

## Nomination to change the conservation class of a species under the Queensland *Nature Conservation Act 1992*

Complete this form to nominate a species for assessment of its conservation class under the *Nature Conservation Act 1992* (NC Act). Any subspecies, variety, race, hybrid, mutation or geographically separate population (hereafter 'species') can be nominated. The appropriate conservation class will be selected during an expert assessment process and, following approval processes, reflected in the next suitable update of the NC Act.

A species may be nominated to an appropriate conservation class from any other conservation class. The nomination assessment process may result in a species being recommended to the conservation class as nominated, or to a class better supported by scientific data and expert opinion. Assessments and nominations will be shared with the Commonwealth and other Australian jurisdictions within the species' distribution.

All plant and vertebrate species native to Queensland are protected under the NC Act and classified as Least Concern unless found eligible for a different conservation class. Invertebrate species are only protected under the NC Act if specifically named under a conservation class. A species can be nominated for listing or reassignment from any conservation class to:

A national threat category:

- Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (E) or Vulnerable (V) if it meets at least one of the International Union for Conservation of Nature (IUCN) criteria for species at risk of extinction

A state threat class:

- Near Threatened (NT) if the species meets at least one of the criteria for species at risk of becoming threatened in the future based on concerns relating to population dynamics or threats
- Least Concern (LC) if evidence is provided that no criteria for a higher class have been met, and the species won't become eligible for a higher class in the foreseeable future should conservation actions cease due to reclassification.

The assessment of species against the national threat categories reflected in this form complies with the [Memorandum of Understanding](#) for the Common Assessment Method (CAM) between the Commonwealth and Australian states and territories. The objective of the CAM is for partner jurisdictions to adopt each other's national assessments as appropriate. Information about the CAM can be found at <https://www.qld.gov.au/environment/plants-animals/wildlife-permits/common-assessment>.

To nominate a species with an Australian distribution that is not restricted to Queensland, use the nomination form and guidelines at <http://www.environment.gov.au/biodiversity/threatened/nominations/forms-and-guidelines> and email the completed form to the Australian Government at [EPBC.nominations@environment.gov.au](mailto:EPBC.nominations@environment.gov.au).

## Important notes for completing this form

- **To enable a species eligibility for listing to be assessed against the criteria, please complete the form as comprehensively as possible by providing a response in each box with an orange border.**
- Completing a nomination is a demanding task. Nominators are encouraged to seek advice from experts where appropriate to assist in completing the nomination form.
- The opinion of scientific experts may be cited as personal communication with their approval. Please provide the experts names, qualifications and contact details (including employment in a government agency if relevant) in the reference list at the end of the form.
- Include any available information and analysis or state when the required information is not available.
- Figures, tables and maps can be included at the end of the form or provided as separate electronic files or hardcopy documents (referenced as appendices or attachments in your nomination).
- Cross-reference relevant areas of the nomination form where needed.
- **Reference all information sources**, both in the text and in a reference list at the end of the form.
- Identify confidential material and the reason it is sensitive. With the exception of information you have identified as confidential, nominations under the CAM process may be made available by a state, territory or the Commonwealth Government to experts or the public for comment.
- If the species is listed nationally, the Australian Government will publish nomination information on its website. Your details as nominator will not be released and will be treated as confidential information.
- Guidance on interpreting this nomination form can be found in the “*Guidelines for Assessing the Conservation Status of Native Species*” developed by the Australian Government under the EPBC Act here <http://www.environment.gov.au/biodiversity/threatened/nominations/forms-and-guidelines>. Although not fully relevant under the NC Act, the guidelines provide assistance on several aspects of this form. Please email [SpeciesTechnical.Committee@des.qld.gov](mailto:SpeciesTechnical.Committee@des.qld.gov) for further advice on completing the nomination.

## Further information on selected questions

### INTRODUCTION

Species native to Queensland may be nominated to any conservation class under the NC Act, including to transfer between classes. If the taxon at risk is a population or hybrid, or if you wish to know if it has been unsuccessfully nominated under the NC Act in the past, please contact the Queensland Department of Environment and Science for advice at [SpeciesTechnical.Committee@des.qld.gov.au](mailto:SpeciesTechnical.Committee@des.qld.gov.au).

To search for a species' conservation class under the NC Act please refer to the *Nature Conservation (Wildlife) Regulation 2006*: <https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2006-0206>.

You can also search the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of threatened species in the Species Profile and Threats Database (SPRAT) at [www.environment.gov.au/cgi-bin/sprat/public/sprat.pl](http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl).

The full lists of threatened fauna and flora under the EPBC Act are available here:  
[www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna](http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna)  
[www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora](http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora).

You can find a list of nominated species that did not meet the assessment criteria for listing under the EPBC Act at [www.environment.gov.au/biodiversity/threatened/unsuccessful-species.html](http://www.environment.gov.au/biodiversity/threatened/unsuccessful-species.html).

**A nomination to transfer a species from a threatened conservation class to Least Concern or Near Threatened under the NC Act need not address sections marked with an asterisk (\*).**

## SCIENTIFIC AND COMMON NAMES OF NOMINATED SPECIES

- Provide the currently accepted scientific and common name(s) for the species (including Indigenous names, where known). Note any other scientific names that have been used recently such as superseded names.

## TAXONOMY

- Record the species' authority and the taxonomic group to which it belongs (Family name is sufficient for plants; both Order and Family name are required for fauna).
- Is the species known to hybridise with other species? Describe any cross-breeding with other species in the wild, indicating where and how frequently this occurs.

## DISTRIBUTION

- In accordance with the CAM, the Commonwealth is the default assessment 'lead' for species occurring across multiple Australian jurisdictions, and the nomination will be subject to the prioritisation and assessment process under the EPBC Act. Download the nomination form here <http://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/nomination-form-species.pdf>, and email it to [epbc.nominations@environment.gov.au](mailto:epbc.nominations@environment.gov.au). Further information on the EPBC Act nomination, prioritisation and assessment process is available at <http://www.environment.gov.au/biodiversity/threatened/nominations>.  
Note: where the relevant jurisdictions agree, a State or Territory (rather than the Commonwealth) may take the lead on assessing a cross-jurisdictional species, in consultation with the Commonwealth and other jurisdictions.
- A nomination for a species endemic to Queensland or with its only Australian distribution in Queensland, for example a species only occurring in Queensland and Papua New Guinea, can be assessed under the NC Act. Please submit your completed nomination form to [SpeciesTechnical.Committee@des.qld.gov.au](mailto:SpeciesTechnical.Committee@des.qld.gov.au).
- Describe the species' current geographic distribution within Queensland, and where applicable, outside Australia.
- Provide a map, if available, indicating latitude, longitude, map datum and location names
  - Indicate the percentage of the global population that occurs in Queensland, and what is its significance?
  - Is the Queensland population distinct, geographically isolated, or does part or all of the population migrate into/out of the Queensland jurisdiction?
  - Explain the relationship between the Queensland population and the global population.
  - Do global threats affect the Queensland population?
- Give locations of other existing or proposed populations such as populations that are captive, propagated, naturalised outside their range, recently re-introduced to the wild, and planned to be re-introduced. Note if these sites have been identified in recovery plans. Provide latitude, longitude, map datum and location name, where available, in an attached table.
- Give details of fauna species' home ranges/territories including any relevant daily and seasonal or irregular movement patterns, such as arrival/departure dates if migratory.
- Does the species occur within an EPBC Act listed ecological community? You will find a list of EPBC Act listed ecological communities here: [www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl](http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl).

