

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 list the low spreading shrub, *Hibbertia superans* Toelken as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to *Hibbertia superans* Toelken from Part 2 of Schedule 1 (Endangered species) 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 Department of Planning, Industry and Environment (DPIE) 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 1481.

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

Submissions close 26th August 2023.

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 DPIE 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.

NSW Threatened Species Scientific Committee

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.***

Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

NSW Threatened Species Scientific Committee

Public Exhibition period: 26/05/2023 – 26/08/2023

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 the low spreading shrub, *Hibbertia superans* Toelken as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to *Hibbertia superans* Toelken from Part 2 of Schedule 1 (Endangered species) of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Hibbertia superans Toelken was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.2(a)(b)(c)

The NSW Threatened Species Scientific Committee has found that:

1. *Hibbertia superans* was originally described as *H. sericea*, or *Pleuranda sericea* in 1817 as part of a species complex now recognised as twelve species and three subspecies (Toelken 2000). In the 2001 Final Determination (NSW Scientific Committee 2001) an endangered population previously known as *H. incana* was included in the assessment, however this species is now known as *H. crinita* (PlantNET 2022a) and is not included in this assessment. *Hibbertia superans* was previously thought to occur at a disjunct occurrence near Mt Boss (inland from Kempsey) on the mid north coast of NSW (NSW Scientific Committee 2001), but this record now belongs to a separate taxon and not included in this assessment (*H. Toelken in litt.* December 2022).
2. PlantNET (2022b) describes *H. superans* as “Low spreading shrubs with few to many, weak twisting branches to 40 cm long. Leaves linear, rarely linear-elliptic, (5.6-) 7.5 - 10 (-12.3) mm long, 0.9 -1.2 (-1.4) mm wide; apex acuminate to acute; base gradually tapering to petiole, petiole to 0.5 mm long; margins revolute, appearing thickened. Young branches and leaves covered with long silky hairs over a dense indumentum of short stiff hairs. Longer hairs often wearing off with age. Some scattered stellate hairs also present, particularly on the younger branches and the lower surface of leaves. Flowers single; sessile or shortly pedicellate; terminal on main branches (or rarely on short shoots); bracts linear, 8.3 - 9.5 mm long, 1.0 - 1.3 mm wide, leaf-like with distinct central vein, villous sometimes becoming tomentose above and below. Calyx not accrescent; outer calyx lobes linear-lanceolate, acute, with slender central vein, villous-tomentose, mostly 7.5 - 9 mm long and 1.4 - 1.7 mm wide, much longer than inner lobes; inner calyx lobes oblong-elliptic to obovate, obtuse to rounded, 4.2 - 6.5 (-7.6) x 1.9 - 2.7 mm, outside villous over more or less appressed pubescent, inside rarely with a few appressed hairs towards the apex. Petals broadly obovate, 5.5 - 6.7 mm long, emarginate. Stamens 6 - 9, subequal; filaments basally connate, but often some more than others; anthers narrowly oblong, (1.4-) 1.6 - 1.8 mm long, dehiscent mainly by

NSW Threatened Species Scientific Committee

lateral slits. Pistils 2; ovaries laterally compressed, each with 4 ovules; style from outer apex of ovary, curved outwards and around the cluster of stamens to end at the apex of the outer anthers. Fruit villous with very dense erect simple hairs. Seeds oblong-obovoid, often oblique, 1.5 - 1.7 x 1.1 - 1.4 mm, fleshy aril expanding into a scarcely lobed sheath adpressed to the base of seed, often to one side of base of seed." *Hibbertia superans* has been recorded up to 40cm high and spreading up to 1 m wide (R. Miller *in litt.* December 2022).

