Australian Government
Department of Climate Change, Energy, the Environment and Water

Consultation on Species Listing Eligibility and Conservation Actions

Pultenaea insularis (Beyeria bush-pea)

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

1) the eligibility of *Pultenaea insularis* (Beyeria bush-pea) 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@dcceew.gov.au. Please include species scientific name in Subject field.

or by mail to:

The Director
Threatened Species Assessments
Biodiversity Division
Department of Climate Change, Energy, the Environment and Water
(Attention: species.consultation@dcceew.gov.au)
GPO Box 3090
Canberra ACT 2601

Responses are required to be submitted by 18 November 2024.

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
Draft assessment/information about the species and its eligibility for listing	11
Conservation actions for the species	25
References cited	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.dcceew.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: Guidelines for assessing the conservation status of native species according to the Environment Protection and Biodiversity Conservation Act 1999 and Environment Protection and Biodiversity Conservation Regulations 2000 (dcceew.gov.au).

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: Nominating a species, ecological community or key threatening process under the EPBC Act - DCCEEW.

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.dcceew.gov./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. Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

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. Alternatively, email the department at privacy@dcceew.gov.au. A copy of the Department's Privacy Policy is available at: https://www.dcceew.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 and Water.

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 *Pultenaea insularis* (Beyeria bush-pea)

SECTION A - GENERAL

1. Is the information used to assess the nationally threatened status of the species 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? 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? (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 not in the current advice?

SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL NATIONAL POPULATION OF THE SPECIES? (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? 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 (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 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

☐ 96–98% - 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? (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 period between the mid-1970s tolate-1980s *(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 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

    ☐ 96–98% - 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' total population size over the last approximately 36–48 years (i.e. three generations)? 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, information suggests this range

    ☐ 96–98% - high level of certainty, information indicates quantity 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? (If no, skip to section F)

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

13. Does the assessment consider the entire geographic extent of the species? If not, please provide justification for your response.

14. Has the survey effort for this species been adequate to determine its 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 km^2 ☐ 100 – 5 000 km^2 ☐ 5 001 – 20 000 km^2 ☐ >20 000 km^2

    Level of your confidence in this estimated extent of occurrence

    ☐ 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

    ☐ 96–98% - high level of certainty, information indicates quantity within this range

    ☐ 99–100% - very high level of certainty, data are 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 km^2 ☐ 11 – 500 km^2 ☐ 501 – 2000 km^2 ☐ >2000 km^2

    Level of your confidence in this estimated extent of occurrence:

    ☐ 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

    ☐ 96–98% - high level of certainty, information indicates quantity within this range

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

SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES? (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 km^2 ☐ 100 – 5 000 km^2 ☐ 5 001 – 20 000 km^2 ☐ >20 000 km^2

    Level of your confidence in this estimated extent of occurrence

    ☐ 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

    ☐ 96–98% - high level of certainty, information indicates quantity within this range

    ☐ 99–100% - very high level of certainty, data are 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 km^2 ☐ 11 – 500 km^2 ☐ 501 – 2000 km^2 ☐ >2000 km^2

    Level of your confidence in this estimated extent of occurrence:

    ☐ 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

☐ 96–98% - high level of certainty, information indicates quantity within this range

☐ 99–100% - very high level of certainty, data are 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? (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 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 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? (If no, skip to section I)

25. What planning, management and recovery actions are currently in place supporting protection and recovery of the species? 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?

27. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species?

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

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 has?

30. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species?

31. How aware of this species are land managers where the species is found?

32. What level of awareness is there with individuals or organisations around the issues affecting the species?

    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?

Australian Government
Department of Climate Change, Energy, the Environment and Water

Conservation Advice for *Pultenaea insularis* (Beyeria bush-pea)

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.

Beyeria bush-pea in flower © Copyright, Department of Environment and Water, South Australia (SASCC 2023)

Conservation status

Pultenaea insularis (Beyeria bush-pea) is proposed to be listed in the Critically Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act).

Beyeria bush-pea was assessed by the Threatened Species Scientific Committee (TSSC) to be eligible for listing as Critically Endangered under Criterion 2. The TSSC's assessment is at Attachment A. The Committee's assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: A4ace: Endangered
- Criterion 2: B1ab(i,ii,iii,iv,v): Critically Endangered

- Criterion 3: C1: Endangered
- Criterion 4: D1+D2: Vulnerable
- Criterion 5: Insufficient data

The main factors that make the species proposed for listing in the Critically Endangered category are a very restricted Extent of Occurrence (EOO), severe fragmentation, and continuing decline in EOO, Area of Occupancy (AOO), area, extent and quality of habitat, number of subpopulations and number of mature individuals.

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.

Contents

Conservation status 11
Species information 14
Taxonomy 14
Description 14
Distribution 14
Cultural and community significance 16
Relevant biology and ecology 17
Habitat critical to the survival 18
Important populations 18
Threats 18
Conservation and recovery actions 25
Primary conservation objective 25
Conservation and management priorities 26
Stakeholder engagement/community engagement 28
Survey and monitoring priorities 28
Information and research priorities 29
Links to relevant implementation documents 29
Conservation Advice and Listing Assessment references 30
Other sources 32
Attachment A: Listing Assessment for *Pultenaea insularis* 34
Reason for assessment 34
Assessment of eligibility for listing 34
Key assessment parameters 34
Criterion 1 evidence 38
Criterion 2 evidence 39
Criterion 3 evidence 40
Criterion 4 evidence 41
Criterion 5 evidence 42
Adequacy of survey 42
Public consultation 42
Listing and Recovery Plan Recommendations 42

Species information

Taxonomy

Conventionally accepted as *Pultenaea insularis* J.Z.Weber (Weber 1995), Family: Fabaceae (or Leguminosae in South Australia).

The status of the taxon as a species was rejected by de Kok & West (2004), and the authors asserted that *P. insularis* should be a taxonomic synonym of *Pultenaea pedunculata* Hook. However, subsequent genetic work (Taylor 2012) and a detailed and comprehensive examination of herbarium material has confirmed that it is a distinct species with discrete characteristics (Lang 2022, pers comm, in Davies 2023). Consequently, the Council of Heads of Australasian Herbaria (CHAH 2011) re-asserted the taxon to species level, in keeping with Weber's (1995) description.

Description

Simple description

Beyeria bush-pea is a spreading or prostrate shrub to 60 cm high, rooting at the nodes, with wiry green to reddish-brown, woody and hairy branches. Leaves are elliptical, to 6 mm long and 3 mm wide, with flat or recurved margins and pointed tips, green to dark-green, sometimes with a reddish tint. The leaf upper surface is hairy.

Flowers are solitary (not in clusters), yellow pea-flowers to 5 mm long, mainly towards the apex of branches. The fruit is a hairy, flat, brown, ovoid pod to 4 mm long. Seeds are brown and firm when mature.