## BIOLOGY/ECOLOGY

- **Life cycle:** Provide detail on the age at sexual maturity, average life expectancy, natural mortality rates, and generation length
  - “*Generation length*” is defined as the average age of parents of the current cohort (i.e. newborn individuals in the population), and reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in species that breed only once. Where generation length varies under threat, use the more natural pre-disturbance generation length. It is often calculated as = (longevity + age at maturity)/2. Provide details of the method(s) used to calculate the generation length.
- **Reproduction:** Provide detail on the reproductive requirements of this species.
  - **Flora:** When does the species flower and set fruit? What conditions are needed for this? What are the pollinating and seed dispersal mechanisms? If the species reproduces vegetatively, describe when, how and what conditions are needed. Does the species require a disturbance regime (e.g. fire, cleared ground) to reproduce?
  - **Fauna:** provide an overview of the species' breeding system and breeding success, including: when it breeds; what conditions are needed for breeding; whether there are any breeding behaviours that may make it vulnerable to a threatening process.
- **Habitat**
  - Provide information on aspect, topography, substrate, climate, forest type, associated species, sympatric species and anything else that is relevant to the species' habitat.
  - Explain how habitats are used (e.g. breeding, feeding, roosting, dispersing, basking, etc.).
  - Does the species use refuge habitat (e.g. in times of fire, drought or flood)? Describe this habitat.
- **Feeding (fauna):**

- Summarise the feeding behaviours, diet, and the timing/seasonality associated with these. Include any behaviour that may make the species vulnerable to a threatening process.
- **Movement (fauna):** provide information on daily and seasonal movement patterns.

## IDENTIFICATION OF KNOWN THREATS AND IMPACTS OF THE THREATS

- For each threat, describe:
  - a. whether it is actual or potential
  - b. how and where it impacts on this species
  - c. what its effect has been so far (is the threat known or suspected?, does it only affect certain populations?) Present supporting information/research).
  - d. its expected effect in the future (is the threat known or suspected?, does it only affect certain populations?, is there supporting research/information?) Present supporting information/research).
  - e. its relative importance or the magnitude of the impact on the species.
- Identify and explain any additional biological characteristics particular to the species that are threatening to its survival (e.g. low genetic diversity).
- If subject to natural catastrophic events, i.e. events with a low predictability that are likely to severely affect the species, identify the type of event, its likely impact, and its likelihood of occurrence (e.g. a drought/cyclone in the area every 100 years). If **climate change** is an important threat to the species, provide referenced information on how climate change might significantly increase the species' vulnerability to extinction. Please refer to the *Guidelines for Assessing the Conservation Status of Native Species*:  
<http://www.environment.gov.au/system/files/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2018.pdf>.

## \*CONSERVATION ADVICE: THREAT ABATEMENT AND RECOVERY ACTIONS

- Describe how threats are or could be abated and/or species recovered.
- Identify who is undertaking these activities and how successful the activities have been to date.
- Describe any mitigation measures or approaches that have been developed specifically for the species at identified locations. Identify who is undertaking these activities and how successful the activities have been to date.
- For species nominated as Extinct in the Wild, provide location details for any naturalised or captive populations and the level of human intervention required to sustain the species.

## IMPACT OF TRANSFERRING A THREATENED SPECIES TO NEAR THREATENED OR LEAST CONCERN

- Only complete this section if you are nominating a species for transfer to Near Threatened or Least Concern from a class of nationally threatened wildlife (Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable).
- Provide details of the expected impact on the species if conservation actions ceased following its transfer out of a threatened wildlife class.

## CURRENT LISTING CLASS AND CATEGORY

- Note: The term 'class' under the NC Act is equivalent to the term 'category' under the EPBC Act.
- Select the species' current class under the NC Act where applicable. Search the species' NC Act class here: <https://www.legislation.qld.gov.au/view/html/inforce/current/sl-2006-0206>.
- Select the species' current category under the EPBC Act where applicable. Search the Australian Government SPRAT Database here: [www.environment.gov.au/cgi-bin/sprat/public/sprat.pl](http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl).

## NOMINATED LISTING CLASS

- **After completing the section 'Eligibility against the criteria'** sufficient evidence should be available to determine your response to this section. Please select the NC Act class to which the species is being nominated.

## REASONS FOR A NOMINATION TO TRANSFER TO ANOTHER CLASS

Please describe why the species is being nominated to transfer to another conservation class in Queensland:

- *Genuine.* The change in class is the result of a genuine status change that has taken place since the previous assessment. For example, the change is due to an increase in the rate of decline, a decrease in population or range size or habitat, or declines in these for the first time (owing to increasing/new threats).
- *Knowledge.* The change in class is the result of new knowledge, e.g. owing to new or newly synthesised information about the status of the taxon (e.g. better estimates for population size, range size or rate of decline).
- *Taxonomy.* The change in class is due to a taxonomic change adopted during the period since the previous assessment. Such changes include:

- *newly split* (the taxon is newly elevated to species level)
- *newly described* (the taxon is newly described as a species)
- *newly lumped* (the taxon is recognised following lumping of two previously recognised taxa)
- *no longer valid/recognised* (either the taxon is no longer valid, e.g. because it is now considered to be a hybrid, variant form or subspecies of another species, or the previously recognised taxon differs from a currently recognised one as a result of a split or lump).
- *Mistake*. The previous class was applied in error.
- *Other*. The change in class is the result of other reasons not easily covered by the above, and/or requires further explanation. Examples include change in assessor's attitude to risk and uncertainty.

## INITIAL LISTING

- The reasons for the initial NC Act listing may be available in the original nomination for the species. This can be obtained by emailing the Department of Environment and Science's Species Technical Committee at [SpeciesTechnical.Committee@des.qld.gov.au](mailto:SpeciesTechnical.Committee@des.qld.gov.au).
- The reasons for EPBC Act listing may also be available. Search for the species' EPBC Act listing and conservation advice for threatened species in the SPRAT Database [www.environment.gov.au/cgi-bin/sprat/public/sprat.pl](http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl).
- If there is insufficient information to provide details of the reasons for the original listing, please state this.

## CHANGES IN SITUATION LEADING TO THE NOMINATION TO TRANSFER TO ANOTHER CLASS

- Describe the changes that have occurred or are likely to occur to the species' population, range or habitat that influence the nomination to change the species' conservation class.

## ELIGIBILITY AGAINST CRITERIA

- For a species to be eligible as Near Threatened or a class of threatened wildlife, it must be assessed as meeting **at least one** of the five 'criteria' on this nomination form. For example, for a species listed as Vulnerable to be transferred to the Endangered class, it must meet the threshold/s for at least one of the five criteria for Endangered.
- A species does not have to be found eligible for the same class under all criteria; however, all questions must be answered. If information is not available for a particular criterion, a statement to this effect is required.
- If you hold unpublished data that support assessment of a criterion, you must provide them with the nomination.
- Standards for assessing a species' conservation status in Australia align with the IUCN Red List Criteria and Categories. Please refer to the IUCN guidelines for explanations of how to address the criteria <http://s3.amazonaws.com/iucnredlist-newcms/staging/public/attachments/3151/redlistguidelines.pdf>.

