Consultation on Species Listing Eligibility and Conservation Actions

Daviesia pseudaphylla (Stirling Range daviesia)

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

1) the eligibility of *Daviesia pseudaphylla* (Stirling Range daviesia) for inclusion on the EPBC Act threatened species list in the Critically 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.

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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 <u>'Common Assessment Method' (CAM)</u>. 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: <u>https://www.awe.gov.au/about/commitment/privacy</u>.

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 DAVIESIA PSEUDAPHYLLA (STIRLING RANGE DAVIESIA)

SECTION A - GENERAL

- 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

<u>SECTION B</u> 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?

<u>SECTION C</u> 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:

□ <50 □ 50-250 □ 250-1000 □ 1000-2500 □ 2500-10,000

Level of your confidence in this estimate:

- \Box 0–30% low level of certainty/ a bit of a guess/ not much information to go on
- \Box 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 during the early 1990s (at or soon after the start of the most recent three generation period)? 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:

□ <50 □ 50-250 □ 250-1000 □ 1000-2500 □ 2500-10,000

Level of your confidence in this estimate:

 \Box 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 over the last approximately 90 years (i.e. three generations period)? 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:

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

<u>SECTION E</u> 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:

 \Box <100 km² \Box 100 – 5000 km² \Box 5000 – 20,000 km² \Box >20,000 km²

Level of your confidence in this estimated extent of occurrence

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

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

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

 \Box 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:

 \Box <10 km² \Box 10 – 500 km² \Box 500 – 2000 km² \Box >2000 km²

Level of your confidence in this estimated extent of occurrence:

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

 \Box 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

<u>SECTION F</u> 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:

 \Box <100 km² \Box 100 – 5000 km² \Box 5000 – 20,000 km² \Box >20,000 km²

Level of your confidence in this estimated extent of occurrence

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

 \Box <10 km² \Box 10 – 500 km² \Box 500 – 2000 km² \Box >2000 km²

Level of your confidence in this estimated extent of occurrence:

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

<u>SECTION G</u> 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?

<u>SECTION H</u> 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?

<u>SECTION I</u> 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 Daviesia pseudaphylla (Stirling Range daviesia)

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 status of the species and help inform conservation actions, further planning and a potential 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.

<u>Note</u>: 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 approved conservation advice and listing assessment for the Stirling Range daviesia. It provides a foundation for conservation action and further planning.



Daviesia pseudaphylla

Photos: J.A. Cochrane & E. Hickman

Daviesia pseudaphylla © Copyright. Photography by J.A. Cochrane & E. Hickman. Image used with the permission of the Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions (https://florabase.dpaw.wa.gov.au/help/copyright). Accessed on Monday, 31 January 2022.

Conservation status

Daviesia pseudaphylla (Stirling Range daviesia) is proposed to be transferred from the Endangered category to the Critically Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999.*

Daviesia pseudaphylla was assessed by the Threatened Species Scientific Committee to be eligible for listing as Critically Endangered under criterion 1. 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: A4bce: Critically Endangered
- Criterion 2: B1ab(i,ii,iii,iv,v): Critically Endangered
- Criterion 3: C1: Vulnerable
- Criterion 4: Ineligible
- Criterion 5: Insufficient data

The main factor that makes the species eligible for listing in the Critically Endangered category is its very severe reduction in population size and very restricted geographic distribution.

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 <u>Species Profile and Threat Database</u>.

Species information

Taxonomy

Conventionally accepted as Daviesia pseudaphylla Crisp (1995). Family: Fabaceae.

Description

Daviesia pseudaphylla (Stirling Range daviesia) is a low spreading, spindly shrub, growing to 0.3 m high by 1.5 m wide. Its stem bears phyllodes (flattened leaf stalks) that grow up to 3 cm long by up to 1.5 mm wide, with their edges curving upwards. The standard (largest petal) is up to 10 mm long and yellow-orange on the sides. A dark purple colour is also seen with a central three-lobed yellow streak on the top. Also evident is a dark red keel and dark red wings, up to 8 mm long. Inflorescences are comprised of two or three flowers. Fruit is a flat pod 20 mm long, 8 mm wide with small, hard seeds containing an elaiosome (fatty body on the outside of the seed, used to aid in seed dispersal) (Brown et al. 1998).

Distribution

Stirling Range daviesia is endemic to Koikyenunuruff/Stirling Ranges in the Esperance Plains bioregion (IBRA7) of WA. The species occurs within the South Coast Natural Resource Management Region.

The species occurs in five subpopulations within Stirling Range National Park. The most recent estimate of the Stirling Range daviesia population is 1657 mature individuals and 3323 juveniles (S. Barrett 2022 pers. comm. 4 January; Table 1). Plants are very cryptic when not in flower in unburnt vegetation, which can influence estimates, but are easier to survey in the initial years after fire (S. Barrett 2022 pers. comm. 4 January).

In addition, a translocation site to the south of Stirling Range National Park was planted in 2010–2011 with 199 plants, of which 61 mature individuals were alive in 2021 (Table 1). No recruitment has been observed at this site, although this is unsurprising as the species requires fire to stimulate recruitment, and the translocation site has not been burnt during this period (S. Barrett 2022 pers. comm. 4 Jan). Nevertheless, as the IUCN Red List Guidelines require that translocated sites demonstrate recruitment to be considered as a subpopulation (IUCN 2019), this translocation site is not yet considered a subpopulation in this assessment (e.g. it is not included in population, extent of occurrent or area of occupancy estimates in Table 5).

Subpopulation ¹	Date	Mature individuals	Juvenile/ seedlings	Confidence level
1	15/12/21	1650	1650	medium
	16/10/20	50	3415	medium
	2018	650		medium
	2015	1000		medium
	2013	1000		medium
	2011	5000		medium
	2009	7500		medium
	2006	8000		medium
4	2020	0	1	high
	2019	0	5	high
6	2019	0	1227	medium
	2018	290		high
	2013	50		high
7	2019	0	85	high
8	2019	7	360	high
	2018	30		high
	2014	28		high
Translocation	2021	61	0	
site ²	2010/11	0	199	

Table 1 Recent monitoring data for Stirling Range daviesia

Source: S. Barrett 2022 pers. comm. 4 January

Notes: ¹ subpopulation numbering likely reflects historic issues with misidentifications (i.e. numbers 2, 3, and 5 do not represent historical or extinct subpopulations). ² Translocation site planted in 2010/11 with 199 plants, of which 61 mature individuals were alive in 2021.

