



Consultation on Species Listing Eligibility and Conservation Actions

Styphelia perileuca (montane green five-corners)

You are invited to provide your views and supporting reasons related to:

- 1) the eligibility of *Styphelia perileuca* (montane green five-corners) for inclusion on the EPBC Act threatened species list in the Endangered category; and
- 2) the necessary conservation actions for the above species.

The purpose of this consultation document is to elicit additional information to better understand the status of the species and help inform on conservation actions and further planning. As such, the below draft assessment should be considered to be **tentative** as it may change following responses to this consultation process.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing by email to: species.consultation@awe.gov.au

Please include species scientific name in Subject field.

or by mail to:

The Director
Bushfire Affected Species Assessments Section
Department of Agriculture, Water and the Environment
John Gorton Building, King Edward Terrace
GPO Box 858
Canberra ACT 2601

Responses are required to be submitted by 8 July 2022.

Contents of this information package	Page
General background information about listing threatened species	2
Information about this consultation process	3
Consultation questions specific to the assessment	4
Information about the species and its eligibility for listing	11
Conservation actions for the species	22
References cited	25
Listing assessment	30

General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at: <https://www.awe.gov.au/environment/biodiversity/threatened>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at: <https://www.awe.gov.au/sites/default/files/env/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2021.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at: <https://www.awe.gov.au/environment/biodiversity/threatened/nominations>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at: <https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans>.

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[Common Assessment Method](#)' (CAM). As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <https://www.awe.gov.au/about/commitment/privacy> .

Information about this consultation process

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

CONSULTATION QUESTIONS FOR *Styphelia perileuca* (montane green five corners)

SECTION A - GENERAL

1. Is the information used to assess the nationally threatened status of the species/subspecies robust? Have all the underlying assumptions been made explicit? Please provide justification for your response.
2. Can you provide additional data or information relevant to this assessment?
3. Have you been involved in previous state, territory or national assessments of this species/subspecies? If so, in what capacity?

PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT

SECTION B DO YOU HAVE ADDITIONAL INFORMATION ON THE ECOLOGY OR BIOLOGY OF THE SPECIES/SUBSPECIES? (If no, skip to section C)

Biological information

4. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?
5. Do you have any additional information on the ecology or biology of the species/subspecies not in the current advice?

SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL NATIONAL POPULATION OF THE SPECIES/SUBSPECIES? (If no, skip to section D)

Population size

6. Has the survey effort for this taxon been adequate to determine its national adult population size? If not, please provide justification for your response.
7. Do you consider the way the population size has been derived to be appropriate? Are there any assumptions and unquantified biases in the estimates? Did the estimates measure relative or absolute abundance? Do you accept the estimate of the total population size of the species/subspecies? If not, please provide justification for your response.
8. If not, can you provide a further estimate of the current population size of mature adults of the species/subspecies (national extent)? Please provide supporting justification or other information.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the

table below of possible species/subspecies numbers, and also choose the level of confidence you have in this estimate:

Number of mature individuals is estimated to be in the range of:

☐ 1–50 ☐ 51–250 ☐ 251–1000 ☐ >1000 ☐ >10 000

Level of your confidence in this estimate:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, information suggests this range
- ☐ 95–100% - high level of certainty, information indicates quantity within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

SECTION D ARE YOU AWARE OF TRENDS IN THE OVERALL POPULATION OF THE SPECIES/SUBSPECIES? (If no, skip to section E)

9. Does the current and predicted rate of decline used in the assessment seem reasonable? Do you consider that the way this estimate has been derived is appropriate? If not, please provide justification of your response.

Evidence of total population size change

10. Are you able to provide an estimate of the total population size in the past? Please provide justification for your response.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species/subspecies numbers, and also choose the level of confidence you have in this estimate.

Number of mature individuals is estimated to be in the range of:

☐ 1–50 ☐ 51–250 ☐ 251–1000 ☐ >1000 ☐ >10 000

Level of your confidence in this estimate:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, information suggests this range

- ☐ 95–100% - high level of certainty, information indicates quantity within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

11. Are you able to comment on the extent of decline in the species/subspecies' total population size in the past? Please provide justification for your response.

If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of decline, and also choose the level of confidence you have in this estimated range.

Decline estimated to be in the range of:

- ☐ 1–30% ☐ 31–50% ☐ 51–80% ☐ 81–100% ☐ 90–100%

Level of your confidence in this estimated decline:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, suggests this range of decline
- ☐ 95–100% - high level of certainty, information indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data are accurate within this range

12. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

SECTION E ARE YOU AWARE OF INFORMATION ON THE TOTAL RANGE OF THE SPECIES/SUBSPECIES? (If no, skip to section F)

Current Distribution/range/extent of occurrence, area of occupancy

13. Does the assessment consider the entire geographic extent and national extent of the species/subspecies? If not, please provide justification for your response.
14. Has the survey effort for this species/subspecies been adequate to determine its national distribution? If not, please provide justification for your response.

15. Is the distribution described in the assessment accurate? If not, please provide justification for your response and provide alternate information.
16. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.
17. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of extent of occurrence, and also choose the level of confidence you have in this estimated range.

Current extent of occurrence is estimated to be in the range of:

☐ <100 km² ☐ 100 – 5 000 km² ☐ 5 001 – 20 000 km² ☐ >20 000 km²

Level of your confidence in this estimated extent of occurrence

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, data suggests this range of decline
- ☐ 95–100% - high level of certainty, data indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of area of occupancy, and also choose the level of confidence you have in this estimated range.

Current area of occupancy is estimated to be in the range of:

☐ <10 km² ☐ 11 – 500 km² ☐ 501 – 2000 km² ☐ >2000 km²

Level of your confidence in this estimated extent of occurrence:

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence

- ☐ 51–95% - reasonably certain, data suggests this range of decline
- ☐ 95–100% - high level of certainty, data indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data is accurate within this range

SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES/SUBSPECIES? (If no, skip to section G)

Past Distribution/range/extent of occurrence, area of occupancy

18. Do you consider that the way the historic distribution has been estimated is appropriate?
Please provide justification for your response.
19. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the former extent of occurrence and/or area of occupancy.

If, because of uncertainty, you are unable to provide an estimate of past extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past extent of occurrence, and also choose the level of confidence you have in this estimated range.

