

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 list *Hibbertia puberula* subsp. *extensa* R.T.Mill as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species 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 31 July 2026

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 Angela Moles, FRSN
Chairperson
NSW Threatened Species Scientific Committee

NSW Threatened Species Scientific Committee

Public exhibition period: 8/05/2026 – 31/07/2026

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 list *Hibbertia puberula* subsp. *extensa* R.T.Mill as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Hibbertia puberula subsp. *extensa* R.T.Mill was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(a)(d)(e i,ii,iii,iv) and Clause 4.4(a)(e i,ii A(I)) because: 1) the species has a very highly restricted geographic range with a minimum extent of occurrence estimated at 66 km²; 2) it has a low total number of mature individuals (estimated at ≤175), with the largest subpopulation containing ≤50 mature individuals; 3) the population is considered to be severely fragmented; and 4) there is an observed continuing decline in the area, extent and quality of habitat and inferred continuing decline in the extent of occurrence, area of occupancy, number of subpopulations, and number of mature individuals due to the clearing, fragmentation, and degradation of habitat, and adverse fire regimes, particularly high frequency fire and high severity fire.

The NSW Threatened Species Scientific Committee has found that:

1. *Hibbertia puberula* Toelken (family Dilleniaceae) is described as a decumbent to suberect shrublet “with few wiry branches to 30 cm long, pubescent, often glabrescent, with simple long and short hairs (hairs often curved or hooked). Leaves with petiole 0.2–0.5 mm long; lamina narrowly ovate to almost linear, (1.2–)3–5.5(-8) mm long, (0.6–)0.8–1.4(-1.8) mm wide; base appearing abruptly constricted because margin strongly revolute (under surface not visible); apex more or less obtuse. Flowers single or rarely up to 3-flowered; pedicels short; bracts more or less elliptic, mostly 3–3.5(-4) mm long, leaf-like. Calyx with outer lobes ovate, more or less beaked with margin recurved distally, mostly 6–10 mm long, outer surface hispid, inner surface pubescent to silky hairy; inner calyx lobes oblong-elliptic to oblong-ovate, mostly 5–7 mm long, hispid with spreading bristles mainly along central ridge. Petals obovate, 6–8 mm long, broadly bilobed. Stamens (9–)10–14, inserted on one side of ovary, subequal; filaments fused on lower one-third. Carpels 2, slightly hairy, sometimes almost villous. Fruit puberulous with simple hairs.” (Toelken and Miller 2012; PlantNet 2023a).
2. The subspecies *Hibbertia puberula* subsp. *extensa* R.T.Mill is a decumbent to suberect shrublet described as having “branches stiff-woody and lateral ones spreading up to about right angles. Leaf lamina mainly lanceolate. Outer calyx lobes ovate, 6.1–7.9 mm long, 3.1–3.8 mm wide, acute to beaked with ± strongly recurved margins and distinctly raised ridge towards the apex, strigose to hirsute; inner calyx lobes elliptic rarely oblong-ovate, 4–5 mm long, 2.9–3.4 mm wide, with innermost two abruptly constricted into minute terminal point continuous with broad

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membranous margins, hirsute to strigose with hairs becoming smaller towards the margins. Stamens 4–7; anthers 0.8–1.2 mm long.” (Toelken and Miller 2012; PlantNet 2023b).

3. *Hibbertia puberula* subsp. *extensa* is currently known to be endemic to the Sydney Basin Bioregion of New South Wales (NSW) (Commonwealth DCCEEW 2012). The subspecies has a disjunct distribution comprised of multiple small and isolated sites and subpopulations, where it is often highly localised. The distribution extends from South Maroota and Bateau Bay in the north to the Wanganderry Tablelands and Appin in the south. The distribution of *H. puberula* subsp. *extensa* spans the traditional lands of the Dharug, Tharawal, Gundungurra, Eora, and Kuring-gai peoples (AIATIS 1996).
4. *Hibbertia puberula* subsp. *extensa* has a very highly restricted geographic range. The extent of occurrence (EOO) was calculated at 66–4,391 km² based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2024). The area of occupancy (AOO) is estimated to be 20–32 km² and was calculated using 2 x 2 km grid cells, the scale recommended by IUCN (2024). A plausible range for both AOO and EOO is provided due to the taxonomic uncertainty of the Bateau Bay records, and uncertainty around whether the subspecies persists in the Wanganderry Tablelands and South Maroota.
5. The estimated minimum population size of *Hibbertia puberula* subsp. *extensa* is ≤200 mature individuals, with fewer than 250 individuals across all age classes (Miller *et al.* 2024). The population occurs across 8–10 known subpopulations as defined by IUCN (2024), which are identified by a distance of ≥1 km between occurrences, as gene flow from either pollination or seed dispersal is considered to be very limited beyond this distance. This accounts for the taxonomic uncertainty of a subpopulation at Bateau Bay, and the probable loss of a subpopulation in South Maroota.
6. Based on recent survey data, the largest subpopulation at Appin West is unlikely to contain greater than 50 mature individuals (Miller *et al.* 2024).
7. *Hibbertia puberula* subsp. *extensa* is considered to be severely fragmented as it is inferred that >50% of its population occurs in habitat patches that are smaller than would be required to support a viable population and separated from other habitat patches by a large distance relative to dispersal kernel of the species, as per the IUCN (2024) definition.
8. *Hibbertia puberula* subsp. *extensa* typically occurs in heathy upland swamps along intermittent seeps associated with underlying sandstone or sandstone rockplate (Toelken and Miller 2012; Miller *et al.* 2024). The subspecies occurs on shallow sandy soils which may be humic, loamy, or lateritic (Miller *et al.* 2024).
9. *Hibbertia puberula* subsp. *extensa* occurs at elevations ranging from 30 m above sea level (a.s.l.) at Bateau Bay, 200–370 m a.s.l. around Appin and Dharawal National Park, and 730 m a.s.l. on the Wanganderry Tablelands.