Subpopulation 1 has been subject to phosphite application from 2002–2018 to test the effect of this control on dieback caused by *P. cinnamomi*. Treated and un-treated quadrats were monitored over this time (Table 2). The subpopulation was burnt in 2000 and 2018.

Table 2 Monitoring data for subpopulation 1: density of plants per m² in 5 x 5 m quadrats

	2002	2018 pre-fire	2018 post-fire	2020	2021
Phosphite sprayed	1.2	0.2	0.64	0.5	0.4
Non spray	0.7	0.008	0.46	0.1	0.09

Source: S. Barrett 2022 pers. comm. 4 January





Source: Base map Geoscience Australia; species distribution data <u>Species of National Environmental Significance</u> 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 contained 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. However, the species may not be as widespread as the map suggests.

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.

Stirling Range daviesia occurs on the traditional lands of the Ganeang, Goreng and Minang dialectals groups of the Noongar Nation. Koikyenunuruff (Stirling Range) is a culturally significant landscape to Noongars and features in Dreaming stories (DPAW 2016; South West Aboriginal Land & Sea Council 2022). Bluff Knoll is the location where the spirits of Ganeang, Goreng and Minang Traditional Owners go after death (South West Aboriginal Land & Sea Council 2022). An Aboriginal Heritage Place, Kojaneerup (5145), has been registered with the Western Australian Department of Planning, Lands and Heritage in or adjacent to lands where Stirling Range daviesia occurs (DPLH 2022). Additionally, the Wagyl Kaip & Southern Noongar Aboriginal Corporation Indigenous Land Use Agreements (2018), executed by the Western Australian Government and the Noongar Nation, includes lands in or adjacent to lands where Stirling Range daviesia occurs.

The cultural significance of Stirling Range daviesia is currently unknown. However, given the acknowledged importance to Aboriginal peoples of Connection to Country and the widespread importance of Caring for Country (which includes biodiversity, 'place', custom and totemic elements) it is considered likely that the species has or is associated with some cultural and/or community significance.

Relevant biology and ecology

Habitat

Stirling Range daviesia inhabits gently sloping areas of open mallee and heath, with a substrate of shallow stony clay over schist or sandy loam over sandstone and quartz gravel in Koikyenunuruff/Stirling Range. This species co-occurs with *Beaufortia anisandra* (dark beaufortia), *Eucalyptus marginata* (jarrah), *E. decurva* (slender mallee), *E. staeri* (Albany blackbutt), *Hakea cucullata* (hood leaved hakea), *Lambertia ericifolia* (heath-leaved honeysuckle) and *Xanthorrhoea preisii* (balga) (Robinson & Coates, 1995; Brown, et al., 1998; Phillimore & Brown, 2001; ALA 2022).

Reproductive Ecology

Little is known about the reproductive ecology of Stirling Range daviesia, and as a result, this section draws largely on published literature from congeneric species.

Flowering occurs from July to December (Brown et al. 1998). The flowers are likely pollinated by native bees, including from the Colletidae and Hallictidae (Crisp 1995; Young & Brown 1998; Scaccabarozzi et al. 2018). *Daviesia* are self-incompatible (Young & Brown 1998). Some species of *Diuris* (Orchidaceae) mimic *Daviesia* flowers in morphology in order to attract and deceive insect pollinators of *Daviesia* species without offering food rewards (Scaccabarozzi et al. 2018). Higher numbers of *Daviesia* flowers are correlated with increased percentage pollination of *Diuris* (Scaccabarozzi et al. 2018).

Daviesia species have ant-dispersed seed, with maximum dispersal distances limited to within 5–8 m of the adult plant (He et al. 2009). Longer-distance dispersal of *Daviesia* species may also be achieved occasionally by *Dromaius novaehollandiae* (emu), although seed still required heating to break dormancy (Calviño-Cancela et al. 2006; 2008; He et al. 2009). Other birds, such as *Leiopa ocellata* (malleefowl) may also be occasionally facilitate seed dispersal (CTSSC 2022 pers. comm. 7 March).

Germination of *Daviesia* species usually occurs following fire events, with heat breaking the dormancy of soil-stored seed (Hanley & Lamont 2000).

Daviesia species host rhizobial bacterial communities in their root systems, the presence of which can increase adult growth (Thrall et al. 2011). The identity and ecology of bacteria that associate with Stirling Range daviesia are unknown.

The length of the primary juvenile period is likely to be about three to four years to 50 percent flowering (S. Barrett 2022 pers. comm. 3 February). The maximum longevity of adult plants is unknown, but the minimum longevity is 18 years (S. Barrett 2022 pers. comm. 3 February).

Fire ecology

Stirling Range daviesia is an obligate seeder (S. Barrett 2022 pers. comm. 4 January). Seeds of Stirling Range daviesia form a soil seed bank (S. Barrett 2022 pers. comm. 4 January), with germination triggered by fire (Table 2; Hanley & Lamont 2000), and possibly other forms of disturbance. Minimum and maximum tolerable fire intervals are unknown.

Habitat critical to the survival

Stirling Range daviesia inhabits gently sloping areas of open mallee and heath, with a substrate of shallow stony clay over schist or sandy loam over sandstone and quartz gravel in Koikyenunuruff/Stirling Ranges.

At this point in time there is insufficient information available to describe, with spatial information, areas of habitat that are critical to the survival of the species. Further research is needed to do this (see conservation actions). Until such information is available, all habitat for this species should be considered habitat critical for the species' long-term survival.

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, in keeping with the terminology used in the EPBC Act and state/territory environmental legislation.

There is sufficient evidence through the species eligibility for listing as Critically Endangered to consider all populations/the national population as important populations of this species under particular pressure of survival and which therefore require protection to support the recovery of the species.

Threats

The most serious threats to Stirling Range daviesia are inappropriate fire regimes, changes to temperature and precipitation patterns, and dieback caused by *Phytophthora cinnamomi*.