## DECLARATION

In signing this nomination form, you agree to grant the Queensland Government (as represented by the Department of Environment and Science) a perpetual, non-exclusive, worldwide, royalty-free licence to use, reproduce, publish, communicate and distribute information that you have provided in the nomination form that is not referenced to other sources with the exception of information specifically identified by you as confidential, in websites and publications and to promote those websites and publications in any medium.

As nominator, your details are automatically subject to the provisions of the *Privacy Act 1988* and will not be divulged to third parties. The Commonwealth, State and Territory governments have agreed to collaborate on national threatened species assessments using the CAM. As part of this collaboration, your nomination, including your details as nominator, may be provided to other government jurisdictions, who will also observe these privacy and confidentiality arrangements.

If you subsequently agree to be cited as the author of specific, cited information, you will be acknowledged in all publications and websites in which that information appears, in a manner consistent with the *Style Manual for Authors, Editors and Printers* (latest edition).

# Nomination form to change the conservation class of a species in Queensland

## Details of the nominated species

### SCIENTIFIC NAME OF SPECIES (SUBSPECIES, VARIETY, ETC. TO BE SPECIFIED WHERE RELEVANT)

*Zieria exsul* Duretto & P.I.Forst.

### COMMON NAME(S)

Banished Stink Bush

### TAXONOMY

Provide any relevant detail on the species' taxonomy (e.g. authors of taxon or naming authority, year and reference; synonyms; Family and Order).

*Zieria exsul* Duretto & P.I.Forst., *Austrobaileya* 7: 502 (2007).

### \*CONVENTIONAL ACCEPTANCE OF TAXONOMY

Is the species' taxonomy conventionally accepted?

Yes

No

If the species is not conventionally accepted, please provide the following information:

- a taxonomic description of the species in a form suitable for publication in conventional scientific literature

OR

- evidence that a scientific institution has a specimen of the species, and a written statement signed by a person who is a taxonomist and has relevant expertise (has worked with, or is a published author on, the group of species nominated) that the species is considered to be a new species.

Not applicable

### \*DESCRIPTION

Provide a description of the species. Include where relevant its distinguishing features, size and social structure.

How distinct is this species in its appearance from other species? How likely is it to be misidentified?

Shrub to 60 cm tall forming an open, straggly bush. Stems erect to decumbent, spindly; branches without decurrent leaf bases, not obviously glandular, with a sparse to moderately dense indumentum of simple, bifid to stellate hairs. Leaves palmately trifoliolate, not obviously glandular though weakly pellucid gland dotted; petioles 2–3 mm long, sparsely pilose; terminal leaflets obovate, 10–16 × 2.5–5 mm, tips acute to apiculate, margins recurved to revolute, midrib and some secondary veins raised abaxially, adaxial surfaces sparsely pilose, abaxial surfaces densely stellate tomentose; lateral leaflets similar to terminal leaflets but smaller, 5–12 × 2–4 mm. Inflorescence axillary, longer than the subtending leaf, 1–12-flowered, not or weakly glandular verrucose, glabrous; peduncle 10–19 mm long; bracts linear-lanceolate, persistent, 2–2.5 mm long; secondary peduncles 3–10 mm long; pedicels 1.3–2.5 mm long, not obviously glandular, glabrous and slightly glaucous. Sepals ovate-triangular, 1–1.2 × 0.8–1 mm, valvate in bud, not glandular tuberculate, tips acute and inflexed, adaxial surfaces minutely pilose, becoming glabrous towards centre, abaxial surfaces glabrous and slightly glaucous. Petals elliptic, 2–2.5 × c. 1.5 mm, white though drying pink, valvate in bud, not obviously glandular, adaxial surfaces minutely pilose, abaxial surfaces densely stellate-tomentose. Staminal filaments c. 0.7 mm long, glabrous, eglandular; anthers c. 0.5 mm long, apiculum absent. Gynoecium glabrous. Cocci 3–5 × 2–2.5 mm, slightly glandular verrucose, glabrous, base of style persistent forming a minute apical apiculum. Seeds oblong-ovoid, 2.8–3 × 1.4–1.5 mm, longitudinally striate, dark-brown (Duretto & Forster 2007).

Not likely to be misidentified. An identification key to *Zieria* in Queensland was provided by Duretto & Forster (2007), and an overall key to the Australian species is provided by George *et al.* (2013). The southern-most location near Eimbah is notable for plants that have fewer glands on the foliage.

*Zieria exsul* may represent a 'neo-endemic' species (Duretto & Forster 2007) that has evolved from a stabilised hybrid between *Z. laxiflora* and *Z. minutiflora*; however, it is usually only found in association with the second of these two species. *Z. exsul* produces fruit and seed and does not demonstrate introgression (Harrison & Larson 2014) to either parent, although reproductive fertility remains to be determined. A targeted conservation

genetics study is required of this species as the broad scale studies of genetic variation in *Zieria* by Barrett *et al.* 2014, 2018) indicate complex patterns with incomplete lineage sorting within the genus and a taxonomy that is not necessarily congruous with the parts of the genome examined so far.

## DISTRIBUTION

Provide a succinct overview of the species' known or estimated current and past distribution, including international/national distribution. Provide a map if available.

Is the species' habitat protected within the reserve system (e.g. national parks, Indigenous Protected Areas, or other conservation estates, private land covenants, etc.)? If so, which populations? Which reserves are actively managed for this species? To your knowledge, which reserves are being actively managed in way that provides incidental benefits for this species? Give details.

*Zieria exsul* is endemic to the Sunshine Coast of south-east Queensland, Australia where it is known from four locations<sup>1</sup> (with sublocations) from Mooloolaba in the north to Elimbah in the south (**Map 1**). These four locations are broadly known as Mooloolaba (1), Palmview (2), Currumundi (3) and Elimbah (4). It is likely that the species was more widespread in the ancient (before European settlement) past as the four locations are disjunct indicating a species that had already become fragmented into discrete subpopulations<sup>2</sup>. In the recent (last 120 years) past of European land settlement, the habitat for this species has been extensively cleared for agriculture, housing and infrastructure in south-east Queensland.

At location 1 (Mooloolaba), the species occurs in three discrete sublocations over c. 2.5 km distance, spread over three land tenures (road reserve, state land, private freehold land).

At location 2 (Palmview), the species occurs in four sublocations within the Palmview Conservation Park; these are all likely to be part of the one subpopulation.

At location 3 (Currumundi), the species occurs at one sublocation on private freehold land.

At location 4 (Elimbah), the species occurs at one sublocation in a road reserve.

Locations 1 to 3 are within the Sunshine Coast Regional Council jurisdiction. Location 4 is within the Moreton Bay Regional Council jurisdiction.

**Conservation Reserves:** The species is present in Palmview Conservation Park; all other locations (or sublocations thereof) are in road reserves (1, 3, 4) managed by regional councils or on private land (1, 3).

No reserves are being actively managed for this species, apart from a cessation of broadscale vegetation clearing.

<sup>1</sup>For a definition of location and sublocation see next box

<sup>2</sup>For a definition of population and subpopulation see next box

## BIOLOGY/ECOLOGY

Provide a summary of biological and ecological information.

