

***Eucalyptus approximans* Maiden (Myrtaceae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Not Listed

Current NSW TSC Act Status: Vulnerable

Proposed change for alignment: List as Vulnerable under EPBC Act.

Conservation Advice: *Eucalyptus approximans*.

Summary of Conservation Assessment

Eucalyptus approximans Maiden is eligible for listing as Vulnerable under Criteria D2. The main reasons for this are i) restricted area of occupancy (12 -20 km²) and there are only two known locations based on a west to east gradient of increased risk of worsening drought conditions, ii) drier conditions that may be beyond the limits of the species tolerance could result continuing declines at least in the Cathedral Rock NP population, and if these conditions coincide with fires, particularly high frequency fires, this population may be lost relatively quickly resulting in a single remaining location thereby qualifying the species as CR under B1ab(i, ii, iv, v) (as the EOO for the species already meets the threshold for CR [<100 km²] under criterion B).

Description and Taxonomy

The NSW Scientific Committee (2008) state that “*Eucalyptus approximans* Maiden (family Myrtaceae) is a mallee that has been described by Hill (2002, p.158) as follows: ‘Mallee to 5 m high; bark smooth, white, green or grey, shedding in ribbons. Juvenile leaves disjunct, lanceolate, glossy green. Adult leaves disjunct, narrow-lanceolate, 7-10 cm long, 0.6-0.9 cm wide, green, glossy, concolorous. Umbellasters 7-flowered; peduncle terete, 4-10 mm long; pedicels terete, 1-4 mm long. Buds clavate, 3-6 mm long, 3-4 mm diam., scar absent; calyptra hemispherical, shorter than and as wide as hypanthium, minutely warty. Fruit cylindrical or hemispherical, 6-8 mm long, 5-7 mm diam.; disc flat; valves enclosed.’”

“*Eucalyptus approximans* was originally described by Joseph Maiden in 1920 from Barren Mountain in north-eastern NSW. Since this original description two other mallee Eucalypts, *E. codonocarpa* Blakely & McKie (1930) and *E. microcodon* L.A.S. Johnson & K.D. Hill (1991), have occasionally been included within a broadly circumscribed *E. approximans*. Hill (2002), however, treated all three taxa as distinct species and believed that the name *E. approximans* should only refer to the population growing on Barren Mountain. Hill’s (2002) circumscriptions are those currently recognised by the New South Wales Herbarium (<http://plantnet.rbg Syd.nsw.gov.au/floraonline.htm>, accessed 05 July 2017). *E. approximans* can be distinguished from *E. codonocarpa* and *E. microcodon* by having narrow, linear to narrow-lanceolate adult leaves c. 1 cm wide. In contrast, *E. codonocarpa* and *E. microcodon* have broader, lanceolate adult leaves to 2 cm wide. *E. approximans* also has a narrower disc on its fruit.”

The treatment of *E. approximans* as a distinct taxon, separate from *E. codonocarpa* (Table 1.) is accepted by the Council of Heads of Australasian Herbaria (CHAH 2006). Most of the records (made prior to 2002) of *E. approximans* outside of the Barren Mountain population, were found to be *E. codonocarpa* or *E. microcodon*. There is, however, a single specimen from Cathedral Rock National Park (CRNP) identified in 1972 which was identified as *E. approximans* and has since been confirmed to be *E. approximans* under the current taxonomic definition of the species (I. Telford, pers. comm. Dec. 2016, L. Copeland, pers. comm. Dec. 2016).

<u>Feature</u>	<u><i>Eucalyptus approximans</i></u>	<u><i>Eucalyptus codonocarpa</i></u>	<u>Reference</u>
Leaf shape	Linear, straight or slightly curved	Lanceolate, markedly curved	Williams 1992
Leaf width	5-10 mm wide	10-22 mm wide	Williams 1992
	6-9 mm wide	8-18 mm wide	Hill 2002
	c.9 mm wide	To 200 mm wide	Brooker & Kleinig
Leaf oil glands on dried leaves	Very numerous and raised on one surface	Scarcely raised	Williams 1992
Bud no per umbel	7	3-7	Hill 2002
Disc	narrow	broad	Hill 2002
		“broader”	Brooker & Kleinig

Table 1. Distinguishing features between *Eucalyptus approximans* and *E. codonocarpa* (L. Copeland, 2017).