Past extent of occurrence is estimated to be in the range of:

- ☐ <100 km² ☐ 100 – 5 000 km² ☐ 5 001 – 20 000 km² ☐ >20 000 km²

Level of your confidence in this estimated extent of occurrence

- ☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on
- ☐ 31–50% - more than a guess, some level of supporting evidence
- ☐ 51–95% - reasonably certain, data suggests this range of decline
- ☐ 95–100% - high level of certainty, data indicates a decline within this range
- ☐ 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of past area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past area of occupancy, and also choose the level of confidence you have in this estimated range:

Past area of occupancy is estimated to be in the range of:

☐ <10 km² ☐ 11 – 500 km² ☐ 501 – 2000 km² ☐ >2000 km²

Level of your confidence in this estimated extent of occurrence:

☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, data suggests this range of decline

☐ 95–100% -high level of certainty, data indicates a decline within this range

☐ 99–100% - very high level of certainty, data is accurate within this range

PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS

SECTION G DO YOU HAVE INFORMATION ON THREATS TO THE SURVIVAL OF THE SPECIES/SUBSPECIES? (If no, skip to section H)

20. Do you consider that all major threats have been identified and described adequately?
21. To what degree are the identified threats likely to impact on the species/subspecies in the future?
22. Are the threats impacting on different populations equally, or do the threats vary across different populations?
23. Can you provide additional or alternative information on past, current or potential threats that may adversely affect the species/subspecies at any stage of its life cycle?
24. Can you provide supporting data/justification or other information for your responses to these questions about threats?

SECTION H DO YOU HAVE INFORMATION ON CURRENT OR FUTURE MANAGEMENT FOR THE RECOVERY OF THE SPECIES/SUBSPECIES? (If no, skip to section I)

25. What planning, management and recovery actions are currently in place supporting protection and recovery of the species/subspecies? To what extent have they been effective?
26. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species/subspecies?
27. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species/subspecies?

SECTION I DO YOU HAVE INFORMATION ON STAKEHOLDERS IN THE RECOVERY OF THE SPECIES/SUBSPECIES?

28. Are you aware of other knowledge (e.g. traditional ecological knowledge) or individuals/groups with knowledge that may help better understand population trends/fluctuations, or critical areas of habitat?
29. Are you aware of any cultural or social importance or use that the species/subspecies has?
30. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species/subspecies?
31. How aware of this species/subspecies are land managers where the species/subspecies is found?
32. What level of awareness is there with individuals or organisations around the issues affecting the species/subspecies?
 - a. Where there is awareness, what are these interests of these individuals/organisations?
 - b. Are there populations or areas of habitat that are particularly important to the community?

PART 3 – ANY OTHER INFORMATION

33. Do you have comments on any other matters relevant to the assessment of this species/subspecies?

Conservation Advice for *Styphelia perileuca* (montane green five-corners)

This draft document is being released for consultation on the species listing eligibility and conservation actions

The purpose of this consultation document is to elicit additional information to better understand the eligibility of the species for listing and inform conservation actions, further planning and the potential need for a Recovery Plan.

The draft assessment below should therefore be considered **tentative** at this stage, as it may change as a result of responses to this consultation process.

Note: Specific consultation questions relating to the below draft assessment and preliminary determination have been included in the consultation cover paper for your consideration.

This document combines the draft conservation advice and listing assessment for the species. It provides a foundation for conservation actions and further planning.



Photo of *Styphelia perileuca* (montane green five-corners) © Copyright, Geoff Derrin (2017) ([CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/))

Conservation status

Styphelia perileuca (montane green five-corners) is proposed to be transferred from the Vulnerable category to the Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act).

Styphelia perileuca was assessed by the Threatened Species Scientific Committee to be eligible for listing under criterion 2 as Endangered. The Committee's assessment is at Attachment A. The Committee's assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: Insufficient data
- Criterion 2: B1ab(v)+B2ab(v): Endangered
- Criterion 3: C2a(i): Endangered
- Criterion 4: D1: Endangered
- Criterion 5: Insufficient data

The main factors that make the species proposed for listing in the Endangered category are a severely fragmented and restricted distribution, occurrence at one location, projected continuing decline in the number of mature individuals and a small population size.

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the [Species Profile and Threats Database](#).

Species information

Taxonomy

Conventionally accepted as *Styphelia perileuca* J.M.Powell, Family: Ericaceae.

Description

Montane green five-corners is an erect to spreading shrub which grows 0.6–1.5 m high. The leaves are broad with a spiky tip, 6–12 mm long and 3–5 mm wide, with fine teeth along the edges. The single hanging flowers are pale green or translucent yellow green with fine red stripes. The fruit is 8–11 mm long, somewhat fleshy and translucent yellow green in colour (description from Powell et al. 1992; DPIE 2020a).

Distribution

Montane green five-corners is known from the eastern edge of the New England Tablelands of New South Wales (NSW) near the town of Ebor (Powell et al. 1992; DPIE 2020a). It occurs between Point Lookout and Styx River State Forest in the south and the northern edge of Cathedral Rock National Park (NP) in the north (Map 1). There is also an unconfirmed record of the species from the Coolacurrippa district in Nowendoc State Forest much further south (ALA 2021; Eco Logical Australia 2021).

Montane green five-corners is known from four subpopulations - Cathedral Rock (in the National Park and private property nearby), Point Lookout (in New England NP), private land at Yaraandoo and Styx River State Forest (ALA 2021; Eco Logical Australia 2021). Most subpopulations are separated by approximately 20 km.

