion, modified hydrological regimes, firewood collection, rabbit browsing, rural tree decline and inappropriate fire regimes.

| 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

It is estimated that there are 700 to 900 individuals, and the taxon is inferred 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:



Eucalyptus baueriana subsp. *thalassina* Werribee Blue-box

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