

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister approved this conservation advice and included this species in the Critically Endangered category, effective from 17/11/2015

Conservation Advice

Callistemon megalongensis

Megalong Valley bottlebrush

Taxonomy

Conventionally accepted as *Callistemon megalongensis* (Craven & S.M.Douglas) Udovicic & R.D.Spencer (Udovicic and Spencer, 2012).

Summary of assessment

Conservation status

Critically endangered: Criterion 2 B2 (a,b,i,ii,iii,iv,v);

Callistemon megalongensis has been found to be eligible for listing under the following listing categories:

Criterion 2: B2 (a,b,i,ii,iii,iv,v): Critically Endangered

Criterion 3: B3 (a,b i,ii,iii,iv,v): Endangered

The highest category for which *Callistemon megalongensis* is eligible to be listed is Critically Endangered.

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of information provided by the NSW Government as part of the process to systematically review species that are inconsistently listed under the EPBC Act and relevant NSW legislation.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 33 business days from 2 October to 18 November 2014. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Description

Callistemon megalongensis (Megalong Valley bottlebrush) is a bottlebrush shrub which grows 4.5–5 m tall. The species has narrow leaves approximately 30–45 mm wide. Its bark is subpapery, medium soft and flaking or peeling. The Megalong Valley bottlebrush flowers in spikes, approximately 35 mm wide, consisting of 40–50 pink-purple coloured stamens. The species' fruit is approximately 5 mm long (Craven, 2009). The Megalong Valley bottlebrush can be easily mistaken for the relatively common species *Callistemon citrinus* and accurate identification is largely reliant on the species being in flower (Douglas and Robyn, 2006; NSW OEH, 2013). *C. citrinus* differs from *C. megalongensis* in that it has wider flower spikes 40–70mm and the filaments are bright red, sometimes purplish red or lilac (Plantnet, 2015).

Distribution

The Megalong Valley bottlebrush is endemic to the Sydney Basin Bioregion in NSW. The species is known to occur at eight sites within one population in the eastern Megalong Valley in the western Blue Mountains (NSW OEH, 2013). The species primarily occurs in shrubby swamps in the vicinity of Nellies Glen Road (Douglas and Robyn, 2006; NSW OEH, 2013; NSW Scientific Committee, 2013). Its range extends along the associated downstream watercourses of the Eastern Megalong Valley and into the fringing vegetation of Megalong Creek (NSW OEH, 2013).

The Megalong Valley bottlebrush occurs on both private and Crown land (Douglas, 2003). Part of the species' population occurs within the Blue Mountains National Park and the Greater Blue Mountains World Heritage Area (Douglas and Robyn, 2006). The swamps in which the species occurs are included within the NSW listed ecological community 'Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps' (Douglas, pers. comm., 2014) and the nationally listed 'Temperate Highland Peat Swamps on Sandstone' ecological community.

Based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by the IUCN, both the species' area of occupancy and extent of occurrence have been estimated to be 8 km² (NSW Scientific Committee, 2013). Finer scale distribution mapping has also been completed. Based on detailed ground surveys and vegetation mapping, the species' extent of occurrence has been estimated to be approximately 3.9 km² and the species' area of occupancy has been estimated to be less than 0.15 km² (Douglas, pers. comm., 2014). The total population size is estimated to be less than 2000 (Douglas and Robyn, 2006; NSW Scientific Committee, 2013).

The Megalong Valley bottlebrush is in non-commercial cultivation and may be planted in botanic gardens. The species' seed has been stored at Mt Annan Botanic Garden (Douglas, pers. comm., 2014).

Cultural Significance

Not known.

Relevant Biology/Ecology

The Megalong Valley bottlebrush occurs primarily in shrubby swamp habitat and swampy woodland beneath the sandstone plateau of the upper Blue Mountains (Craven, 2009; NSW Scientific Committee, 2013). Some specimens extend below these swamps, usually following drainage lines. The swamp-based populations are partially connected by specimens along Megalong Creek, with the exception of a western 'subpopulation' that has been partially isolated through land clearing in the past (Douglas and Robyn, 2006). The species' habitat varies in structure, with the western-most swamp being more open in structure, with a significantly different species mix in the surrounding woodland (Douglas, 2013).