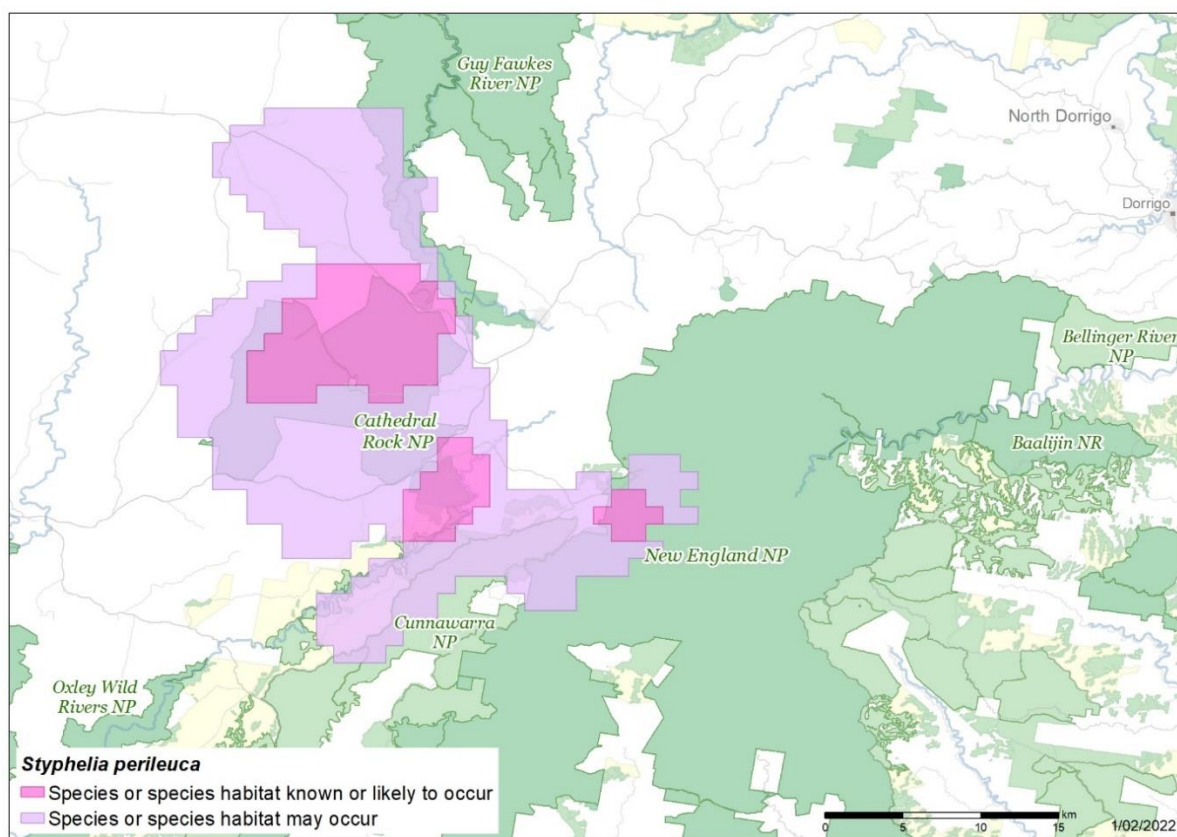
In 1992, the species was described in Cathedral Rock NP as locally common over 2–3 km² and absent from the rest of the park (Powell et al. 1992). Prior to the 2019-20 bushfires, over 1000 mature individuals were recorded in Cathedral Rock NP (Table 1) (DPIE 2020b). Surveys in Cathedral Rock NP in November 2019 located 144 immature plants ranging from 3-15 cm tall (Eco Logical Australia 2021). Further surveys in September 2021 in the park located 30–50 mature individuals (partially protected from the 2019-20 bushfires by a relict dam and the Ebor-Guyra Road) (UNE 2021). The species was also known from approximately 30-70 plants on private property adjoining the National Park prior to the 2019-20 bushfires. Surveys in February 2021 failed to locate any plants on the property (UNE 2021). The other three subpopulations have not been surveyed recently and their population size is based on pre-fire estimates from various points in time.

Table 1 Population information for montane green five-corners*

Subpopulation	Number of mature individuals (date recorded)	Fire History
1a. Cathedral Rock NP	1000+ (prior to 2019 bushfires) 30-50 (September 2021)	Burnt in January 2003 (Snowy Creek Fire) Most of the previously known locations in and around Cathedral Rock NP burnt in late 2019. 144 immature plants, 3-15cm tall were recorded in November 2019
1b. Private property adjoining Cathedral Rock NP	30-70 (prior to 2019 bushfires) 0 (February 2021)	Burnt in late 2019
2. Point Lookout (in New England NP)	2 (1984) Plants also seen 1998	Possibly burnt in 2019
3. Yaraandoo	3 (2003)	Not burnt in 2019
4. Styx River State Forest	54 (2008)	Possibly burnt in 2019

*from Eco Logical Australia 2021; UNE 2021; ALA 2022; Bionet 2022; DPIE 2022

Map 1 Modelled distribution of montane green five-corners



Source: Base map Geoscience Australia; species distribution data [Species of National Environmental Significance](#) database.

Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

Species distribution mapping: The species distribution mapping categories are indicative only and aim to capture (a) the habitat or geographic feature that represents to recent observed locations of the species (known to occur) or habitat occurring in close proximity to these locations (likely to occur); and (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

Cultural and community significance

The cultural, customary and spiritual significance of species and the ecological communities they form are diverse and varied for Indigenous Australians and their stewardship of Country. This section describes some examples of this significance but is not intended to be comprehensive or applicable to, or speak for, Indigenous Australians. Such knowledge may be held by Indigenous Australians who are the custodians of this knowledge and have the rights to decide how this knowledge is shared and used.

Montane green five-corners is found across land belonging to multiple Traditional Owner cultural and dialect groups including the Dunghutti, Anaiwan, Gumbaynggirr and Biripi people (AIATSIS 1996). There is little information on how the Dunghutti, Anaiwan, Gumbaynggirr and Biripi people related to Country in this region and what that may mean for the cultural significance of montane green five-corners.

Various species in the genus *Styphelia* were once a common local native bush tucker for Indigenous Australians along the east coast of Australia (Manson & Whiteside 2001). For example, the fruit of *Styphelia triflora* (pink five corners) and *S. viridis* (green five corners) were used both as a medicine and food source. From August to November, the fruit was traditionally collected and eaten raw. The green unripe fruit was also eaten to relieve digestive problems. Flowers were eaten and nectar was also extracted (Manson & Whiteside 2001). The plant's annual life cycle was also used as an indicator for other forms of hunting and gathering. For example, *Pogona barbata* (eastern bearded dragon) was attracted *Styphelia* species at flowering time to catch insects. This provided Indigenous Australians with a convenient way of catching the eastern bearded dragon which was also a popular food source (Manson & Whiteside 2001).

Further consultation with the Traditional Owners of these lands will benefit the conservation of the species by providing awareness of traditional knowledge and management practices on Country.

Relevant biology and ecology

Habitat

Montane green five-corners grows in open eucalypt forest in sandy soils or light brown sandy loams over granite, and occasionally in heath on trachyte (Powell et al. 1992; Sheringham & Westaway 1995). Associated species include *Eucalyptus dalrympleana* (mountain gum), *E. youmanii* (Youman's stringybark), and *E. radiata* (narrow-leaved peppermint) (Powell et al. 1992; Sheringham & Westaway 1995). Sites where this species grows tend to be on broad ridges and gentle slopes at 1250–1500 m above sea level (Powell et al. 1992).

In Cathedral Rock NP following the 2019-20 bushfires, young plants were observed in a tall layered open forest dominated by narrow-leaved peppermint, *E. obliqua* (messmate stringybark), and *E. dalrympleana* subsp. *heptantha* (mountain gum). Common shrubs in the area included *Acacia dealbata* (silver-leaf wattle) and *Polyscias sambucifolia* (elderberry panax) while the diverse ground layer was usually dominated by *Lomandra longifolia* (spiny mat-rush), *Poa sieberiana* (snow grass) and *Austrostipa rudis* (tall speargrass) (Eco Logical Australia 2021).

Reproductive Ecology

Montane green five-corners flowers and fruits mainly in September, December and January. There are also single records of buds and flowers in March and April respectively (Powell et al. 1992). The time to reproductive maturity and lifespan of the species is unknown. The species' pollinators are unknown, however it is likely to be bird and/or insect pollinated as is common in other Ericaceae (Ford et al. 1979; Keighery 1996; Johnson 2013). Moths and butterflies are important pollinators in the *Styphelia* genus (Keighery 1996) and European honeybee (*Apis mellifera*) have been found to pollinate other species in the genus (Kato & Kawakita 2004).