Include information on:

- life cycle including age at sexual maturity, life expectancy and natural mortality rates
- specific biological characteristics
- the species' habitat requirements
- for fauna: feeding behaviour and food preference and daily/seasonal movement patterns
- for flora: pollination and seed dispersal patterns

### **Life cycle**

*Zieria exsul* is a short-lived perennial shrub. It is sexually mature under ideal conditions at approximately two years from seed germination. Life expectancy and natural mortality rates are unknown; however, it is unlikely that individuals persist beyond ten years of age. The species is killed by moderate to intense fires and appears to be an obligate seeder requiring recruitment from the soil seed bank. It is likely that the species requires infrequent natural disturbance in the habitat as would occur by fire reducing the above ground biomass. The species is short lived and the presence of individuals at any sublocation is probably dependent on the fire history.

**Habitat:** *Zieria exsul* is restricted to lowland wallum woodland and open forest on sandy substrates that are often seasonally waterlogged. Dominant canopy species include *Corymbia intermedia*, *Eucalyptus racemosa*, *E. robusta*, *Syncarpia glomulifera*, with the mid and under storeys usually quite dense with a high diversity of wallum species. Individuals of *Z. exsul* have been usually found in ecotonal areas between continuously moist areas and higher better drained habitats.

*Reproductive biology:* *Zieria exsul* has bisexual flowers and is most probably obligately outbreeding. *Zieria exsul* is thought to be an 'obligate seeder' as are a number of other species in the genus (Duretto & Forster 2007), with recruitment after fire being dependent on the soil seed bank. The small regular flowers are not morphologically specialised and fit the syndrome for pollination by small invertebrates such as bees and flies; however, pollination remains unstudied. The capsular fruit release the seed locally and it is assumed that most fall close to the parent plant. The seeds (as with all species of *Zieria*), have an ant attractive elaiosome. Dispersal remains unstudied; however, long range dispersal (i.e. beyond 100 m from the parent individual as defined by Cain *et al.* 2000) is thought unlikely with the species unable to cross large habitat gaps in short periods of time.

Following Rabinowitz *et al.* (1986) 'seven forms of rarity' classification, *Zieria exsul* can be categorised as having a narrow distribution with a restricted habitat type and small local populations.

### Definition of Critical Terms

#### **The context of species and the listing process**

"Species can be defined as populations that are diagnosably distinct, reproductively isolated, cohesive, or exclusive groups of organisms" (Harrison & Larson 2014).

All species (or lesser taxonomic categories of biological classification) have an evolutionary origin and existence in terms of time and space. All species have periods of range expansion, followed by fragmentation, reduction and eventual extinction (Levin 2000). Many of the species that are dealt with in respect to the listing process are already well advanced towards the final stage where the different subpopulations have become fragmented and are now restricted to small areas of suitable habitat. This may contrast to species where the primary threatening process has been habitat destruction.

**Individual:** A genetically discrete organism (within the genetic and morphological confines of a species, subspecies or variety: collectively taxon) that has arisen from sexual reproduction, *viz.* a seed. Individuals may spatially comprise singletons (i.e. a tree by itself) or may comprise many ramets that lack physical connection (i.e. clonal disintegration). It should be noted that for plants, many 'individuals' are genetically essentially indistinguishable due to inbreeding and the accumulation of similar genes or the mode of seed reproduction (e.g. apomixis).

**Location:** The IUCN clearly defines a location in terms of conservation status listing, *viz.* "The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat" (IUCN 2012). A 'sublocation' is part of a greater 'location' and often comprises discrete collection spots (e.g. along a road reserve at discontinuous intervals).

**Population:** The IUCN clearly defines a population, *viz.* "The term 'population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only" (IUCN 2012). In the absence of genetic data, disjunct locality/location records (those that are separated by gaps of different ecological habitat, i.e. Regional Ecosystems where the taxon is absent and unable to easily disperse across the gap) are considered to represent subpopulations. A population or subpopulation may consist of one to many individuals (this by definition means that a taxon can be a single individual). Greatly disjunct subpopulations or groups of subpopulations are inferred (in the absence of genetic analysis) to harbour significant genetic variation due to historical patterns of genetic drift, and may equate to metapopulations (see next).

**Metapopulation:** One or many subpopulations (geographically contiguous or disjunct) that share genetic connectivity (i.e. unique gene combinations as often quantified by the distribution of haplotypes<sup>4</sup>). A taxon that has population groups in e.g. the Wet Tropics and Border Ranges, would be inferred to comprise several metapopulations unless genetic analysis proved otherwise. The ultimate aim of species conservation biology is to conserve the different subpopulations and genetic variation (total taxon variation and subpopulation variation). The greater the genetic variation within a taxon or subpopulation, then the greater potential exists for 'adaptation' in response to stochastic events (e.g. climate change). A taxon may comprise one to many metapopulations. The number of metapopulations may or may not be equivalent to the number of subpopulations and it should be noted that the two concepts are not the same in biology.

**Genetic Variation:** Total variation (100%) for a taxon is the variation that was present prior to the impact of the threatening processes (e.g. post European settlement in Australia and resultant land clearing/alteration; climate variation causing death of individuals, subpopulations etc., e.g. widespread eucalypt deaths in droughts). This

does not take into account ongoing genetic diversification that may result from factors such as mutation or introgression. Genetic variation can be measured in various ways (allozymes, discrete DNA regions of the genome) and the variation numerically quantified thus enabling comparison of individuals, subpopulations and metapopulations. Taxa that have been highly fragmented and severely impacted from recent human mediated actions may retain significant levels of variation, despite small population sizes (e.g. *Gossia gonoclada*), with the inference being that due to the slow mode of reproduction; incipient inbreeding and the accumulation of deleterious gene combinations has not yet had a chance to occur. In general, higher levels of fragmentation and destruction of subpopulations and individuals results in reduced genetic variation, especially in the longer term through attrition of unique individuals and gene combinations. It should also be noted that natural threatening processes (e.g. drought; or incipient inbreeding due to isolation and small population size) will result in the loss of genetic variation.

<sup>4</sup>A haplotype is a set of DNA variations, or polymorphisms, that tend to be inherited together. A haplotype can refer to a combination of alleles or to a set of single nucleotide polymorphisms (SNPs) found on the same chromosome (<https://www.genome.gov/genetics-glossary/haplotype>).

## Threats

### IDENTIFICATION OF KNOWN THREATS AND IMPACT OF THE THREATS

Identify any known threats to the species in the table below. Describe **past, current or future** threats, whether the threats are **actual or potential**, and the **type and level of impact** you believe each threat is having on the species.

