

Publication date: 9 August 2024

## Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list *Cassinia heleniae* Orchard as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Cassinia heleniae* Orchard has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

## Summary of Conservation Assessment

*Cassinia heleniae* Orchard was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (b)(d)(e i,iii) and Clause 4.4 (b)(e i,ii A(II)) because: (1) it has a highly restricted geographic distribution (the estimates for extent of occurrence and area of occupancy are 67 km<sup>2</sup> and 32 km<sup>2</sup>, respectively); (2) the total population occurs within only two threat-defined locations; (3) the total number of mature individuals is low (<2000), with a very low number of mature individuals (<250) in each subpopulation; and (4) there is inferred continuing decline in the area, extent and quality of habitat, and number of mature individuals due to increases in the frequency and severity of fires driven by climate change, and grazing by feral herbivores.

The NSW Threatened Species Scientific Committee has found that:

1. *Cassinia heleniae* Orchard (family Asteraceae) is described as “erect few-stemmed shrubs 1.0–1.5 m tall; bark on older stems mid-brown, longitudinally fissured, braided; young stems green to reddish, sticky, densely aculeate with uni- and biseriate spreading gland-tipped hairs 0.2 mm long, plus sessile globular hairs, and (on youngest plants) a few cottony hairs. Leaves terete, (9–)15–25 mm long, (0.6–)0.7–0.9 mm wide, 20–30 times as long as wide; margins entire, reflexed to midrib; tip abruptly recurved with a mucro 0.3 mm long; midrib sunken above, prominent below; upper surface mid-green, with sparse to dense coarse aculeate hairs 0.1–0.2 mm long, sometimes gland-tipped when young; lower surface mostly obscured, with lamina densely cottony, and midrib subglabrous on undersurface with scattered sessile globular hairs and occasional aculeate hairs. Inflorescence a round to flat-topped compound dichasium of (20–) 100–150 cylindrical capitula each (5.0–)5.5–6.0 mm long, appearing bright white from a distance. Receptacle small, elongate, 0.6 mm long. Phyllaries papery, spirally arranged, opaque pure white above, with a central greenish hyaline section and a basal cream opaque stereome. Outer phyllaries ovate, hooded, 1.5–2.0 mm long, 1.0–1.1 mm wide, white opaque almost throughout (greenish subhyaline above stereome), with small stereome, few sessile globular hairs on stereome. Inner phyllaries oblong, (4.2–)4.5–5.0 mm long, 1.1–1.2 mm wide, sometimes split at tip,

## NSW Threatened Species Scientific Committee

---

opaque white in upper third, greenish hyaline in centre, with creamy opaque stereome in lower third, with scattered sessile globular hairs on dorsal surface of stereome. Florets 5–7 per capitulum. Paleae 3–5 per capitulum (linear–) lanceolate, 3.7–4.5 mm long, (0.4–)0.8–1.0(–1.1) mm wide, creamy subhyaline almost throughout, white opaque at extreme tip, longitudinally plicate, acute at tip, with sparse subglobular hairs on stereome. Pappus uniseriate, of 19–25 shortly barbellate bristles 3.0–4.0 mm long, slightly wider and flattened below, fused at extreme base; apical cells blunt, very slightly swollen. Corolla tube white, green below, 2.5–3.5 mm long, 0.4 mm diameter at throat, tapering gradually to base, swollen around stylopodium; lobes deltoid, 0.3 mm long, with sessile globular hairs on outer surface. Anthers 2.1 mm long including a flat linear anther appendage 0.45 mm long and as wide as the thecae; anther tails 0.2 mm long; filament collars 0.25 mm long. Style 2.1 mm long, plus arms 1.2 mm long, tufted at tip; stylopodium obturbinate, smooth. Ovary green, cylindrical, 0.7–0.8 mm long, longitudinally ribbed, with very sparse twin hairs. Achene olive-brown, cylindrical, 0.9–1.0 mm long, 0.5 mm diameter, irregularly longitudinally ribbed, sometimes with transverse ribs at apex, with occasional twin hairs, but almost glabrous. On maturity the phyllaries spread to shed the achenes, but the old heads remain on the plant for approximately 6 months.” (Orchard 2005). *Cassinia heleniae* is distinguished from other *Cassinia* species by a long flower head and sharp leaf tips (Orchard 2005).