Threat	Status and severity ^a	Evidence	
Disease			
Dieback caused by Phytophthora spp. infection	 Timing: current Confidence: known Likelihood: almost certain Consequence: catastrophic Trend: stable Extent: across the entire range 	 Phytophthora cinnamomi is an introduced soil-borne plant pathogen that results in plant death through the destruction of root systems (DPAW 2014). 'Dieback caused by the root-root fungus Phytophthora cinnamomi' is listed as a Key Threatening Process under the EPBC Act (DOEE 2018). Stirling Range daviesia is susceptible to <i>P. cinnamomi</i>, based on sampling of dying wild plants and experimental inoculation of ex situ plants (Barrett et al. 2008; S. Barrett 2022 pers. comm. 4 January). The pathogen is present across the species' habitat (S. Barrett 2022 pers. comm. 4 January). The pathogen is present across the species' habitat (S. Barrett 2022 pers. comm. 4 January). Comparing plant density in 2020 relative to 2002 (i.e. at equivalent times in the species' life cycle two years post-fire) in quadrats sprayed with phosphite versus non-sprayed quadrats, shows that plant density reduced by 58% in sprayed quadrats and 86% in non-sprayed quadrats (Table 2). Therefore, declines in plant density were lower in sprayed versus unsprayed quadrats from 2002-2020, although declines were still substantial even in quadrats sprayed with phosphite. The effects of interactions between the pathogen and fire on Stirling Range daviesia are not well understood, but fire has been demonstrated to increase the severity and extent of <i>P. cinnamomi</i> disease in Koikyenunuruff/Stirling Range (Moore et al. 2014). Fire also places burnt populations at greater risk of the disease. Fire kills adult plants, reducing seed production. It also stimulates germination of soil-stored seed, with subsequent seedlings then vulnerable to <i>P. cinnamomi</i>. 	
Habitat loss disturb	ance and modifications	on insect pointators, whis 1995j.	
Fire regimes that cause decline in biodiversity	 Timing: current Confidence: known Likelihood: likely Consequence: catastrophic Trend: increasing Extent: across the entire range 	Stirling Range daviesia is an obligate seeder (S. Barrett 2022 pers. comm. 4 January), with adult plants killed by fire and recruiting from seed. All subpopulations were burnt in May 2018 (S. Barrett 2022 pers. comm. 4 January). Subpopulations were previously burnt by fire in 2000 (S. Barrett 2022 pers. comm. 4 January). The 2018 fire was the result of escaped prescribed burns in the area. Strong winds resulted in prescribed burns on private property and crown land growing out of control and becoming bushfires (BOM 2018; OBRM 2018). There are a number of mechanisms by which the fire regime impacts a species with obligate seeding traits (Keith 1996; DAWE 2021a). These include the frequency of fire (high vs low); the severity of fires (high vs low); the season of fire; and the interactions between fire and climate change and other threats (herbivory, disease, etc.). Stirling Bange daviesia may be	

Table 3 Threats impacting Stirling Range daviesia

Threat	Status and severity a	Evidence
		sensitive to high fire frequency, low fire severity, out of season fires, and interactions between fire and climate change, fire and disease, and potentially fire and pollinator availability.
		Too frequent fires
		Obligate seeders require a minimum time between successive fires to allow time for the species to accumulate sufficient soil-stored seed to ensure population persistence (Keith 1996, DAWE 2021a). This is termed the minimum fire interval. Stirling Range daviesia has a primary juvenile period of three to four years (S. Barrett 2022 pers. comm. 4 January). The minimum fire interval for the species could be in the order of 7–10 years, as the species likely requires several flowering seasons to restore the soil seed bank to pre-fire levels, and possibly longer if other threats such as dieback from <i>P. cinnamomi</i> reduce fecundity. Stirling Range daviesia may occur with other species that have longer minimum fire intervals.
		Alternatively, in the long absence of fire, non-sprouting fire recruiting plants may senesce and die before there is an opportunity for regeneration (Whelan 1995; Bond & van Wilgen 1996). The lifespan of Stirling Range daviesia is unknown, although is a minimum of 18 years (S. Barrett 2022 pers. comm. 4 January). However, the species has soil-stored seed that is likely viable for many years. Therefore, fire exclusion may be unlikely to pose a significant threat to the population.
		Low severity fires
		Temperature-sensitive obligate seeders require soil temperatures to be sufficient to break seed dormancy (either physically or physiologically) and initiate germination (Auld & O'Connel 1991; Auld & Ooi 2009). Failure to do this can result in a low rate of recruitment and subsequent population decline (Regan et al. 2003). Low severity fires can occur when fuel loads are low, e.g., because previous fire has reduced vegetation load, or when fires occur out-of-season. Low fire severity is associated with lower post-fire seedling emergence in other <i>Daviesia</i> spp. (Knox & Clarke 2006). Although it is unknown if Stirling Range daviesia has temperature- sensitive dormancy, low severity fires are a risk to the species, until further research suggests otherwise.
		Out of season fires
		When fire occurs out of season there are a number of mechanisms that lead to recruitment failure and reduce the recovery potential of species following fire (DAWE 2021a). These include:
		1) seedling mortality due to desiccation as a consequence of the interaction between out of season fires and fire-hydrological interactions, particularly by temperate region obligate seeders (Miller et al. 2019),
		2) low rate of seed production due to sub-optimal flowering cues (Morgan 1995) and/or dormancy cues (Ooi et al. 2007), particularly by species that rely on seasonal pollinators or specific flowering conditions, and
		 disruption to processes that facilitate post-fire recovery and limit dispersal (Jasinge et al. 2018; Keith

Threat	Status and severity a	Evidence
		et al. 2020), particularly by species with seasonal growing conditions or that require high temperatures during fire to stimulate germination.
		Stirling Range daviesia is adapted to seasonal fire regimes consisting of fire during the dry dormant summer periods followed by moist conditions during the growing and reproductive period. If fires occur during the growing season, standing plants will be killed before seed is produced, inhibiting the population from being replenished. Out-of-season fires are also usually of low severity. Low fire severity is associated with lower post-fire seedling emergence in other <i>Daviesia</i> spp. (Knox & Clarke 2006).
		Nothing is known about the impacts of out-of-season fire on Stirling Ranges daviesia. Out-of-season prescribed burning is likely to negatively impact post- fire recruitment (Knox & Clarke 2006; Miller et al. 2019). In addition, prescribed burning at any time of year places obligate seeders at risk of bushfire events that occur in the immediate future, by putting the population in a fire-sensitive juvenile state. This effects of this have been documented for the nearby population of <i>Banksia montana</i> (Stirling Range Dryandra; DAWE 2021b).
		Fire interactions
		There are a range of mechanisms by which fire interacts with other threats and impacts the species recovery potential following fire (DAWE 2021a).
		For Stirling Range daviesia, the interaction between climate change and the fire regime could lead to significant impacts on the population. Climate change can increase the frequency of fire through changes in the landscape moisture levels, increasing the risk of localised extinctions (Gallagher et al. 2021). For example, climate change is predicted to increase the number of days of elevated temperatures and increase the Forest Fire Danger Index in south-west Australia (DIICCSRTE 2013; Dowdy et al. 2019; CSIRO & BOM 2020). This indicates a potential subsequent reduction in the fire-free interval (Enright et al. 2014).
		Climate associated warming and drying can also reduce the species' resilience by interacting with natural hydrological cycles (see climate change section).
		Climate associated threat pathways can act in concert through processes such as 'interval squeeze', whereby climate change drives increased pressure via higher fire frequency, while also reducing resilience via slower rates of maturation and lower fecundity (Enright et al. 2015; Henzler et al. 2018).
		Prescribed burning can also increase the frequency of fire. For example, a widespread fire in 2018 was the result of an escaped prescribed burn and was followed a year later by a wildfire in 2019 (OBRM 2018). Although the latter fire did not burn Stirling Range daviesia subpopulations, nearby subpopulations of other threatened flora were burnt by both fires (e.g. DAWE 2021b).
		Other potential fire-related threats include potential fire-disease and possibly fire-pollinator interactions. For example, fire has been demonstrated to increase the