Beyeria bush-pea is similar to *P. pedunculata,* which has larger flowers (to 8 mm long) and longer narrower leaves (12 mm x 3 mm) (Weber 1995).

Distribution

Beyeria bush-pea is endemic to South Australia (SA) and is restricted to the MacGillivray district of eastern Kangaroo Island (Map 1). The species has historically been recorded at six subpopulations (Table 1), however, as of 2022/23, surviving plants were only present at five subpopulations (Davies 2023; Duval 2023, pers comm, 12 September).

In July 2022, Davies (2023) surveyed all known subpopulations of Beyeria bush-pea giving a total count of 502 mature individuals. The largest subpopulation is found in Beyeria Conservation Park (CP), where 321 mature plants were observed (down from ~600 plants observed in 1995 (Weber)). The most northerly subpopulation is found at Kingscote Airport, where 15 mature plants were recorded. The other subpopulations are all on narrow road verges. The largest roadside subpopulation is found near the junction of Elsegood and Moores Roads, where 146 plants were found (down from 295 observed in 1996 (Davies)). The other roadside subpopulation (20 plants) observed by Davies (2023) in 2022 is located towards the southern end of Elsegood Road and on adjoining Lovering Road. Davies (2023) found no extant plants at the Halls Road subpopulation in 2022, however, Duval (2023, pers comm, 12 September) observed two mature plants at this site in September 2023, bringing the total number of individuals of the species to 504.

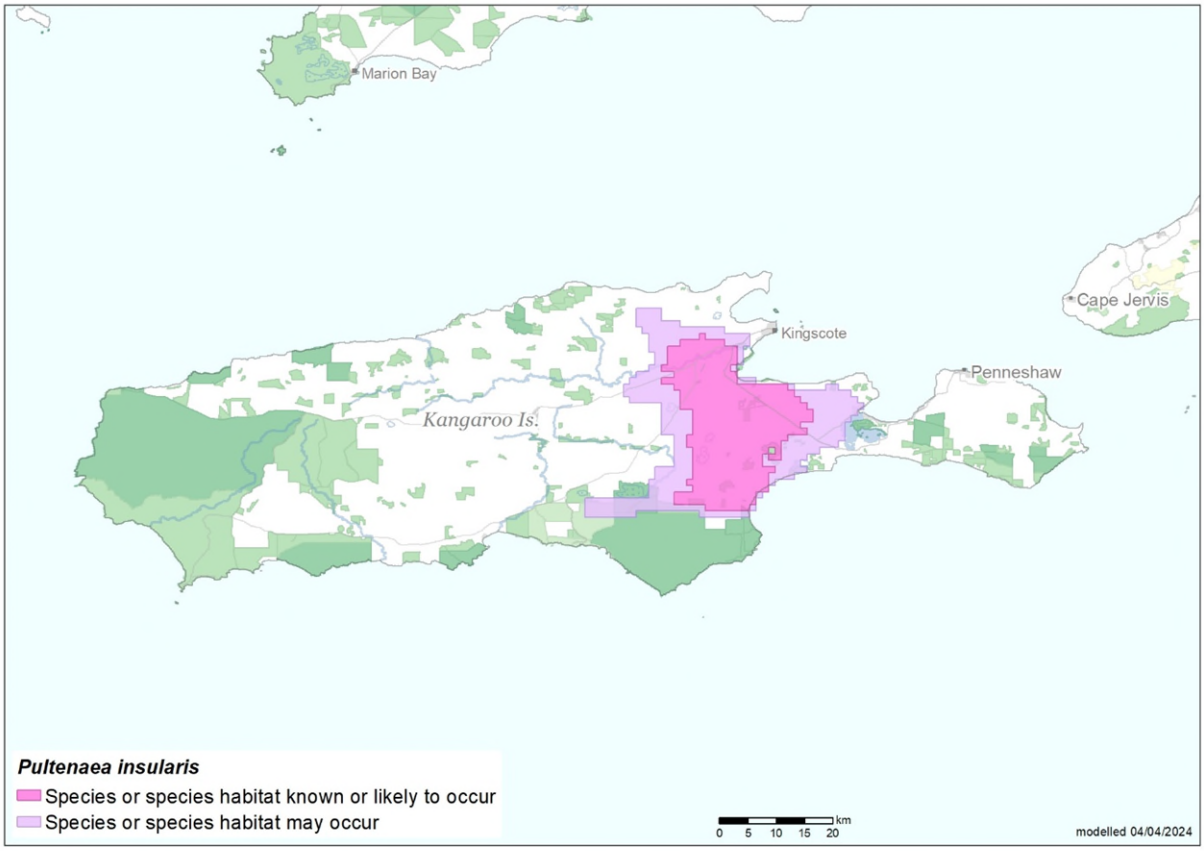
One other roadside subpopulation was surveyed where a single standing plant was recorded in 1996 (Davies 1996). This subpopulation is on Wheatons Road, west of Elsegood Road, however, no standing plants were found there in 2022 (Davies 2023).

Table 1 Subpopulation plant counts of Beyeria bush-pea

Subpopulation details	**Tenure**	**No. of individuals (survey date)[a]**
Beyeria CP	Beyeria CP	~ 600 (1995) 321 (2022)
Kingscote Airport[b]	Kangaroo Island Council	15 (2022)
Near junction of Elsegood and Moores Roads	Kangaroo Island Council	295 (1996) 146 (2022)
Southern end of Elsegood Road and on adjoining Lovering Road[b]	Kangaroo Island Council	20 (2022)
Halls Road north of Moores Road	Kangaroo Island Council	11 (1996) 2 (2023)
Wheatons Road	Kangaroo Island Council	1 (1996) 0 (2022)
Total	N/A	> 907 (1995/96) 504 (2022/23)

[a] Survey dates and sources: 1995 (Weber 1995); 1996 (Davies 1996); 2022 (Davies 2023); 2023 (Duval 2023, pers comm, 12 September).
[b] Subpopulations at Kingscote Airport and Southern end of Elsegood Road and on adjoining Lovering Road were not surveyed in 1995/96.

Map 1 Modelled distribution of Beyeria bush-pea



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 contained herein. Due to limited survey effort and information available, Beyeria bush-pea, and its habitat, may occur in areas where it has not yet been recorded, and the modelled distribution (Map 1) should be considered as indicative only.
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 Australian communities and their stewardship of Country. This section describes some examples of this significance but is not intended to be comprehensive, 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.

Kangaroo Island is an important place in local Indigenous culture, with many significant sites and features in Dreamtime Stories and Songlines connecting Country, people and culture in the region. The Kaurna, Ramindjeri, and Ngarrindjerri peoples have a cultural interest in Kangaroo Island (Draper 2015).