The species flowers from mid-November to early December, although this can vary with seasonal conditions (Craven, 2009; Douglas and Robyn, 2006). The species is likely to be pollinated by insects, birds and possibly small mammals. The Megalong Valley bottlebrush re-sprouts after fire or after mechanical damage (Douglas, 2013; Douglas and Robyn, 2006). The species is likely to be advantaged by ecological burning at a low-moderate intensity which burns the shrub layer, but is not too frequent (a fire frequency of approximately 10–20 years is estimated to be advantageous for the species) (NSW OEH, 2013).

The species is estimated to reach sexual maturity at approximately seven years. The species' life expectancy is unknown but individuals are estimated to live for several decades. The generation length of the Megalong Valley bottlebrush is unknown but is likely to be similar to other callistemons occurring in similar habitat (Douglas, 2013; Douglas, pers. comm., 2014).

Germination trials undertaken by the Australian National Botanic Gardens revealed no evidence of germination problems as a possible explanation of the species' rarity. The species' genetic diversity has not been assessed, but high rates of germination and survival of juveniles do not indicate inbreeding depression (Douglas, pers. comm., 2014).

Threats

A number of threatening processes are impacting upon the Megalong Valley bottlebrush. The species' small population size and restricted area of habitat make it highly vulnerable to threatening processes (NSW OEH, 2013).

Land clearance associated with road upgrades and the maintenance of infrastructure such as powerlines, water mains and pipelines is a threat to the species (Douglas and Robyn, 2006; NSW OEH, 2013). This is a threat through direct damage to plants as well as through associated erosion, sedimentation and other forms of habitat degradation (NSW OEH, 2013). This threat primarily affects the lower section of the swamps in which the species occurs and their drainage lines (Douglas and Robyn, 2006). Based on the species current and likely original distribution, land clearance is estimated to have caused roughly a 5–10% loss of the species' population. Historically, land clearance for rural land use has removed habitat and has resulted in the westernmost part of the species' range becoming somewhat isolated. This threat is now restricted to freehold land and could result in the loss of some core habitat (Douglas, pers. comm., 2014).

Inappropriate fire regimes are a threat to the species. This species may require burning at approximately 10–20 year intervals, at a low-moderate intensity that burns the shrub layer (NSW OEH, 2013). Evidence indicates that the swamps in which the species occurs have become over-mature (taller and less open) due to the prolonged absence of fire. As a result, future fires are likely to be very intense and hard to control, and could potentially burn the species' entire habitat in one event. The species' association with moist areas, that are also potentially fire prone, makes it particularly at risk from the predicted effects of climate change (Douglas, 2013; Douglas, pers. comm., 2014).

Competition from weeds is a threat to the Megalong Valley bottlebrush. A small portion of the species' habitat is currently compromised by weeds, including Japanese honeysuckle (*Lonicera japonica*) and blackberry (*Rubus fruticosus* agg. species) (Douglas and Robyn, 2006; NSW OEH, 2013; NSW Scientific Committee, 2013). Presently, this threat is restricted to roadsides, some drainage lines, and formerly cleared areas of creekflat (NSW Scientific Committee, 2013). However, if inadequately controlled, weed invasion could conceivably degrade the species' entire habitat (Douglas and Robyn, 2006; Douglas, 2013). Competition from weeds becomes a greater threat to the species if the existing vegetation structure around the species is disturbed or the site is affected by nutrification.

Feral animals are a potential threat to the Megalong Valley bottlebrush through soil compaction, increased erosion and subsequent loss of habitat. One swamp north of Megalong Creek has been severely modified by feral pigs digging up the substrate and digging up plants (Douglas, 2013).