- Cassinia heleniae* is endemic to the north-western slopes of NSW. Based on confirmed records, *Cassinia heleniae* occurs exclusively within the Torrington region, specifically the Binghi Plateau (Eco Logical 2009), on the traditional lands of the Ngarabal people (AIATSIS 2022). All records occur within and around the Torrington State Conservation Area (SCA) and there are currently considered to be five subpopulations within this area as per the IUCN (2022) definition.
- The number of mature individuals of *Cassinia heleniae* is estimated to be 109–1400 based on surveys conducted in 2021 following the 2019–20 bushfires (Hunter 2021). Of the seven sites surveyed by Hunter (2021), four had fewer than 10 plants, two had 10–50 plants and one had 50–100 plants. One of the sites containing less than 10 plants had not been burnt and was comprised entirely of mature individuals. The remaining six burnt sites were comprised predominantly of juvenile plants. Assuming the midpoint of estimates for each survey site, there are at least approximately 155 individuals, and the total number of individuals across the full population (including those not surveyed) was estimated by Hunter (2021) to be no more than 2000. Application of a 33% juvenile attrition rate based on average estimates for other obligate seeders (Benwell 1998; Ooi 2010) results in an estimated range of 109–1400 mature individuals. It is considered unlikely that any subpopulations are larger than 250 mature individuals.
- Cassinia heleniae* has a highly restricted distribution. It has an estimated Extent of Occurrence (EOO) of 67 km<sup>2</sup>, based on a minimum convex polygon, the method of assessment recommended by IUCN (2022). The Area of Occupancy (AOO) is estimated to be 32 km<sup>2</sup> based on 2 km x 2 km grid cells, the scale recommended by IUCN (2022). Both AOO and EOO were calculated based on confirmed records and survey information following the 2019-20 bushfires.

## NSW Threatened Species Scientific Committee

---

5. *Cassinia heleniae* grows on podzolic soils of coarse granite derived sand, or sandy loam over granite (Orchard 2005) at elevations of 900–1160 m above sea level. *Cassinia heleniae* is found in association with stringybark forest and/or *Eucalyptus andrewsii* (New England blackbutt) shrubby forest, with a dense understory of *Acacia torringtonensis*, *Persoonia tenuifolia* (fine-leaf geebung), *Styphelia* sp., *Leucopogon melaleucoides*, *Leptospermum* sp., *Brachyloma saxicola*, *Mirbelia speciosa*, *Callitris* sp. and *Melichrus* sp.
6. *Cassinia heleniae* buds in December, flowers in March and sheds its fruits by June (Orchard 2005). Pollination by insects is inferred based on the sweet honey smell of the flowers (Orchard 2004). Seeds of *Cassinia* species typically have plumose achenes (dry fruit containing a seed with a pappus), commonly associated with wind dispersal and making dispersal possible over long distances. Seed viability and germination cues of *C. heleniae* are suspected to be associated with fire or disturbance, as observed in many other *Cassinia* species (APS 2020; Clarke *et al.* 2000 Haywood 2019). For these species the absence of disturbance (possibly fire) and suppression of recruits by competitive shrubs and grasses impacts the survival and establishment of seedlings (Collier & Garnett 2018). Information on the longevity of *C. heleniae* plants and seeds is unknown and cannot be inferred from other *Cassinia* species because plant and seedbank longevity vary widely in the genus.
7. *Cassinia heleniae* is a facultative resprouter, having the ability to both resprout and recruit from the seed bank post fire. It is uncertain whether resprouting is limited to low severity fires and under what conditions plants are killed by fire (Hunter 2021). Burning of populations of the related species *C. tegulata* identified that the primary recruitment mechanism is via seed, with only one in five plants resprouting after fire (Haywood 2019).
8. *Cassinia heleniae* is predominately threatened by adverse fire regimes which are exacerbated by climate change, and browsing by feral herbivores, particularly feral rabbits (*Oryctolagus cuniculus*) and goats (*Capra hircus*). Site disturbance and mining may also threaten populations, with much of the land in and around the current distribution of *C. heleniae* being explored for potential mining operations. 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Anthropogenic climate change', 'Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus*', and 'Competition and habitat degradation by feral goats, *Capra hircus*' are listed as Key Threatening Processes under the Act.
9. *Cassinia heleniae* occurs in two threat-defined locations when the threat of adverse fire regimes is considered as the most serious plausible threat. The northernmost site is considered one threat-defined location because it is surrounded by cleared habitat and may therefore be less likely to burn. The second threat-defined location comprises the remainder of the species' distribution because it has no such buffer and is small enough that it could be adversely affected by a single fire event as happened in 2019-2020. Additionally, unverified records indicate another possible population to the east at Washpool NP, however surveys are required to confirm this. Given the uncertainty of the effects of fire on the northern site in Torrington

# NSW Threatened Species Scientific Committee

---

SCA and the existence of records in Washpool NP, it is likely that at least two threat-defined locations exist.