There is no reference to the cultural and community significance of Beyeria bush-pea or any *Pultenaea* species in published literature. Nevertheless, such knowledge may be held by Indigenous Australians who are the custodians of this knowledge and have the right to decide how this knowledge is shared and used.

Relevant biology and ecology

Habitat

Beyeria bush-pea grows in sandy-clay soils (Weber 1995) and ironstone soils (DEW 2024). It is found in pockets of native mallee woodland and shrubland within a predominantly agricultural area of Kangaroo Island dominated by cropping and grazing land (DEW 2024). The larger and higher quality pockets of habitat may be Kangaroo Island narrow-leaved mallee (*Eucalyptus cneorifolia*) woodland, which is listed as a Critically Endangered ecological community under the EPBC Act, however, the narrow subpopulations on roadsides are unlikely to meet the minimum condition thresholds for the ecological community (DOE 2014).

The species can be found in association with *E. cneorifolia* (Kangaroo Island narrow-leaved mallee) and secondary tree mallee species including *E. albopurpurea* (purple-flowered mallee box), *E. cosmophylla* (cup gum), *E. diversifolia* subsp. *diversifolia* (coastal white mallee) and *E. leptophylla* (narrow-leaved red mallee). Co-occurring tall shrub species include *Banksia marginata* (silver banksia), *B. ornata* (desert banksia), *Callistemon rugulosus* (scarlet bottlebrush), *Melaleuca lanceolata* (dryland teatree) and *M. uncinata* (broombush) along with low shrub species *Thryptomene ericaea* (heath thryptomene), *Acacia paradoxa* (prickly acacia), *Adenanthos macropodianus* (silver bush), *Allocasuarina striata* (stalked oak-bush), *Bertya rotundifolia* (Kangaroo Island bertya), *Calytrix glaberrima, C. tetragona* (fringe myrtle), *Isopogon ceratophyllus* (horny conebush), *Petrophile multisecta* (cone-bush) and *Platylobium obtusangulum* (common flat-pea) over *Orthrosanthus multiflorus* (DEW 2024).

Relevant biology and ecology

Beyeria bush-pea flowers profusely from November to December (Weber 1995) and is inferred to be pollinated by native bees, as in other *Pultenaea* species (Armstrong 1979). During seed collecting field work for this species from 2020 to 2023 it was observed that only a few individuals within a given subpopulation set seed (Duval 2024, pers comm, 18 April). Seed dispersal is unknown but is inferred to be via ants (that is, very localised dispersal), again, as in other *Pultenaea* species (Berg 1975).

Beyeria bush-pea produces fully developed embryos with dormancy imposed by the physical seed coat (Duval 2023, pers comm, 22 August). This physical dormancy is overcome with scarification or heat treatment, after which germination can commence (DEW 2023). The species forms a persistent soil seed bank (Duval 2023, pers comm, 8 May).

The time to maturity from seed germination to first flowering is two years (Duval 2024, pers comm, 18 April). Longevity of Beyeria bush-pea is unknown, however, other *Pultenaea* species exhibit primary juvenile periods of between three and seven years (Clarke et al. 2009; Muir et al. 2014) and lifespans under 50 years (Muir et al. 2014).

Fire and disturbance ecology

Beyeria bush-pea has been observed to be an obligate seeder (Duval 2024, pers comm, 18 April), however, no detailed fire ecology studies have been carried out on the species. It may be similar

to other fire-sensitive *Pultenaea* species which are obligate seeders (Auld & O'Connell 1991; Auld 1996). Recruitment at the Beyeria CP subpopulation was observed following prescribed burning in March 2012 (Duval 2023, pers comm, 22 August).

Beyeria bush-pea can also recruit following disturbance (Duval 2023, pers comm, 22 August). This was observed at the subpopulation at Beyeria CP, following partial clearance between 1979 and 1983, and in roadside vegetation, where the ground is frequently disturbed (Weber 1995; Overton 2003, pers comm, in Taylor 2012).

Some *Pultenaea* species have a non-dormant seed fraction that allows germination in the absence of fire or disturbance (for example, *P. polifolia* (Auld & O'Connell 1991)), however, surveys of Beyeria bush-pea in 2022 (Davies 2023) found only mature individuals, including where plants were protected from macropod browsing at Beyeria CP, indicating that Beyeria bush-pea relies on fire or disturbance for germination.

Habitat critical to the survival

All habitat for known subpopulations of Beyeria bush-pea is critical to its survival. This includes the area occupied by all known extant subpopulations, areas of similar habitat surrounding and linking known subpopulations, habitat at sites where plants were known to occur until recently, and additional occurrences of similar habitat that may contain undiscovered subpopulations of the species or be suitable for future translocations.

A definition of 'Habitat critical to survival' for a species is outlined in the Significant Impact Guidelines 1.1 (DOE 2013a).

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

The definition of important population is outlined in the Significant Impact Guidelines 1.1 (DOE 2013a): an 'important population' is a population that is necessary for a species' long-term survival and recovery.

Beyeria bush-pea has a very restricted distribution and all populations are important for the long-term survival and recovery of the species.

Threats

Threats in Table 2 are presented in approximate order of highest to lowest impact, based on available evidence. The most serious threats to Beyeria bush-pea are clearance of native

vegetation, competition with invasive garden escapees and intensive browsing by macropods (Davies 2023).

Table 2 Threats

Threat	Status [a]	Evidence
Habitat loss, disturbance and modification		
Clearance of native vegetation	• Timing: past/future • Confidence: observed/projected • Likelihood: likely • Consequence: major • Trend: decreasing • Extent: across part of its range	*Land clearance* is listed as a Key Threatening Process (KTP) under the EPBC Act (DEH 2001). The area where Beyeria bush-pea occurs has been extensively cleared for agriculture—primarily cropping and grazing (ABARES 2021). This has likely impacted the total population size and distribution of the species, which is now very restricted to narrow roadside vegetation and in remnant vegetation at Kingscote Airport and Beyeria CP. Further habitat clearance may occur in the future for road construction and other infrastructure upgrades. **Threat interactions** Interaction between *clearance of native vegetation* and *invasive plant species* Land clearance can promote weed invasion into native vegetation patches both directly, via transport of seeds and tubers, and indirectly, via changes in abiotic conditions. Changes in the local microclimate, soil nutrients, water availability and salinity, particularly at the edges of native vegetation patches, can promote the recruitment and spread of weed species (Hobbs & Yates 2003), leading to habitat degradation and plant population declines.
Roadside maintenance	• Timing: past/current/future • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: static • Extent: across part of its range	Roadside maintenance, in the form of slashing and heavy machinery use to clear vegetation from the road and create table drains and turn-out drains, occurs in the vicinity of roadside subpopulations of Beyeria bush-pea. Declines of standing Beyeria bush-pea plants have been observed in all roadside subpopulations between 1996 and 2022/23 (Davies 1996, 2023; Duval 2023, pers comm, 12 September). Disturbance (in the form of seed abrasion/scarification) is an important germination cue for Beyeria bush-pea, especially in the absence of fire (DEW 2023); however, too frequent disturbance can lead to population decline if sufficient time is not allowed for plants to mature and produce adequate seed. **Threat interactions** Interaction between *roadside maintenance* and *invasive plant species* Disturbance due to roadside maintenance may lead to germination of Beyeria bush-pea seeds, however, it may also cause invasive plant seed germination and spread of invasive *Asparagus*

