

NSW Threatened Species Scientific Committee

Notice of Preliminary Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Preliminary Determination to support a proposal to remove *Muehlenbeckia* sp. Mt Norman (J.T.Hunter 3847) Makinson from the Schedules of the Act by omitting reference to this species from Part 3 of Schedule 1 (Vulnerable species). The omission of species from the Schedules is provided for by Part 4 of the Act.

How to make a submission

The NSW TSSC welcomes public involvement in the assessment process and places preliminary determinations on public exhibition on the NSW TSSC pages on the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) website. This public exhibition provides an opportunity for the public to comment on this preliminary determination as well as provide any additional information that is relevant to the assessment.

Postal submissions regarding this Preliminary Determination may be sent to:

Secretariat
NSW Threatened Species Scientific Committee
Locked Bag 5022
Parramatta NSW 2124.

Email submissions in Microsoft Word or PDF formats to:
scientific.committee@environment.nsw.gov.au

Submissions close 25 October 2025

What happens next?

After considering any submissions received during the public exhibition period the NSW TSSC will make a Final Determination and a notice will be placed on the NSW DCCEEW website to announce the outcome of the assessment. If the Final Determination is to support a listing, then it will be added to the Schedules of the Act when the Final Determination is published on the legislation website. www.legislation.nsw.gov.au.

Privacy information

The information you provide in your submission may be used by the NSW TSSC in the assessment to determine the conservation status and listing or delisting of threatened or extinct species, threatened populations and threatened or collapsed ecological communities or to assess key threatening processes.

The NSW TSSC may be asked to share information on assessments with NSW Government agencies, the Commonwealth Government and other State and Territory governments to collaborate on national threatened species assessments using a common assessment method and to assist in the management of species and ecological communities.

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If your submission contains information relevant to the assessment it may be provided to state and territory government agencies and scientific committees as part of this collaboration.

If you wish your identity and personal information in your submission to be treated as confidential you must:

- *request your name be treated as confidential, and*
- *not include any of your personal information in the main text of the submission or attachments so that it can be easily removed.*

Professor Em Caroline Gross
Chairperson
NSW Threatened Species Scientific Committee

Public Exhibition period: 25/07/2025 – 25/10/2025

Preliminary Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Preliminary Determination to support a proposal to remove *Muehlenbeckia* sp. Mt Norman (J.T.Hunter 3847) Makinson from the Schedules of the Act by omitting reference to this species from Part 3 of Schedule 1 (Vulnerable species). The omission of species from the Schedules is provided for by Part 4 of the Act.

Summary of Conservation Assessment

The NSW Threatened Species Scientific Committee has found that:

1. *Muehlenbeckia* sp. Mt Norman (J.T.Hunter 3847) Makinson, now described as *Muehlenbeckia costata* K.L.Wilson & Makinson, is “a scrambling or decumbent subshrub or twiner to 4 m in height, dioecious. Stems slender, green to reddish, not glaucous, weakly striate, to 5 m long. Leaves solitary, persistent, not succulent, yellow-green, slightly paler abaxially, often reddish on margins and veins, not glaucous, simple, petiolate; petiole 10–20(–25) mm long, usually no more than 1/3 as long as blade; blade ovate to oblong-ovate, 25–75(–140) mm long, 10–50(–90) mm wide; distal third of blade with edges strongly convex; base truncate to more or less cordate or sagittate; margins strongly crisped, slightly wavy; apex obtuse, emarginate, or acute, occasionally short-apiculate (apiculum to 3 mm long); ocrea short-tubular, not ciliate on upper margin, soon disintegrating. Flowers 2–5 per cluster in usually axillary spikes 0.5–10 cm long, spikes not crowded at branch ends. Perianth 5-merous, sepaloid, divided for 2/3–3/4 of its length in female flowers, rather more in male flowers; perianth segments 1.5–2.0 mm long, persistent, greenish becoming orange and fleshy in fruiting stage, papery when dry. Stamens 8; anthers 0.7–0.9 mm long. Style 3-fid. Nut broad-elliptical in outline, subterete to broadly trigonous, 3–4 mm long, with 6 broad rounded longitudinal ridges, black, dull, tuberculate, partly enclosed by persistent perianth” (Wilson and Makinson 2024).
2. *Muehlenbeckia costata* is locally restricted to a number of rocky outcrops scattered widely across the New England Tableland of northern NSW and southeast Queensland, with two outlying sites in the Pilliga and the NSW Central Tablelands near Lithgow. The species is currently known from six subpopulations (per the IUCN (2022) definition) across its range, with each typically consisting of localised clusters of records on and between rocky outcrops in an area of continuous habitat that may be affected by a single fire event.
3. The Area of Occupancy (AOO) of *Muehlenbeckia costata* is estimated to be 68 km² using 2 x 2 km grid cells, the scale recommended by IUCN (2022). The Extent of Occurrence (EOO) is estimated to be 47,932 km² and is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2022). Both EOO and AOO were calculated using ArcGIS (Esri 2015), enclosing all confirmed survey records and cleaned spatial datasets.