Distribution and Abundance

Based on only including the Barren Mountain population within *Eucalyptus approximans*, the NSW Scientific Committee (2008) stated that “*Eucalyptus approximans* is endemic to New South Wales where it is known only from Barren Mountain, largely within New England National Park. Some plants also occur on the northern base of Barren Mountain, just outside the National Park boundary.”

“*Eucalyptus approximans* has a very highly restricted geographic distribution. The extent of occurrence and area of occupancy are both estimated to be less than 4 km² (Copeland 2008). This calculation is based on the species occupying a single 2 x 2 km grid square, the spatial scale of assessment recommended by the IUCN (2008).”

Some record databases still show erroneous records of *E. approximans* outside of Barren Mountain in New South Wales and Queensland. The majority of records outside of Barren Mountain in NSW appear to be based on changes to the species taxonomic definition over time and coincide with records of *E. codonocarpa* and are all dated prior to the treatment of *E. approximans* as a distinct species (Hill 2002). There is, however, one specimen from Cathedral Rock National Park, c. 25.5 km WSW of the Barren Mountain population, which has been confirmed to be *E. approximans* (I. Telford, pers. comm. Dec. 2016). Targeted surveys in the vicinity of the Cathedral Rock NP record were carried out in May 2017 by Lachlan Copeland. This survey targeted rocky outcrops believed to be suitable habitat for *E. approximans* and located a large continuous population of the species on a granite outcrop approximately 2.3 km WNW of Round Mountain, consisting of between 500 and 1000 mature individuals. North east of this large population, 16 small discrete stands of the species were located containing an estimated 135 mature individuals (Copeland, 2017). The habitat of *E. approximans* in Cathedral Rock NP differs somewhat from that on Barren Mountain, plants in the former tended to occur on the edge of granite outcrops in shallow soils while the Barren Mountain population occurs on slightly deeper, finer textured soils on rhyolite (Copeland, 2017). The new population also extends the species upper altitudinal limit from c. 1370 m to c. 1500 m.

In addition to these newly observed populations, older records of “*E. codonocarpa*” in Cathedral Rock NP were also obtained from a former ranger (Anon. pers. comm., May, 2017), the records (at sites not seen by Copeland) are scattered within a 2.5 km radius, NW to SE of the large population located during the surveys in by Copeland in 2017. These records are likely to be further examples of misidentified *Eucalyptus approximans*, given that the presence of the species in the park has now been confirmed and that the southern limit of *E. codonocarpa* is currently believed to be c. 50 km north, in the vicinity of Pheasant Mountain based on verified specimens (I. Telford, pers. comm. Dec.

2016). As these records are unverified and the numbers of individuals are described in relative terms they have not been used to calculate number of mature individuals and have only been included in the upper estimate of the species' geographic distribution.

Based on the Barren Mountain records and the new verified records from Cathedral Rock NP (Copeland, 2017) and all collated and cleaned records available through relevant databases, the best estimates of the extent of occurrence (EOO) (calculated using a convex hull polygon as recommended by IUCN, 2017) was found to be 25 km² and the area of occupancy (AOO) to be 12 km², using a 2 x 2km grid, as recommended by IUCN (2017). Upper bound estimates which include the older records of *E. codonocarpa* in Cathedral Rock National Park, which are now considered likely to be misidentified *E. approximans*, extend EOO to 76 km² and AOO to 20 km².

The population on Barren Mountain is only accessible through private property. In the last 5 years, there has been no access to the site and this looks to continue for the foreseeable future (L. Copeland, pers. comm. Dec. 2016).

Estimates of population size for mallees carry a level of uncertainty due to the habit of these species to form dense, multi stemmed stands and resprout from lignotubers. At present a conservative estimate for the Barren Mountain population is a minimum of 2000 mature individuals (Copeland, 2008) and the estimate for the Cathedral Rock NP population is estimated to contain between 500 and 1000 mature individuals (Copeland, 2017). A lower bound estimate of 2500 mature individuals is therefore the minimum likely population size with 3000 mature individuals almost equally as valid a minimum given the level of uncertainty. If the additional Cathedral Rock NP records of *E. codonocarpa* are later confirmed to be misidentified *E. approximans* the total number of mature individuals for Cathedral Rock NP may increase by a further 500-1000 (Anon. pers. comm., May 2017).