Threat	Status [a]	Evidence
		declinatus (bridal veil) and *Asparagus asparagoides* (bridal creeper) via movement of underground tubers. Beyeria bush-pea seedlings are particularly vulnerable to smothering by the highly competitive bridal veil and bridal creeper. These weeds are able to resprout via underground tubers (Weeds Australia 2023) which would likely re-establish much faster than Beyeria bush-pea seedlings. Interaction between *roadside maintenance* and *disease* Roadside maintenance activities in the vicinity of Beyeria bush-pea subpopulations would enable the spread of *Phytophthora cinnamomi* if it is present in these areas and if poor roadside maintenance hygiene is practised. There is currently one confirmed record of *P. cinnamomi* adjacent to Elsegood Road (DEW 2024). Roadside maintenance activities could spread the disease from this site to other sites, potentially affecting a very significant proportion of Beyeria bush-pea plants (33% of plants are found on roadsides).
Weed control	• Timing: past/current • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: unknown • Extent: across part of its range	Herbicide use and physical removal (grubbing) are the primary methods used to control bridal veil, bridal creeper and grassy weeds in the vicinity of roadside Beyeria bush-pea plants (Wilson 2006; Lashmar 2024, pers comm, 20 February). Grubbing and herbicide spraying of bridal veil in September 2023 along Elsegood Road, south of Moores Road, resulted in off-target impacts to Beyeria bush-pea with dieback observed on some plants. It was noted, in December 2023, that 29 out of 131 Beyeria bush-pea plants observed at the subpopulation were experiencing moderate to severe dieback (mostly in areas that were hand weeded and spot sprayed) with a further 56 experiencing minor dieback. The cause of the dieback has been mostly attributed to root disturbance from grubbing of adjacent bridal veil plants (Lashmar 2024, pers comm, 23 August), however, herbicide use in close proximity is also considered a threat to Beyeria bush-pea plants (Lashmar 2024, pers comm, 23 August).
Invasive plant species		
Loss and degradation of habitat by invasion of garden plant species	• Timing: past/current/future • Confidence: observed • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range	*Novel biota and their impact on biodiversity* is listed as a KTP under the EPBC Act (DOE 2013b). At least one of the two highly competitive and invasive garden species bridal veil and bridal creeper are present at every extant Beyeria bush-pea subpopulation (Davies 1996, 2023). These species can outcompete and smother Beyeria bush-pea plants, especially at the seedling life history stage. Both weeds are recognised as Weeds of National Significance (Weeds Australia 2023). Davies (2023) recorded bridal veil either smothering or occurring within 1 m of almost

Threat	Status [a]	Evidence
		100% of Beyeria bush-pea plants on roadsides in 2022. Davies (2023) also observed an increase in the prevalence of these weeds since surveys in 1996 (Davies 1996). This period coincided with a decline of over 46% in the number of standing Beyeria bush-pea plants at roadside subpopulations (Davies 2023). Bridal veil has not been seen in the vicinity of Beyeria bush-pea plants within Beyeria CP or at Kingscote Airport (Duval 2023, pers comm, 8 May) but bridal creeper has (Davies 2023). Davies (2023) also noted infrequent occurrences of *Olea europaea* (European olive) in the Elsegood Road/Moores Road subpopulation in 2022. **Threat interactions** See *Fire* threat and *Roadside maintenance* threat.
Loss and degradation of habitat by invasion of grasses	• Timing: past/current/future • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: increasing • Extent: across part of its range	*Novel biota and their impact on biodiversity* is listed as a KTP under the EPBC Act (DOE 2013b). Invasive grasses can spread, often from farm paddocks, into roadside patches of native vegetation where they can compete with native plants for resources. Davies (1996, 2023) found *Ehrharta calycina* (perennial veldt grass) and *Phalaris aquatica* (phalaris) present at a number of roadside subpopulations in 1996 and 2022. In 2022, at the Lovering Road subpopulation, perennial veldt grass had > 30% cover in parts, and was, in most places, within 1 m of Beyeria bush-pea plants. Phalaris cover was mostly < 30% across roadside subpopulations and was often within 3 m of Beyeria bush-pea plants. An increase in the prevalence of phalaris between 1996 and 2022 at a number of roadside Beyeria bush-pea subpopulations was noted by Davies (2023). *Thinopyrum elongatum* (tall wheatgrass) was also recorded at the site of the Elsegood Road/Moores Road junction subpopulation, albeit sparsely distributed. **Threat interactions** See *Fire* threat and *Roadside maintenance* threat.
Herbivory		
Browsing by macropods	• Timing: past/current/future • Confidence: observed • Likelihood: almost certain • Consequence: major • Trend: unknown • Extent: across part of its range	Persistent browsing by macropods can reduce the capacity of perennial plants to produce flowers, fruits and seed, and can prevent seedlings from establishing and reaching maturity. In 2022, Davies (2023) found that 79% of the Beyeria CP subpopulation was heavily browsed by *Macropus fuliginosus fuliginosus* (Kangaroo Island western grey kangaroos) and *Notamacropus eugenii eugenii* (Kangaroo Island tammar wallabies). Of the 66 plants not

Threat	Status [a]	Evidence
		browsed, almost half (30) were not browsed due to being protected by cages. **Threat interactions** See *Fire* threat
Firebreak maintenance		
Slashing of native vegetation on firebreaks	• Timing: current/future • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: unknown • Extent: across part of its range	Firebreaks have been created at Kingscote Airport in native vegetation adjacent to the airstrip. These firebreaks are maintained by the mechanical slashing of vegetation to near ground-level. Part of the Kingscote Airport subpopulation is within the firebreak footprint (Davies 2023). Davies (2023) reported that non-selective slashing of vegetation is a potential threat to the small subpopulation of Beyeria bush-pea at the site if sufficient soil seed bank replenishment is not allowed to occur. Loss of this subpopulation would significantly reduce the EOO of the species since it is a relict outlier.
Fire		
Fire regimes that cause declines in biodiversity [b]	• Timing: current/future • Confidence: suspected • Likelihood: possible • Consequence: moderate • Trend: increasing • Extent: across the entire range	*Fire regimes that cause declines in biodiversity* is listed as a KTP under the EPBC Act (DAWE 2022). The mechanisms by which fire can impact species are diverse and can be direct or indirect. ***Low fire frequency*** Low fire frequency may deplete the number of standing Beyeria bush-pea plants and the soil seed bank if the rate of senescence is higher than the rate of fire-stimulated recruitment (Keith 1996). Fire is an important germination cue for Beyeria bush-pea (DEW 2023), however, fire overlap with subpopulations has been absent across its range other than planned burns at Kingscote Airport and Beyeria CP in 2005 and 2012, respectively, and a bushfire in Beyeria CP in 1954 (DEW 2024). Although it is possible that seeds can germinate without fire cues (for example, from disturbance), survival and establishment of such germinants are expected to be low in unburnt conditions compared to the post-fire environment (Keith 1996), especially where the highly competitive weeds bridal veil and bridal creeper are present. ***Out-of-season fires*** Post-fire seedling mortality is influenced by the season of fire and, specifically, the level of soil moisture and post-fire weather conditions (Keith 1996). Kangaroo Island experiences a distinct and predictable winter rainfall maximum with summers that are usually hot and dry (BOM 2019). This suggests that seedling recruitment conditions are most favourable if fires occur in late summer to early autumn, immediately preceding reliable moisture. Given that the fire regime impacting Beyeria bush-pea is predominantly due to