Threat	Status and severity a	Evidence
		severity and extent of <i>P. cinnamomi</i> disease in Koikyenunuruff/Stirling Range (Moore et al. 2014). Fire may interact with pollination if pollinator communities are negatively impacted by inappropriate fire regimes, which is poorly understood at present.
Climate Change		
Changes to temperature and precipitation patterns	 Timing: current Confidence: inferred Likelihood: almost certain Consequence: major Trend: increasing Extent: across the entire range 	The CSIRO & Bureau of Meteorology (2020) predict southwest Western Australia will experience decreased precipitation and increased average temperatures, as well as greater frequency of droughts. This is likely to cause substantial changes to the unique climate in which the Stirling Range daviesia occurs (Monks et al. 2019). The drier, hotter conditions projected under climate change could reducing the area of habitat suitable for Stirling Range daviesia (Monks et al. 2019). The species' habitat occurs on the south side of Koikyenunuruff/Stirling Ranges, and is influenced by orographic rainfall (S. Barrett 2022 pers. comm. 4 Jan). Declines in rainfall may negatively affect the species, particularly if they occur post-fire when juveniles are more susceptible to low soil moisture (Henzler et al. 2018). The interaction between fire and drought is a threat to many obligate seeders, including Stirling Range daviesia (Burgman & Lamont 1992).

^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

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 3 in terms of the extent that it is operating on the species. The risk matrix (Table 4) 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; 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.

Likelihood	Con	Consequences					
	Not	significant	Minor	Moderate	Major		Catastrophic
Almost certain					Chang tempo and precip patter	ges to erature pitation rns	Dieback caused by <i>Phytophthora</i> spp. infection
Likely							Fire regimes that cause decline in biodiversity
Possible							
Unlikely							
Unknown							
Risk Matrix legen	Risk Matrix legend/Risk rating:						
Low Risk	Moderate Risk High Risk Very High Risk			y High Risk			
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 - such events are known to have occurred on a worldwide bases but only a few ties

Unknown – currently unknown how often the incident 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 stalls or reduces Major – population decreases Catastrophic – population extirpation/extinction

Priority actions have then been developed to manage the threat 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 outcome (green and blue shading respectively) it may be more appropriate to identify further research or maintain monitoring.

Conservation and recovery actions

Primary conservation objective

By 2030, the population of Stirling Range daviesia will have increased in abundance and viable subpopulations are sustained in habitats where threats are managed effectively.

Conservation and management priorities

Habitat loss, disturbance and modifications impacts

• Ensure that the locations of all subpopulations are recorded on relevant state databases, including those used by land management and fire response agencies.

- Do not construct new fire breaks, tracks or paths in or near Stirling Range daviesia sites or habitat.
- Avoid all further loss and fragmentation of habitat, including during firefighting operations.

Fire impacts

- Develop and implement a fire management strategy that optimises the survival of Stirling Range daviesia.
 - Avoid planned burns in all habitat of known subpopulations until the fire-response and the minimal fire-interval period of Stirling Range daviesia are better understood.
 - Take the likelihood of increasingly frequent bushfires into account when developing prescribed burning programs, to avoid excessive, frequent burning of any localities.
 - If planned fire impacts subpopulations, managers must ensure that subsequent fires do
 not occur within the critical regeneration period to allow the species to rebuild its soil
 seed bank to sustain the population through the next fire event.
 - Provide maps of known occurrences to local and State Rural Fire Services.

Climate change and severe weather impacts

- Spread the risk to the species associated with climate change and fire by establishing multiple translocated populations (see Ex situ recovery actions).
- Identify (see Information and research priorities) and protect any current or future habitat likely to remain or become suitable habitat due to climate change and ensure impacts of other threats to this habitat are minimised.
- 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

- Minimise the impacts associated with the transformation of landscapes because of *P. cinnamomi* infestation by implementing mitigation measures in the area adjacent to, and surrounding, subpopulations where *P. cinnamomi* presents a threat. Consider the localised use of a biodegradable, systemic fungicide such as phosphite or other alternatives, that minimise potential off-target impacts that may result from the build-up of phosphorus in low-nutrient soils (Lambers et al. 2013; Hopper et al. 2021).
- Ensure appropriate hygiene and management measures are undertaken to reduce the impact of *Phytophthora* spp. on Stirling Range daviesia and its habitat. Refer to DOEE (2018) and DBCA (2020) for guidelines.
- Determine which lineages of *P. cinnamomi* are present in Stirling Range daviesia habitat.
- Promote research and development of treatments of *P. cinnamomi* dieback, including alternatives to phosphite.

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.
- Investigate the identity and ecological role of rhizobial bacterial communities in Stirling Range daviesia and options for storage.

Stakeholder engagement/community engagement

- Engage and involve Traditional Owners in conservation actions, including surveying for new populations and management actions. Work with Traditional Owners to divulge any traditional knowledge associates with the species ensuring the practices to record, store and share this knowledge are mutually supported.
- Liaise with relevant land managers to ensure that subpopulations are not accidentally damaged or destroyed. The approval and assistance of land managers should also be sought to implement recovery actions, and recent population data should inform management.
- Engage community groups by encouraging participation in surveys or monitoring for the species.
- Promote public awareness of biodiversity conservation and protection through dissemination of information through print and digital media.