The species germination requirements are unknown but may be similar to other Ericaceae where fire is required to break seed dormancy in many species (Gilmour et al. 2000). It's possible the species displays delayed seed germination following fire, as has been observed in other Ericaceae species (Keith 2002; Ooi 2010). However, seed germination requirements in the Ericaceae can be complex and are poorly understood. The woody-fruited species *Styphelia tenuiflora* (common pin-heath) from Western Australia exhibited physiological dormancy for up to two months post-release from the fruit (either buried or in litter) but by 24 months these seeds were no longer viable (Norman et al. 2008). Further studies are required into the seed biology and dormancy mechanisms for montane green five-corners.

Fire ecology

There are conflicting reports on the fire response of montane green five-corners. Some reports state individuals of the species reshoot from lignotubers after severe fire (Beresford-Smith 1991 cited in Quinn et al. 1995) while others categorise the species as an obligate seeder, i.e. killed by fire and regenerates only from seed (Clarke et al. 2009; Gallagher 2022). Observations from surveys following the 2019-20 bushfires suggest that that species exhibits both fire responses (Eco Logical Australia 2021). Most plants observed in post-fire surveys in 2022 appeared to be young root suckers emerging from an underground rootstock as they were firmly fixed in the ground, were not spindly, and often arose from a central point. Other spindlier plants were thought to be post-fire seedlings. However, this could not be confirmed without digging up the soil at the base of the plants (Eco Logical Australia 2021).

Little is known about the primary or secondary juvenile period of montane green five-corners, or the longevity of adult plants. Other Ericaceae such as *Leucopogon* have primary juvenile periods of 3–11 years (Ooi 2019). Given its montane habitat where conditions for growth may be temperature limited, it is possible that the primary juvenile period for montane green five-corners is relatively long compared to similar species. Therefore, it may be towards the longer end of the 3–11 year range given for *Leucopogon* by Ooi (2019). Recent field surveys note the species appears to be slow growing (Eco Logical Australia 2021) and expert opinion concurs that the juvenile period is likely to be toward the longer end of the range given by Ooi (2019) (DPE 2022. pers comm 8 February).

Montane green five-corners may be negatively impacted by high frequency fires where they are severe enough to kill adult plants and occur at short enough intervals to kill regenerating seedlings and resprouting plants before they are able to replenish the soil seed bank or develop sufficient woody tissue to withstand further fires (Keith 1996; DPIE 2020a). Typically, the fire-free interval required by woody species is approximately 15 years (Keith 1996). The NSW Saving our Species Conservation Strategy (in draft) and the Cathedral Rock NP Fire Management

Strategy recommends a minimum of 10 years between high severity fires in the species habitat (NSW NPWS 2021; DPIE 2021).

It is unclear if the species is capable of recruiting in the absence of fire, although some other southeast Australian Ericaceae species produce a small percentage of seed lacking physiological dormancy mechanisms, which could allow occasional recruitment in the absence of fire (Keith 1997).

Habitat critical to the survival

As described above, montane green five-corners grows in open eucalypt forests in sandy soils or light brown sandy loams over granite, and occasionally in heath on trachyte.

Habitat critical to the survival of the species includes the area of occupancy of the extant subpopulations; areas of similar habitat surrounding these subpopulations that provide potential habitat for natural range extension and are necessary to provide habitat for pollinators; and additional occurrences of similar habitat in the known distribution of the species that may contain the species or be suitable sites for future translocations.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

Important populations

In this section, the word population is used to refer to subpopulation (as defined by IUCN 2001), in keeping with the terminology used in the EPBC Act and state/territory environmental legislation. An 'important population' is a population that is necessary for a species' long-term survival and recovery (DotE 2013).

All populations of montane green five-corners are important for the long-term recovery and survival of this species due to its restricted distribution and the presence of ongoing threats.

Threats

The main threats to montane green five-corners are fire regimes that cause declines in biodiversity and climate change. Other potential threats to the species include recreational/management activities, dieback caused by *Phytophthora cinnamomi* and impacts from invasive species.

Weeds can invade, establish and outcompete native vegetation, particularly following disturbance events such as fire. However, surveys in Cathedral Rock NP following the 2019-20 bushfires found that weeds were relatively uncommon and observations by experts throughout much of the park suggest that weeds rarely dominate on the relatively poor granitic soils (Eco Logical Australia 2021). Therefore, this has not been included as a threat in the table below. Weeds may be impacting on other subpopulations of montane green five-corners, however there is no information regarding this threat in other areas.

Threats in Table 2 are noted in approximate order of highest to lowest impact, based on available evidence.

Table 2 Threats

Threat	Status ^a	Evidence
Habitat loss, disturbance and modification impacts		
Fire regimes that cause declines in biodiversity ^b	<ul style="list-style-type: none"> • Timing: current/future • Confidence: inferred • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range 	<p><i>High frequency fire</i></p> <p>Montane green five-corners has been observed both resprouting and regenerating from seedlings following the 2019-20 fires (Eco Logical Australia 2021). The species may be negatively impacted by high frequency fires where they are severe enough to kill adult plants and occur at short enough intervals to kill regenerating seedlings and resprouting plants before they are able to replenish the soil seed bank or develop sufficient woody tissue to withstand further fires (Keith 1996; DPIE 2020a). The minimum recommended fire free interval for the species is approximately 10 years (NSW NPWS 2021; DPIE 2021) but could be longer given the species likely long juvenile period due to growth conditions in its montane habitat (see <i>Fire ecology</i> section above).</p> <p><i>Low frequency fires</i></p> <p>Low frequency fires can pose a threat to species that have limited recruitment in the absence of fire. However, it is unknown whether montane green five-corners recruits in the absence of fire. The maximum tolerable fire-free interval for the species is unknown.</p> <p><i>Out-of-season fire</i></p> <p>Out-of-season fires (i.e. during cooler months) can lead to delayed and reduced levels of seedling emergence in species with physiologically dormant seeds (Ooi 2007).</p> <p><i>High severity fire</i></p> <p>High severity fire alone is unlikely to lead to population decline in montane green five-corners. High severity fire may lead to adult plant mortality and mortality of some seed in the soil seed bank close to the surface. However, only seeds near the surface (i.e., the top 3–5 cm) are exposed to extreme temperatures (Palmer et al. 2018; Tangney et al. 2020).</p> <p><i>Fire history</i></p> <p>In 2019–20, catastrophic bushfire conditions resulted in extensive bushfires across eastern Australia. Gallagher (2022) reports that 73% percent of the species modelled distribution was within the extent of these fires. On-ground observations found that most of the previously known locations in and around Cathedral Rock NP were burnt in late 2019 (Eco Logical Australia 2021). No post-fire surveys were conducted on the other three known subpopulations of the species. Previous surveys of these subpopulations indicate they contained <10% of the mature individuals of the species.</p> <p>These bushfires were partially attributed to severe drought conditions in 2017–2019 in NSW leading to low fuel moisture content, leaf senescence and shedding, and lack of moist impediments to fire spread (Nolan et al. 2020).</p>