Threat	Status [a]	Evidence
		planned burns, (which have occurred in late spring—for example, the November 2005 planned burn at Kingscote Airport (DEW 2024)), population decline could occur in the future unless the timing of burns is adjusted. Furthermore, climate change, over the coming decades, in the region, will result in more hot days, more time spent in drought and lower annual rainfall (DEW 2022), further increasing the seedling mortality risk related to out-of-season fires. **Threat interactions** Interaction between *fire* and *invasive plant species* Fire can have both positive and negative impacts on Beyeria bush-pea plants and their habitat depending on the specific fire regime and any complementary weed control. Fire may enable establishment of invasive plants, resulting in population decline of Beyeria bush-pea due to fire-competition interactions (DAWE 2022). The roadside subpopulations are specifically at risk as seedling survivorship post-fire will be extremely low due to competition with weeds (Duval 2024, pers comm, 18 April). These subpopulations will be unlikely to return to their pre-fire state as their small sizes would lack resilience (Duval 2024, pers comm, 18 April). Conversely, fire is important for promoting understorey species, including Beyeria bush-pea, in the Kangaroo Island narrow-leaved mallee woodland ecological community. In the absence of an appropriate fire regime, native understorey plants may gradually decline and become increasingly outcompeted by weeds, further impeding their growth and recruitment (Klein 2024, pers comm, 30 July). Interaction between *fire* and *browsing by macropods* Post-fire macropod browsing of relatively palatable Beyeria bush-pea seedlings is a known issue on Kangaroo Island (Duval 2023, pers comm, 8 May). If not reduced, severe seedling mortality can occur (Keith 1996), leading to eventual population decline.
Disease		
Dieback and disease caused by *Phytophthora cinnamomi*	• Timing: future • Confidence: suspected • Likelihood: possible • Consequence: moderate • Trend: unknown • Extent: across part of its range	*Phytophthora cinnamomi* is an introduced soil-borne pathogen that infects a wide variety of native plant species and may contribute to plant dieback (Cahill et al. 2008; DOEE 2018). *Disease in natural ecosystems caused by Phytophthora cinnamomi* is listed as a KTP under the EPBC Act (DOEE 2018). While no susceptibility tests have been documented for Beyeria bush-pea, it is known that other *Pultenaea* species are highly susceptible to the pathogen (Kueh et al. 2012).

Threat	Status [a]	Evidence
		The pathogen is prevalent on Kangaroo Island and is spread by vehicles, human foot traffic, machinery and equipment, and water. A confirmed record of *P. cinnamomi* has been found close to the subpopulation at the southern end of Elsegood Road and on adjoining Lovering Road (DEW 2024). **Threat interactions** See *Roadside maintenance* threat.

[a]Timing—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
[b]Fire 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 – >90% chance that threat will have an impact on the species within the next 3 generations or 10 years, whichever is longer
Likely – 66-90% chance that threat will have an impact on the species within the next 3 generations or 10 years, whichever is longer
Possible – 33-66% chance that threat will have an impact on the species within the next 3 generations or 10 years, whichever is longer
Unlikely – <33% chance that threat will have an impact on the species within the next 3 generations or 10 years, whichever is longer
Unknown – probability that threat will have an impact on the species within the next 3 generations or 10 years, whichever is longer, could be 0-100%

Categories for consequences are defined as follows:

Catastrophic – affecting survival, reproduction or essential movement of individuals in >80% of the population or across >80% of the distribution within the next 3 generations or 10 years, whichever is longer
Major – affecting survival, reproduction or essential movement of individuals in 50-80 % of the population or across 50-80% of the distribution within the next 3 generations or 10 years, whichever is longer
Moderate – affecting survival, reproduction or essential movement of individuals in 20-50% of the population or across 20-50% of the distribution within the next 3 generations or 10 years, whichever is longer
Minor – affecting survival, reproduction or essential movement of individuals in 5-30% of the population or across 5-30% of the distribution within the next 3 generations or 10 years, whichever is longer
Not significant – affecting survival, reproduction or essential movement of individuals in <5% of the population or across <5% of the distribution within the next 3 generations or 10 years, whichever is longer

The risk matrix (Table 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			Loss and degradation of habitat by invasion of grasses Roadside maintenance Weed removal Slashing of native vegetation on firebreaks	Loss and degradation of habitat by invasion of garden plant species Browsing by macropods	
Likely				Clearance of native vegetation	
Possible			Fire regimes that cause declines in biodiversity Dieback and disease caused by *P. cinnamomi*		
Unlikely					
Unknown					

Risk Matrix legend/Risk rating:

Low Risk	Moderate Risk	High Risk	Very High Risk

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/low or moderate risk (green and blue 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 2034, the population of Beyeria bush-pea will have increased in abundance and the EOO and AOO will have increased or remained stable. The species will be sustained in habitats where threats are managed effectively.

Conservation and management priorities

Clearance of native vegetation

- Avoid vegetation clearance (for example for road construction and other infrastructure upgrades) in known or unsurveyed potential Beyeria bush-pea habitat.
- Restore and revegetate cleared or degraded areas of suitable habitat to extend and improve habitat for the species.
- Where appropriate, consider incorporating land identified as habitat for the species into the conservation reserve tenure via purchase, offsets or other appropriate means.

Browsing by macropods

- Set up fenced exclosures (or cages) around Beyeria bush-pea plants in Beyeria CP to protect against browsing by macropods, especially after planned burns. Fenced areas should be monitored to prevent biomass accumulation. Set up adjacent similar sized unfenced plots so that that the impact of browsing can be quantified by monitoring.