Survey and monitoring priorities

- Undertake surveys for Stirling Range daviesia across its range.
- Maintain a monitoring program to:
 - monitor species recruitment and plant health after fire and drought events;
 - determine population size and trends;
 - document post-fire recovery and causes of recruitment failure;
 - determine threats and their impacts; and,
 - monitor the effectiveness of management actions and the need to adapt them if necessary.

Information and research priorities

- Develop effective, alternative treatments to prevent dieback caused by *P. cinnamomi*.
- Increase knowledge surrounding the ecology of Stirling Range daviesia. This includes improving understanding of recruitment and soil-seed bank dynamics (e.g. seed bank longevity), appropriate fire regimes, seed and plant longevity, genetic structure, and minimum viable population size.

- Identify the pollinator(s) of Stirling Range daviesia, and better understand the degree of pollinator specificity, the ecological requirements of pollinators, and how pollinators respond to threats, including the impacts of drought, fire or vegetation change resulting from *Phytophthora* spp. disease.
- Ascertain the cultural significance of Stirling Range daviesia.
- Investigate the impact of drought on Stirling Range daviesia.
- Determine habitat critical to the survival of Stirling Range daviesia.
- 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).

Links to relevant implementation documents

<u>Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* (2018)</u>

<u>Draft listing assessment for Key Threatening Process 'fire regimes that cause biodiversity loss'</u> (2021)

Approved Conservation Advice for *Daviesia pseudaphylla* (Stirling Range daviesia). Department of the Environment, Water, Heritage and the Arts, Canberra (2008).

<u>Stirling Range Daviesia (*Daviesia pseudaphylla*) Interim Recovery Plan 2001-2004. Department of Conservation and Land Management, Western Australia (2001).</u>

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Attachment A: Listing Assessment for Daviesia pseudaphylla

Reason for assessment

This assessment follows prioritisation of a nomination from the TSSC.

Assessment of eligibility for listing

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

Key assessment parameters

Table 5 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	4021	3451	4591	To estimate the number of mature individuals present following the fire, the number of juveniles/seedlings that survive to become mature individuals must be projected based on rates of seedling survival.
				The species has a primary juvenile period of three to four years to 50% flowering (S. Barrett 2022 pers. comm. 4 Jan) and monitoring of subpopulation 1 in 2006 (six years after the 2000 fire) recorded no juvenile plants (Table 1). Therefore, in the absence of fire, it is likely that almost all juvenile plants would be mature by six years of age (i.e. by 2024).
				The most-recent estimate of 3323 juvenile plants, includes 1650 juveniles recorded in subpopulation 1 in late 2021 (i.e. three year old plants), and 1672 seedlings recorded across subpopulations 6, 7 and 8 in 2019 (i.e. one year old seedlings).
				Survival of juveniles in subpopulation 1 from 2020 to 2021 (i.e. from two to three years of age) was 97% (Table 1). Assuming a similar annual percentage survival rate in subpopulation 1 over the next three years, the number of current juveniles (1650) surviving to become mature individuals by 2024 is estimated at 1505. Assuming survival of young mature plants is effectively 100% in the first five

Table 5 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
				it is not yet considered as a subpopulation under the IUCN Red List definition due to a lack of recruitment to date (IUCN 2019).
Trend	declining			Seedling densities in quadrats were considerably lower (almost 50%) after the 2018 fire compared with after the 2000 fire, suggesting the population is in decline.
Generation time (years)	11	~10	~15	The generation length of Stirling Range daviesia is not documented. The length of the primary juvenile period is likely to be about three to four years and the minimum longevity of adult plants is 18 years (S. Barrett 2022 pers. comm. 4 Jan). Therefore, the generation length of Stirling Range daviesia could be 11 years (see justification under Criterion 1). Other estimates of longevity could give slightly different generation length estimates. If the primary juvenile period was three years instead of four, generation length could be 10 years. If longevity of adult plants was closer to 30 years, the generation length could be around 15 years.
Extent of occurrence	20 km²	8 km ²	~64 km ²	The extent of occurrence (EOO) is based on the mapping of available point records from 2001 to 2021. The EOO is equivalent to AOO according to the IUCN Red List Guidelines, as using a minimum convex hull method results in an EOO of less than AOO (IUCN 2019). The maximum bound represents the EOO if plants at translocated site recruit and this is considered a subpopulation. The minimum bound represents an estimate if subpopulations 4, 7 and 8 become extinct.
Trend	contracting			Subpopulation 4 consisted of a single plant when most recently monitored in 2019 (Table 1). The extinction of this or other subpopulations would cause a contraction in the EOO of the species.
Area of Occupancy	20 km ²	8 km ²	24 km ²	The AOO is estimated is based on the mapping of available point records from 2001 to 2021. The AOO is calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines (IUCN 2019). The maximum bound represents the AOO if plants at translocated site recruit

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification	
				and this is considered a subpopulation. The minimum bound represents an estimate if subpopulations 4, 7 and 8 become extinct.	
A00 is a standardised s projected to be current thresholds. The resolut the spatial scale of threa fine-scale estimate of th existing populations of	patial measure of the ly occupied by the tax ion (grid size) that m ats than by the spatia he actual area occupie a taxon (e.g. breeding	e risk of extinction, th con. It is estimated us aximizes the correla l scale at which AOO ed. In some cases, AO g sites for migratory	hat represents the ard sing a 2 x 2 km grid t tion between AOO ar is estimated or shap 10 is the smallest are species).	ea of suitable habitat known, inferred or o enable comparison with the criteria ad extinction risk is determined more by ee of the taxon's distribution. It is not a a essential at any stage to the survival of	
Trend	contracting			Subpopulation 4 consisted of a single plant when most recently monitored in 2019 (Table 1). The extinction of this or other subpopulations would cause a contraction in the AOO of the species.	
Number of subpopulations	5	2	6	The number of subpopulations of the species is five (Table 1). Maximum and minimum bounds represent estimates if the species is more or less widespread than current records suggest (e.g. if subpopulations extinct, or if the translocated site demonstrates recruitment and is then considered as a subpopulation).	
Trend	declining			Subpopulation 4 consisted of a single plant when most recently monitored in 2019 (Table 1). The extinction of this or other subpopulations would cause a decline in the number of subpopulations of the species.	
Basis of assessment of subpopulation number	See justification under 'Number of subpopulations' above				
No. locations	1	1	~6	The most significant threats to the species are dieback caused by <i>P. cinnamomi</i> , inappropriate fire regimes, climate change and interactions among these threats. Of these, inappropriate fire regimes and interactions among the above threats are likely to result in a single location. The species is an obligate seeder with a primary juvenile period of three to four years and a generation length of 11 years. Multiple fires 18 months apart have recently occurred in Koikyenunuruff/Stirling Range, with some species such as <i>Banksia montana</i> being burned by both fires (DAWE 2021b). Although the 2019 fire in Koikyenunuruff/Stirling Range did not impact Stirling Range daviesia, it is possible that similar	