4. The current estimated minimum population size of *Muehlenbeckia costata* is 8,250 mature individuals. However, *M. costata* is dependent on severe fire to initiate germination, with emergent plants apparently short-lived (Hunter *et al.* 1998). Hence, abundance and detectability are likely to decline with time since fire, which may influence interpretations of abundance and demographic change. Natural fluctuations occur in *M. costata* subpopulations depending on the fire regime, with the species reaching peak abundance 6–12 months post-fire and persisting in the soil seedbank for decades (and potentially longer) between suitable fires (Hunter *et al.* 1998; Hunter 1999). This means that abundance estimates for sites with less frequent monitoring or observations have high error margins as the current records are dependent on the time of observation relative to the last hot fire event.
5. *Muehlenbeckia costata* is typically found around recently burnt montane rocky outcrops, with most occurrences above 1,100 m elevation (Hunter *et al.* 1998), though the most westerly record is as low as 500 m elevation (Hunter 2011a). While it often occurs in heath and mallee vegetation on large outcrops with significant areas of bare rock (Hunter *et al.* 1998), the species has also been recorded within the forest and woodland matrix adjoining the outcrops at some sites (Hunter 2020; G. Phillips pers. obs. April 2020). Plants are mostly found on granite (Hunter *et al.* 1998), although have also been recorded on trachyte and sandstone (Hunter 2011a, 2015). The plants often occur in shallow soils within cracks and fissures on outcrops and can come to completely dominate these habitats in the early post-fire period (G. Phillips pers. obs. March 2020, April 2020).
6. *Muehlenbeckia costata* is an obligate seeding species dependent on the passage of hot fire to complete its short lifecycle (Hunter *et al.* 1998), with no plants ever recorded without a preceding spring or summer fire. Times between recorded mass germination events are often 10–30 years apart, although the longest recorded time between fires inferred to be sufficiently hot to trigger germination at any known site is approximately 55 years (NSW NPWS 2022). This suggests that the species can remain dormant in the soil seedbank for several decades, if not much longer (Hunter 1999).
7. *Muehlenbeckia costata* recruits *en masse* immediately following a hot fire (Hunter *et al.* 1998). Following a germination event, flowering follows after only 2–3 months and continues throughout the typical 1–3-year lifespan, with female plants also continually producing fruit over a similar timeframe (Hunter *et al.* 1998; Hunter 1999, 2006, 2011b). Standing plants then succumb quickly at the end of the lifecycle, with most plants contracting a rust fungus prior to and during senescence, which rapidly kills off the aboveground plants (Hunter *et al.* 1998). Within two years from the time of fire, most plants have fully senesced (Hunter *et al.* 1998), though persistent individuals have been recorded up to 4–5 years after fire (Hunter 2006, 2011b; G. Phillips pers. obs. August 2023).
8. *Muehlenbeckia costata* is dioecious, with male and female flowers borne on separate plants (Hunter *et al.* 1998). This species is primarily likely to be wind pollinated as per other *Muehlenbeckia* (Wodehouse 1931). However, large numbers of insects such as small flies, ladybeetles (Coccinellidae), and ants have been observed visiting inflorescences in peak flower on *M. costata* and related species (Schuster *et al.* 2011; G. Phillips pers. obs. March 2020) and may therefore

play an additional role in pollination. The seeds of *Muehlenbeckia costata* develop within a fleshy perianth that turns bright orange/red at maturity (Hunter *et al.* 1998). This makes birds and lizards primary candidates for dispersal across and between habitat areas (Hunter *et al.* 1998).