Invasive plant species impacts

- Remove bridal creeper within visible proximity to all Beyeria bush-pea plants in the Beyeria CP and the Kingscote Airport subpopulations.
- Remove all bridal veil, bridal creeper, perennial veldt grass, phalaris and tall wheat-grass within visible proximity of all extant and non-extant roadside subpopulations of Beyeria bush-pea, giving priority to the largest Beyeria bush-pea subpopulation along Elsegood Road.

Roadside maintenance

- In collaboration with Kangaroo Island Council, implement a roadside significant sites database and roadside marker system for sites of high environmental significance on Kangaroo Island to highlight known Beyeria bush-pea sites and specific requirements for their protection.
- Minimise impacts to roadside Beyeria bush-pea plants by considering appropriate disturbance frequency and seasonal timing in the planning of road maintenance activities.

Weed removal

- Develop and apply weed control protocols, taking into account appropriate methodology, chemicals, weather conditions, application methods and training; see Robertson (2005), Muyt (2001) and Weeds Australia (2023), to minimise off-target impacts to Beyeria bush-pea.
- At subpopulations where Beyeria bush-pea may be difficult to detect due to smothering by weeds, undertake surveys and flag individual Beyeria bush-pea plants before control occurs, and use methods other than hand weeding and spraying (for example brush application) when close to Beyeria bush-pea plants.

Slashing of native vegetation on firebreaks

- Adjust firebreak slashing in the vicinity of Kingscote Airport to avoid impacts on the Beyeria bush-pea subpopulation.

- Fence the subpopulation of Beyeria bush-pea at Kingscote Airport, where necessary, to protect from slashing.

Fire

- Develop and implement a fire management strategy that reduces the risk of sustained population decline and extinction of Beyeria bush-pea. Ensure any recommended fire intervals are well supported by strong evidence.
- Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of Beyeria bush-pea, that they support rather than degrade the habitat necessary for the species, that they do not promote the invasion of exotic species and that they do not increase the impacts of herbivory.
- Avoid impacts to subpopulations during fire-fighting operations or other fire management works by ensuring information on the species' importance and accurate location information is available on databases used by the relevant fire management agencies to limit impacts of suppression and hazard reduction operations.
- Avoid application of fire retardants during fire suppression operations in the vicinity of Beyeria bush-pea plants.
- After fire, manage impacts of any herbivores and weeds that may limit Beyeria bush-pea recruitment and plant growth.
- Raise awareness of the location of this species with the SA Country Fire Service and other fire management agencies to minimise the impact to the taxon of prescribed burns.

Dieback and disease caused by *P. cinnamomi*

- Evaluate the susceptibility of the species to disease and, if required, develop biosanitation protocols for accessing species' habitat in accordance with national guidelines (see "Arrive Clean, Leave Clean" DOE 2015).

Ex situ recovery actions

- Collect a sample of seed from as many subpopulations as possible and place under long-term storage at the South Australian Seed Conservation Centre (SASCC). Seed collections should be in accordance with Australian germplasm conservation guidelines (refer to Martyn Yenson et al. 2021 or Commander 2021).
- Thirty-five Beyeria bush-pea plants were translocated in 2021 by the South Australian Government to constructed enclosures at two properties (Duval 2023, pers comm, 8 May). These translocations should continue to be monitored to maturity, seed set and recruitment to ensure they are viable and are contributing to a reduction in the extinction risk for the species.
- Investigate the feasibility of supplementing existing translocations and/or establishing new translocation sites 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 populations through to recruitment to ensure they are viable. The impact that land tenure may have on execution of translocation procedures and ongoing plant maintenance should be considered in feasibility investigations.

- Propagation of Beyeria bush-pea plants from Beyeria CP and Elsegood Road has also taken place by the South Australian Government (Duval 2023, pers comm, 8 May). Monitoring of this program should be conducted to ensure that lessons learned can be applied for future propagation work.

Stakeholder engagement/community engagement

- Facilitate co-design of weed control protocols and collaboration between Kangaroo Island Council, Kingscote Airport management and the SA government to ensure that weed management is consistent across all subpopulations and learnings are shared between the relevant land managers.
- Raise awareness of roadside subpopulations with Kangaroo Island Council road maintenance staff and contractors.
- Investigate, with Kingscote Airport management, the potential for a formal Heritage Agreement to be placed on the area of native vegetation containing the Beyeria bush-pea subpopulation.
- Invite conservation-oriented organisations, such as Friends of Parks groups, to assist:
  - with monitoring of Beyeria bush-pea subpopulations to foster interest in the conservation of this species and other threatened flora on Kangaroo Island,
  - the SASCC in seed collection activities prior to long-term storage,
  - tertiary institutions and other relevant stakeholders in exploring the information and research priorities listed in this Conservation Advice.
- Encourage volunteers to assist SA government staff with stages of translocation, including propagation of seedlings at the newly established Kangaroo Island Rare Plant Garden, planting seedlings for new and supplementary translocations, monitoring the plantings; and providing supplementary watering if necessary.
- Place educational signs at the site of known subpopulations to highlight the importance of the subpopulations and the species.
- Support engagement of Indigenous Australians in conservation actions, including fire management, surveys, monitoring and management actions.
- Adopt best practice for effective threat management through an adaptive management approach based on partnerships around co-design, co-implementation and social learning. Promote wide acceptance and capacity building, including explicit use of local knowledge in planning, management actions and monitoring supported by cost-effectiveness and risk-based collective decision making.

Survey and monitoring priorities

- Monitor all extant subpopulations every three to five years to determine mature plant survival and seedling regeneration, short-term and long-term trends in the survival rate of seedlings to maturity, and the success of conservation actions. Monitoring should also be used to collect data on the primary juvenile period, reproductive length and lifespan of the species.
- Monitor the site of the former subpopulation at Wheatons Road for plants every three to five years.

- Monitor caged and associated control plots in Beyeria CP to quantify the impact of macropod browsing.
- Conduct surveys in other areas of suitable habitat on Kangaroo Island to identify potential translocation sites for the establishment of new subpopulations or augmentation of existing subpopulations. Potential sites could be determined via computer modelling of the species' required biophysical variables (for example, vegetation communities, soil characteristics, site drainage).
- Monitor post-fire and post-disturbance sites to determine seed germination success.
- Determine the density of seeds in the soil seed bank at various sites to inform the appropriate frequency and timing of any planned fire or disturbance on existing subpopulations. If inadequate, planned fire or disturbance should only occur after standing plants have adequately replenished the soil seed bank.
- Include outcomes from surveys into relevant biodiversity data repositories for adaptive management and learning.

Information and research priorities

- Conduct research into:
  - Ascertaining a suitable fire regime (frequency, severity & seasonal timing) for all subpopulations of Beyeria bush-pea. This will include a determination of minimum, maximum and optimal ages of plants for seed production under different habitat and climatic regimes.
  - The susceptibility of Beyeria bush-pea to the soil pathogen *Phytophthora cinnamomi*.
- Explore the fire response mechanisms of the species.
- Undertake a population genetics study to determine the extent of genetic diversity within and between subpopulations, and the potential for inbreeding.
- Determine appropriate integrated weed management protocols to minimise dieback and impacts on Beyeria bush-pea plants.
- Undertake vulnerability assessments of the species' sensitivity and adaptive capacity to changing climatic conditions which draw on genetic, physiological and ecological evidence.
- Investigate potential climate refuges (local micro-climate refuges should be considered as a priority over more distant sites) that may be suitable for translocations, including both modelled and experimental approaches (for example, 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 (for example, introduction of diseases, pests and/or pathogens, and invasiveness of the species).

Links to relevant implementation documents

Arrive clean, leave clean (2015)

Guidelines for the translocation of threatened plants in Australia (Australian Network for Plant Conservation 2018)

Plant germplasm conservation in Australia: strategies and guidelines for developing, managing and utilising ex situ collections (2021)

Recovery plan for nationally threatened plant species on Kangaroo Island South Australia (2012)

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

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

Attachment A: Listing Assessment for *Pultenaea insularis*

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 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	504	504	> 504	The number of mature individuals used in the assessment, and the minimum plausible value, are based on the findings of the 2022 survey of all known subpopulations by Davies (2023) and observations by Duval (2023, pers comm, 12 September). The maximum plausible value is greater than 504 mature individuals as unrecorded plants may exist.
Trend	Declining			The size of the Beyeria CP subpopulation has reduced from ~600 in 1995 to 321 in 2022 (Davies 2023). Furthermore, the roadside subpopulations have reduced from over 307 in 1996 (Davies 1996) to 168 in 2022/23 (NB. this includes plants from the subpopulation at the southern end of Elsegood Road and on adjoining Lovering Road, which was not surveyed in 1995/96) (Davies 2023; Duval 2023, pers comm, 12 September). Excluding the two small subpopulations which were not surveyed in 1995/96 (Kingscote Airport (n = 15), and Southern end of Elsegood Road and on adjoining Lovering Road (n = 20)), the reduction in total population size from 1995/96 to 2022/23 is from 907 to 469, or 48%. Note that to include the Kingscote Airport subpopulation and the Southern end of Elsegood Road and on

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
				adjoining Lovering Road subpopulation in the calculation, and assume no reduction in their size between 1995/96 and 2022 (that is, from 942 plants to 504), would still result in a 46% reduction in total population size. Duval (2023, pers comm, 8 May) outlined that many understorey plant species in Kangaroo Island narrow-leaved mallee woodland will see standing mature plant numbers gradually decline in the absence of appropriate fire and disturbance and that species will eventually be present in the persistent soil seed bank only. However, no estimates are available of the soil seed bank density and viability of Beyeria bush-pea. The rate of soil seed bank senescence is also unknown.
Generation time (years)	12–16	12	16	Generation length is unknown. Primary juvenile period is estimated to be between 2 and 7 years (Clarke et al. 2009; Muir et al. 2014; Duval 2024, pers comm, 18 April) and lifespan under 50 years (Muir et al. 2014) based on other *Pultenaea* species. Based on this, a range estimate of generation length can be calculated using the IUCN (2022) formula: primary juvenile period + [z*(reproductive lifespan)] where the reproductive value, z, is 0.21 based on other woody shrubs (Fung & Waples 2017). This gives an estimated range of: Minimum: 2 + [0.21*(50 - 2)] = 12.1 years Maximum: 7 + [0.21*(50 - 7)] = 16.0 years The generation length used in the assessment is 12–16 years.
Extent of occurrence (EOO)	69 km^2	69 km^2	69 km^2	Extent of Occurrence estimates have been calculated by fitting a minimum convex polygon around all reliable records, as per IUCN guidelines (IUCN 2022). The minimum and maximum EOO is 69 km^2 which is based on only extant subpopulations, as observed in 2022/23 (Davies 2023; Duval 2023, pers comm, 12 September). This is the EOO used in the assessment. Addition of the roadside subpopulation at Wheatons Road west of Elsegood Road, surveyed in 1996 (Davies 1996) but not seen in 2022 surveys (Davies 2023), to the EOO calculations would not substantially increase the value.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Trend	Contracting			The Wheatons Road subpopulation lost all standing plants between 1996 and 2022 (Davies 1996, 2023), causing the EOO to contract to 69 km^2. Under current management practices the EOO is expected to continue contracting.
Area of Occupancy[1] (AOO)	36 km^2	36 km^2	40 km^2	The AOO estimates have been calculated based on species records occupying 2 x 2 km grid cells as per IUCN Guidelines (2022). The minimum AOO is 36 km^2 which based on only extant subpopulations, as surveyed in 2022/23 (Davies 2023; Duval 2023, pers comm, 12 September). This is the AOO used in the assessment The maximum AOO is 40 km^2 and includes the addition of the roadside subpopulation at Wheatons Road west of Elsegood Road, surveyed in 1996 (Davies 1996) but not seen in 2022 surveys (Davies 2023). This subpopulation has not been seen in recent surveys so has not been included in the AOO estimate used in this assessment.
Trend	Contracting			The Wheatons Road subpopulation lost all standing plants between 1996 and 2022 (Davies 1996, 2023), causing the AOO to contract from 40 km^2 to 36 km^2 in that period. Under current management practices the AOO is expected to continue contracting.
Number of subpopulations	5	5	5	The minimum and maximum plausible value are the number of extant subpopulations recorded in 2022/23 (Davies 2023; Duval 2023, pers comm, 12 September) survey (Davies 2023).
Trend	Stable			The number of extant subpopulations has declined since 1996 but the current trend is stable.
Basis of assessment of subpopulation number	For the purposes of this conservation status assessment, all plants of the species < 1 km apart are grouped as part of a single subpopulation, assuming any insect pollinator is unlikely to travel more than 1 km, and seed is unlikely to be transferred more than a few metres. Furthermore, subpopulations have only been recorded where standing plants are present as of 2022/23.			
No. locations	3	1	5	The most serious plausible threat which could rapidly (within a single generation) affect all Beyeria bush-pea individuals is the invasion by escaped garden plants, namely bridal veil and bridal creeper. This threat exists across all extant subpopulations (Davies 2023). These weed species have been a major threat at all extant subpopulations since at least 1996 (Davies 1996, 2023)