Styphelia perileuca (montane green five-corners)

Threat	Status ^a	Evidence
Recreational/management activities	<ul style="list-style-type: none"> • Timing: future • Confidence: suspected • Likelihood: possible • Consequence: minor • Trend: static • Extent: across part of its range 	In Cathedral Rock NP, montane green five-corners regrowth and seedlings grow within one to two metres of a popular walking track and are therefore susceptible to trampling by bushwalkers or physical damage by track maintenance (Eco Logical Australia 2021).
Climate change		
Increased temperatures, droughts, fire danger weather, and changes in precipitation	<ul style="list-style-type: none"> • Timing: current/future • Confidence: inferred • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range 	<p>The New England North West Region of NSW is expected to undergo an increase in severe and average Forest Fire Danger Index values, which are used as an indicator of fire risk. These increases are projected for summer and spring which represent peak fire risk season (DPIE 2014). These changes to fire conditions will likely increase the probability of frequent and high severity bushfires impacting the montane green five-corners into the future.</p> <p>In this region of NSW there is also a projected increase in minimum and maximum temperatures and the number of hot days (above 35°C). Rainfall is projected to decrease in winter and increase in autumn (DPIE 2014).</p> <p>The impact of drought montane green five-corners is uncertain. However, generally drought may cause widespread plant mortality in forest ecosystems, as many plants are vulnerable to drought stress and hydraulic failure of their vascular system (Allen et al. 2010; Choat et al. 2012; De Kauwe et al. 2020).</p> <p>Gallagher (2022) found that 53 % of the species' modelled distribution was in severe drought in the 12 months preceding the 2019-20 bushfires which may impact on the species ability to regenerate. Post-fire recruitment and seedling survival can be threatened by drought, as environments with higher precipitation may have greater capacity to regenerate compared to environments where drought conditions are present pre- or post-fire (Auld 2020).</p> <p>Warmer temperatures, changes to precipitation patterns and fire interactions may also favour the spread and increase severity of <i>Phytophthora cinnamomi</i> infection (Moore et al. 2015; Homet et al. 2019).</p>

Styphelia perileuca (montane green five-corners)

Threat	Status ^a	Evidence
Disease		
Dieback caused by <i>Phytophthora cinnamomi</i>	<ul style="list-style-type: none"> • Timing: future • Confidence: suspected • Likelihood: possible • Consequence: major • Trend: unknown • Extent: across part of its range 	<p><i>Phytophthora cinnamomi</i> is an introduced soil-borne pathogen, which infects a large range of plant species and may contribute to plant death, especially when other stressors are present, such as waterlogging, drought and fire (DOEE 2018). <i>P. cinnamomi</i> can migrate through zoospores via soil moisture/water and by direct hyphal infection from susceptible species with infected roots and mud clinging to vehicles, animals and walkers and movement of infected plant materials or soil (DOEE 2018). Dieback caused by <i>P. cinnamomi</i> is listed as a Key Threatening Process under the EPBC Act (DOEE 2018).</p> <p>The susceptibility of montane green five-corners to <i>P. cinnamomi</i> is unknown and there is no evidence of the disease impacting on the species. However, the Ericaceae are known to possess highly susceptible species and at least one species of <i>Styphelia</i> is known to be susceptible to the disease (Schahinger et al. 2003).</p> <p>In Cathedral Rock NP, a number of seedlings grow within one to two metres of a popular walking track (Eco Logical Australia 2021) and are therefore susceptible to the pathogen being introduced by bushwalkers or in gravel introduced during track upgrades.</p>
Invasive species impacts		
Herbivory and trampling by feral herbivores	<ul style="list-style-type: none"> • Timing: future • Confidence: suspected • Likelihood: possible • Consequence: moderate • Trend: static • Extent: across part of its range 	<p>Montane green five-corners may be threatened by habitat degradation and grazing by feral deer (<i>Dama dama</i>, <i>Axis axis</i> and <i>Cervus spp.</i>) and feral pigs (<i>Sus scrofa</i>), however there is no direct evidence of this threat impacting on the species</p> <p>Feral deer can have a range of environmental impacts including grazing and damage to vegetation through trampling and antler rubbing (NSW Scientific Committee 2004). Herbivory and environmental degradation caused by feral deer are listed in NSW as a Key Threatening Process under the <i>Threatened Species Act 1995</i> (NSW Scientific Committee 2004).</p> <p>Feral pigs impact native plant species through grazing, destruction of plants and alteration of soil structure through digging, rooting and wallowing behaviours (Commonwealth of Australia 2017). Predation, habitat degradation, competition and disease transmission by feral pigs is listed as a Key Threatening Process under the EPBC Act.</p>

^aTiming—identifies the temporal nature of the threat

Confidence—identifies the nature of the evidence about the impact of the threat on the species

Likelihood—identifies the likelihood of the threat impacting on the whole population or extent of the species

Consequence—identifies the severity of the threat

Trend—identifies the extent to which it will continue to operate on the species

Extent—identifies its spatial context in terms of the range of the species

^bFire regimes that cause declines in biodiversity include the full range of fire-related ecological processes that directly or indirectly cause persistent declines in the distribution, abundance, genetic diversity or function of a species or ecological community. 'Fire regime' refers to the frequency, intensity or severity, season, and types (aerial/subterranean) of successive fire events at a point in the landscape

Categories for likelihood are defined as follows:

Almost certain – expected to occur every year
 Likely – expected to occur at least once every five years
 Possible – might occur at some time
 Unlikely – known to have occurred only a few times
 Unknown – currently unknown how often the threat will occur

Categories for consequences are defined as follows:

Not significant – no long-term effect on individuals or populations
 Minor – individuals are adversely affected but no effect at population level
 Moderate – population recovery stable or declining
 Major – population decline is ongoing
 Catastrophic – population trajectory close to extinction

Each threat has been described in Table 2 in terms of the extent that it is operating on the species. The risk matrix (3) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; the spatial extent, and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed in consultation with experts and using available literature.

Table 3 Risk Matrix

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain				Fire regimes that cause declines in biodiversity Increased temperatures, droughts, fire danger weather, and changes in precipitation	
Likely				Allee effects	
Possible		Recreational and management activities	Herbivory & trampling by feral herbivores	Dieback caused by <i>Phytophthora cinnamomi</i>	
Unlikely					
Unknown					

Risk Matrix legend/Risk rating:

Low Risk	Moderate Risk	High Risk	Very High Risk
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Priority actions have then been developed to manage the threats, particularly where the risk was deemed to be 'very high' (red shading) or 'high' (orange shading). For those threats with an unknown or low risk (blue and green shading respectively) research and monitoring actions have been developed to understand and evaluate the impact of the threats, where appropriate.

Conservation and recovery actions

Primary conservation objective

By 2032, the population of montane green five-corners will have increased in abundance and subpopulations are sustained in habitats in which key threats are managed effectively.