3. *Hibbertia superans* is endemic to the Greater Sydney region of NSW. It mainly occurs in the northwest Sydney region between Baulkham Hills and Wisemans Ferry. It has also been recorded in very small numbers in the Berowra Valley, Belrose, North Turramurra, Dural and Manly, and in the lower Blue Mountains between Blaxland and Faulconbridge.
4. The geographic distribution of *H. superans* is highly restricted. The Extent of Occurrence (EOO) is 1,427 km² and the Area of Occupancy (AOO) is 160 km². The Extent of Occurrence (EOO) is based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2022). The AOO is based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2022). The EOO and AOO encompasses the entire known past and extant distribution of the species.
5. The total population size of *Hibbertia superans* is estimated to be approximately 750 mature individuals. Historically it has been recorded from around 45 sites, with eleven sites with over 100 mature individuals and much smaller numbers at the other sites. Currently, the two largest sites of *H. superans* are adjacent to Cattai Creek, Kellyville. *Hibbertia superans* is now known from eleven subpopulations, with the largest located in northwest Sydney from Castle Hill to Glenorie containing 90% of the population.
6. *Hibbertia superans* has undergone a very large reduction in population size since the late 1990s and early 2000s (2-3 generations). Population trend data is available for 92% of the population recorded in the late 1990s (3,092 mature individuals at 16 sites) and early 2000s (3,380 mature individuals at 45 sites). This large subset of the population has declined 77% to 722 individuals as a result of land clearing for residential and rural-residential development, low fire frequency, habitat degradation from human disturbance and competition from weeds. The population trajectory of the other 8% of the population (288 mature individuals) is unknown but it is reasonable to infer a similar decline in the presence of the current known ongoing threats. At least 100 mature individuals have been identified from approved or in progress development applications to be cleared in the near future, which will equate to a total reduction in population size of 80% since the late 1990s and early 2000s (DPE 2022).
7. *Hibbertia superans* is severely fragmented because >50% of the total AOO consists of stands of the species that are considered unviable, the definition required by the IUCN Guidelines (2022) for a species to be severely fragmented. 128 km² (80%) of the remaining AOO of *H. superans* contain stands of 12 or less individuals which is considered unviable.

NSW Threatened Species Scientific Committee

8. *Hibbertia superans* is found on a mixture of land tenures: 23 sites (>50% of sites) are on private land or part on private or unreserved Crown land, 11 are on, or part on, Council or Crown reserves, four are in a NPWS reserve, two are on Aboriginal Land Council land and one in State Forest.
9. *Hibbertia superans* occurs in Dry Sclerophyll Forest on sandstone ridgetops, often close to the shale/sandstone transition (James 2012; PlantNET 2022b; Toelken 2000). *Hibbertia superans* is often associated with canopy species such as *Allocasuarina littoralis*, *Angophora bakeri*, *A. hispida*, *Corymbia gummifera*, *C. eximia*, *Eucalyptus piperita*, *E. sclerophylla*, *E. sp. Cattai*, *E. squamosa* and a large diversity of understory shrubs including other threatened flora such as *Acacia bynoeana*, *Darwinia biflora*, *Epacris purpurascens* var. *purpurascens*, *Leucopogon fletcheri* subsp. *fletcheri*, *Persoonia hirsuta* and *Pimelea curviflora* var. *curviflora* (Millar 2022; NSW Scientific Committee 2001). *Hibbertia superans* has been recorded in three Sydney Basin Bioregion threatened ecological communities, Sydney Turpentine-Ironbark Forest and Duffy's Forest Ecological Community.
10. *Hibbertia superans* flowers from July – December (PlantNET 2022b). Flowers first appear from resprouting material about two years after fire (DPE 2022b). The time to first flowering of seedlings is unknown. The fruit is dehiscent, and the seed has a fleshy aril which encourages ant dispersal (Benson and MacDougall 1995). The average lifespan of another species of *Hibbertia*, *H. tenuis* is estimated to be 10–20 years (TSSC 2010) and this estimate is used in this *H. superans* assessment as it is consistent with the large declines in individuals recorded 20 years after fire. Using this information, the generation time for *H. superans* is inferred to be 7-12 years, with three generations being 21-36 years.
11. *Hibbertia superans* is a facultative seeder that is well-adapted to repeated fire in the landscape. The longevity of *H. superans* seeds in the seedbank is unknown, however *Hibbertia* species are thought to have a persistent seedbank (Cuneo *et al.* 2018; TSSC 2016). It recovers well after fire mostly from re-growth from rootstock (James 2012). Seed germination may require high fire intensity (James 2012), as it does in the small, rare western Sydney *Hibbertia spanantha* (Toelken and Robinson 2015). Populations fluctuate with large numbers recorded 2-4 years after fire and falling as vegetation increases in height and density (James 2012).
12. *Hibbertia* spp. have been reported to be pollinated by native bees, honeybees *Apis mellifera*, pollen-seeking "hoverflies", and pollen consuming beetles (Armstrong 1979; Tucker & Bernhardt 2000). *Hibbertia superans* has zygomorphic flowers, where the stamens are aggregated in one side of the flower, and it is thought that native bees are the most effective pollinators of such flowers (Tucker and Bernhardt 2000). The seeds of *Hibbertia* are thought to be dispersed by physical forces of wind and water and ants which are attracted to the fleshy aril (Rice and Westoby 1981) and as such it highly unlikely that seeds are transported far from any cluster of individuals.