Past threats	Impact of threat
Land clearing for agriculture.	This has been the primary past threat to the species, with the majority of the potential habitat long cleared at all locations for multiple agricultural uses especially sugar cane, non-native pine ( <i>Pinus spp.</i> ) plantations and cattle grazing.
Land clearing for housing and industrial development.	The Sunshine Coast in southeast Queensland has been and continues to be one of the fastest growing areas of housing and industrial development in the state (Mallawaarachchi <i>et al.</i> 2006; Spearritt 2009). The area of occurrence for <i>Zieria exsul</i> is highly fragmented with remnant vegetation greatly reduced and restricted to conservation reserves, road reserves and private land on multiple tenures. As a whole, this area of the Sunshine Coast can be considered to be subject to cumulative biodiversity impacts, i.e. "death by a thousand cuts" (Whitehead <i>et al.</i> 2017).
Fragmentation into subpopulations.	The species is known from four disjunct locations (some with sublocations) that are considered as four discrete subpopulations. These four locations are likely to be the result in part of natural processes of dispersal and fragmentation prior to European settlement. In the absence of genetic analysis it is not known if these subpopulations are equivalent to metapopulations or whether the entire population is a single metapopulation. The process of disjunct metapopulation formation is considered to represent a natural process by which species journey towards eventual extinction (Levin 2000). Within some of the four locations (aka subpopulations), the species has a highly fragmented distribution with multiple sublocalities. This is due in part to natural factors where not all species are distributed continuously due to habitat variation and historical factors such as fire history. However, in the case of <i>Zieria exsul</i> , the habitat at each location has been highly fragmented due to land clearing (see above).
Current threats	Impact of threat
Land clearing for agriculture.	Agriculture continues as a land use activity on the Sunshine Coast; however, it is rapidly being displaced by both housing and industrial development.
Land clearing for housing and industrial development.	The Sunshine Coast in southeast Queensland continues to be one of the fastest growing areas of housing and industrial development in the state (Mallawaarachchi <i>et al.</i> 2006; Spearritt 2009). The area of occurrence for <i>Zieria exsul</i> is highly fragmented with remnant vegetation greatly reduced and restricted to conservation reserves, road reserves and private land on multiple tenures. Immediately adjacent to the Palmview Conservation Park, land use covers infrastructure corridors (motorways, roads), housing developments, intensive agriculture (e.g. strawberries) and tourism theme parks. As a whole, this area of the Sunshine Coast can be considered to be subject to cumulative biodiversity impacts, i.e. "death by a thousand cuts" (Whitehead <i>et al.</i> 2017).
Land clearing for infrastructure.	Concomitant with the burgeoning housing and industrial development in the area of occurrence for <i>Zieria exsul</i> is an ever expanding infrastructure system of new and expanded road corridors. The area of occurrence for <i>Z. exsul</i> is already highly

	fragmented with remnant vegetation greatly reduced and restricted to conservation reserves, road reserves and private land on multiple tenures. Immediately adjacent to the Palmview Conservation Park, land use covers infrastructure corridors (motorways, roads), housing developments, intensive agriculture (e.g. strawberries) and tourism theme parks. As a whole, this area of the Sunshine Coast can be considered to be subject to cumulative biodiversity impacts, i.e. “death by a thousand cuts” (Whitehead <i>et al.</i> 2017).
Fire management.	In the case of singletons or handfuls of individuals in road reserves or along fence lines, these remain under direct threat from fires, particularly where the natural habitat has been replaced or is adjacent to an anthropogenic grassland of introduced pastures species that can carry a heavy fuel load. In some of the sublocations that occur in small remnants on private land or road reserves, it is likely that fire will be excluded except by error or deliberate illegal burns. Palmview Conservation Park is the only location where some form of fire management is in place; however, the location is entirely surrounded or bounded by other land uses and cleared land. Even if fire is excluded in the short term (which would not be ideal for the <i>Zieria</i> or many other of the lowland wallum species present) due to neighbouring concerns, it is likely that uncontrolled burns of the location are inevitable.
Genetic structure.	The conservation genetics of <i>Zieria exsul</i> remains unstudied. A natural progression of fragmentation is the loss of genetic diversity. This species has very few extant individuals at any one time and it is likely that genetic diversity is low overall.
Habitat quality.	The habitat is highly fragmented. Where this species has been found is often alongside tracks, in road reserves or minute remnants of bushland. All of the locations have large boundaries and recurring impacts from human usage. Due to the wallum substrates, alien weed invasion is relatively minimal with the most threat being from naturalised pasture legumes and grasses that displace the native flora and increase fuel loads around the habitat margins potentially causing hotter fires when they do occur.
Hydrological changes	At the Palmview location where the most sublocations have been found, <i>Zieria exsul</i> appears to occur in an ecotonal zone between wetter and drier habitats with subtle differences in the water table being responsible for the vegetation variation. All locations for this species are pretty well immediately adjacent to cleared land with varied usages (agriculture, housing, industry, infrastructure corridors), so changes in the water table or directions of water flow are likely to impact on the known sublocations.
<b>Future threats – actual</b>	<b>Impact of threat</b>
Land clearing for agriculture.	Agriculture will continue to reduce within the area of occurrence as other land uses such as housing and industry predominate. However, clearing of small remnant patches of vegetation on land that may be classed as non-remnant and where the species may occur, will result in a further reduction of sublocations.
Land clearing for housing development.	The Sunshine Coast in southeast Queensland continues to be one of the fastest growing areas of housing and industrial development in the state (Mallawaarachchi <i>et al.</i> 2006; Spearritt 2009). The area of occurrence for <i>Zieria exsul</i> is highly fragmented with remnant vegetation greatly reduced and restricted to conservation reserves, road reserves and private land on multiple tenures. Immediately adjacent to the Palmview Conservation Park, land use covers infrastructure corridors (motorways, roads), housing developments, intensive agriculture (e.g. strawberries) and tourism theme parks. As a whole, this area of the Sunshine Coast can be considered to be subject to cumulative biodiversity impacts, i.e. “death by a thousand cuts” (Whitehead <i>et al.</i> 2017).
Land clearing for infrastructure.	The Sunshine Coast in southeast Queensland continues to be one of the fastest growing areas of housing and industrial development in the state (Mallawaarachchi <i>et al.</i> 2006; Spearritt 2009). The area of occurrence for <i>Zieria exsul</i> is highly fragmented with remnant vegetation greatly reduced and restricted to conservation reserves, road reserves and private land on multiple tenures. Immediately adjacent to the Palmview Conservation Park, land use covers infrastructure corridors (motorways, roads), housing developments, intensive agriculture (e.g. strawberries) and tourism theme parks. As a whole, this area of the Sunshine Coast can be considered to be subject to cumulative biodiversity impacts, i.e. “death by a thousand cuts” (Whitehead <i>et al.</i> 2017).
Reduction or degradation of habitat due to weed invasion.	Without control measures being undertaken (i.e. patch remnant weed maintenance), habitat quality and individual patch size will likely decrease for the entire population.

Future threats – potential	Impact of threat
Genetic structure.	The conservation genetics of <i>Zieria exsul</i> remains unstudied. A natural progression of fragmentation is the loss of genetic diversity. This species has very few extant individuals at any one time and it is likely that genetic diversity will decrease overall.

### \*CONSERVATION ADVICE: THREAT ABATEMENT AND RECOVERY ACTIONS

Give an overview of recovery and threat abatement/mitigation actions that are underway, have been formally proposed or that you would like to recommend. Address all threats listed or state threats that lack conservation advice.