Ecology

The NSW Scientific Committee (2008) state that "*Eucalyptus approximans* grows in mallee scrub in shallow soils derived from trachyte. The species usually forms dense clumps with numerous shrubs, ferns and sedges beneath them. *E. approximans* rarely coexists with other species of *Eucalyptus*, apparently because its preferred substrate is usually too shallow for the other trees to inhabit. The altitude of the area ranges from 1250-1430 m above sea level and most stands of the species are on relatively flat or northerly facing aspects. Like other mallee Eucalypts, *E. approximans* has been observed to resprout from a basal lignotuber after fire (Clarke *et al.* 2000)."

The habitat of *E. approximans* in Cathedral Rock NP differs somewhat from that on Barren Mountain, plants in the former tended to occur on the edge of granite outcrops in shallow soils while the Barren Mountain population occurs on slightly deeper, finer textured soils on trachyte (Copeland, 2017). The new population also extends the species upper altitudinal limit from c. 1370 m to c. 1500 m.

Threats

The NSW Scientific Committee (2008) stated that "At present there is no evidence that the population of *Eucalyptus approximans* is undergoing a continuing decline, although inappropriate fire regimes and long-term climate change may threaten the species in the future. The very highly restricted geographic distribution means that the species may be prone to the effects of human activities or stochastic events within a very short time period."

The newly located population of *E. approximans* in Cathedral Rock National Park was also noted as having no apparent threats during recent surveys, with the most significant likely threat being a regime of too frequent fire (Copeland 2017). Both populations are almost entirely reserved in either Cathedral Rock National Park or New England National Park, with only a handful of older records occurring outside of reserved tenure on private land.

While there remains no evidence of continuing decline for the species at present (L. Copeland pers. comm. Dec. 2016), climate change driven shifts in rainfall/drought patterns and related changes to fire frequency have been suggested as posing a significant threat to *E. approximans* in the future given its restricted range and relative isolation on mountaintops (J. T. Hunter, pers. comm. Dec. 2016).

There is evidence that the area across which *E. approximans* occurs will become increasingly dry under future climate change, at least under the most extreme scenario of "... rapid economic and population growth based on intensive fossil fuel consumption modelled by the IPCC (scenario A1FI, IPCC 2007) ..." (Tozer *et al.* 2017). Under this scenario annual evapotranspiration deficits (ETD's), the amount that annual rainfall falls short of meeting evapotranspiration demand, are predicted to increase by c. 950% and c. 350% for the Barren Mountain population and Cathedral Rock NP populations respectively (Tozer *et al.* unpublished). While, the magnitude of change is larger for the Barren Mountain population in the east, the forecast ETD for this population is below the levels currently experienced by the Cathedral Rock NP population in the west. The increases in ETD for the Cathedral Rock NP represent a shift to a markedly drier climate for the species, several orders of magnitude beyond the driest conditions the species currently experiences.

An increase in the summer rainfall deficit could affect the risk of extinction of *E. approximans* if conditions exceed the physiological tolerance of the species. Exactly how tolerant *E. approximans* is of dry conditions is unknown, as is the extent to which the potential for increased ETD's will be realised at the site scale. Projections of change to mean summertime rainfall indicate a decrease of around 5% across the species range over the next 20 years (OEH 2014). The impact of climatic drying is likely to be more severe in the western population where deficits are predicted to increase beyond the current range experienced within the species' distribution. Deficits in the eastern population are not expected to exceed this range, however this shift could be exacerbated by the skeletal soils in which *E. approximans* tends to grow due to the limited soil water storage capacity. Reduced water availability in an already dry environment poses a risk to sensitive life history stages such as seedling establishment. If recruitment is impaired, then as mature plants senesce the population will begin to decline. An eastward range contraction of the species resulting in the loss of Cathedral Rock NP population is therefore a plausible scenario if human-induced changes in climate continue to follow the most extreme of the modelled scenarios.