10. Adverse fire regimes are inferred to be causing continuing declines in the area, extent and quality of habitat and the number of mature individuals for *Cassinia heleniae*. Gallagher *et al.* (2021) estimated that approximately 67.5% of the modelled range and 87.5% of known occurrences were likely to have burnt in the 2019-20 bushfires. High fire frequency may kill individuals and exhaust the plants' ability to resprout, reach reproductive maturity and replenish the seedbank, leading to population declines. Interaction between fire and drought may also contribute to population decline and is expected to increase under future climates (DAWE 2022). Climate change is increasing fire severity, frequency and the length of the fire season (Abram *et al.* 2021; NSW DPE 2014), interacting with adverse fire regimes. Pre-fire droughts, such as the one experienced prior to the 2019–2020 fire season, can reduce resilience to fire and elevate mortality or reduce reproduction in plant populations (DAWE 2022). Post-fire drought can additionally cause declines in flowering and seed germination, and increase mortality in immature plants, as well as slow growth rates and increase time to maturity.
11. Feral grazing pressures are inferred to be causing continuing declines in the area, extent and quality of habitat and the number of mature individuals for *Cassinia heleniae*, with feral goats and European rabbits being of particular concern. Feral goats inhabit rocky outcrop areas throughout the park and there is a large European rabbit population around Nomad's Picnic Area (NSW NPWS 2003), which is close to three of the sites where *C. heleniae* occurs. Feral goats can negatively impact plant species by preventing establishment of new plants (Harrington 1976), contributing to soil erosion (Bayne *et al.* 2004), and dispersing the seeds of invasive species (DEWHA 2008). *Cassinia* species have been observed to be damaged by browsing and, where required, caging has proved beneficial to the survival of adult plants of *C. rugata*, increasing plant condition and reproduction (Collier & Garnett 2018). While there is no record of *C. heleniae* being directly impacted by browsers, the lack of direct observations is likely because the species is not commonly encountered, and no dedicated monitoring program is in place.
12. *Cassinia heleniae* Orchard is not eligible to be listed as a Critically Endangered species.
13. *Cassinia heleniae* Orchard is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation (2017)*:

## **Assessment against *Biodiversity Conservation Regulation 2017* criteria**

The Clauses used for assessment are listed below for reference.

## **Overall Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e i,iii) and Clause 4.4 (b)(e i,ii A(II))**

### **Clause 4.2 – Reduction in population size of species**

---

# NSW Threatened Species Scientific Committee

---

**(Equivalent to IUCN criterion A)**

**Assessment Outcome: Data Deficient**

<b>(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:</b>			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
<b>(2) - The determination of that criteria is to be based on any of the following:</b>			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

**Clause 4.3 – Restricted geographic distribution of species and other conditions**

**(Equivalent to IUCN criterion B)**

**Assessment Outcome: Endangered under Clause 4.3 (b)(d)(e i,iii)**

<b>The geographic distribution of the species is:</b>			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
<b>and at least 2 of the following 3 conditions apply:</b>			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

**Clause 4.4 – Low numbers of mature individuals of species and other conditions**

**(Equivalent to IUCN criterion Clause C)**

**Assessment Outcome: Endangered under Clause 4.4 (b)(e i,ii A(II))**

<b>The estimated total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or

# NSW Threatened Species Scientific Committee

	(c)	for vulnerable species	moderately low.
<b>and either of the following 2 conditions apply:</b>			
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
		(i)	for critically endangered species      very large, or
		(ii)	for endangered species                      large, or
		(iii)	for vulnerable species                        moderate,
	(e)	both of the following apply:	
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and
		(ii)	at least one of the following applies:
		(A)	the number of individuals in each population of the species is:
			(I)      for critically endangered species      extremely low, or
			(II)     for endangered species                      very low, or
			(III)    for vulnerable species                        low,
		(B)	all or nearly all mature individuals of the species occur within one population,
		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.

**Clause 4.5 – Low total numbers of mature individuals of species  
(Equivalent to IUCN criterion D)**

**Assessment Outcome: Data Deficient**

<b>The total number of mature individuals of the species is:</b>			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

**Clause 4.6 – Quantitative analysis of extinction probability  
(Equivalent to IUCN criterion E)**

**Assessment Outcome: Data Deficient**

<b>The probability of extinction of the species is estimated to be:</b>			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

**Clause 4.7 – Very highly restricted geographic distribution of species–vulnerable species**

**(Equivalent to IUCN criterion D2)**

**Assessment Outcome: Data Deficient**

	For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
--	-------------------------	--

# NSW Threatened Species Scientific Committee

---

Senior Professor Kristine French  
Chairperson  
NSW Threatened Species Scientific Committee

## Supporting Documentation:

Commonwealth DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023). Conservation Advice for *Cassinia heleniae*. Australian Government, Canberra, ACT.

## References:

Abram NJ, Henley BJ, Gupta AS, Lippmann TJ, Clarke H, Dowdy AJ, Sharples JJ, Nolan RH, Zhang T, Wooster MJ & Wurtzel JB (2021) 'Connections of climate change and variability to large and extreme forest fires in southeast Australia' *Communications Earth & Environment* **2**, 1–17. doi: 10.1038/s43247-020-00065-8

AIATSIS (Australian Institute of Aboriginal and Torres Strait Islander Studies) (2022) *Map of Indigenous Australia*. Available at: <https://aiatsis.gov.au/explore/map-indigenous-australia>

APS (Australasian Plant Society NSW) (2020) *Cassinia quinquefaria* profile. Available at: <https://resources.austplants.com.au/plant/cassinia-quinquefaria>

Benwell AS (1998) Post-fire seedling recruitment in coastal heathland in relation to regeneration strategy and habitat. *Australian Journal of Botany* **46**, 75-101. doi.org/10.1071/BT94046

Clarke P, Davison E & Fulloon L (2000) Germination and dormancy of grassy woodland and forest species: effects of smoke, heat, darkness and cold. *Australian Journal of Botany* **48**, 687-699. doi.org/10.1071/BT99077

Collier P & Garnett R (2018) *Cassinia rugata* (Wrinkled Dollybush), Asteraceae. *Australasian Plant Conservation* **26**, 21-24. Available at: <https://search.informit.org/doi/10.3316/informit.603775558686175>

DAWE (Department of Agriculture, Water and the Environment) (2022) *Fire regimes that cause declines in biodiversity as a key threatening process*. Department of Agriculture Water and the Environment, Canberra.

DEWHA (Department of the Environment, Water, Heritage and the Arts) (2008) *Threat abatement plan for competition and land degradation by unmanaged goats*. Department of the Environment, Water, Heritage and the Arts, Canberra. Available at: <https://www.awe.gov.au/sites/default/files/documents/tap-goat-report.pdf>

## NSW Threatened Species Scientific Committee

---

Eco Logical (2009) *Prioritisation of high conservation status mainland islands*. Prepared by Eco Logical Australia Pty Ltd for the Department of the Environment, Water, Heritage and the Arts, 1 July 2009.

Gallagher RV, Allen S, Mackenzie BDE, Yates CJ, Gosper CR, Keith DA, Merow C, White MD, Wenk E, Maitner BS, He K, Adams VM & Auld TD (2021) High fire frequency and the impact of the 2019–2020 megafires on Australian plant diversity. *Diversity and Distributions* **27**, 1166–1179. doi. 10.1111/ddi.13265

Harrington G (1976) The effects of feral goats and sheep on the shrub populations in a semi-arid woodland. *The Rangeland Journal* **1**, 334-345.

JT Hunter (2021) Post Fire Assessments Torrington Summary Table 1: Count of populations found of select flora species of concern, the category of population size and estimated living individuals and projected estimate of the total population that may occur within the Torrington State Conservation Area and Bolivia Hill Nature Reserve. In possession of NSW Department of Planning and Environment, Parramatta.

NSW DPE (Department of Planning and Environment) (2014) *Adapt NSW Climate Projections for NSW*. NSW Department of Planning and Environment. Accessed 14 March 2022. Available at: <https://climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/New-England-North-West-Climate-Change-Downloads>.

NSW NPWS (National Parks and Wildlife Service) (2003) *Torrington State Conservation Area: Plan of management*. National Parks and Wildlife Service, Glenn Innes, NSW. Available at: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Parks-plans-of-management/torrington-state-conservation-area-plan-of-management-030126.pdf>

Ooi MK (2010) Delayed emergence and post-fire recruitment success: effects of seasonal germination, fire season and dormancy type. *Australian Journal of Botany* **58**, 248-256. doi.org/10.1071/BT09228

Orchard A (2004) A revision of *Cassinia* (Asteraceae: Gnaphalieae) in Australia. 1. Introduction and generic and infrageneric considerations. *Australian Systematic Botany* **17**, 469-481. doi.org/10.1071/SB04025

Orchard A (2005) A revision of *Cassinia* (Asteraceae: Gnaphalieae) in Australia. 4. Section Costatae. *Australian Systematic Botany* **18**, 455-471. doi.org/10.1071/SB05002