Metric	Estimate used	Minimum plausible	Maximum plausible	Justification	
	assessment	value	value		
		value	value	extremely short intervals between fires could occur again in the future and affect the species' entire population, particularly considering the predicted increase in fire danger weather and fire frequency as a result of climate change (Enright et al. 2015; Nolan et al. 2021; Table 2). The interaction between climate change and inappropriate fire regimes could also cause the rapid elimination of the species, if climate change drives increased pressure via higher fire frequency, while also reducing resilience via slower rates of maturation, lower fecundity, or higher post-fire seedling mortality through post-fire drought (Enright et al. 2015; Henzler et al. 2018). The effects of interactions between dieback from <i>P. cinnamomi</i> and fire on Stirling Range daviesia are not well understood, but fire has been demonstrated to increase the severity and extent of <i>P. cinnamomi</i> disease in Koikyenunuruff/Stirling Range (Moore et al. 2014) and is likely to accelerate the population decline currently observed due to dieback from <i>P. cinnamomi</i> . Therefore, Stirling Range daviesia is likely to have a single location based on the threats of inappropriate fire regimes, and interactions between dieback from <i>P. cinnamomi</i> , inappropriate fire regimes and climate change. The maximum estimate may plausibly be around six if all wild subpopulations and the translocated	
				site are considered as separate locations.	
Trend	stable As the number of locations is estimated as one, it is unlikely to decline any further until the species becomes extinct in the wild. becomes extinct in the wild.				
Basis of assessment of location number	See justification under 'No. locations' above.				
Fragmentation	Not severely fragmented. A taxon can be considered to be severely fragmented if most (>50%) of its total AOO is in habitat patches that are (1) smaller than would be required to support a viable population, and (2) separated from other habitat patches by a large distance, sufficient that gene flow among subpopulations is unlikely (IUCN 2019). The majority of subpopulations (three out of five) of Stirling Range daviesia contain less				
	than 1000 individuals (Table 1), a rudimentary estimate suggested by Frankham et al. (2014) as being a general minimum viable subpopulation size for resilience to genetic threats associated with small subpopulations.				
	However, subpop in southwest Wes	However, subpopulations are unlikely to be genetically isolated. A study of <i>Daviesia triflora</i> in southwest Western Australia found evidence of gene flow among subpopulations up to			

Daviesia pseudaphylla (Stirling Range daviesia) Conservation Advice

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
	2.4 km apart, sug dispersal by emu in southwest Wes they also play a r of moving 13.7 km comm. in He et al between five hou Cansela et al. 2000 km apart, the dist gene flow among subpopulations a be severely fragm	gesting that the lik (He et al. 2009). E stern Australia (Ca ole in infrequent d n per day (Davies . 2009), and capab rs and four days, a 8). The distance be cance across which most subpopulation re not considered mented.	tely mechanism for mu are known to d lviño-Cancela et al ispersal of Stirling et al. 1971) or 0.5– le of retaining seed lthough most seed etween the majorit a gene flow was obs ons is likely to occu genetically isolated	r gene flow was occasional seed lisperse seed of other <i>Daviesia</i> species . 2006; 2008), and it is possible that Range daviesia seed. Emu are capable .1 km per hour (S.J.J.F. Davies pers. d of <i>Daviesia</i> spp. in their gut for is excreted after one day (Calviño- ty of subpopulations is less than 2.4 served by He et al. (2009). Therefore, ar occasionally and the majority of d. As a result, the species is unlikely to
Fluctuations	Not subject to ext mature individua following fire (Ta seed banks when not fall within the	extreme fluctuations in EOO, AOO, number of subpopulations, locations or uals. Subpopulations may fluctuate by close to an order of magnitude Table 1). However, as fires stimulate mass recruitment from large persistent en there were few mature individuals before the event, the fluctuation does the definition of 'extreme fluctuations' (IUCN 2019).		

Criterion 1 Population size reduction

Redu	ction in total numbers (measured over t	he longer of 10 years or 3 g	eneratio	ns) based on	any	of A1 to A4
		Critically Endangered Very severe reduction	Endang Severe	gered reduction		Vulnerable Substantial reduction
A1		≥ 90%	≥ 70%			≥ 50%
A2, A	3, A4	≥ 80%	≥ 50%			≥ 30%
A1 A2 A3 A4	Population reduction observed, estimat past and the causes of the reduction are understood AND ceased. Population reduction observed, estimat past where the causes of the reduction be understood OR may not be reversibl Population reduction, projected or susp to a maximum of 100 years) [(<i>a</i>) cannot An observed, estimated, inferred, projec- reduction where the time period must if future (up to a max. of 100 years in futu- reduction may not have ceased OR may be reversible.	red, inferred or suspected in e clearly reversible AND red, inferred or suspected ir may not have ceased OR ma e. bected to be met in the futur t <i>be used for A3</i>] cted or suspected population nclude both the past and th ire), and where the causes of not be understood OR may	n the n the ay not re (up on ne of not	- Based on any of the following	(a) (b) (c) (d) (e)	direct observation [except A3] an index of abundance appropriate to the taxon a decline in area of occupancy, extent of occurrence and/or quality of habitat actual or potential levels of exploitation the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Criterion 1 evidence

Eligible under Criterion 1 A4bce as Critically Endangered

Generation time

The length of the primary juvenile period is likely to be about three to four years (S. Barrett 2022 pers. comm. 3 February). The maximum longevity of adult plants is unknown, but the minimum longevity is 18 years (S. Barrett 2022 pers. comm. 3 February).

Therefore, the generation length of Stirling Range daviesia could be 11 years.

Generation time = age of first reproduction + [0.5 * (length of reproductive period)]Generation time = 4 + [0.5 * (18 - 4)] = 11 years

This gives an estimated three-generation period of approximately 33 years.

Population trend

The population of Stirling Range daviesia appears to be in decline (Table 1; S. Barrett 2021 pers. comm. 4 Jan). Subpopulation 1 has been monitored for the longest period of time, enabling the decline of the species to be estimated by comparing data from equivalent stages in the species' life cycle (i.e. the same number of years post-fire).