Predicted drier conditions are likely to impact negatively on the species recovery from fire, regardless of whether the fire interval shortens and fire frequency becomes as significant a threat as has been suggested (J. T. Hunter, pers. comm. Dec. 2017, Copeland 2017). The impact of a drying climate on fire frequencies will depend partly on the extent to which the occurrence of fire is currently limited by weather (availability to burn) and the extent to which fuel accumulation rates may be reduced under drier conditions (Bradstock 2010). There is at present insufficient evidence to conclude that climate change will increase fire frequency at either *E. approximans* location, however, conditions, such as reduced water availability, which negatively impact the seed store size and seedling recruitment of resprouters exposed to fire are known to increase vulnerability to population decline (Enright *et al.* 2014). While fire at present does not pose a clear threat to the species, the compounding effect of rainfall deficiencies will reduce *E. approximans* ability to recover from fires when they occur and would contribute to a continuing decline over time.

Recent studies on the impact of climate change on the range and distribution of *Eucalyptus* species over the next 70 years have further emphasised the threat which climate change may pose to *E. approximans*. Species distribution modelling of the effect of both intermediate and high emission climate change scenarios on 108 *Eucalyptus* and *Corymbia* species suggest that all species occurring

in temperate areas will experience a southward climatic envelope shift to some degree due to a climate change driven decrease in precipitation (Butt *et al.* 2013), supporting the ETD's predicted under the models of Tozer *et al.* (2017). Similarly, a larger study of the effect of climate change on *Eucalyptus* distribution, under an intermediate emission scenario, which looked at 657 species found that by 2085 91% of *Eucalyptus* species will experience an average range contraction of 51% (Gonzalez-Orozco *et al.* 2016). The latter study specifically included *E. approximans*, however, they used an outdated taxonomic definition which included *E. codonocarpa*, and the range contraction predicted for the species was predicted to be as high as 92.1% by 2085. There are two options for sedentary organisms when faced with climatic envelope shifts, disperse into more suitable habitat or tolerate and adapt to the changes. For Eucalypts, there is evidence the capacity of mature individuals to adapt to changes as they occur is limited by vascular traits which appear fixed (Pfautsch *et al.* 2016), as the climate gets drier the risk of embolism increases and Eucalypt vascular systems lack the phenotypic plasticity to adapt. Combine with the small EOO, restriction to mountaintops and limited dispersal ability of *E. approximans* suggests the species has a limited capacity to respond if such a range shift occurred.

Assessment against IUCN Red List criteria

For this assessment is it considered that the survey of *Eucalyptus approximans* has been adequate and there is sufficient scientific evidence to support the listing outcome.

Criterion A Population Size reduction

Assessment Outcome: Data Deficient

Justification: At present, there is insufficient evidence to determine to what extent if any the population has reduced over a relevant period of time.

Criterion B Geographic range

Assessment Outcome: Least Concern

Justification: The best and upper estimates of EOO for *Eucalyptus approximans* (25 km² and 75 km² respectively, calculated using a convex hull polygon as recommended by IUCN, 2017) meet the threshold for Critically Endangered (<100 km²), while the best and upper estimates of AOO (12 km² and 20 km² respectively, calculated using a 2 x 2km grid, as recommended by IUCN, 2017) meet the threshold for Endangered (<500 km²). However, only one of the sub-criteria is met for any threat category and *E. approximans* is therefore considered Least Concern under Criterion B.

In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

- a) The population or habitat is observed or inferred to be severely fragmented or there is either 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

Assessment Outcome: sub criterion met at Endangered threshold

Justification: Based on a west to east gradient of increased risk of worsening drought conditions there are two locations for *E. approximans*, the Barren Mountain population, and the Cathedral Rock NP population.

- 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

Assessment Outcome: Sub criterion not met

Justification: At present the species does not appear to have suffered continuing declines in the past or present and whether conditions under future climate scenarios will be sufficient to cause continuing declines is uncertain.

- c) Extreme fluctuations.

Assessment Outcome: Data Deficient

Justification: There is insufficient data to determine whether extreme fluctuation occur.

