

Determination for provisional listing of an endangered species on an emergency basis

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Determination for provisional listing, on an emergency basis, of the species *Pultenaea* sp. Werrikimbe NP (L.M. Copeland 4477) as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Provisional Listing of Endangered species on an emergency basis is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Pultenaea sp. Werrikimbe NP (L.M. Copeland 4477) (family Fabaceae) 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). The main reasons for this species being eligible are: i) it has a very highly restricted geographic range (EOO 41 km²), ii) there is inferred continuing decline and v) the species occurs within two to four threat-defined locations.

The NSW Threatened Species Scientific Committee has found that:

1. *Pultenaea* sp. Werrikimbe NP (L.M. Copeland 4477) (family Fabaceae) is described in PlantNet (accessed November 2023) as a "procumbent shrub; stems appressed-pubescent. Leaves alternate, linear to oblanceolate, 8–15(-16) mm long, 1.1–1.6 mm wide, apex acuminate and partly recurved, margins mostly recurved, upper surface concave with a row of hairs along midrib, lower surface silky, hairs persistent; stipules 5.8–6.9 mm long. Inflorescences terminal, dense with 5–9 flowers; bracts imbricate, persistent, 3.1–5.7 mm long, not fused at apex, ovate to elliptic, glabrous with uniformly ciliate margins. Flowers 4.1–4.5 mm long; pedicels 0.7–1.1 mm long; bracteoles 2.5–4.0 mm long, lacking stipules, lanceolate, acuminate, weakly keeled, sparsely hairy, attached 0.2–0.7 mm above base of calyx tube. Calyx 3.1–4.2 mm long, moderately hairy; lobes acuminate. Ovary hairy." There is a manuscript being prepared (Barrett *et al.* in prep.) describing the species as *Pultenaea rubescens*.
2. *Pultenaea* sp. Werrikimbe NP (L.M. Copeland 4477) is hereafter referred to in this determination as *Pultenaea* sp. Werrikimbe NP. *Pultenaea* sp. Werrikimbe NP is closely related to *P. parrisiae* (PlantNet accessed November 2023; Barrett *et al.* (in prep)), a species from southern NSW and north-eastern Victoria. *Pultenaea* sp. Werrikimbe NP has affinities "to *Pultenaea parrisiae* and *P. elusa*, differing in the sparser indument on the stems, larger juvenile leaves, distinctly petiolate adult leaves that are only moderately recurved at the apex, inflorescence bracts which are commonly shorter and broader, pedicels of intermediate length, bracteoles attached on calyx wall (as for *P. elusa*), and smaller calyx and corolla." (Barrett *et al.* in prep). Barrett *et al.* (in prep) details these differences in a table (Table 1 of the paper) and provides a modification to the NSW Flora Online Key.

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3. *Pultenaea* sp. Werrikimbe NP is endemic to New South Wales (NSW) and is currently known from two populations in north-eastern NSW. There is a population at Carrai, which is c.60km ESE of Armidale and c.80km inland from Nambucca Heads. The population is largely on freehold land that is surrounded by land reserved for conservation: Carrai State Conservation Area (some *P.* sp. Werrikimbe NP individuals occur within the SCA), Carrai National Park (NP) and Oxley Wild Rivers NP. The freehold land is subject to a development application for a Critical State Significant Infrastructure Project (EMM 2023). The second population of *P.* sp. Werrikimbe NP is in Werrikimbe National Park, located c.50km directly south of the Carrai area and c.70km inland from Port Macquarie. To date, these are the only areas where *P.* sp. Werrikimbe NP has been recorded, but it may occur elsewhere.
4. *Pultenaea* sp. Werrikimbe NP is currently known to occur in open forest in swampy areas (PlantNet accessed October 2023). The Werrikimbe NP population is currently known to occur in a mostly treeless soak and adjacent to a drainage line (D. Young *in litt.* February 2024) in a shrubby open forest with *Eucalyptus campanulata* and *E. radiata*, with a dense layer of *Epacris*, *Comesperma* and *Daviesia* in the understorey on sandy loam over granite (NHNSW database). At the Carrai site, the species was recorded in small patches of wet and heathy habitat on the Carrai Plateau (EMM 2023). The herbarium record (NHNSW database) notes the species growing near the edge of a shrub-sedge swamp with a sparse canopy of *Eucalyptus* spp. and an understorey of *Callistemon* sp., *Epacris paludosa* and a ground layer of sedges and forbs. *Pultenaea* sp. Werrikimbe NP may occur in other topographies, vegetation communities and edaphic conditions.
5. The geographic distribution of *Pultenaea* sp. Werrikimbe NP is very highly restricted. The area of occupancy (AOO) and the extent of occurrence (EOO) were estimated using the GeoCAT tool (Bachman *et al.* 2011) with the adjustment of the grid reference point to give the minimum AOO estimate as per NSW TSSC Guidelines (2020) and IUCN (2022). Occurrence data were available from records held at the NSW Herbarium (NHNSW database) and data from EMM (2023). The AOO was estimated to be 12 km² based on the species occupying three (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2022). The EOO was estimated to be 41 km² based on a minimum convex polygon enclosing all reliably mapped occurrences of the species, the method of assessment recommended by IUCN (2022).
6. The number of mature individuals of *Pultenaea* sp. Werrikimbe NP is low. At Carrai, 509 plants were recorded in a survey undertaken in 2021/22 (EMM 2023), some three years after the site was burnt in the 2019/20 fires. It was not specified how many of these plants were mature (EMM 2023). A targeted survey at the site where the species had previously been recorded in Werrikimbe NP, was undertaken in November 2023. There were estimated to be at least 200 *P.* sp. Werrikimbe NP individuals across an area of less than one km² (D. Young *in litt.* February 2024). It is also unclear how many of these plants were mature, although many were observed to have flowered.