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10. Commonly co-occurring species include *Eucalyptus racemosa*, *E. sieberi*, *Corymbia gummifera*, *Banksia ericifolia*, *B. oblongifolia*, *Leptospermum squarrosus*, *Melaleuca thymifolia*, *Dillwynia floribunda*, *Epacris microphylla*, *Hibbertia ericifolia* subsp. *acutifolia*, *Xanthorrhoea resinosa*, and *Drosera spathulata* (Miller *et al.* 2024).
11. Little is known about the fire and disturbance ecology of *Hibbertia puberula* subsp. *extensa*. The genus contains both resprouting species and obligate seeding species (Ferrer-Paris *et al.* 2022). *Hibbertia puberula* subsp. *puberula* has been documented to resprout following fire (G. Phillips pers. comm. December 2023). However, Miller *et al.* (2024) noted that *H. puberula* subsp. *extensa* was killed by fire at the type locality in Appin and suggested that the subspecies may be an obligate seeder.
12. *Hibbertia puberula* subsp. *extensa* generally flowers from October to December and March to April (Toelken and Miller 2012). As *H. puberula* subsp. *extensa* is zygomorphic, native bees and/or beetles are likely to be the primary pollinators (Tucker and Bernhardt 2000).
13. *Hibbertia puberula* subsp. *extensa* seeds possess a fleshy aril (Toelken and Miller 2012), a structure that has been demonstrated to aid dispersal by ants (myrmecochory) in other *Hibbertia* species (Berg 1975). However, it is unlikely that seeds of *H. puberula* subsp. *extensa* are transported far from parent plants by ants, as ants are reported to typically transport seeds over distances of <2 m in sclerophyllous vegetation (Gómez *et al.* 1998). *Hibbertia puberula* is known to have a persistent seedbank (Cuneo *et al.* 2018).
14. *Hibbertia puberula* subsp. *extensa* is threatened by the clearing, fragmentation, and degradation of habitat, particularly from recreational vehicle use, bike use, and track maintenance, and adverse fire regimes, particularly high frequency and high severity fire. Weed invasion and coal mining are potential threats at several sites. Flower mites are limiting the reproductive output of plants in at least two subpopulations and may be an emerging threat. 'Clearing of native vegetation', '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', 'Invasion of native plant communities by exotic perennial grasses' and 'Alteration of habitat following subsidence due to longwall mining' are listed as Key Threatening Processes under the Act.
15. The combined threats of the clearing, fragmentation, and degradation of habitat, and adverse fire regimes, particularly high frequency and high severity fire, are observed to be causing continuing decline in the area, extent and quality of habitat and inferred to be causing continuing decline in the number of mature individuals. Targeted surveys undertaken in 2023 to inform this assessment surveyed all known habitat of the subspecies, except for the South Maroota subpopulation, which was inferred to have been destroyed by road widening. These surveys revealed an observed continuing decline in the area, extent, and quality of habitat due to the clearing, fragmentation, and degradation of habitat, caused primarily by track maintenance and associated activities, and inappropriate recreational vehicle

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and bike use in habitat areas. The presumed loss of the South Maroota subpopulation to habitat clearing is inferred to have resulted in continuing decline in the extent of occurrence, area of occurrence, and number of subpopulations of the subspecies.

16. Adverse fire regimes are inferred to be contributing to continuing decline in the number of mature individuals. It is inferred that the 2019–2020 wildfire killed all individuals in the Wanganderry Tablelands subpopulation. It is plausible that the Wanganderry subpopulation also lost its soil seedbank due to post-fire erosion of the highly susceptible skeletal soils where the subspecies was found (Miller *et al.* 2024). Follow-up surveys are needed to determine the fate of this subpopulation, but if this has occurred, the subpopulation may now be extinct, which would result in a decline in EOO, AOO, number of subpopulations, and number of locations.
17. *Hibbertia puberula* subsp. *extensa* R.T.Mill is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate 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: *Hibbertia puberula* subsp. *extensa* was found to be Critically Endangered under Clause 4.3(a)(d)(e i,ii,iii,iv) and Clause 4.4(a)(e i,ii A(I)).

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

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(Equivalent to IUCN criterion B)

Assessment Outcome: Critically Endangered under 4.3(a)(d)(e i,ii,iii,iv)

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: Critically Endangered under Clause 4.4(a)(e i,ii A(I))

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: Endangered under Clause 4.5(b)

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: 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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Professor Angela Moles, FRSN
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Saunders M (2025) *Hibbertia puberula* subsp. *extensa* R.T.Mill (Dilleniaceae). NSW Department of Climate Change, Energy, the Environment and Water.

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Tucker SC, Bernhardt P (2000) Floral ontogeny, pattern formation, and evolution in *Hibbertia* and *Adrastaea* (Dilleniaceae). *American Journal of Botany* **87**(12), 1,915–1,936.