9. *Muehlenbeckia costata* appears to have complex seed dormancy which enables the seeds to persist long-term in the soil seedbank and germinate in the post-fire environment when conditions are most suitable. Despite possessing a hard seed coat, many *Muehlenbeckia* species do not possess physical dormancy, but instead have physiological dormancy requiring environmental cues for germination (South Australian Seed Conservation Centre 2018a, 2018b, 2018c; Wotton 2018). *Muehlenbeckia costata* appears to primarily require soil heating and exposure to smoke for germination: Hunter (1999) found weak evidence of greater germination rates following smoke treatment and heating for 10 minutes at temperatures from 80°C to as high as 120°C, than in controls and after heating without smoke treatment. These temperatures are representative of the conditions experienced by the top 1–2 cm of soil in high intensity wildfires (Bradstock and Auld 1995). This suggests that high intensity fires may result in the strongest germination.
10. Previously identified threats to *Muehlenbeckia costata* include adverse fire regimes, particularly the exclusion of suitably hot fire for extended periods, trampling where the species occurs on trails, road maintenance where the species abuts roads and tracks, and browsing by feral goats (*Capra hircus*) (Hunter *et al.* 1998; OEH 2021). Another more recently identified threat is weed invasion by competing disturbance-promoted species such as inkweed (*Phytolacca octandra*; G. Phillips pers. obs. March 2021). ‘Competition and habitat degradation by feral goats (*Capra hircus*)’ is listed as a key threatening process under the Act.
11. When the threat of adverse fire regimes is considered, particularly a reduction of sufficiently hot wildfires, the six subpopulations of *Muehlenbeckia costata* can be treated as six threat-defined locations, as per the IUCN (2022) definition. This is due to fire-related threats resulting in the lowest number of locations for the taxon. The large distances between these locations are significant enough that each is considered a geographically distinct area where single wildfire events are unlikely to extend to any other location based on the fire history of the region (NSW NPWS 2022). This, combined with differing fire management strategies and priorities across differing national parks (NSW NPWS 2005a, 2005b, 2005c, 2013), means each location is likely to have a different risk profile for fire-related threats.
12. Continuing decline is not evident in the known subpopulations of *Muehlenbeckia costata* despite potential threats. Adverse fire regimes may contribute to decline in the population of *M. costata* if suitably hot wildfires are excluded from known subpopulations over long periods of time or if fire precedes severe droughts that may limit seedling recruitment. *Muehlenbeckia costata* is reliant on intense fires to germinate and complete its lifecycle (Hunter *et al.* 1998), and so a reduction in the occurrence of intense fires may disrupt the lifecycle of *M. costata* by limiting germination events and diminishing subsequent recruitment for the species. Furthermore, increased occurrences of lower intensity fire may also disrupt the lifecycle of *M. costata* as the ground fuels required to sufficiently heat the soil and maintain heat long enough to break dormancy will not be allowed to build up over

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time. However, observations following the 2019-2020 fire season indicate that the population of *M. costata* show no evidence of decline because of these processes. It is also highly plausible that more frequent severe fires driven by changes in climate may positively affect the *M. costata* population in the future (CSIRO and BOM 2022; AdaptNSW 2023), potentially increasing the number of and strength of germination events, and diminishing the threat of exclusion of sufficiently hot fires. Competition by disturbance-promoted weed species such as inkweed, trampling and road and track maintenance, and browsing by feral goats are also noted as plausible threats, however, there is no direct evidence of any of these threats causing continuing decline in the abundance or habitat of *M. costata*, nor is there certainty that they will do so in the future. As such, all identified threats to *M. costata* are considered only to be plausible future threats, not satisfying the definition for continuing decline (IUCN 2022).

13. In view of the above, the NSW Threatened Species Scientific Committee is of the opinion that *Muehlenbeckia costata* K.L.Wilson & Makinson (syn. *Muehlenbeckia* sp. Mt Norman (J.T.Hunter 3847) Makinson) is not eligible to be listed as a threatened species in any category under the Act.

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:

Muehlenbeckia sp. Mt Norman (J.T.Hunter 3847) Makinson was found to be ineligible for listing as none of the criteria were met.

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Not met.

(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.	

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Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)

Assessment Outcome: Not met.

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,
	(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 C)

Assessment Outcome: Not met.

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:

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			(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: Not met.

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.

Clause 4.7 - Very highly restricted geographic distribution of species—vulnerable species

(Equivalent to IUCN criterion D2)

Assessment Outcome: Not met.

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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Chairperson
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Supporting Documentation:

Phillips GP (2024) Conservation Assessment of *Muehlenbeckia costata* K.L.Wilson & Makinson (Polygonaceae). NSW Threatened Species Scientific Committee.

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