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7. Details on the ecology of *Pultenaea* sp. Werrikimbe NP are not known. Seeds in *Pultenaea* are physically dormant (Auld and O'Connell 1991) and are dispersed locally by ants (the seeds have an elaiosome) (Berg 1975; Rice and Westoby 1981). These seeds will form a persistent soil seed bank, with germination often triggered by soil heating in the passage of a fire (Auld and O'Connell 1991). Many *Pultenaea* species are known to be killed by fire and rely on seedling recruitment from a soil seed bank after fire for persistence (Auld 1996), while some *Pultenaea* species can resprout after fire as well as having seedling recruitment. The fire response of *P.* sp. Werrikimbe NP is unknown but several of its close relatives (*P. parrisiae*, *P. palacea*) are known to be obligate seeders and are killed by fire and have persistent soil stored seed banks (Ferrer-Paris and Keith 2022). The fires of 2019/20 burnt all known areas where *P.* sp. Werrikimbe NP occurs. Mapping of fires shows the fire frequency at the Carrai population in the last 30-40 years has been high with fires in 2019/20, 2012/13, 2000/01, 1993/94, 1991/92 (burnt the eastern edge of the population) and 1986/87 (NSW SEED 2023). This corresponds to fire intervals of 7, 12, 7, 2 (part) and 7 years. Obligate seedling *Pultenaea* species need to be able to replenish their soil seed banks between fires otherwise declines will occur. Intervals between fires that allow persistence are expected to be from 7-10 years (NSW RFS 2023), so the past fire history at Carrai is generally near the lower limit (7 years). There are longer intervals between fires recorded for the Werrikimbe area (approximately 26 and 17 years) (NSW SEED 2023).
8. The Carrai population of *Pultenaea* sp. Werrikimbe NP is threatened by habitat degradation, and there is the risk of introduction of pathogens and an adverse fire regime should a proposal for an infrastructure project be approved and constructed. The fire regime that the species is currently experiencing may be leading to decline. Road maintenance activities are considered a future threat to the species in both populations.
9. *Pultenaea* sp. Werrikimbe NP has been recorded in the project area of the proposed Oven Mountain Pumped Hydro Energy Storage Project (The Project) (EMM 2023). The EIS for the Project was published in September 2023. "The Project involves building two 'off river' water containment structures to create an upper and a lower reservoir, on an ephemeral tributary of the Macleay River. An underground hydro-electric power station complex will connect the reservoirs via a power waterway and tunnels, enabling power generation. The pumped hydro system will connect to the existing transmission network via new overhead high voltage transmission lines." (EMM 2023). The *P.* sp. Werrikimbe NP individuals at Carrai mostly occur within the proposed Project area with the majority of the plants in two areas within the construction envelope. There are 143 individuals (out of a total of 509, or 28% - it is not specified if they are mature) surrounded by the disturbance footprint, adjacent to and within 30m of an area planned to accommodate the placement of 10m high spoil piles. Disturbance to the individuals and degradation of their habitat is likely, e.g. through changes to the microclimatic conditions such as sunlight levels, average windspeed and soil moisture availability. During the construction period, increased dust levels may inhibit growth

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of vegetation, while weed species and pathogens may be introduced to the habitat (EMM 2023). As *P. sp.* Werrikimbe NP grows in wet and heathy habitat in this area, the effect of the altered water flow patterns and drainage as a result of the Project is highly likely to lead to decline and loss of *P. sp.* Werrikimbe NP individuals and degradation of habitat. A second area of roadside habitat near the boundary of the Carrai State Conservation Area is susceptible to roadside disturbance and changes to the fire regime.

10. Some of the close relatives of *Pultenaea sp.* Werrikimbe NP are known to be impacted by the plant pathogens *Phytophthora cinnamomi* and *P. gregata* (Barker and Wardlaw 1995; Wan *et al.* 2020). Whilst *Pultenaea sp.* Werrikimbe NP has not been tested, it may also be susceptible to these pathogens. *Pultenaea paleacea* was found to be highly susceptible to *Phytophthora cinnamomi*, while Wan *et al.* (2020) found *Pultenaea parrisiae* was highly susceptible to *Phytophthora gregata*. Introduction of these pathogens into habitat containing *Pultenaea sp.* Werrikimbe NP may lead to plant deaths if the species is similarly susceptible. Given the majority of the Carrai population is within the Project area, there is a high risk of introduction of pathogens to the area during all phases of the Project. Spread of pathogens may be hastened in swampy areas given the pathogens are water dispersed (Cahill *et al.* 2008)). Other species within the habitat may also be susceptible to the pathogens.
11. The current fire regime at Carrai may be leading to decline in the population of *Pultenaea sp.* Werrikimbe NP if it is an obligate seeding species. Obligate seeding *Pultenaea* species need to be able to replenish their soil seed banks between fires otherwise declines will occur. Intervals between fires that allow persistence are expected to be at least 7-10 years in *Pultenaea* (NSW RFS 2023). The past fire history at Carrai is generally near the lower limit (7 years) and may be leading to decline in the species. The disturbance to the habitat, should the proposed Project proceed, may impede the natural spread of fire in the landscape. A change from the current fire regime to one of more frequent fire (if hazard reduction burning is introduced into the area to protect life and property) or less frequent fire (the natural spread of fire is impeded by infrastructures and wildfire is actively excluded from the area), may lead to a disruption of critical stages in the life cycle of *Pultenaea sp.* Werrikimbe NP and other species in the habitat. This may lead to decline of the species and decline in the quality of the habitat.
12. *Pultenaea sp.* Werrikimbe NP (L.M. Copeland 4477) is not eligible to be listed as a Critically endangered species.
13. Under the *Biodiversity Conservation Act 2016* a species is eligible to be provisionally listed as, in the opinion of the NSW Threatened Species Scientific Committee:
 - (a) the species:
 - (i) although not previously known to have existed in New South Wales, is believed on current knowledge to be native to New South Wales, or

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- (ii) is subject to an immediate and significant threat of extinction, or
- (iii) was presumed to be extinct or extinct in the wild but has been rediscovered, and
- (b) the species is not listed in Schedule 1 as an endangered or critically endangered species.

14. *Pultenaea* sp. Werrikimbe NP (L.M. Copeland 4477) is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is subject to an immediate and significant threat of extinction.

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).

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data Deficient.

(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:			
	(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.
(2) - The determination of that criteria is to be based on any of the following:			
	(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).

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
and at least 2 of the following 3 conditions apply:			
	(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.

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	(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: Vulnerable under Clause 4.4 (b)(e i,ii(A III)).

The estimated total number of mature individuals of the species is:				
	(a)	for critically endangered species	very low, or	
	(b)	for endangered species	low, or	
	(c)	for vulnerable species	moderately low.	
and either of the following 2 conditions apply:				
	(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: Vulnerable under Clause 4.5(c).

The total number of mature individuals of the species is:			
	(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

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

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

(Equivalent to IUCN criterion D2)

Assessment Outcome: Vulnerable under Clause 4.7.

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.
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NSW Threatened Species Scientific Committee

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