Criterion C Small population size and decline

Assessment Outcome: Least Concern

Justification: The current lower bound estimate for the number of mature *E. approximans* individuals is 2500-3000, which falls below the threshold of Vulnerable (<10,000). This number is unlikely to increase beyond this threshold even if all possible records are field verified, but it may be lower depending on more detailed population estimates and assessment of what is an individual in a multistemmed species. However, *E. approximans* does not meet any of the sub criteria for Criterion C and is therefore considered Least Concern.

At least one of two additional conditions must be met. These are:

C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future).

Assessment Outcome: Data Deficient

Justification: At present, there is insufficient evidence to quantify to what extent if any the population has or will experience continuing declines.

C2. An observed, estimated, projected or inferred continuing decline

Assessment Outcome: Sub criterion not met

Justification: At present the species does not appear to have suffered continuing declines in the past or present and whether conditions under future climate scenarios will be sufficient to cause continuing declines is uncertain.

In addition, at least 1 of the following 3 conditions:

a (i). Number of mature individuals in each subpopulation ≤ 1000 (VU).

Assessment Outcome: Sub criterion not met

Justification: There are believed to be at least 2000 mature individuals in the Barren Mountain sub population.

a (ii). % of mature individuals in one subpopulation = 100% (VU).

Assessment Outcome: Sub criterion not met

Justification: The species is known from at two populations/sub-populations.

b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: Data Deficient

Justification: There is insufficient data to determine whether extreme fluctuation occur.

Criterion D Very small or restricted population

Assessment Outcome: Vulnerable under Criterion D2

Justification: *E. approximans* meets criteria D2 as it has a restricted AOO (12 -20 km²), is known from only two locations and there are plausible threats which may drive it to Critically Endangered within a short period of time.

To be listed as Vulnerable, a species must meet at least one of the two following conditions:

D. Population size estimated to number fewer than 1,000 mature individuals

Assessment Outcome: Sub criterion not met

Justification: There are believed to be at least 2500-3000 mature individuals.

D2. Restricted area of occupancy (typically <20 km²) or number of locations (typically <5) with a plausible future threat that could drive the taxon to CR or EX in a very short time.

Assessment Outcome: Vulnerable

Justification: *E. approximans* has a restricted area of occupancy (12 -20 km²), is known from only two locations. Increasingly dry conditions predicted for the near future in the western part of *E. approximans* range may lead to a loss of one location as environmental conditions would be beyond the species tolerance. This would result an eastward range

contraction and the Barren Mountain site would then be the sole remaining location, thereby qualifying the species as CR under B1ab(i, ii, iv, v).

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient

Justification: There is insufficient data available to quantify extinction risk for this species.

Conservation and Management Actions

There is no recovery plan for this species and it is listed in the Keep-watch management stream under the NSW Saving Our Species (SOS) program. While management actions are currently focused on monitoring the species there are also a number of conservation actions that have been identified.

Habitat loss, disturbance and modification

- Prevent any loss of known or potential habitat on private land during environmental planning as well as during biodiversity certification of environmental planning instruments for Bellingen LGA.
- Consider the location of the known populations during NPWS reserve planning activities.
- Review guidelines in Reserve Fire Management Strategy to protect this species from adverse fire regimes. Current guidelines indicate an interval of 7 to 30 years for the Barren Mountain population (NPWS 2014) and an interval of less than 10 years for the Cathedral rock population (NPWS 2006), it is unclear what these intervals are based on and they may not be appropriate for this species.

Ex situ conservation

- Establish ex situ seed banking collection.

Stakeholder Management

- Prevent any loss of known or potential habitat on private land during environmental planning as well as during biodiversity certification of environmental planning instruments for Bellingen LGA.
- Consider the location of the known populations during NPWS reserve planning activities.
- Negotiate renewal of access to Barren Mtn population via private land, to enable survey and monitoring.

Survey and Monitoring priorities

- Monitor population size, habitat condition and threats at known site with large population.
- Estimate mature population sizes at both known locations along with population structure.

Information and Research priorities

- Conduct research to determine ecological requirements, including fire ecology, and undertake field studies to monitor seedling establishment and survivorship. May involve autecological study or literature search for information on similar species.
- Research into tolerance limits for temperature and water requirements.
- Field validation of records that may incorrectly refer to *E. codonocarpa*.
- Map extent of known populations.