Monitoring data for subpopulation 1 is available from 2006–2021. In 2006, six years after the 2000 fire, the subpopulation was estimated at 8000 mature individuals. Using an annual 97% survival rate of juveniles from 2021 onwards and assuming 100% survival of mature plants (see Table 5), the number of mature individuals in subpopulation 1 when current juveniles reach maturity in 2024 (i.e. six years after the 2018 fire, the same number of years post-fire as the 2006 monitoring data) is projected to be 3155 mature individuals (1650 currently mature plants + 1505 current juveniles that will have survived and matured by 2024). This represents a decline of 61 percent over a period of 18 years. A decline of this magnitude is supported by observations that the number of seedlings germinating after the 2018 fire was almost half that observed following the 2000 fire (S. Barrett 2022 pers. comm. 4 Jan). Monitoring of plant densities in quadrat data also suggests a similar 58 percent decrease in plant density in 2020 (two years post-fire) compared with 2002 (two years post-fire) in quadrats spayed with phosphite. However, in quadrats not sprayed with phosphite, the decrease in plant density was substantially higher, estimated at 86 percent (Table 2).

To calculate the decline in subpopulation 1 over a three generation period (2006–2039) it is necessary to project the number of mature individuals present in 2039. A decline of 61 percent (i.e. 39 percent survival) over 18 years, assuming exponential decay, equates to an exponential rate of decline of: $\ln(0.39)/18 = -0.05231$ per year. Using this rate of decline, the number of individuals present at the end of a three generation period from 2006 to 2039, can be estimated with the equation: $8000 * e^{-0.05231*33} = 1424$ plants, where 8000 is the number of mature individuals present in 2006 and 33 is the three generation period in years. This equates to a decline over this period of 82 percent (100-[1424/8000*100] = 82 percent).

However, subpopulation 1 was sprayed with phosphite to limit the impacts of *P. cinnamomi* from 2002–2018 (S. Barrett 2022 pers. comm. 4 Jan). Phosphite has not been applied to subpopulations 4, 6, 7 and 8, despite the presence of *P. cinnamomi* in all subpopulations. Therefore, the decline of 82 percent in subpopulation 1 may be lower than in subpopulations not sprayed with phosphite. A likely estimate of decline in other subpopulations may be estimated from quadrats in subpopulation 1 where phosphite was not applied. Within subpopulation 1, a decline in plant density of 86 percent over 18 years was observed in quadrats without phosphite application (Table 2). Using this rate of decline in the equations from the previous paragraph,

the estimated decline over a 33 year in the absence of phosphite application could be 97 percent $(\ln(0.14)/18 = -0.10922; 8000 * e^{-0.10922*33} = 218; 100-[218/8000*100] = 97$ percent).

To estimate the decline in subpopulations 4, 6, 7 and 8 over a three generation period from 2006–2039 it is necessary to estimate the number of mature individuals present in 2006 and 2039. Although there is no estimate of the number of mature individuals in 2006 in these subpopulations, it may be retrospectively projected, based on there being an estimated 866 plants (296–1436) in 2024, which was 18 years after 2006: 866 / $e^{-0.10922*18}$ = 6185 plants (2114–10,256) in 2006. The number of mature individuals projected to be present in 2039 across subpopulations 4, 6, 7 and 8 is therefore: 6185 * $e^{-0.10922*33}$ = 168 mature individuals (58–279).

Therefore, the overall population size across all subpopulations of Stirling Range daviesia in 2006 is estimated at 8000 + 6185 (2114–10,256) = 14,185 mature individuals (10,114–18,256). The projected overall population size in 2039 is estimated at 1424 + 168 (58–279) = 1592 mature individuals (1482–1703). This represents a likely **overall decline of 89 percent** (85–91 percent). This level of decline is plausible considering the threats (*P. cinnamomi* infection, inappropriate fire regimes and climate change) are difficult or impossible to ameliorate, and are likely to continue to affect the species and cause a contraction in EOO, AOO and quality of habitat (Table 5).

Therefore, Stirling Range daviesia appears to be eligible for listing as Critically 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 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 (A00)	< 10 km ²	< 500 km ²	< 2,000 km ²		
AND	AND at least 2 of the following 3 conditions:					
(a)	Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10		
(b)	(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)	(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(i,ii,iii,iv,v) as Critically Endangered

Extent of occurrence (EOO) and area of occupancy (AOO)

The EOO of Stirling Range daviesia is 24 km² and the AOO is 24 km² (Table 5).

The EOO appears to meet the threshold for listing as Critically Endangered under B1, and the AOO appears to meet the threshold for listing as Endangered under B2.

Severely fragmented

Stirling Range daviesia is not considered to be severely fragmented. Although the majority of subpopulations appear to be smaller than a rudimentary estimate of minimum viable population size (e.g. 1000 individuals as per Frankham et al. 2014), there is likely to be occasional gene flow among most subpopulations as most subpopulations occur less than 2.4 km apart, a distance across which gene flow was observed in *Daviesia triflora*, presumably from seed dispersal by emu (see justification in Table 5). Therefore, the species does not appear to meet the severe fragmentation requirement for listing under this criterion.

Number of locations

The most significant threats to the species are dieback caused by *P. cinnamomi*, inappropriate fire regimes, climate change and interactions among these threats.

Phytophthora cinnamomi is present in all subpopulations and Stirling Range daviesia is susceptible (Barrett et al. 2008; S. Barrett 2022 pers. comm. 4 January). Comparing plant density in quadrats sprayed with phosphite versus non-sprayed quadrats in subpopulation 1

shows that plant density reduced by 58% in sprayed quadrats and 86% in non-sprayed quadrats (Table 2). Dieback from *P. cinnamomi* infection is the most likely cause of this observed population decline, and it is plausible that it could cause the rapid elimination of subpopulations 4, 7 and 8 within one generation (11 years), due to the very small number of plants in these subpopulations. Subpopulations 1 and 6 are larger, and although *P. cinnamomi* is likely to cause a significant decline in the number of plants in these subpopulations, it may not cause their extinction within a one generation period. Therefore, it is plausible that the number of locations due to dieback from *P. cinnamomi* is approximately three (a separate location for each of subpopulations 4, 7 and 8), but this threat probably cannot define locations for subpopulations 1 and 6.