Current threats	Abatement or recovery action underway
Land clearing for agriculture.	Apart from general regulations under the Queensland <i>Vegetation Management Act</i> (VMA), there are no specific actions or conservation advice available for clearing of land where <i>Zieria exsul</i> may occur. In many instances this species occurs on land that is non-remnant and/or exempt from land clearing regulation under the VMA.
Land clearing for housing development.	Nothing specifically known. This is dependent on competent survey for threatened species being undertaken.
Land clearing for infrastructure.	The Department of Transport and Main Roads (DTMR), Sunshine Coast (SCRG) and Moreton Bay Regional Councils (MBRC) are aware that the species is present in the area. This is dependent on competent survey for threatened species being undertaken.
Fire management.	There are currently no fire management actions specifically designed for enhancing <i>Zieria exsul</i> habitat or increasing the number of individuals through time.
Genetic structure.	Nothing underway
Habitat quality.	Nothing underway
Hydrological changes.	Nothing underway
Abatement or recovery action proposed	
Land clearing for agriculture.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species. By listing under the Nature Conservation (Plants) regulation, the distribution of species will be included in the protected plants flora survey trigger map, which alerts landholders of the potential presence of the species.
Land clearing for housing development.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species. By listing under the Nature Conservation (Plants) regulation, the distribution of species will be included in the protected plants flora survey trigger map, which alerts landholders of the potential presence of the species
Land clearing for infrastructure.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species. By listing under the Nature Conservation (Plants) regulation, the distribution of species will be included in the protected plants flora survey trigger map, which alerts landholders of the potential presence of the species
Fire management.	Increase documentation subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species. By listing under the Nature Conservation (Plants) regulation, the distribution of species will be included in the protected plants flora survey trigger map, which alerts landholders of the potential presence of the species.  Develop a fire management action plan for the primary sublocations at each location. A management plan for this species should be devised to Palmview Conservation Park managed by SCRC and road reserves managed by DTMR.
Genetic structure.	A conservation genetics study is required for <i>Zieria exsul</i> to determine if the species occurs in subpopulations that equate to the four overall locations and are operating as a single metapopulation; whether genetic substructuring occurs within subpopulations; what is an effective population size based on genetic variation; and whether some genetic variation is already infrequent or at threat of extinction.
Future threats – actual	Abatement or recovery action underway

Land clearing for agriculture.	Nothing underway that is specific to <i>Zieria exsul</i>
Land clearing for housing development.	Nothing underway that is specific to <i>Zieria exsul</i>
Land clearing for infrastructure.	Nothing underway that is specific to <i>Zieria exsul</i> . The species was recently documented at a new location as a result of a consultancy survey for the Department of Transport and Main Roads.
Reduction or degradation of habitat due to weed invasion.	Nothing underway that is specific to <i>Zieria exsul</i> . There will be some ongoing weed management planning for Palmview Conservation Park, but it is unlikely that the other locations will have anything planned.
<b>Abatement or recovery action proposed</b>	
Land clearing for agriculture.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species.
Land clearing for housing development.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species.
Land clearing for infrastructure.	Increase documentation of subpopulation occurrence within each overall location. Raise local awareness with councils and landowners about this species.
Reduction or degradation of habitat due to weed invasion.	Develop a weed management plan for each location, especially for the major stands (sublocations) for the species. Implement the weed management plan.
<b>Abatement or recovery action underway</b>	
<b>Future threats – potential</b>	
Genetic structure.	Nothing underway that is specific to <i>Zieria exsul</i>
<b>Abatement or recovery action proposed</b>	
Genetic structure.	A conservation genetics study is required for <i>Zieria exsul</i> to determine if the species occurs in subpopulations that equate to the four overall locations and whether the species population is operating as a single metapopulation; whether genetic substructuring occurs within subpopulations; what is an effective population size based on genetic variation; and whether some genetic variation is already infrequent or at threat of extinction. The extent of gene flow or contamination with other species such as <i>Z. laxiflora</i> and <i>Z. microphylla</i> requires determination.

### Listing class/category

#### CURRENT LISTING CLASS/CATEGORY

[Please mark the boxes that apply by double clicking them with your mouse.]

In what class is the species currently listed under the **NC Act**?

- |                                     |  |  |  |
|-------------------------------------|--|--|--|
| <input type="checkbox"/> Extinct    | <input type="checkbox"/> Extinct in the Wild | <input type="checkbox"/> Critically Endangered | <input checked="" type="checkbox"/> Endangered |
| <input type="checkbox"/> Vulnerable | <input type="checkbox"/> Near Threatened     | <input type="checkbox"/> Least Concern         | <input type="checkbox"/> Not listed            |

In what category is the species currently listed under the **EPBC Act**?

- |                                     |   |  |  |
|-------------------------------------|---|--|--|
| <input type="checkbox"/> Extinct    | <input type="checkbox"/> Extinct in the Wild    | <input type="checkbox"/> Critically Endangered | <input type="checkbox"/> Endangered            |
| <input type="checkbox"/> Vulnerable | <input type="checkbox"/> Conservation Dependent |  | <input checked="" type="checkbox"/> Not listed |

#### NOMINATED LISTING CLASS

To what class under the **NC Act** is the species being nominated?

- |                                     |  |   |                                     |
|-------------------------------------|--|---|-------------------------------------|
| <input type="checkbox"/> Extinct    | <input type="checkbox"/> Extinct in the Wild | <input checked="" type="checkbox"/> Critically Endangered | <input type="checkbox"/> Endangered |
| <input type="checkbox"/> Vulnerable | <input type="checkbox"/> Near Threatened     | <input type="checkbox"/> Least Concern                    | <input type="checkbox"/> Not listed |

## Nominating a species to transfer to another class

### REASON FOR A NOMINATION TO TRANSFER TO ANOTHER CLASS

What is the reason for the nomination?

Genuine change of status     New knowledge     Mistake     Other  
Taxonomic change -  'split'     newly described     'lumped'     no longer valid

### INITIAL LISTING

Describe the reasons for the species' initial listing under the NC Act and/or the EPBC Act and, if available, the criteria under which it was formerly considered eligible.

*Zieria exsul* was listed as **Endangered** under the NC Act as the category of **Critically Endangered** was not regulated in Queensland at that time. The criteria used at the time were **A1ac, 3; B2ab(i-v),D**

### CHANGES IN SITUATION LEADING TO THE NOMINATION TO TRANSFER TO ANOTHER CLASS

Please complete (a), (b) OR (c) as appropriate to the nomination.

#### (a) Critically Endangered, Endangered, Vulnerable or Near Threatened

Describe the change in circumstances that make the species eligible for listing in a class other than Extinct and Extinct in the Wild.

*Zieria exsul* was listed as **Endangered** under the *NCA* as the category of **Critically Endangered** was not regulated in Queensland at that time. The species has now been documented from an additional location and sublocations but is eligible for the category of **Critically Endangered**.

#### (b) Extinct in the Wild

A native species is eligible to be included in the Extinct in the Wild class if: (a) thorough searches have been conducted for the species; and (b) the species has not been seen in the wild over a period appropriate for its life cycle or form. The species may still survive in cultivation, captivity or as a naturalised population (or populations) well outside the historic range.

Describe how circumstances have changed that now make the species eligible for listing as Extinct in the Wild. Provide details of the last valid record or observation of the species in the wild.

n/a

#### (c) Extinct

A native species is eligible to be included in the Extinct class if there is no reasonable doubt that the last member of the species has died. A taxon is presumed Extinct when exhaustive surveys in the known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.

Describe how circumstances have changed that now make the species eligible for listing as Extinct. Provide details of the last valid record or observation for the species in the wild and captivity.

n/a

## Eligibility against the criteria

### Standard of scientific evidence and adequacy of survey

For this assessment is it considered that the survey of the species has been adequate and there is sufficient scientific evidence to support the listing outcome.

**CRITERION A**

**Population size reduction (reduction in total numbers) measured over the longer of 10 years or 3 generations based on any of A1 to A4**

	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
A1	≥ 90%	≥ 70%	≥ 50%	≥ 20%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%	≥ 20%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>				
<p><i>based on any of (a) to (e)</i></p>				
<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites</p>				

Please identify whether the species meets A1, A2, A3 or A4. Include an explanation, supported by data and information, on how the species meets the criterion (A1 – A4). If available include information on:

- whether the population trend is increasing, decreasing or static
- estimated generation length and method used to estimate the generation length

**You must provide a response.** If there is no evidence to demonstrate a population size reduction, this **must be** stated.