Conservation and management priorities

Fire impacts

- Develop and implement a fire management strategy that maintains an appropriate fire regime for the species, that protects all subpopulations burnt during fires (including planned burns and bushfires) from further fire (including planned burns and bushfires) for at least 10 years (i.e. the minimum fire interval) until seedlings and regrowth matures, and the soil-stored seed bank is rebuilt.
- Avoid impacts to subpopulations during fire-fighting operations, or other fire management works, by ensuring accurate species location information is available to relevant fire management agencies.

Habitat loss, disturbance and modifications impacts

- Ensure locations of subpopulations are kept updated on state databases including those used by fire and land management agencies.
- If required, install signs and possibly barriers to prevent trampling and damage during track maintenance at sites near walking tracks.

Climate change and severe weather impacts

- Investigate options for maintaining in situ persistence as the climate changes, for example by minimising other population pressures, enhancing resilience and promoting recruitment or supplementing existing subpopulations.

Disease impacts

- Determine the susceptibility of montane green five-corners to *P. cinnamomi*.
- Implement a hygiene management plan and risk assessment to protect known subpopulations from introduction of new isolates of *P. cinnamomi* or other pathogens.
- Ensure that appropriate hygiene protocols are adhered to when entering or exiting the known locations of montane green five-corners, such as those outlined in the *Arrive Clean, Leave Clean. Guidelines to help prevent the invasive plant diseases and weeds threatening our native plants, animals and ecosystems* (Commonwealth of Australia 2015).

Invasive species impacts

- Monitor for the presence and impact of feral deer and feral pigs. If evidence is found, undertake actions to reduce impact, including control and herbivore fencing around individuals.
- Continue to monitor for the presence and impact of weeds post fire. If required, implement weed management actions in consultation with land managers and community groups, using appropriate techniques to minimise the effect of herbicide on native vegetation,

Ex situ recovery actions

- To manage the risk of losing genetic diversity, undertake appropriate seed collection and storage, and monitor the viability of stored seed. For species where few seed are produced, seed quality is low, or seeds are difficult to store long-term, undertake alternative ex situ storage such as tissue culture and cryopreservation, vegetative propagation or cultivation of living collections. Seed/tissue collection and storage should be conducted in accordance with best practice guidelines and procedures (refer to Martyn Yenson et al. 2021 or Commander 2021).
- If appropriate, investigate the feasibility of establishing translocated subpopulations that will improve the conservation outlook of the species. Translocations should be conducted in accordance with best practice guidelines and procedures (refer to Commander et al. 2018), including monitoring translocated subpopulations through to recruitment to ensure they are viable.

Stakeholder engagement/community engagement

- Engage and involve Traditional Owners in conservation actions, including the implementation of Indigenous fire management practices and other survey, monitoring and management actions.
- Liaise with the local community and government agencies to ensure that up-to-date population data and scientific knowledge inform the implementation of conservation actions for this species.
- Coordinate protection and recovery actions with non-government stakeholders (e.g. Landcare and bush regeneration groups, landowners and managers) as well as with Local and State government environmental field and extension officers.
- Inform managers of sites where there are known subpopulations and consult with these groups regarding options for conservation management and protection of the species.

Survey and monitoring priorities

- Undertake targeted surveys to improve knowledge of existing subpopulations, particularly those at Point Lookout (in New England NP), Styx River State Forest and Yaraandoo.
- Resurvey previously known sites of the species in Cathedral Rock NP in 1-2 years when enough time has elapsed to allow plants to have grown taller and be more detectable.
- Carefully excavate the soil (minimising damage to the plants) at the base of one or more of small plants in Cathedral Rock NP to determine if they are resprouting from a rootstock or are seedlings, or both responses are present within the population.

- Develop and maintain a monitoring program to:
 - Document the number of plants in all subpopulations,
 - Record responses to future fires,
 - Determine trends in population size and distribution,
 - Determine threats and their impacts; and
 - Monitor the effectiveness of management actions and the need to adapt them if necessary
- Survey suitable habitat for new subpopulations and to locate suitable sites for translocations.

Information and research priorities

- Undertake vulnerability assessments of the species' sensitivity and adaptive capacity to changing climatic conditions which draw on genetic, physiological or ecological evidence.
- If vulnerability assessments indicate the species has a high likelihood of extinction due to climate change, undertake research to identify climate refuges that may be suitable for translocations, including both modelling and experimental approaches (e.g. trial translocations). Consideration should be given to the benefits to the species in mitigating climate change related threats, as well as the risks to the recipient site (e.g. introduction of diseases, pests and/or pathogens, and invasiveness of the species).
- Map habitat critical to the survival of the species and identify any critical habitat on Commonwealth land.
- Investigate the population genetics and pollination biology of the species.
- Investigate recruitment (including seed biology, dormancy mechanisms, germination requirements, the length of the primary and secondary juvenile periods), seedling survival and plant longevity.
- Identify fire regimes that are detrimental and those that allow population persistence.
- Ascertain the cultural significance of the species to Traditional Owners.

Recovery Plan decision

A decision about whether there should be a Recovery Plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Links to relevant implementation documents

This Conservation Advice is developed to be able to subsequently inform other planning instruments such as a Bioregional Plan or a multi-entity Conservation Plan.

[Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* \(2018\)](#)

[Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs \(*Sus scrofa*\) \(2017\)](#)

[Montane green five-corners \(*Styphelia perileuca*\) – Saving our Species strategy](#)

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THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Threatened Species Scientific Committee finalised this assessment on DD Month Year.

Attachment A: Listing Assessment for *Styphelia perileuca*

Reason for assessment

This assessment follows prioritisation of a nomination from the Threatened Species Scientific Committee.

Assessment of eligibility for listing

This assessment uses the criteria set out in the [EPBC Regulations](#). The thresholds used correspond with those in the [IUCN Red List criteria](#) except where noted in criterion 4, sub-criterion D2. The IUCN criteria are used by Australian jurisdictions to achieve consistent listing assessments through the Common Assessment Method (CAM).

Key assessment parameters

Table 4 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria. The definition of each of the parameters follows the [Guidelines for Using the IUCN Red List Categories and Criteria](#).