Inappropriate fire regimes are a threat to Stirling Range daviesia that could cause the rapid elimination of any or all of the species' subpopulations. Stirling Range daviesia is an obligate seeder (S. Barrett 2022 pers. comm. 4 January), and relies on post-fire germination from soilstored seed and adequate time for recruits to mature and restore the soil seed bank. All subpopulations were burnt by the 2018 fire, illustrating the capacity for fire to affect the entire population of the species. The primary juvenile period of Stirling Range daviesia is three to four years. If fires occur within this period, they are likely to cause the decline or extinction of subpopulations by killing juvenile plants before they are able to replenish the soil seed bank (DAWE 2021a). Multiple fires 18 months apart have recently occurred in Koikyenunuruff/Stirling Range, with some species such as *Banksia montana* being burned by both fires (DAWE 2021b). This illustrates the possibility of high fire frequency in Koikyenunuruff/Stirling Range and it is possible that similar extremely short intervals between fires could occur again in the future and affect the species' entire population, particularly considering the predicted increase in fire danger weather and fire frequency as a result of climate change (Enright et al. 2015; Nolan et al. 2021; Table 2). Therefore, it is plausible that the number of locations due to inappropriate fire regimes is one.

Climate change is another threat to Stirling Range daviesia that could cause the elimination of the species. Stirling Range daviesia occurs on the south-facing slopes of Koikyenunuruff/Stirling Ranges, which are influenced by orographic rainfall (S. Barrett 2022 pers. comm. 4 Jan). The CSIRO & Bureau of Meteorology (2020) predict southwest Western Australia will experience decreased precipitation and increased average temperatures, as well as greater frequency of droughts due to climate change. This is likely to reduce the area of suitable habitat for the species (Monks et al. 2019). However, it is unlikely that climate change alone would cause the rapid elimination of the species within one generation (11 years), as Stirling Range daviesia has soil-stored seed that can survive drought conditions. Therefore, climate change probably cannot be used to define the number of locations for Stirling Range daviesia on its own. Instead, the interactions between climate change and fire are a more significant threat (see below).

The interactions among the threats of dieback from *P. cinnamomi*, inappropriate fire regimes and climate change could cause the rapid elimination of the species' entire population. The interaction between climate change and inappropriate fire regimes could also cause the rapid elimination of the species, if climate change drives increased pressure via higher fire frequency, while also reducing resilience via slower rates of maturation, lower fecundity or higher post-fire seedling mortality through post-fire drought (Enright et al. 2015; Henzler et al. 2018). The effects of interactions between dieback from *P. cinnamomi* and fire on Stirling Range daviesia are not well understood, but fire has been demonstrated to increase the severity and extent of *P.*

cinnamomi disease in Koikyenunuruff/Stirling Range (Moore et al. 2014). Fire stimulates the germination of soil-stored seed that were not affected by *P. cinnamomi* when lying dormant in the soil seed bank. The germinating seedlings, however, are vulnerable to dieback from *P. cinnamomi*, so fire effectively puts the burnt subpopulations into a *P. cinnamomi*-vulnerable state, increasing population decline from dieback due to *P. cinnamomi*.

Therefore, Stirling Range daviesia is likely to have a single location based on the threats of inappropriate fire regimes, and interactions between dieback from *P. cinnamomi*, inappropriate fire regimes and climate change.

Continuing decline

Monitoring of Stirling Range daviesia has documented an estimated 61 percent decline of mature individuals in subpopulation 1 since 2006, and a decline of 89 percent is projected across the entire population in three generations from 2006–2039 (see Criterion 1). Subpopulation 4 consisted of a single plant when last monitored in 2020 (Table 1). If this subpopulation were to go extinct, as appears likely, it would cause a contraction in both EOO and AOO, and decline in number of subpopulations. Therefore, there is an observed or projected continuing decline in number of mature individuals, EOO, AOO and number of subpopulations.

Habitat quality is also observed and projected to continue declining due to inappropriate fire regimes, climate change and dieback caused by *P. cinnamomi* (Table 3). *Phytophthora cinnamomi* is present in all subpopulations of the species and continues to cause declines and local extinctions of susceptible plants, including Stirling Range daviesia. Dieback caused by *Phytophthora* spp. may also have indirect negative impacts on Stirling Range daviesia (e.g. through impacts on insect pollinators; Wills 1993). The species occurs on the southern slopes of Koikyenunuruff/Stirling Ranges in habitat influenced by orographic rainfall. This habitat is likely to be negatively impacted by observed and projected declines in rainfall and increasing frequency of drought due to climate change. The habitat of Stirling Range daviesia is also susceptible to inappropriate fire regimes. For example, fires in 2018 and 2019 double-burned parts of Koikyenunuruff/Stirling Ranges, causing declines in other obligate seeder shrubs (e.g. DAWE 2021b). Although Stirling Range daviesia was not impacted by the 2019 fire, declines in habitat quality are projected to occur in future if similarly inappropriate fire regimes impact its habitat.

Accordingly, the species appears to meet the continuing decline requirement for listing under this criterion.

Extreme fluctuations

There are no known extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals. Subpopulations may fluctuate by close to an order of magnitude following fire (Table 1). However, as fires stimulate mass recruitment from large persistent seed banks when there were few mature individuals before the event, the fluctuation does not fall within the definition of 'extreme fluctuations' (IUCN 2019). Therefore, Stirling Range daviesia does not meet the threshold for listing as Endangered under sub-criterion (c).

Conclusion

The data presented above appear to demonstrate that Stirling Range daviesia is eligible for listing as Critically 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.

		Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estii	nated 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 generation (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 Population size and decline

Criterion 3 evidence

Eligible under Criterion 3 C1 as Vulnerable

The population of Stirling Range daviesia is estimated at 4021 (3451–4591) mature individuals, when the current cohort of juveniles reaches maturity (Table 5). Therefore the population appears to be limited.

The species is projected to decline by an estimated 89 (85–91) percent in the three generation period from 2006–2039 (see evidence presented for Criterion 1). Therefore, it meets the requirements of subcriterion C1. The subcriterion C2 is not met as the species has multiple subpopulations of which the largest is >1000 mature individuals. Therefore, Stirling Range daviesia appears to meet the requirements for listing as Vulnerable under this criterion.

However, the purpose of this consultation document is to elicit additional information to better understand the subspecies' 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.

	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 km² or number of locations ≤ 5

Criterion 4 Number of mature individuals

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 <u>common</u> <u>assessment method</u>.

Criterion 4 evidence

Ineligible

As per the evidence presented above for Criterion 3, the number of mature individuals is estimated at 4021 (3451–4591) mature individuals (Table 5). Therefore, the species does not appear to meet the requirements 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 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. Therefore, there is insufficient information to determine the eligibility of the subspecies for listing in any category 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.

Adequacy of survey

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

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.

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.

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