The species has a generation time of approximately two years, based on observation of wild individuals after habitat burns, although this may be longer. Any large-scale population reduction has occurred in the period before the last six (three generations) or 10 years (Bradshaw 2012; Reside et al. 2017), so this criterion cannot be applied.

The species has experienced widespread reduction in available habitat over the last 120 years throughout the area of occupancy; however, exact data is not available as it is not known how much of the cleared habitat was occupied by the species. *Zieria exsul* is not present in the majority of extant habitat patches (lowland wallum woodland) within the area of occurrence so was probably never extensively distributed in modern time. Where the species is extant, the stands are minute remnants surrounded by areas of cleared land that would have supported the suitable habitat; however, there are no precise estimates available on the percentage loss due to the naturally patchy distribution of the species. At the extant locations (1, 2, 3, 4), survey of other nearby remnants (potential sublocations) of this habitat type have not revealed additional stands of *Z. exsul*; however, this is dependent on fire history at each sublocation.

## CRITERION B:

### Geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy

	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>	< 40,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>	< 4,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions for CR, EN or VU:				AND (b) for NT
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10	Not applicable
(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				≥ 10% within the longer of 10 years or 3 generations
(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				Not applicable

Please refer to the '[Guidelines for Using the IUCN Red List Categories and Criteria](#)' for assistance with interpreting the criterion particularly in relation to calculating 'extent of occurrence', 'area of occupancy' and understanding of the definition and use of 'severely fragmented', 'locations', 'continuing decline' and 'extreme fluctuations'.

Please identify whether the species meets B1 or B2. Except for Near Threatened species, include an explanation, supported by data and information, on how the species meets at least 2 of (a), (b) or (c). For Near Threatened species, include an explanation, supported by data and information, on how the species meets (b).

Please note that locations must be defined by a threat. A location is a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the species present.

**If available, include information on:**

- Whether there are smaller populations of the species within the total population and, if so, the degree of geographic separation between the smaller populations within the total population
- Any biological, geographic, human induced or other barriers enforcing separation

**You must provide a response.** If there is no evidence to demonstrate that the geographic distribution is precarious for either extent of occurrence AND/OR area of occupancy, this **must be** stated.

*Zieria exsul* meets the thresholds for listing as **Endangered** under criterion **B2ab(i-v),c(ii-iv)** based on severe fragmentation of the habitat and number of locations. It is known from four locations, mostly on freehold land, which are all threatened with land clearing pressures and inappropriate fire regimes. For the CAM assessment, *Z. exsul* has an estimated extent of occurrence of 131.5 km<sup>2</sup> (minimum convex polygon) and an area of occupancy of 24 km<sup>2</sup> (2 x 2km<sup>2</sup> grid method).

## CRITERION C

Small population size and decline				
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
Estimated number of mature individuals	< 250	< 2,500	< 10,000	< 20,000
AND either (C1) or (C2) is true				AND (C1) is true
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in the future	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)	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 (a) or (b):				
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000	Not applicable
OR				
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%	Not applicable
(b) Extreme fluctuations in the number of mature individuals	Applicable	Applicable	Applicable	Not applicable

Please identify the estimated total number of mature individuals and either an answer to C1 or C2. Include an explanation, supported by data and information, on how the species meets the criteria. **Note:** If the estimated total number of mature individuals is unknown but presumed to be likely to be >10 000, you are not required to provide evidence in support of C1 or C2, just state that the number is likely to be >10 000.

**You must provide a response.** If there is no evidence to demonstrate small population size and decline this **must be stated**.

*Zieria exsul* is eligible for Critically Endangered under criterion **C2a(i),b**.

The species occurs in four broad locations that are probably equivalent to four subpopulations. The primary stands or sublocations for this species are as follows:

Location 1 (Mooloolooba): This comprises three sublocations. The primary sublocation is a minute remnant of vegetation in the road reserve next to the Sunshine Motorway along a fenceline. This sublocation had less than 20 individuals, but has not been surveyed in the last five years. At the second sublocation (Lady Musgrave Drive), a single plant was found in 2009. At the third sublocation (Mountain Creek State High School), less than five plants were found in 2017.

Location 2 (Palmview). This comprises four sublocations wholly within Palmview Conservation Park over about 1 km<sup>2</sup>. The western 2014 sublocation contained no individuals in 2017. The other three sublocations had single individuals in 2014 and 2017 respectively.

Location 3 (Currimundi). This comprises a single sublocation in a council reserve. The number of individuals was not recorded but is unlikely to be very large.

Location 4 (Elimbah). This comprises a single sublocation in a road reserve with six individuals in 2019. Although a systematic survey of all subpopulations have not been conducted, adequate information has been collected by opportunistic surveys by Queensland Herbarium and Sunshine Coast staff between 2017 and 2019 to provide a relatively robust estimate of the overall population of *Zieria exsul*.

An estimate of an overall population number would be less than 50 mature individuals; however, this is not based on systematic field survey data at most localities. It is also highly subject to change as the short-lived individuals senesce and die and new individuals recruit, however a decline in the overall population is both inferred and projected given the continued development pressures on its habitat.

## CRITERION D:

Very small population				
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
D1. Number of mature individuals	< 50	< 250	D1. < 1,000	D1. < 3,000
OR				
D2. [Only applies to the VU and NT categories] Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	Not applicable	Not applicable	D2. Typically: AOO < 20 km <sup>2</sup> or number of locations ≤ 5	D2. Typically: AOO < 40 km <sup>2</sup> or number of locations ≤ 10

Please identify the estimated total number of mature individuals and evidence of how the figure was derived.  
For Criterion D2, please provide information on the species' area of occupancy, number of locations and plausible threats.

**You must provide a response.** If there is no evidence to demonstrate eligibility, this **must be** stated.

*Zieria exsul* fulfils the criterion D for **Critically Endangered**.

The species occurs in four broad locations that are probably equivalent to four subpopulations. The primary stands or sublocations for this species are as follows:

Location 1 (Mooloolooba): This comprises three sublocations. The primary sublocation is a minute remnant of vegetation in the road reserve next to the Sunshine Motorway along a fenceline. This sublocation had less than 20 individuals, but has not been surveyed in the last five years. At the second sublocation (Lady Musgrave Drive), a single plant was found in 2009. At the third sublocation (Mountain Creek State High School), less than five plants were found in 2017.

Location 2 (Palmview). This comprises four sublocations wholly within Palmview Conservation Park over about 1 km<sup>2</sup>. The western 2014 sublocation contained no individuals in 2017. The other three sublocations had single individuals in 2014 and 2017 respectively.

Location 3 (Currimundi). This comprises a single sublocation in a council reserve. The number of individuals was not recorded.

Location 4 (Elimbah). This comprises a single sublocation in a road reserve with six individuals in 2019.

An optimistic estimate of an overall population number would be less than 50 mature individuals; however, this is not based on rigorous field survey data at most localities. It is also highly subject to change as the short lived individuals senesce and die and new individuals recruit.

## CRITERION E:

Quantitative Analysis				
	Critically Endangered (CR)	Endangered (EN)	Vulnerable (VU)	Near Threatened (NT)
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% within 100 years	≥ 5% within 100 years

Please identify the probability of extinction and evidence of how the analysis was undertaken.