Grazing by livestock is a threat to the Megalong Valley bottlebrush (Douglas and Robyn, 2006; NSW OEH, 2013; NSW Scientific Committee, 2013). Surveys have found evidence of the species' being grazed and killed by cattle. As the species can re-sprout from epicormic and basal buds, grazing has to be intense and protracted to kill individual mature plants. However, grazing can severely retard growth and fertility even if not fatal. Juvenile plants can more easily be destroyed through grazing or trampling by livestock (Douglas and Robyn, 2006). Grazing can change the vegetation structure and prevent regeneration of other native species in the area, making the area more vulnerable to other threats such as weed invasion (Douglas and Robyn, 2006; Douglas, 2013). Grazing is currently restricted to cleared, or largely cleared, freehold land in the area. However, this threat could spread if fences are breached or if livestock are allowed to graze elsewhere, for example within the national park (Douglas and Robyn, 2006; Douglas, 2013).

Genetic contamination is a potential threat to the species. This could occur if non-local species or varieties of callistemon are introduced in sufficient proximity to the Megalong Valley bottlebrush. While there is no evidence that this threat is having an impact as yet, this threat is likely to intensify with further urbanisation of the upper Blue Mountains area (Douglas and Robyn, 2006).

Additional threats to the species include horse riding and use of recreation vehicles and trail bikes on informal tracks within the species' habitat, and alterations to the swamp hydrology (NSW OEH, 2013; NSW Scientific Committee, 2013). Road works have affected drainage patterns which has resulted in gully erosion at one location (Douglas and Robyn, 2006) and the construction of a dam has also affected the hydrology of one of the swamps (Douglas and Robyn, 2006; NSW Scientific Committee, 2013).

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

Criterion 1: Reduction in numbers (based on any of A1 – A4)

- A1. An observed, estimated, inferred or suspected population very severe $\geq 90\%$, severe $\geq 70\%$ substantial $\geq 50\%$ size reduction over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
- (a) direct observation
 - (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.
- A2. An observed, estimated, inferred or suspected population very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$ size reduction over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
- A3. A population size reduction very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
- A4. An observed, estimated, inferred, projected or suspected population size reduction very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

Evidence: not eligible

Field surveys indicate that the species has historically experienced a reduction in its geographic distribution due to past land clearance (Douglas and Robyn, 2006). While the area of habitat removal may have been minor, in the context of the species' specific habitat requirements and its small geographic distribution, any losses are potentially significant (NSW Scientific Committee, 2013). Land clearance and livestock grazing towards the western limit of the species' distribution has at least partially fragmented the species' population, reducing connectivity with the most westerly occurrence. Based on the species' current and likely original distribution, land clearance is estimated to have caused roughly a 5–10% loss of the species' population (Douglas, pers. comm., 2014).

Significant reductions in the extent of occurrence are feasible given current predictions concerning the impacts of climate change, though not in the short term. Potentially significant losses are possible within the next 100 years due to factors such as drought, severe fire and severe erosion of habitat (Douglas, pers. comm., 2014).

Given the ongoing threats impacting upon the species (outlined in the threats section above) the species is suspected to have undergone a reduction in numbers and is likely to undergo a further reduction in numbers. However, there are insufficient data available to quantitatively determine past or future rates of decline for the purposes of this criterion i.e. whether the reduction would be very severe, severe, substantial, or not substantial over the past three generations.

Following assessment of the data the Committee has determined that the species is ineligible for listing in any category under this criterion as the past, current or future population declines are thought unlikely to exceed 20% in any 3-generation period.

Criterion 2:

Geographic distribution (based on either of B1 or B2)

B1. Extent of occurrence estimated to be very restricted <100 km², restricted <5,000 km² or limited < 20,000 km²

B2. Area of occupancy estimated to be very restricted <10 km², restricted <500 km² or limited <2,000 km²

AND

Geographic distribution is precarious for the survival of the species,
(based on at least two of a–c)

- a. Severely fragmented or known to exist at a limited location.
- b. Continuing decline, observed, inferred or projected, in any of the following:
 - (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 the following:
 - (i) extent of occurrence
 - (ii) area of occupancy
 - (iii) number of locations or subpopulations
 - (iv) number of mature individuals

Evidence: eligible under Criterion 2 B2 (a,b,i,ii,iii,iv,v) for listing as Critically Endangered

Based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by the IUCN, both the species' area of occupancy and extent of occurrence have been estimated to be 8 km² (NSW Scientific Committee, 2013). Finer scale distribution mapping has also been completed. Based on detailed ground surveys and vegetation mapping, the species' extent of occurrence has been estimated to be approximately 3.9 km² and the species' area of occupancy has been estimated to be less than 0.15 km² (Douglas, pers. comm., 2014). This extent of occurrence and area of occupancy are below the threshold for a 'very restricted' distribution.