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NSW SCIENTIFIC COMMITTEE

Final Determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the mallee *Eucalyptus approximans* Maiden as a VULNERABLE SPECIES in Part 1 of Schedule 2 of the Act, and as a consequence, to omit reference to *Eucalyptus approximans* Maiden from Part 1 of Schedule 1 (Endangered species) of the Act. Listing of vulnerable species is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. *Eucalyptus approximans* Maiden (family Myrtaceae) is a mallee that has been described by Hill (2002, p.158) as follows: "Mallee to 5 m high; bark smooth, white, green or grey, shedding in ribbons. Juvenile leaves disjunct, lanceolate, glossy green. Adult leaves disjunct, narrow-lanceolate, 7-10 cm long, 0.6-0.9 cm wide, green, glossy, concolorous. Umbellasters 7-flowered; peduncle terete, 4-10 mm long; pedicels terete, 1-4 mm long. Buds clavate, 3-6 mm long, 3-4 mm diam., scar absent; calyptra hemispherical, shorter than and as wide as hypanthium, minutely warty. Fruit cylindrical or hemispherical, 6-8 mm long, 5-7 mm diam.; disc flat; valves enclosed."
2. *Eucalyptus approximans* was originally described by Joseph Maiden in 1920 from Barren Mountain in north-eastern NSW. Since this original description two other mallee Eucalypts, *E. codonocarpa* and *E. microcodon*, have occasionally been included within a broadly circumscribed *E. approximans*. Hill (2002), however, treated all three taxa as distinct species and believed that the name *E. approximans* should only refer to the population growing on Barren Mountain. *E. approximans* can be distinguished from *E. codonocarpa* and *E. microcodon* by having narrow, linear to narrow-lanceolate adult leaves c. 1 cm wide. In contrast, *E. codonocarpa* and *E. microcodon* have broader, lanceolate adult leaves to 2 cm wide. *E. approximans* also has a narrower disc on its fruit.
3. *Eucalyptus approximans* is endemic to New South Wales where it is known only from Barren Mountain, largely within New England National Park. Some plants also occur on the northern base of Barren Mountain, just outside the National Park boundary.
4. *Eucalyptus approximans* grows in mallee scrub in shallow soils derived from trachyte. The species usually forms dense clumps with numerous shrubs, ferns and sedges beneath them. *E. approximans* rarely coexists with other species of *Eucalyptus*, apparently because its preferred substrate is usually too shallow for the other trees to inhabit. The altitude of the area ranges from 1250-1430 m above sea level and most stands of the species are on relatively flat or northerly facing aspects. Like other mallee Eucalypts, *E. approximans* has been observed to resprout from a basal lignotuber after fire (Clarke *et al.* 2000).
5. *Eucalyptus approximans* has a very highly restricted geographic distribution. The extent of occurrence and area of occupancy are both estimated to be less than 4 km² (Copeland 2008). This calculation is based on the species occupying a single 2 x 2 km grid square, the spatial scale of assessment recommended by the IUCN (2008).
6. The total population of *Eucalyptus approximans* has been estimated to be at least 2000 mature individuals (Copeland 2008). *Eucalyptus approximans* is locally abundant on Barren Mountain and is the dominant species in the mallee scrub community at that location.
7. At present there is no evidence that the population of *Eucalyptus approximans* is undergoing a continuing decline, although inappropriate fire regimes and long-term climate change may threaten

the species in the future. The very highly restricted geographic distribution means that the species may be prone to the effects of human activities or stochastic events within a very short time period.

8. *Eucalyptus approximans* is not eligible to be listed as a Critically Endangered species or as an Endangered Species.

9. *Eucalyptus approximans* Maiden is eligible to be listed as a vulnerable species as, in the opinion of the Scientific Committee, it is facing a high risk of extinction in New South Wales in the medium-term future as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation 2002*:

Clause 18

The geographic distribution of the species is observed, estimated or inferred to be very highly restricted such that it is prone to the effects of human activities or stochastic events within a very short time period.

Professor Lesley Hughes

Chairperson

Scientific Committee

Proposed Gazettal date: 21/11/08

Exhibition period: 21/11/08 – 23/01/09

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