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
				and have the ability to smother and outcompete Beyeria bush-pea plants with their dense root mats. All subpopulations surveyed in 1995/96 and 2022/23 saw declines in the number of Beyeria bush-pea plants across the period, including losses of 47% at Beyeria CP and 52% along roadsides. While it is expected that a soil seed bank exists where standing plants have been lost, the current fire and disturbance regime has not been successful at promoting recruitment and reversing losses of Beyeria bush-pea plants. Given that the impacts of bridal veil and/or bridal creeper have occurred across all subpopulations the threat could be considered a single weed "event" and, therefore, a single location. This is the minimum plausible value. The number of locations used in the assessment, however, is three. There are three land managers for the five subpopulations so there are likely three different approaches to weed management and three different possibilities for the level of mitigations. The maximum number of locations is five given that the five subpopulations may respond differently to weed management techniques.
Trend	Stable			The number of locations is not expected to increase or decrease in the near future.
Basis of assessment of location number	See justification.			
Fragmentation	The species is severely fragmented. All five extant subpopulations occur at least 2 km apart in habitat patches separated by cropping and grazing land. Seed dispersal is inferred to be highly localised (via ants), therefore, subpopulations are isolated. Furthermore, three of the five extant subpopulations comprise very few individuals (20 plants or less). Most of the species' AOO is in habitat patches that are smaller than would be required to support a viable population (for example, narrow strips of roadside vegetation habitat).			
Fluctuations	The species is not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals, and no parameter would be changed by an order of magnitude by any plausible threat.			

[1] 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. It is not a fine-scale estimate of the actual area occupied. 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.
In some cases, AOO is the smallest area essential at any stage to the survival of existing populations of a taxon (for example, breeding sites for migratory species). For further information see IUCN Standards and Petitions Committee (2019).

Criterion 1 Population size reduction (*IUCN Criterion A*)

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%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND have ceased.

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.

A3 Population reduction, projected, inferred or suspected to be met in the future (up to a maximum of 100 years) [*(a) cannot be used for A3*]

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.

Based on any of the following

(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

Source: IUCN Red List Criteria used to evaluate if taxon is eligible to be included in an IUCN Red List threatened category (Critically Endangered, Endangered or Vulnerable).

Criterion 1 evidence

Eligible under Criterion 1 A4ace for listing as Endangered

The generation length of the species is estimated at 12–16 years giving a three-generation period of 36–48 years. The total number of mature individuals of Beyeria bush-pea has reduced by at least 46% over the period from 1995/96 to 2022/23 (see Table 4) primarily due to invasion by the weeds bridal veil and bridal creeper. These weeds are still threats across all extant subpopulations (Davies 2023) and it is reasonable to assume that their impacts will not cease or decrease significantly over the next 10–15 years. Therefore, the rate of decline in the total number of mature individuals over the three-generation period between 1995/96 and 2031–2043 is likely greater than 50%.

The total past population reduction is a direct observation, and there is also an observed past decline in AOO, EOO (see Table 4) and quality of habitat primarily from the threats of weed invasion and roadside maintenance activities. These declines are projected to continue into the future.

The Committee considers that the species will undergo a severe reduction (> 50%) in the total number of individuals over three generations from 1995/96 to 2031–2043. Furthermore, the

causes of the reduction have not ceased. Therefore, the species has met the relevant elements of Criterion 1 to make it eligible for listing as Endangered.

Criterion 2 Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy (*IUCN Criterion B*)

		Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1.	Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**
B2.	Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**
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			

Source: IUCN Red List Criteria used to evaluate if taxon is eligible to be included in an IUCN Red List threatened category (Critically Endangered, Endangered or Vulnerable).

Criterion 2 evidence

Eligible under Criterion 2 B1ab(i,ii,iii,iv,v) for listing as Critically Endangered

The EOO is estimated to be 69 km² and the AOO is estimated to be 36 km² (see Table 4) meeting the threshold for Critically Endangered for EOO (< 100 km²) and Endangered for AOO (< 500 km²).

In addition to these thresholds, at least two of the following three conditions must be met.

Severely fragmented and number of locations

The species is severely fragmented and the number of locations is three (see Table 4).

Continuing decline

As outlined in Table 4, there have been recent declines (over the period from 1995/96 to 2022/23) in the number of subpopulations of the species from six to five (with accompanying contractions in AOO and EOO) and the number of mature individuals. Over the same period the area, extent and quality of habitat have declined primarily due to weed invasion and roadside maintenance activities. These declines are expected to continue under current management practices.

Extreme fluctuations

Extreme fluctuations in EOO, AOO, number of subpopulations or locations and mature individuals are unlikely.

The Committee considers that the species' EOO is very restricted, the species' distribution is severely fragmented and continuing decline is observed in the EOO, AOO, area, extent and quality of habitat, number of subpopulations and the number of mature individuals. Therefore, the species has met the relevant elements of Criterion 2 to make it eligible for listing as Critically Endangered.

Criterion 3 Population size and decline (*IUCN Criterion C*)

		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 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[1] based on at least 1 of the following 3 conditions:				
(a)	(i) Number of mature individuals in each subpopulation	**≤ 50**	**≤ 250**	**≤ 1,000**
	(ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**
(b) Extreme fluctuations in the number of mature individuals				

[1] The IUCN Red List Criterion C does not allow for the provision for 'geographic distribution is precarious for its survival'. The corresponding Criterion 3 in the EPBC Regulations currently includes the provision for considering the geographic distribution impact on the survival of the species.

Criterion 3 evidence

Eligible under Criterion 3 C1 for listing as Endangered

The estimated total number of mature individuals of this species is low (approximately 504) and there is a recent) observed high rate of continuing decline (46%) in the number of mature individuals between 1995/96 and 2022/23 (26–28 years). Two generations for the species is 24–32 years, meaning this 46% decline has occurred within two generations.

The Committee considers that the estimated total number of mature individuals of this species is low and is experiencing is a recent, observed, high rate of continuing decline. Therefore, the species has met the relevant elements of Criterion 3 to make it eligible for listing as Endangered.

Criterion 4 Number of mature individuals (*IUCN Criterion D*)

	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+2 for listing as Vulnerable

The total number of mature individuals is 504, which is low. Therefore, the species has met the relevant elements of Criterion 4 to make it eligible for listing as D Vulnerable.

The number of locations is three and, given the current rate of decline, there is a plausible future threat (invasive weeds) that could drive the species to Critically Endangered or Extinct in a very short time (N.B. the species already qualifies for listing as Critically Endangered under Criterion 2). Therefore, the species has met the relevant elements of Criterion 4 to make it eligible for listing as D2 Vulnerable.

However, EPBC regulations do not currently include provisions for listing species under subcriterion D2 (see [1]).

Criterion 5 Quantitative analysis (*IUCN Criterion E*)

	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

Source: IUCN Red List Criteria used to evaluate if taxon is eligible to be included in a IUCN Red List threatened category (Critically Endangered, Endangered or Vulnerable).

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 species for listing in any category under this criterion.

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 made. The purpose of this consultation document is to elicit additional information to help inform the decision.

Cataloguing data

This publication (and any material sourced from it) should be attributed as: Department of Climate Change, Energy, the Environment and Water 2024, Conservation Advice for *Pultenaea insularis* (Beyeria bush-pea), Canberra.

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