The species' is known to occur within an area less than 4 km² in the Megalong Valley in the western Blue Mountains (NSW OEH, 2013). As such, the species is known to exist in a limited location. Land clearance and livestock grazing has reduced connectivity with the most westerly portion of the species' distribution, at least partially fragmenting the species' population (Douglas, pers. comm., 2014). A decline in the extent of occurrence, area of occupancy, quality of habitat, number of mature individuals and sites is projected due to the ongoing threats outlined in the threats section above.

The Committee considers that the species' extent of occurrence and area of occupancy is very restricted, and the geographic distribution is precarious for the survival of the species because its occurrence is limited and decline in the number of mature individuals and populations, the area of occupancy, extent of occurrence and quality of habitat is projected. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as critically endangered.

Criterion 3:

The estimated total number of mature individuals is very low <250, low <2,500 or limited <10,000; **and** either of (A) or (B) is true

- (A) evidence suggests that the number will continue to decline at a very high rate (25% in 3 years or 1 generation, whichever is longer, up to 100 years), high rate (20% in 5 years or 2 generations, whichever is longer, up to 100 years) or substantial rate (10% in 10 years or 3 generations, whichever is longer, up to 100 years); or
- (B) the number is likely to continue to decline and its geographic distribution is precarious for its survival (based on at least two of a – c):
 - a. Severely fragmented or known to exist at a limited location.
 - b. Continuing decline, observed, inferred or projected, in any of the following:
 - (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 the following:
 - (i) extent of occurrence
 - (ii) area of occupancy
 - (iii) number of locations or subpopulations
 - (iv) number of mature individuals

Evidence: eligible under Criterion 3B (a,b i,ii,iii,iv,v) for listing as Endangered

The total population size of the Megalong Valley bottlebrush is estimated to be less than 2000 (Douglas and Robyn, 2006; NSW Scientific Committee, 2013). This is below the threshold for a 'low' number of mature individuals.

The species' geographic distribution is precarious for its survival given that it occurs in a limited location and is being impacted upon by numerous ongoing threats (outlined in the threats section above). Continuing decline in the extent of occurrence, area of occupancy, quality of habitat, number of mature individuals and sites is projected.

The Committee considers that as the estimated total number of mature individuals of this species is low, and the geographic distribution is precarious for the survival of the species because its occurrence is limited and decline in the extent of occurrence, area of occupancy, quality of habitat, number of mature individuals and sites is projected. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it eligible for listing as endangered.

Criterion 4:

Estimated total number of mature individuals:

- (a) Extremely low < 50
- (b) Very low < 250
- (c) Low < 1000

Evidence: not eligible

The total population size of the Megalong Valley bottlebrush is estimated to be less than 2000 mature individuals (Douglas and Robyn, 2006; NSW Scientific Committee, 2013).

As the species' total number of mature individuals is estimated to be less than 2000 and not considered to be extremely low, very low or low, the species is ineligible for listing under this criterion.

Criterion 5:

Probability of extinction in the wild based on quantitative analysis is at least:

- (a) 50% in the immediate future (i.e. 10 years or three generations, whichever is longer, up to a maximum of 100 years); or
- (b) 20% in the near future (i.e. 20 year or five generations, whichever is longer, up to a maximum of 100 years); or
- (c) 10% in the medium-term future (i.e. within 100 years).

Evidence: insufficient data to determine eligibility

There is no known population viability analysis or other modelling undertaken for this species. The species is therefore ineligible for listing under this criterion.

Conservation Actions

Recovery Plan

A recovery plan for the species is not recommended as the approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats.