Table 4 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	110	110	1130+	<p>Prior to the 2019-20 bushfires 1130+ mature individuals were recorded across four subpopulations, including over 1000 mature individuals in Cathedral Rock NP (Table 1).</p> <p>Surveys following the 2019-20 bushfires in Cathedral Rock NP located 30-50 mature individuals and 144 immature plants (ranging from 3–15 cm). Further surveys are required to accurately determine post-fire numbers as the species can be difficult to detect when emerging, and not all previously known locations were surveyed due to imprecise location data (Eco Logical Australia 2021).</p> <p>The number of mature individuals across all four subpopulations is approximately 110, based on post-fire surveys in and around Cathedral Rock NP, and pre-fire estimates across the other three subpopulations. This estimate has been used in the assessment.</p>

Styphelia perileuca (montane green five-corners)

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Trend	Declining			<p>Following the 2019-20 bushfires, surveys of previously known sites in and around Cathedral Rock NP located 30-50 mature individuals and 144 immature plants. It is likely that the species persists at other previously known locations within the park and further surveys are required to accurately determine numbers.</p> <p>However, based on the number of mature individuals recorded prior to the fires in Cathedral Rock NP and adjacent property (1070+) compared to the number of post-fire mature individuals (30-50) and seedlings (144), coupled with ongoing threats (see Criteria 1 and 2 below) a decline in numbers is likely.</p>
Generation time (years)	Unknown	Unknown	Unknown	<p>There is insufficient information available to calculate the generation length of montane green five-corners.</p> <p>Based on other species in the family Ericaceae, the primary juvenile period could be up to 11 years (Ooi 2019; DPE 2022. pers comm 8 February) (see Relevant Biology and Ecology).</p> <p>While the species appears to be slow growing, the longevity of the species is unknown.</p>
Extent of occurrence	148 km ²	Unknown	148 km ²	<p>Based on known subpopulations, the maximum extent of occurrence (EOO) is estimated at 148 km². This figure is based on the mapping of point records from a 37-year period (1984–2021) obtained from state governments, museums and CSIRO.</p> <p>Records older than 20 years have been used in the EOO calculation as the subpopulation at Point Lookout which was recorded in 1984 is thought to be extant based on surveys from 1998. The EOO was calculated using a minimum convex hull, based on the IUCN Red List Guidelines (IUCN 2022).</p>
Trend	Stable			<p>The EOO appears to be stable and there is no evidence of an increase or decrease in EOO.</p>

Styphelia perileuca (montane green five-corners)

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Area of Occupancy	56 km ²	Unknown	56 km ²	<p>The estimate used in the assessment is based on the mapping of point records from 1984–2021 obtained from state governments, museums and CSIRO.</p> <p>Records older than 20 years have been used in the AOO calculation as the subpopulation at Point Lookout which was recorded in 1984 is thought to be extant based on surveys from 1998.</p> <p>The area of occupancy (AOO) was calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines (IUCN 2022).</p>
<p>AOO is a standardised spatial measure of the risk of extinction, that represents the area of suitable habitat known, inferred or projected to be currently occupied by the taxon. It is estimated using a 2 x 2 km grid to enable comparison with the criteria thresholds. The resolution (grid size) that maximizes the correlation between AOO and extinction risk is determined more by the spatial scale of threats than by the spatial scale at which AOO is estimated or shape of the taxon's distribution. It is not a fine-scale estimate of the actual area occupied. In some cases, AOO is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. breeding sites for migratory species).</p>				
Trend	Possibly contracting			<p>The AOO may be contracting following the 2019-20 bushfires as the species was located at two sites in Cathedral Rock NP. However, the species can be difficult to detect post-fire and not all known sites were surveyed.</p>
Number of subpopulations	4	4	4	<p>The species is known from four distinct subpopulations at Cathedral Rock (in the National Park and adjoining private property), Point Lookout (in New England NP), Styx River State Forest and Yaraandoo (Table 1).</p>
Trend	Stable			<p>There is no evidence of any change in the number of subpopulations.</p>
Basis of assessment of subpopulation number	The number is based on four geographically separated subpopulations.			

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
No. locations	1	1	4	<p>Fire regimes that cause declines in biodiversity are the most serious threat to the species.</p> <p>The species is susceptible to a high fire frequency regime that impacts subpopulations before they can replenish the soil seed bank (Keith 1996; Gallagher et al. 2021) (see Relevant Biology and Ecology section above).</p> <p>The very large size of the 2019-20 bushfires, which overlapped with the distribution of three of the four known subpopulations, illustrated that a single fire season could impact the majority of subpopulations. This could conceivably result in one location in future bushfire events.</p> <p>Accordingly, the number of locations used in the assessment is one.</p>
Trend	Declining			<p>The severity, frequency and scale of catastrophic bushfires will likely increase due to climate change.</p> <p>Accordingly, the number of locations in which a single bushfire can rapidly affect all individuals will likely decrease.</p>
Basis of assessment of location number	See justification for 'No. locations' above.			
Fragmentation	Most subpopulations are separated by approximately 20 km, which may limit pollination and gene flow between these subpopulations. In addition, all four subpopulations are likely to be smaller than rudimentary estimates of minimum viable populations of 1000 individuals (Frankham et al. 2014). Therefore, the species is considered severely fragmented.			
Fluctuations	Not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals – no parameter was changed by an order of magnitude by the 2019/20 fire. The species is capable of both resprouting and regenerating from seed following fire and is therefore unlikely to be prone to extreme fluctuations.			

Criterion 1 Population size reduction

Reduction in total numbers (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>Based on any of the following</p> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites 			

Criterion 1 evidence

Insufficient data to determine eligibility

Generation length

There is insufficient information available to calculate the generation length of montane green five-corners (see Table 4 above). Based on other species in the family Ericaceae, the primary juvenile period could be up to 11 years (Ooi 2019; DPE 2022. pers comm 8 February). While the species appears to be slow growing, the longevity of the species is unknown.

Past population reduction

There has been no systematic surveying through time of any subpopulation of montane green five-corners, therefore, it is unclear whether there has been a decline in the total population size. Prior to the 2019-20 bushfires, the species was known from approximately 1000 mature individuals in Cathedral Rock NP (DPIE 2020b). Following the 2019-20 bushfires, surveys were undertaken in and around Cathedral Rock NP at 10 previously known sites. These surveys found 30-50 mature individuals and 144 immature plants (ranging from 3–15 cm) (Eco Logical Australia 2021; UNE 2021). It is highly likely that the species persists at other locations in the park, as small emerging seedlings/regrowth is difficult to detect post-fire and not all previously known locations were surveyed due to imprecise location information (Eco Logical Australia 2021).

Observations suggest that that species both reshoots from lignotubers after intense fires and regenerates from seed (Eco Logical Australia 2021). Therefore, fluctuations in the number of mature individuals are likely following fire events. The species may also display delayed seed germination following fire, as has been observed in other Ericaceae species (Keith 2002; Ooi 2010). No data are available on seedling survival rates for the montane green five-corners. Therefore, it is difficult to compare pre-fire and post-fire population estimates without future post-fire surveys. There appears to be insufficient evidence to consider the species under past population reduction.

Future population reduction

Changes to fire conditions under climate change may expose the montane green five-corners to “interval squeeze”, which is a narrowing of the favourable interval between fires, accelerating population decline (Enright et al. 2015).

The New England North West Region of NSW is expected to undergo an increase in severe and average Forest Fire Danger Index values, which are used as an indicator of fire risk. These increases are projected for summer and spring which represent peak fire risk season (DPIE 2014). These changes to fire conditions will likely increase the probability of frequent bushfires impacting the montane green five-corners into the future. While further research is required on the species fire ecology, the minimum recommended fire-free interval for the species is at least 10 years (NSW NPWS 2021; DPIE 2021) and could be longer given the species ecology. If future fires burn regrowth and seedlings before they can mature and replenish the soil seed bank this is likely to cause a decline in the number of mature individuals through lack of recruitment. However, there is insufficient evidence (e.g., modelling) at the time of this assessment to determine the rate of decline under these projected climate conditions. As such, there appears to be insufficient evidence to consider the species under future population reduction.

Conclusion

There are currently insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2 Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy

	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Criterion 2 evidence

Eligible under Criterion 2 B1ab(v)+B2ab(v) for listing as Endangered

AOO and EOO

The AOO and EOO of montane green five-corners are considered restricted (i.e. eligible for Endangered) and are estimated at 56 km² and 148 km² respectively (Table 4).

Severely fragmented

The species is considered severely fragmented. Most subpopulations are separately by approximately 20 km, which may limit pollination and gene flow between these subpopulations. In addition, all subpopulations are likely to be smaller than rudimentary estimates of minimum viable populations of 1000 individuals (Frankham et al. 2014).

Number of locations

Fire regimes that cause declines in biodiversity are the most serious threat to the species. The species is susceptible to a high fire frequency regime that damages seedlings and regrowth before they can replenish the soil seed bank (Keith 1996; Gallagher et al. 2021). The 2019-20 bushfires are likely to have burnt three of the four known subpopulations (DPIE 2022; Table 1). This illustrates the large spatial scale at which this threat operates and illustrates that a single fire season could impact the majority of subpopulations. It is possible that two fires within a 10-year timeframe could both impact the entire montane green five-corners population, with the 2019-20 bushfires illustrating the large spatial scale at which fire events can occur when fuelled by vegetation subject to widespread drought conditions (Nolan et al. 2020). Therefore the number of locations is one.

Continuing decline

Decline in the number of mature individuals is projected due to the impacts of high fire frequency. Changes to fire conditions under climate change may expose the species to “interval squeeze”, which is a narrowing the favourable interval between fires, accelerating population decline (Enright et al. 2015).

The New England North West Region of NSW is expected to undergo an increase in severe and average Forest Fire Danger Index values, which are used as an indicator of fire risk. These increases are projected for summer and spring which represent peak fire risk season (DPIE 2014). These changes to fire conditions will likely increase the probability of frequent bushfires impacting the montane green five-corners into the future. While further research is required on the species fire ecology, the minimum recommended fire-free interval for the species is approximately 10 years (NSW NPWS 2021; DPIE 2021). This may be an underestimate given the species is thought to be slow growing and could have a primary juvenile period closer to 11 years (Ooi 2019; DPE 2022. pers comm 8 February). If future fires burn regrowth and seedlings before they can mature and replenish the soil seed bank this is likely to cause a decline in the number of mature individuals through lack of recruitment.

The effects of bushfires can be further exacerbated by drought across the species’ distribution. Drought depletes carbohydrate resources held within plant tissues and reduces reproductive output in the years leading up to a fire event, impacting on the size of the seed bank available for post-fire recruitment (Nolan et al. 2020). Gallagher (2022) found that 53 percent of the species modelled distribution was in severe drought in the 12 months preceding the 2019-20 bushfires which may impact on the species ability to regenerate post-fire. Post-fire drought can negatively impact post-fire recruitment success by reducing seed germination and seedling survival (Auld 2020).

Conclusion

The montane green five-corners AOO and EOO are restricted, the species is severely fragmented and known from one location, and continuing decline is inferred in the number of mature individuals.

The data presented above appear to demonstrate that the species is eligible for listing as **Endangered** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species’ status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3 Population size and decline

	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generations (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

Criterion 3 evidence

Eligible under Criterion 3 C2a(i) for listing as Endangered

Number of mature individuals

Prior to the 2019-20 bushfires 1130+ mature individuals were recorded across four subpopulations, including over 1000 mature individuals in Cathedral Rock NP (see Table 1). Post-fire surveys located only 30–50 mature individuals in this subpopulation (partially protected from the 2019-20 bushfires by a relict dam and the Ebor-Guyra Road) (UNE 2021). The species was also known from approximately 30-70 plants on private property adjoining the National Park prior to the 2019-20 bushfires. Surveys in February 2021 failed to locate any plants on the property (UNE 2021). The other three subpopulations have not been surveyed recently. Based on pre-fire estimates, the number of mature individuals in these three subpopulations is 59. Therefore, the estimated total number of mature individuals for the species is approximately 110, which considered very low (≤ 250, Critically Endangered) for the purposes of this criterion.

Continuing decline and geographic distribution

Some level of continuing decline in mature individuals is likely due to fire regimes that cause declines in biodiversity and drought (see criterion 2).

Number of mature individuals in each subpopulation

Montane green five-corners is known from four subpopulations, with 30–50 mature individuals recorded in and around Cathedral Rock NP, 54 recorded in Styx River State Forest and 5 recorded across the other two subpopulations (see Table 1). Therefore, all subpopulations have fewer than 250 mature individuals. The species has met the requirements for listing as Endangered under C2a(i) under this Criterion.

The species could also meet the requirements for listing as Critically Endangered if each subpopulation had less than 50 mature individuals. However, the species can be difficult to detect when emerging, and not all previously known locations in Cathedral Rock NP were surveyed in 2021 (Eco Logical Australia 2021; UNE 2021). Therefore it is likely that more mature individuals exist in the park and the subpopulation is greater than 50 mature individuals.

Conclusion

The data presented above appear to demonstrate that the species is eligible for listing as **Endangered** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4 Number of mature individuals

	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
D. Number of mature individuals	< 50	< 250	< 1,000
D2.¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time			D2. Typically: area of occupancy < 20 km ² or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments may include information relevant to D2. This information will not be considered by the Committee in making its recommendation of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Criterion 4 evidence

Eligible under Criterion 4 D1 for listing as Endangered

The estimated total number of mature individuals is likely to be less than 250 (see criterion 3), which is considered very low for the purposes of this criterion.

Conclusion

Therefore, the Committee considers that the species has met the relevant elements of criterion 4 to make it eligible for listing as **D Endangered**. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 5 Quantitative analysis

	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

Criterion 5 evidence

Insufficient data to determine eligibility

Population viability analysis has not been undertaken.

Conclusion

There are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

Adequacy of survey

The survey effort has been considered adequate and there is sufficient scientific evidence to support the assessment.

Public consultation

Notice of the proposed amendment and a consultation document is made available for public comment for a minimum of 30 business days. Any comments received relevant to the survival of the species are considered by the Committee as part of the assessment process.

Listing and Recovery Plan Recommendations

A decision about whether there should be a Recovery Plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

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Conservation Advice	Approved Conservation Advice for <i>Styphelia perileuca</i>	01 10 2008