NSW Threatened Species Scientific Committee

13. *Hibbertia superans* is threatened by vegetation clearing for residential and rural residential development, low frequency fire, habitat degradation from human activity, competition from weeds and disease (Miller 2022; NSW Scientific Committee 2001)
14. *Hibbertia superans* has been severely impacted by residential and rural residential development over the last few decades with most of its ridgetop habitat now developed (Miller 2022). In recent years, a housing development adjacent to Cattai Creek, on Heath Rd and Saltwater Crescent, cleared 289 of 479 individuals (61%), once the largest known stand of *H. superans*. Similarly, on Cattai Creek, at Cattai Creek Drive, an approved housing developed is planned to clear 77 of 277 individuals in the near future. The small remaining bushland habitat areas that have not been cleared for development face many pressures as a result of adjacent development and substantial human activity. "Clearing of Native Vegetation" is listed as a key threatening process under the Act.
15. Long term absence of fire at *Hibbertia superans* sites is inferred to be a major cause of decline (Miller 2022). Most of the largest recorded patches of *H. superans* are long unburnt (18 – 20+ years) and large declines in number of individuals (40-95%) have been recorded since the previous fire. At long unburnt sites the native vegetation becomes denser and taller, outcompeting the low, spreading *H. superans* and suppressing seedling germination (Miller 2022). Without fire to break seed dormancy and open up the understory to allow seedlings to grow and mature, *H. superans* is unlikely to be able to persist and recolonise these sites. At *H. superans* on private land or in reserves surrounded by urban development, hazard reduction burning is logistically difficult and seldom conducted and wildfire risk is low. Isolation of bushland remnants in the greater Sydney area prevent species migrating to adjacent areas where a different disturbance regime may provide suitable habitat. "Fire regimes that cause declines in biodiversity" is listed as a Key Threatening Process under the EPBC Act.
16. The proximity of the majority of *Hibbertia superans* sites to residential suburbs and rural-residential properties has resulted in human activities impacting the species' habitat in many ways, including by rubbish dumping, weed invasion, property maintenance, nutrification from urban runoff, road and utility easement maintenance and high levels of recreation use (Miller 2022; E Roper pers. comm. February 2023).
17. With the majority of occurrences of *Hibbertia superans* adjacent to or on residential or rural residential land, competition from many species of weeds, especially garden escapes, is an inferred, ongoing threat this species.
18. *Phytophthora cinnamomi* is an inferred, ongoing threat to *Hibbertia superans*, because it affects other *Hibbertia* species (McDougall et al 2005; Wan et al. 2019; Weste and Ashton 1994). *Phytophthora cinnamomi* was suspected to be present at Kenthurst site and given the location of *H. superans* sites within and adjacent to the urban environment, it is likely that *P. cinnamomi* is also present at other sites.

NSW Threatened Species Scientific Committee

'Infection of native plants by *Phytophthora cinnamomi*' is listed as a Key Threatening Process under the Act.

19. *Hibbertia superans* Toelken 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: Critically Endangered under Clause 4.2(a)(b)(c)

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Critically Endangered under Clause 4.2(a)(b)(c)

(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 4.3(b)(d)(e)(i)(ii)(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,	

NSW Threatened Species Scientific Committee

	(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: Endangered under (b)(d)(ii)

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.	

NSW Threatened Species Scientific Committee

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.

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

(Equivalent to IUCN criterion D2)

Assessment Outcome: Clause 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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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Wong V (2023) Conservation Assessment of *Hibbertia superans* Toelken (Dilleniaceae). NSW Threatened Species Scientific Committee.

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NSW Threatened Species Scientific Committee

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NSW Threatened Species Scientific Committee

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