Primary Conservation Objectives

1. Maintain and enhance the species' habitat and connectivity
2. Investigate options for linking, enhancing or establishing additional populations and implement where possible
3. Effectively administer the recovery effort

Conservation and Management actions

1. Protect individuals and habitat from damage caused by the maintenance of infrastructure.
2. Install signs and provide advice to developers, consultants and approval authorities about the existence of the species and its significance and the need to protect from damage
3. Investigate options for linking, enhancing or establishing additional populations. In particular, investigate the possibility of establishing a revegetated corridor to reconnect the somewhat isolated western area of habitat. Where possible, implement these links.
4. Maintain swamp hydrology and water quality within the species' habitat. In particular, manage sediment and stormwater movement to protect habitat and reduce weed facilitation.
5. Implement an appropriate fire management regime for the species' key habitat. Where appropriate, provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigating measures in bush fire risk management plan/s, risk register and/or operation maps.
6. Control and reduce the spread of invasive species occurring within the species' habitat, such as Japanese honeysuckle and blackberry. Identify and remove new weeds in the local area that could become a threat to the species using appropriate methods.
7. Manage sites to monitor and identify, control and reduce the spread of feral animal species.
8. Ensure land owners/managers use an appropriate livestock grazing management regime in the area to ensure livestock grazing does not detrimentally affect this species. Use exclusion fencing or other barriers to manage total grazing pressure at important sites.
9. Engage with private landholders and land managers responsible for the land on which the species occurs and encourage these key stakeholders to contribute to the implementation of conservation management actions.
10. Investigate formal conservation arrangements, management agreements and covenants on private land with known occurrence.
11. Raise awareness among the local community and planning authorities about the risk of genetic contamination with more common varieties of callistemon (e.g. with varieties planted in nearby gardens).
12. Where necessary and appropriate, suitably constrain public access to important sites by installing gates, fencing and signs. In particular, prevent access by horse riders, recreational 4WD vehicles and trail bikes to informal tracks intersecting the species' habitat.

Monitoring priorities

1. Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

Information and research priorities

1. Design a monitoring program to track the species' recovery.
2. Undertake survey work in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants.
3. Further investigate optimal fire regimes for regeneration (vegetative regrowth and/or seed germination), and response to prevailing fire regimes.
4. Identify sites most at risk from habitat damage e.g. through infrastructure maintenance.
5. Investigate the potential and efficacy of DNA-based or other approaches for the identification of individual plants and/or populations to provide a means for detecting and prosecuting illegal collection from the wild.

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Critically Endangered category:
Callistemon megalongensis
- (ii) The Committee recommends that there should not be a recovery plan for this species.

Threatened Species Scientific Committee
3 March 2015

References cited in the advice

Craven LA (2009). '*Melaleuca* (Myrtaceae) from Australia'. *Novon: A Journal for Botanical Nomenclature* 19: 444–453.

Douglas SM (2003). Mysteries of the Megalong: another rare plant for the Blue Mountains. *Australasian Plant Conservation* 12: 5–7.

Douglas S (2013). Report on the establishment of monitoring plots and survey for *Callistemon megalongensis* and *Callistemon* sp. nov. '*purpurascens*'. Ecological Surveys and Planning. Bundanoon, NSW.

Douglas S (2014). Personal communication by email, July 2014. Ecological researcher.

Douglas SM and Robyn S (2006). Report on the conservation status and management requirements of *Melaleuca* sp. 'Megalong Valley'. Unpublished report to Blue Mountains City Council and NSW Department of Environment and Conservation. Ecological Surveys and Planning, Chisholm, ACT.

NSW Office of Environment and Heritage (NSW OEH) (2013). *Callistemon megalongensis* Profile Viewed 14 July 2014

Available on the Internet at:

<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20266>

NSW Scientific Committee (2013). *Callistemon megalongensis* - Critically Endangered species determination - final

Viewed 14 July 2014

Available on the Internet at:

<http://www.environment.nsw.gov.au>

Plantnet (2015). *Callistemon citrinus* fact sheet. Available on the internet at:

<http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Callistemon~citrinus>

Udovicic F and Spencer RD (2012). New combinations of *Callistemon* (Myrtaceae). *Muelleria* 30: 23–25.