**You must provide a response.** If there has been no quantitative analysis undertaken this **must be** stated.

No quantitative analysis undertaken.

## SUMMARY OF CRITERIA UNDER WHICH THE SPECIES IS ELIGIBLE FOR LISTING AS: CR, EN, V, NT, EW or EX

Please mark the criteria and sub-criteria that apply.

<input type="checkbox"/> Criterion A	<input type="checkbox"/> A1 (specify at least one of the following) <input type="checkbox"/> a) <input type="checkbox"/> b) <input type="checkbox"/> c) <input type="checkbox"/> d) <input type="checkbox"/> e); <b>AND/OR</b> <input type="checkbox"/> A2 (specify at least one of the following) <input type="checkbox"/> a) <input type="checkbox"/> b) <input type="checkbox"/> c) <input type="checkbox"/> d) <input type="checkbox"/> e); <b>AND/OR</b> <input type="checkbox"/> A3 (specify at least one of the following) <input type="checkbox"/> a) <input type="checkbox"/> b) <input type="checkbox"/> c) <input type="checkbox"/> d) <input type="checkbox"/> e); <b>AND/OR</b> <input type="checkbox"/> A4 (specify at least one of the following) <input type="checkbox"/> a) <input type="checkbox"/> b) <input type="checkbox"/> c) <input type="checkbox"/> d) <input type="checkbox"/> e)
<input checked="" type="checkbox"/> Criterion B <b>Endangered</b>	<input type="checkbox"/> B1 (specify at least two of the following) <input type="checkbox"/> a) <input type="checkbox"/> b) <input type="checkbox"/> c); <b>AND/OR</b> <input checked="" type="checkbox"/> B2 (specify at least two of the following, other than NT) <input checked="" type="checkbox"/> a) <input checked="" type="checkbox"/> b) <input type="checkbox"/> c)
<input checked="" type="checkbox"/> Criterion C <b>Critically Endangered</b>	<input type="checkbox"/> estimated number of mature individuals <b>AND</b> <input type="checkbox"/> C1 <b>OR</b> <input checked="" type="checkbox"/> C2 <input checked="" type="checkbox"/> a (i) <b>OR</b> <input type="checkbox"/> a (ii) <b>OR</b> <input checked="" type="checkbox"/> C2 <input checked="" type="checkbox"/> b)
<input type="checkbox"/> Criterion D <b>Critically Endangered</b>	<input checked="" type="checkbox"/> D1 <b>OR</b> <input type="checkbox"/> D2
<input type="checkbox"/> Criterion E	
<input type="checkbox"/> EX	
<input type="checkbox"/> EW	
<input type="checkbox"/> LC	Species nominated to change from a higher conservation class to Least Concern. No above boxes apply.

### Other Considerations

#### \*INDIGENOUS CULTURAL SIGNIFICANCE

Is the species known to have cultural significance for Indigenous groups within Australia? If so, to which groups? Provide information on the nature of this significance if publicly available.

Not known

#### FURTHER STUDIES

Identify relevant studies or management documentation that might relate to the species (e.g. research projects, national park management plans, recovery plans, conservation plans, threat abatement plans, etc.).

Nothing current.

#### ADDITIONAL COMMENTS/INFORMATION

Please include any additional comments or information on the species such as survey or monitoring information, and maps that would assist with the consideration of the nomination.

*Zieria exsul* has been grown from seed or cuttings in cultivation by amateur native plant enthusiasts. It does not require any specialist treatment for seed germination or for growth of the plant.

#### IMAGES OF THE SPECIES

Please include or attach images of the species if available, and indicate if you are in a position to authorise their use.

Google *Zieria exsul*. There are numerous online images available of the species. The species is illustrated in Leiper *et al.* (2008) and in the journal *Austrobaileya* where it was described with that being available online.

### Reviewers and references

#### REVIEWER(S)

Has this nomination been peer-reviewed? Have relevant experts been consulted on this nomination? If so, please include their names, current professional positions and contact details.

Queensland Herbarium

## REFERENCE LIST

Please list key references/documentation you have referred to in your nomination.

- Barrett, R.A., Bayly, M.J., Duretto, M.F., Forster, P.I., Ladiges, P.Y. & Cantrill, D.J. (2014). A chloroplast phylogeny of *Zieria* (Rutaceae) in Australia and New Caledonia shows widespread incongruence with species-level taxonomy. *Australian Systematic Botany* 27: 427–449.
- Barrett, R.A., Bayly, M.J., Duretto, M.F., Forster, P.I., Ladiges, P.Y. & Cantrill, D.J. (2018). Phylogenetic analysis of *Zieria* (Rutaceae) in Australia and New Caledonia based on nuclear ribosomal DNA shows species polyphyly, divergent paralogues and incongruence with chloroplast DNA. *Australian Systematic Botany* 31: 16–47.
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- Leiper, G., Glazebrook, J., Cox, D. & Rathie, K. (2008). *Mangroves to Mountains*. Revised Edition. Society for Growing Australian Plants, Logan River Branch: Browns Plains.
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- Mallawaarachchi, T., Morrison, M.D. & Blamey, R.K. (2006). Choice modelling to determine the significance of environmental amenity and production alternatives in the community value of peri-urban land: Sunshine Coast, Australia. *Land Use Policy* 23: 323–332.
- Rabinowitz, D., Cairns, S. & Dillon, T. (1986). Seven forms of rarity and their frequency in the flora of the British Isles. In M.E. Soulé, *Conservation Biology – the science of scarcity and rarity*, pp. 182–204. Sinauer Associates Inc. Publishers: Sunderland, Massachusetts.
- Reside, A.E., Beher, J., Cosgrove, A.J., Evans, M.C., Seabrook, L., Silcock, J.L., Wenger, A.S. & Maron, M. (2017). Ecological consequences of land clearing and policy reforms in Queensland. *Pacific Conservation Biology* 23: 219–230.
- Spearrit, P. (2009). The 200 km city: Brisbane, the Gold Coast, and Sunshine Coast. *Australian Economic History Review* 49: 87–106.
- Whitehead, A.L., Kujala, H. & Wintle, B.A. (2017). Dealing with cumulative biodiversity impacts in strategic environmental assessment: a new frontier for conservation planning. *Conservation Letters* 10: 195–204.

## Nominator's Details

Note: Your details are subject to the provisions of the *Privacy Act 1988* and will not be divulged to third parties, except for state and territory governments and scientific committees that have agreed to collaborate on national threatened species assessments using a CAM. If there are multiple nominators please include details below for all nominators.

**TITLE** (e.g. Mr/Mrs/Dr/Professor/etc.)

**FULL NAME**

**ORGANISATION OR COMPANY NAME (IF APPLICABLE)**

**CONTACT DETAILS**

### DECLARATION

I declare that, to the best of my knowledge, the information in this nomination and its attachments is true and correct.

Signed: [Click here to enter text.](#)

Date: [Click or tap to enter a date.](#)

*\* If submitting by email, please attach an electronic signature*

## Lodging your nomination

Completed nominations may be lodged either:

1. by email in Microsoft Word format to: [SpeciesTechnical.Committee@des.qld.gov.au](mailto:SpeciesTechnical.Committee@des.qld.gov.au)
2. by mail to: The Chair  
Species Technical Committee  
Queensland Herbarium  
Mount Coot-tha Rd  
Toowong QLD 4066

**\* If submitting by mail, you must include an electronic copy on a memory stick.**

Recommended citation: