

# Consultation on Species Listing Eligibility and Conservation Actions

### Lissolepis coventryi (swamp skink)

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

1) the eligibility of *Lissolepis coventryi* (swamp skink) for inclusion on the EPBC Act threatened species list in the Endangered category; and

2) the necessary conservation actions for the above species.

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

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

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

Responses are to be provided in writing by email to: <a href="mailto:species.consultation@awe.gov.au">species.consultation@awe.gov.au</a>

Please include species scientific name in Subject field.

or by mail to:

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

#### Responses are required to be submitted by 1 February 2022.

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#### General background information about listing threatened species

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

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

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

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

#### **Privacy notice**

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

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

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

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

#### Information about this consultation process

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

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

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

### CONSULTATION QUESTIONS FOR LISSOLEPIS COVENTRYI (SWAMP SKINK)

#### **SECTION A - GENERAL**

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

### PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT

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

#### **Biological information**

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

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

#### **Population size**

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

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

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

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

Level of your confidence in this estimate:

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

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

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

#### Evidence of total population size change

10. Are you able to provide an estimate of the total population size during the early 2000s *(at or soon after the start of the most recent three generation period)*? Please provide justification for your response.

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

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

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

Level of your confidence in this estimate:

- $\Box$  0–30% low level of certainty/ a bit of a guess/ not much information to go on
- $\Box$  31–50% more than a guess, some level of supporting evidence
- $\Box$  51–95% reasonably certain, information suggests this range
- $\Box$  95–100% high level of certainty, information indicates quantity within this range
- $\Box$  99–100% very high level of certainty, data are accurate within this range
- 11. Are you able to comment on the extent of decline in the species/subspecies' total population size over the last approximately 21 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:

- $\Box$  0–30% low level of certainty/ a bit of a guess/ not much information to go on
- $\Box$  31–50% more than a guess, some level of supporting evidence
- □ 51–95% reasonably certain, suggests this range of decline
- 95–100% high level of certainty, information indicates a decline within this range
- 99–100% very high level of certainty, data are accurate within this range
- 12. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

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

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

- 13. Does the assessment consider the entire geographic extent and national extent of the species/subspecies? If not, please provide justification for your response.
- 14. Has the survey effort for this species/subspecies been adequate to determine its national distribution? If not, please provide justification for your response.
- 15. Is the distribution described in the assessment accurate? If not, please provide justification for your response and provide alternate information.
- 16. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.
- 17. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

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

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

 $\Box$  <100 km<sup>2</sup>  $\Box$  100 – 5 000 km<sup>2</sup>  $\Box$  5 001 – 20 000 km<sup>2</sup>  $\Box$  >20 000 km<sup>2</sup>

Level of your confidence in this estimated extent of occurrence

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

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

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

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

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

 $\Box$  <10 km<sup>2</sup>  $\Box$  11 – 500 km<sup>2</sup>  $\Box$  501 – 2000 km<sup>2</sup>  $\Box$  >2000 km<sup>2</sup>

Level of your confidence in this estimated extent of occurrence:

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

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

 $\Box$  51–95% - reasonably certain, data suggests this range of decline

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

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

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

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

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

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

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

 $\Box$  <100 km<sup>2</sup>  $\Box$  100 – 5 000 km<sup>2</sup>  $\Box$  5 001 – 20 000 km<sup>2</sup>  $\Box$  >20 000 km<sup>2</sup>

Level of your confidence in this estimated extent of occurrence

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

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

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

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

 $\Box$  <10 km<sup>2</sup>  $\Box$  11 – 500 km<sup>2</sup>  $\Box$  501 – 2000 km<sup>2</sup>  $\Box$  >2000 km<sup>2</sup>

Level of your confidence in this estimated extent of occurrence:

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

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

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

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

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

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

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

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

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

25. What planning, management and recovery actions are currently in place supporting protection and recovery of the species/subspecies? To what extent have they been effective?

- 26. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species/subspecies?
- 27. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species/subspecies?

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

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

#### PART 3 – ANY OTHER INFORMATION

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

# Conservation Advice for Lissolepis coventryi (swamp skink)

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

The purpose of this consultation document is to elicit additional information to better understand the status of the species and help inform conservation actions, further planning and a potential recovery plan. The draft assessment below should therefore be considered **tentative** at this stage, as it may change as a result of responses to this consultation process.

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



Lissolepis coventryi at Mornington Peninsula, Victoria © Copyright, Nick Clemann

# **Conservation status**

*Lissolepis coventryi* is proposed to be listed in the Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999.* 

*Lissolepis coventryi* (swamp skink) was assessed by the Threatened Species Scientific Committee to be eligible for listing as Endangered under Criterion 2. The Committee's assessment is at

Attachment A. The Committee assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: Not eligible
- Criterion 2: B2ab(ii,iii,iv,v): Endangered
- Criterion 3: Insufficient data
- Criterion 4: Insufficient data
- Criterion 5: Insufficient data

The main factors that make the swamp skink eligible for listing in the Endangered category are a restricted area of occupancy, severe fragmentation, and continuing decline in the species' area of occupancy (ii), area, extent and/or quality of habitat (iii), number of locations or subpopulations (iv), and the number of mature individuals (v). This listing category aligns with that published in the Lizard and Snake Action Plan 2017 (Gillespie et al. 2019). This recent IUCN listing assessment considered the species to be Endangered under Criterion B2ab(iii) with an area of occupancy well below 500 km<sup>2</sup>, severe fragmentation and subject to range-wide threats that are leading to a continuing decline in the quality and extent of habitat (Gillespie et al. 2019).

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the <u>Species Profile and Threat Database</u>.

# Species information

## Taxonomy

Conventionally accepted as *Lissolepis coventryi* (Storr 1978) (DEE 2020). The species was formerly known as *Egernia coventryi* and *E. luctuosa*.

## Description

The swamp skink is a moderate-sized skink with an adult snout-vent length (SVL) of about 100 mm and a tail length around 150 percent of the snout-vent length (Clemann et al. 2004; Cogger 2014; SWIFFT 2021). Adults weigh up to 35 g (Robertson 1998). A study of museum specimens found that while SVL did not differ between males and females, males had longer and broader heads than females in terms of absolute head size and head size relative to body size (Clemann et al. 2004). Species in this genus have well-developed limbs, and characteristic features include parietal shields which are not in contact behind the interparietal and a fourth toe markedly longer than the third. The swamp skink varies in dorsal colour which can be pale greenishbrown, olive-brown or yellow-brown (Cogger 2014). The head and limbs are often flecked and streaked with black, and limbs have scattered pale spots. A pale stripe occurs at the lips and the throat and lower flanks are usually flushed with green. The ventral surfaces are whitish (Cogger 2014).

# Distribution

The swamp skink is endemic to south-eastern Australia, distributed from the Mt Gambier region in the west, through southern Victoria (Vic), and probably extends just beyond the New South Wales (NSW) border in the east (Robertson 1998; Cogger 2014) (Map 1). The swamp skink occurs primarily in coastal areas with fewer inland subpopulations, inhabiting freshwater and saltwater wetlands (Clemann and Beardsell 1999; Clemann 2000). In NSW the swamp skink is known from a single record with imprecise locality and date information, but where suitable habitat exists (Robertson 1998; Gillespie et al. 2018). It is, however, believed that the NSW voucher specimen held in the Melbourne Museum is of another species, incorrectly identified as the swamp skink (Clemann 2021, unpublished data).

The swamp skink's distribution has been described as severely disjunct (Clemann 2015). The swamp skink is likely to have declined significantly following European settlement resulting from drastic habitat modification (i.e., draining and clearing of wetlands) (Gillespie et al. 2019). In 1998, the swamp skink was known historically from approximately 77 discrete sites: four extant in South Australian, 72 in Victoria and one in NSW. Many of these remaining subpopulations may no longer be viable (Robertson 1998; Clemann 2015).

Of the 72 sites in Victoria, five to six sites are presumed to be extinct and another 38 sites, due to subpopulation size, are possibly not viable in the long term (Robertson 1998). Only 12 of the 72 sites (concentrated in East Gippsland) are considered potentially secure and will likely require active management to ensure their maintenance (Robertson 1998; SAC 2000 cited in SWIFFT 2021). These figures do not account for site(s) that may now have additional protections under the 2018 listing of the Glenelg and Discovery Bay Ramsar Site (DELWP 2021).



#### Map 1 Modelled distribution of swamp skink

**Source:** Species distribution data <u>Species of National Environmental Significance</u> database, Base map Geoscience Australia. **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

Threatened Species Scientific Committee

errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

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

# Cultural and community significance

The cultural and community significance of the swamp skink is not well known. Wetlands occupied by the swamp skink have Indigenous significance as ceremonial and initiation sites, traditional hunting and gathering grounds, and as boundary markers. Many wetland flora and fauna species have some form of traditional use and many have significance as totems which are considered sacred by their owners (Department of the Environment 2016). Seeking further information on the significance of the swamp skink to Traditional Owners and engaging Traditional Owners in conservation actions are priorities identified in this Conservation Advice.

The swamp skink's occurrence has assisted in the protection of native vegetation in areas such as Chinamans Creek in West Rosebud and Tootgarook Swamp on the Mornington Peninsula where many local people and community groups have an interest in the species and its protection (N Clemann 2021. pers comm 6 August).

### **Relevant biology and ecology**

Habitat

The swamp skink occupies densely vegetated freshwater and saltwater wetlands in south eastern Australia which have natural hydrological regimes and contain shelter sites. Habitat typically has little to no overstorey. Swamp skinks are generally found in areas of poorly-drained peaty soils, with the exception of coastal saltmarsh sites which often have sandy substrates (Clemann 2006 and Douch 1994 cited in Robertson 2007).

The swamp skink basks and forages within dense, low vegetation and areas which may include fallen timber, driftwood, litter, and rocks, although these are not critical attributes for habitat to be suitable for the species. During periods of inactivity, the swamp skink shelters in burrows, or beneath logs, rocks, driftwood and other ground debris (Clemann et al. 2004; Robertson & Clemann 2015; SWIFFT 2021; N Clemann 2021. pers comm 5 August).

There are scarce records of the swamp skink in other habitat types. Clemann and Beardsell (1999) recorded the species in Enfield State Forest in healthy woodland with an open overstorey of messmate (*Eucalyptus obliqua*), scent-bark (*Eucalyptus aromaphloia*) and shining peppermint (*Eucalyptus willisii*). Surveys in 2003 and 2004, undertaken on a private property in coastal foothills approximately 8 km south of Koonwarra, detected the swamp skink in a weedy dam-side area and on mulch under a pear tree in a small orchard. The property was a dairy farm up until 1974 and is heavily infested with introduced weeds. Prior to European settlement of the property and surrounds, it would have been typical South Gippsland open forest. Small remnants of this forest type exist in the area, however, no low-lying, swampy vegetation, typical habitat of the swamp skink, exists in any nearby areas. Clemann (2000 cited in Homan 2006) cautions against assuming that swamp skinks are not present in marginal habitat or areas apparently unlikely to support the species, such as areas heavily infested by weeds. The records

of the swamp skink on the Koonwarra property indicate that it is possible that other isolated subpopulations may be persisting in other parts of the South Gippsland foothills (Homan 2006). While swamp skinks have been detected in degraded habitat, the viability of the species in such habitat is not known.

#### Diet

The swamp skink is omnivorous (Robertson 1980; Clemann et al. 2004). Clemann et al. (2004) reported that the swamp skink preys opportunistically on a variety of invertebrates such as spiders, coleopterans, lepidopterans, ants, hemipterans, and aquatic amphipods. It is not known whether consumption of aquatic invertebrates is due to swamp skinks actively foraging in water, or if they are stranded as water recedes and are then opportunistically preyed on. Plants (e.g., fruits, seeds, and other vegetation) also likely constitute a sizeable proportion of the diet of adults. Sloughed skin has also been found in alimentary tracts of specimens, indicating that the swamp skink actively ingests its shed skin (Clemann et al. 2004).

### Ecology

The swamp skink is a diurnal heliotherm (Robertson 1980, 1998) but can be crepuscular during the hotter summer months (Cogger 2014). It is generally active from early September to May when ambient temperatures exceed about 18 degrees Celsius (Clemann 2000, 2001; Schulz 1985 cited in Chapple 2003). It is a secretive skink, rarely venturing far from cover (burrows, rocks, logs) or vegetation, and will enter water (swimming on the surface or diving) when pursued (Robertson 1997; N Clemann 2021. pers comm 6 August). Swamp skinks typically occur and forage in and adjacent to dense hydrophilic sedge and tussock vegetation; and they utilise fallen timber, litter, and floor wreck to bask (Clemann 2000, 2001; Robertson 1980; Clemann 1997 and Smales 1981 both cited in Chapple 2003). Swamp skinks live in areas that are regularly flooded, and it appears unlikely that the skinks remain in burrows that have been inundated with water (N Clemann 2021, pers comm 6 August). An individual may occupy the same burrow for several days but will utilise virtually any burrow to facilitate escape from predators (N Clemann 2021. pers comm 6 August). One report estimates that an individual has a core activity range of 10 to 35 m<sup>2</sup> around its burrow, and juveniles disperse up to 200 metres (Robertson 1980). Robertson (1998) describes individuals as being largely sedentary, rarely moving more than five metres from initial capture sites. The swamp skink is an aggressive species and will chase other swamp skinks from its territory (N Clemann 2021. pers comm 6 August).

A study by Clemann et al. (2004) reported that female swamp skinks bear one–four live young. Females ovulate in September and October with parturition occurring in late January or early February (Clemann et al. 2004). Chapple (2003) cited the lifespan of the swamp skink to be greater than eight years and up to 10 years, and individuals reaching sexual maturity at two to three years age (70-75 mm SVL). Generation length is estimated to be seven years (Gillespie et al. 2019).

## Habitat critical to the survival

As presented in the Matters of National Significance Significant Impact Guidelines 1.1 (Department of the Environment 2013), habitat critical to the survival of a species refers to areas that are necessary:

- for foraging, breeding and dispersal activities
- for the long-term maintenance of the species
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of subpopulations or recovery of the species.

The swamp skink occupies densely vegetated wetlands (both saltwater and freshwater) such as swamps and adjacent wet heaths, often dominated by *Melaleuca* or *Leptospermum* species, low-lying marshes, lagoon margins and sedgelands, or saltmarshes (Clemann and Beardsell 1999; Clemann 2000; Cogger 2014; Robertson and Clemann 2015; SAC 2000 and Manning 2002 both cited in SWIFFT 2021).

The swamp skink utilises shelter sites such as burrows (self-made or those of freshwater crayfish, yabbies, and crabs), fallen timber, rocks, driftwood and other ground debris (Clemann et al. 2004; Robertson & Clemann 2015; SWIFFT 2021; N Clemann 2021. pers comm 5 August). The swamp skink appears to have specific habitat requirements, favouring areas with dense ground cover and little to no overstorey, and appears to become excluded from areas when vegetation cover exceeds 2–3 m in height (Robertson 1998; Clemann and Beardsell 1999; Robertson and Clemann 2015).

All typical habitat (such as that described above) across the swamp skink's distribution is likely to be critical to the survival of the species. Habitat which does not fit such a description, but is known to support a subpopulation of swamp skink which may be viable in the medium to long term or occurs between disjunct subpopulations of the species and may act as habitat for dispersal is also considered critical to the species' survival.

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

### **Important populations**

In this section, the word population is used to refer to subpopulation, in keeping with the terminology used in the EPBC Act and state/territory environmental legislation.

Given the limited information available on populations of the swamp skink, including population demographics, further research is required to identify important populations. Until further information is available, all populations of the swamp skink should be considered to be important populations.

### Threats

The swamp skink is facing a number of known threats which are presented below in Table 1. In addition, small subpopulations of swamp skinks that have become isolated may have an increased vulnerability to unpredictable disturbances such as disease and bushfire (especially fires that burn peat). Small subpopulations are also generally more likely to lose genetic diversity through random genetic processes, with this loss of diversity potentially reducing their genetic fitness or evolutionary potential, and hence placing them at a greater risk of extinction from other threats (Robertson & Clemann 2015).

Threat	Status and severity a	Evidence
Habitat loss, fragmentati	ion, and degradation	
Removal and draining of habitat for urban development and agriculture	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: unknown</li> <li>Extent: across the entire range</li> </ul>	Significant areas of habitat once occupied by the swamp skink have been cleared since European settlement, primarily in the south-western two-thirds of the range (Robertson 1998; Gillespie et al. 2018). Habitat for the swamp skink within this area is primarily within coastal and lowland areas that have been subject to extensive modification for agricultural and urban development and are poorly represented in reserves (Robertson & Clemann 2015; Robertson 1998). This includes the removal and drainage of swamps, wet heath, riparian vegetation and saltmarsh (e.g., Tootgarook Swamp, Langwarrin) (Clemann 2015). Altered hydrological conditions can also lead to changes in water quality and quantity (SWIFFT 2021).
Timber harvesting	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: unknown</li> <li>Extent: across part of its range</li> </ul>	Timber harvesting immediately beside and around the habitat of swamp skinks has occurred in parts of East Gippsland, including areas severely burned in the 2019/2020 bushfires. Timber harvesting and associated road construction, burning and dense regrowth detrimentally affect swamp skink habitats by affecting soil moisture levels, sedimentation, shading and by destruction of habitat (N Clemann 2021. pers comm 6 August). Timber harvesting is also likely to result in changes to hydrology which could affect subpopulations.
Fragmentation through clearing (e.g., for road and drain construction)	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: unknown</li> <li>Extent: across part of its range</li> </ul>	Many sites where the swamp skink is found are adjacent to or crossed by roads, tracks, bridges and pipelines. Such construction removes habitat and also fragments habitat patches by creating barriers to dispersal and introducing less obvious threats such as: altered hydrology with consequently changes to vegetation, increased weed and disease invasion, increased access for predators and increased bushfire risk (Robertson & Clemann 2015; Clemann 2015).
Changed water regimes of rivers and wetlands	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: unknown</li> <li>Trend: unknown</li> <li>Extent: across part of its range</li> </ul>	Changes to water regimes could affect swamp skink habitat and vary in scale from large and obvious (e.g., those caused by dams and impoundments) to those far less evident, such as track construction changing local hydrological patterns and consequently vegetation distribution. Examples of this occur at a number of sites on the Mornington Peninsula where water regimes (timing and extent of inundation) have changed greatly as a result of draining, impoundment (e.g., Arthurs Seat), weed invasion and agricultural runoff (e.g., Tootgarook Swamp). The effects of these changes on subpopulations of the swamp skink are largely unknown (Robertson & Clemann 2015).
Pollution of rivers, wetlands, and marine and coastal areas and resulting changes to vegetation	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: unknown</li> <li>Trend: unknown</li> <li>Extent: across the entire range</li> </ul>	Any process which impacts the integrity of wetland vegetation (structure and composition) where the swamp skink occurs is a potential threat to the species. Similarly, increased nutrient levels in wetlands (e.g., from agricultural runoff) can also dramatically affect vegetation. Increased nutrient levels are evident at Tootgarook Swamp in Victoria (Robertson & Clemann 2015). The potential consequences of this threat have not been quantified, but may be locally significant, and could be catastrophic in the case of events such as chemical or oil spills in coastal or near-coastal areas (N Clemann 2021. pers comm 6 August). While this threat has the potential to occur across the entire range of the species, it is most severe close to towns and

Table 1 Threats impacting the swamp skink

Threat	Status and severity a	Evidence
		cities, or where gross disturbances such as road construction or logging occurs. It is a potential threat in saltmarsh habitats, particularly near ports and areas where chemicals are stored and transported, such as north of Hastings on the Mornington Peninsula (N Clemann 2021. pers comm 6 August).
Disturbance caused by recreational use	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: minor</li> <li>Trend: unknown</li> <li>Extent: across part of its range</li> </ul>	Swamp skink habitat may be impacted by recreational use, and associated trampling of vegetation (e.g., Arthur's Seat on the Mornington Peninsula), construction of paths, and decreasing available shelter and increasing predator access (Robertson & Clemann 2015).
Invasive species	1	
Impacts from feral herbivores	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: increasing</li> <li>Extent: across part of its range</li> </ul>	Invasive herbivores may present a major threat to the swamp skink. Recent surveys of feral animals in East Gippsland found "significant increase since the last similar survey in 2009" in most feral animals (S Henry pers. comm. 2017 cited Gillespie et al. 2019) and extensive damage to natural ecosystems in this area has been observed (N Clemann 2021. pers comm 6 August). Sambar deer ( <i>Rusa unicolor</i> ) are considered a major invasive pest species in Victoria and are particularly associated with the degradation of wetland areas, reducing mossy or swampy areas to 'mud pools' (Ingamells 2017 cited in Gillespie et al. 2019). Other species including fallow deer ( <i>Dama dama</i> ), red deer ( <i>Cervus elaphus</i> ), hog deer ( <i>Axis porcinus</i> ), feral pigs ( <i>Sus scrofa</i> ) may also occur in areas of habitat (N Clemann 2021. pers comm 6 August) and are likely to cause similar damage. It has not been determined whether such damaged habitat can support the swamp skink (N Clemann and P Robertson pers. comm. 2017 cited in Gillespie et al. 2019). Sambar and fallow deer are damaging swamps, wet heath and coastal areas in eastern Victoria, including swamp skink habitat (N Clemann 2021. pers comm 6 August). Where swamp skinks occur in or adjacent to farmland, domestic stock such as cattle and horses have the potential to damage habitat (N Clemann 2021. pers comm 6 August).
Weed invasion	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: increasing</li> <li>Extent: across the entire range</li> </ul>	Invasion of weed species resulting in changes to vegetation structure and degradation of habitat is a major threat to the swamp skink (Robertson & Clemann 2015; SWIFFT 2021). Weed invasion has the potential to significantly alter the habitat's potential for continued utilisation by the swamp skink. Woody weeds and native trees and shrub species can be a particular concern where they may shade occupied habitat to the extent that it becomes unsuitable for swamp skinks (Robertson & Clemann 2015). For example, blackberry ( <i>Rubus fruticosus</i> L. agg), sweet pittosporum ( <i>Pittosporum undulatum</i> ), and radiata pine ( <i>Pinus radiata</i> ) can all reduce the suitability of habitat for the swamp skink (N Clemann 2021. pers comm 6 August). Conversely, exotic vegetation with very specific structural characteristics can provide suitable habitat for the swamp skink where native vegetation has disappeared (Robertson & Clemann 2015).

Threat	Status and severity a	Evidence
Predation by feral predators such as Cats ( <i>Felis catus</i> ) and European Red Foxes ( <i>Vulpes vulpes</i> )	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: moderate</li> <li>Trend: increasing</li> <li>Extent: across the entire range</li> </ul>	Predation by feral predators such as cats ( <i>Felis catus</i> ) and red foxes ( <i>Vulpes vulpes</i> ) has been identified as a threat to the swamp skink (SWIFFT 2021). The black rat may also prey on swamp skinks (Robertson & Clemann 2015). Feral cats have severe to catastrophic effects on native fauna (Woinarski et al. 2014 cited in Department of the Environment 2015) preying on small and medium-sized mammals, birds, reptiles, amphibians, fish and invertebrates (Department of the Environment 2015). Swamp skinks have some of the traits which make a reptile species vulnerable to cat predation such as high predictability in activity with permanent burrows and being predominately terrestrial (Woinarski et al. 2018). Red foxes are widely distributed in Australia. Their main prey includes small to medium-sized ground dwelling and semi- arboreal mammals, ground nesting birds and chelid tortoises (DEWHA 2008). However, European red foxes are highly adaptable, opportunistic omnivores and are also known to feed upon reptiles and amphibians in addition to numerous other food sources (Agriculture Victoria 2021; Stobo-Wilson et al. 2021). Where subpopulations have been reduced in size and lost connectivity, predation by cats and European red foxes may be particularly harmful. Reduction in ground cover or construction of roads, tracks and boardwalks facilitate access into otherwise dense habitats by feral predators and may create ideal pathways for silent stalking. Swamp skink subpopulations that occur close to urban areas (such as on the Mornington Peninsula) or intensive agricultural areas may be affected by roaming domestic cats, as well as feral cats and European red foxes (Robertson & Clemann 2015; N Clemann 2021, pers comm 6 August).
Climate change Increasing temperatures, changes to precipitation patterns and extreme climatic events	<ul> <li>Timing: current</li> <li>Confidence: observed</li> <li>Consequence: major</li> <li>Trend: increasing</li> <li>Extent: across the entire range</li> </ul>	Direct and indirect effects of rising temperature, changes in rainfall intensity and frequency, and extreme climatic events such as drought, flooding and the frequency of storms will impact on wetland habitats (Salimi et al. 2021). Further, climate change projections show that southern Australia is likely to experience fire weather of increasing severity (CSIRO 2015). Changes to hydrology and rising temperate can change the biogeochemistry and function of wetlands. These changes could result in deterioration of water quality (Roulet & Moore 2006, Stets & Cotner 2008, and Corman et al. 2018 all cited in Salimi et al. 2021). In addition to potential impacts on swamp skink habitat, direct impacts to individuals may also result from increasing temperatures, changes to precipitation patterns, and increasing frequency and intensity of drought and bushfires.
Disease		
<i>Phytophthora</i> dieback caused by introduced soil-borne pathogens such as <i>Phytophthora</i> <i>cinnamomi</i> and other <i>Phytophthora</i> spp.	<ul> <li>Timing: current</li> <li>Confidence: unknown</li> <li>Consequence: moderate</li> <li>Trend: increasing</li> <li>Extent: across the entire range</li> </ul>	<i>Phytophthora cinnamomi</i> is an introduced soil-borne pathogen which infects a large range of plant species and may contribute to plant death, particularly when other stresses are present, such as waterlogging, drought and bushfire (Department of the Environment and Energy 2018). <i>Phytophthora cinnamomi</i> can disperse in water flowing from roots of infected plants to roots of healthy plants and mud clinging to vehicles, animals, and walkers (Department of the Environment and Energy 2018). Dieback caused by <i>P.</i>

Threat	Status and severity a	Evidence
		<i>cinnamomi</i> is listed as a Key Threatening Process under the EPBC Act.
		The vegetation at many sites occupied by swamp skinks is subject to infestation by <i>P. cinnamomi</i> . This pathogen can dramatically alter the prime characteristics of swamp skink habitat (Robertson & Clemann 2015). This threat has the potential to have moderate to major consequences for subpopulations of the swamp skink.
Impacts from domestic a	nimals	
Heavy grazing and trampling of habitat by domestic stock	<ul> <li>Timing: current/future</li> <li>Confidence: inferred</li> <li>Consequence: moderate</li> <li>Trend: unknown</li> <li>Extent: across part of its range</li> </ul>	Grazing and trampling of habitat by stock is a potential threat to the swamp skink (SWIFFT 2021; Robertson & Clemann 2015). Much of the swamp skink habitat remaining on private land is subject to grazing by domestic stock. Heavy grazing can greatly decrease ground vegetation cover, inhibit regeneration, and disturb soil structure (including lizard burrows) and drainage characteristics. It can also increase soil nutrient levels, facilitating weed invasion. Sedge-rich communities of lowland drainage lines are particularly susceptible to impacts from grazing (Robertson & Clemann 2015).

Timing—identify the temporal nature of the threat;

Confidence—identify the extent to which we have confidence about the impact of the threat on the species; Consequence—identify the severity of the threat;

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

Extent—identify its spatial content in terms of the range of the species.

Each threat has been described in Table 1 in terms of the extent that it is operating on the species. The risk matrix (Table 2) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed in consultation with experts and using available literature.

Likelihood	Consequences						
	Not significant	Minor	Moderate	Major	Catastrophic		
Almost certain	Low risk	Moderate risk Disturbance caused by recreational use	Very high risk Impacts from feral herbivores Predation by feral predators	Very high risk Removal and draining of habitat Weed invasion Increasing temperatures, changes to precipitation patterns and extreme climatic events Changed water regimes of	Very high risk		

#### Table 2 Swamp skink risk matrix

Likelihood	Consequences					
	Not significant Minor Moderate			Major	Catastrophic	
				rivers and wetlands		
Likely	Low risk	Moderate risk	High risk Timber harvesting Heavy grazing and trampling of habitat by domestic stock	Very high risk Fragmentation through clearing	Very high risk	
Possible	Low risk	Moderate risk	High risk	Very high risk Pollution of rivers, wetlands, and marine and coastal areas and resulting changes to vegetation	Very high risk	
Unlikely	Low risk	Low risk	Moderate risk	High risk	Very high risk	
Unknown	Low risk	Low risk	Moderate risk <i>Phytophthora</i> dieback	High risk	Very high risk	

#### Categories for likelihood are defined as follows:

Almost certain – expected to occur every year

Likely - expected to occur at least once every five years

Possible - might occur at some time

Unlikely - such events are known to have occurred on a worldwide bases but only a few ties

Unknown – currently unknown how often the incident will occur

#### Categories for consequences are defined as follows:

Not significant - no long-term effect on individuals or populations

Minor – individuals are adversely affected but no effect at population level

Moderate - population recovery stalls or reduces

Major – population decreases

Catastrophic – population extirpation/extinction

Priority actions have then been developed to manage threats to the swamp skink and are outlines below.

# Conservation and recovery actions

## Primary conservation objective

- By 2030, the population of swamp skink will have increased in abundance and viable subpopulations are sustained in habitats which are managed for ongoing threats.
- Habitats associated with the swamp skink are retained and protected.
- Further fragmentation of habitat patches is avoided so that existing linkages between subpopulations remain.

# **Conservation and management priorities** Habitat loss, fragmentation, and degradation

- Ensure that proposed direct and indirect impacts to swamp skink habitat from land clearing, hydrological changes and pollution associated with development and maintenance projects are assessed and avoidance and mitigation measures are employed. This includes:
  - undertaking robust field surveys to identify habitat, noting that the species is cryptic and targeted surveys may not detect the species despite presence (N Clemann 2021. pers comm 6 August)
  - ensuring connectivity is maintained between and within subpopulations through siting and designing infrastructure so as not to affect the habitat of the swamp skink
  - avoiding direct and indirect impacts in the first instance and residual impacts are mitigated against (where appropriate).
- Protect all known colonies of swamp skink in state forest through forestry exclusion zones around subpopulations and suspected habitat, noting the species' cryptic nature.
- Ensure land managers of both public and private land are aware of the swamp skink's occurrence and the presence of suitable habitat and provide protection measures against threats.
- Install signage in areas where recreational activity may impact on habitat for the swamp skink to discourage disturbance to habitat. Consider fencing where it may prevent damage to habitat.

### Invasive species (including threats from grazing, trampling, predation)

- Monitor for the emergence or increase of populations of deer, feral pigs, cats, European red foxes and black rats at and around known subpopulations of swamp skink.
- Implement broad-scale management of deer, cats and European red foxes, and intensive local-scale population suppression in swamp skink habitat.
- Where appropriate, establish and maintain fenced exclusion sites at subpopulations under significant pressure from deer.

## Climate change and bushfire

- Inform fire management authorities of swamp skink occurrences and use of suitable maps to help mitigate against avoidable damage to swamp skink habitat during fire operations. Avoid the use of fire retardants or fire-fighting foams during fire operations.
- Undertake active weed control and control of establishing vegetation that might shade-out habitat after bushfire within and adjacent to swamp skink habitat.
- Ensure immediate and ongoing predator control within swamp skink habitat after fires occur.
- Ensure grazing by introduced herbivores is minimised or prevented following fire.

### Disease

• Ensure appropriate hygiene protocols are adhered to when entering or exiting sites for survey, monitoring or management activities such as those outlined in the *Arrive Clean*, *Leave Clean Guidelines* (Department of the Environment 2015).

#### Impacts from domestic species

- Fence habitat at risk of damage or loss from cattle grazing/trampling.
- Develop and implement a stock management plan together with land managers and local experts to reduce the impacts of grazing where possible.
- Promote the registration and responsible management of domestic cats, targeting urban areas adjacent to known swamp skink habitat.

### Stakeholder engagement/community engagement

- Seek further information on the cultural significance of the swamp skink from Traditional Owners.
- Engage and involve Traditional Owners in conservation actions, including the implementation of survey, monitoring and management actions.
- Liaise with the local community and government agencies to ensure that up-to-date scientific knowledge informs the implementation of conservation actions for the swamp skink.
- Raise awareness of the swamp skinks presence with landholders and land managers including management requirements for the species and legislative requirements regarding habitat disturbance.
- Increase the recognition and support for the swamp skinks recovery by disseminating information on the species and its conservation status to the public. However, record location data for the swamp skink is sensitive and should not be made public.

## Survey and monitoring priorities

- Design and implement a monitoring program for known subpopulations to:
  - determine the size and structure of subpopulations and population trends
  - map the area occupied by subpopulations
  - determine the condition of habitat, identify threats and the priorities for management intervention
  - monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Identify, map, and survey potential habitat across the entire range of the swamp skink. Survey is particularly required in southern NSW where extensive amounts of habitat occur but where the species is only known from one locality. Look for previously undiscovered subpopulations of swamp skink in this habitat.

## Information and research priorities

- Identify and map habitat critical to the survival of the swamp skink.
- Investigate if eDNA methods can be used to detect swamp skinks (e.g., via soil and/or water samples), and if successful, consider using eDNA as a method to confirm the presence of subpopulations.
- Undertake genetic studies to determine the viability of small subpopulations and identify potential priorities for translocations, reintroductions, or subpopulation supplementation.

• Undertake research on the likely impacts of climate change on the swamp skink to inform conservation action and identify potential climate refuges, where possible translocation effort could be focused.

# Links to relevant implementation documents

Commonwealth: Species profile

Victoria: Species profile

# Conservation Advice and Listing Assessment references

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# THREATENED SPECIES SCIENTIFIC COMMITTEE

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

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

# Attachment A: Listing Assessment for Lissolepis coventryi

### **Reason for assessment**

This assessment follows prioritisation of a nomination from the TSSC

# Assessment of eligibility for listing

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

### **Key assessment parameters**

Table 3 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification	
Number of mature individuals	Unknown	Unknown Unknown		The population size of the swamp skink is unknown and cannot be estimated due to the lack of studies on the size of subpopulations.	
Trend	Declining	i		Based on ongoing threats to the swamp skink, including the impacts of the 2019/2020 bushfires (Legge et al. 2021), the number of mature individuals is likely to be declining.	
Generation time (years)	7	7	7	Chapple (2003) cited the lifespan of the swamp skink to be greater than eight years and up to 10 years, and individuals reaching maturity at two to three years age (70-75 mm SVL).	
				A generation length of seven years was reported in the IUCN Red List assessment for the species (Gillespie et al. 2019).	
Extent of occurrence (EOO)	109 000 km <sup>2</sup>	Unknown	Unknown	The minimum plausible value has been estimated based on known occurrences from the past 20 years (2002–2021).	
Trend	Unknown			The trend in the species EOO is currently unsubstantiated but may be declining in association with the decline in habitat and number of mature individuals.	

#### **Table 3 Key assessment parameters**

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Area of Occupancy (AOO)	444 km <sup>2</sup>	Unknown	Unknown	The estimate used in the assessment is based on known occurrences, using record data for the past 20 years (2002–2021) and applying 2 x 2 km grid cells.
				An AOO of <500 km <sup>2</sup> (Endangered) also aligns with the outcomes of the 2019 IUCN Red List assessment (Gillespie et al. 2018) and <i>The Action</i> <i>Plan for Australian Lizards and</i> <i>Snakes 2017.</i>
				The IUCN Red List assessment (Gillespie et al. 2018) of the species takes a precautionary approach and infers an area of occupancy unlikely to exceed 500 km <sup>2</sup> and is probably "well below" this threshold.
Trend	Declining			The trend in AOO is currently unsubstantiated but is likely to be declining in association with the decline in area, extent and quality of habitat and the number of mature individuals caused by the large number of threats operating on the species (Table 1).
Number of subpopulations	N/A	Unknown Unknown		The number of subpopulations has not been used in the assessment however the swamp skink is known from approximately 77 sites (Robertson 1998) and based on the limited dispersal ability of the species, there may be a similar number of subpopulations.
Trend	Declining			The trend in number of subpopulations is currently unsubstantiated but is likely to be declining in association with the decline in habitat and number of mature individuals.
Basis of assessment of subpopulation number	N/A			

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification	
No. locations	>10	>10	Unknown	There are a number of threats operating on the species, with the most serious threat(s) to individual subpopulations differing across the species' distribution in association with the spatial distribution of threats, land tenure and land management. Given the spatial distribution of the species and the most serious plausible threats, the number of locations is likely to be greater than 10. However, it should be noted that the impacts of climate change and other lesser-known threats (e.g., <i>Phytophthora</i> dieback) are likely to be widespread and could significantly reduce this number in the future.	
Trend	Declining. The number of locations is likely to be declining based on the increasing nature of many of the threats operating on the species.			The number of locations is likely to be declining based on the increasing nature of many of the threats operating on the species.	
Basis of assessment of location number	As above.				
Fragmentation	The geographic distribution of the swamp skink has been described as severely fragmented (Gillespie et al. 2019). The swamp skink has specialised habitat requirements and has likely been subject to historical declines. The swamp skink has a limited dispersal ability (Robertson 1980, 1998)., and information available on the species' range in Victoria (the state with the greatest number of occurrences of the species) indicates that at 57–58 percent of sites, the area of suitable habitat is so small that these subpopulations may not be viable in the long term (SAC 2000 cited in SWIFFT 2021).				
Fluctuations	Not subject to ext mature individua bushfires.	treme fluctuations lls. No parameter v	in EOO, AOO, num vas changed by an	ber of subpopulations, locations or order of magnitude by the 2019/2020	

#### **Criterion 1 Population size reduction**

Red	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	Enda Sever	ngered re reduction		Vulnerable Substantial reduction	
A1		≥ 90%	≥ 70%	6		≥ 50%	
A2, A	\3, A4	≥ 80%	≥ 50%	б		≥ 30%	
A1 A2 A3 A4	Population reduction observed, estimate past and the causes of the reduction are understood AND ceased. Population reduction observed, estimate past where the causes of the reduction be understood OR may not be reversible Population reduction, projected or susp to a maximum of 100 years) [( <i>a</i> ) cannot An observed, estimated, inferred, projected reduction where the time period must if future (up to a max. of 100 years in futur reduction may not have ceased OR may be reversible.	red, inferred or suspected in e clearly reversible AND red, inferred or suspected in may not have ceased OR ma e. vected to be met in the futur t be used for A3] cted or suspected populatio nclude both the past and th ure), and where the causes of not be understood OR may	n the ny not re (up n e of not	Based on any of the following	(a) (b) (c) (d) (e)	direct observation [except A3] an index of abundance appropriate to the taxon a decline in area of occupancy, extent of occurrence and/or quality of habitat actual or potential levels of exploitation the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites	

### **Criterion 1 evidence** Not eligible

#### Declines

The swamp skink is likely to have suffered severe historical declines following European settlement resulting from drastic habitat modification (Gillespie et al. 2019). Currently, population size is likely to be declining, with recent impacts to habitat including clearing in the eastern suburbs of Melbourne and the 2019–2020 bushfires (N Clemann 2021. pers comm 6 August). However, no data are available to estimate the extent of past declines due to habitat loss prior to 2019 across the species' range.

Between September 2019 and March 2020, catastrophic bushfires burnt over 100,000 km<sup>2</sup> of habitat for native plants and animals in Australia (Legge at al. 2021). Legge et al. (2021), in response to these bushfires, have undertaken an assessment of fire-affected vertebrate species to estimate population declines for conservation status assessment. The assessment outcomes for the swamp skink are detailed below. Expert elicitation was used to estimate the extent of population decline after fires of varying severity, and the predicted population trajectories out to three generations (21 years) after the fire event. These estimates also include population declines associated with other ongoing threats under current management scenarios, but with an assumption of no further large-scale fires. However, projections of future climate and fire risk suggests this is unrealistic (Williams et al. 2009 and Di Virgilio et al. 2019 both cited in Legge at al. 2021). As such, the projected population decline from immediately prior to the 2019–2020 bushfires to three generations (21 years) after are likely to be underestimates.

The elicited information on population response to fires of varying severity and other ongoing threats was combined with spatial estimates of the overlaps between the species distribution and fire severity mapping. Experts judged that the swamp skink population most plausibly declined by four percent immediately post fire, and by nine percent one year post fire, but plausibly as much as 23 percent (the lower 80 percent confidence bound). Three generations post-fire, the overall population is projected to decline by 15 percent (most plausible estimate) of its pre-2019 level, but plausibly as much as 32 percent (the lower 80 percent confidence bound). For comparison, experts also projected decline in the swamp skink population should the 2019–2020 fire not have occurred. After three generations it was projected to decline by 13 percent (most plausible estimate) from pre-2019 numbers, and plausibly up to 30 percent (the lower 80 percent confidence bound). In other words, the 2019–20 bushfires were predicted to cause an additional two percent decline on top of any declines associated with other ongoing threats to the swamp skink, but given the confidence bounds around these estimates, it is likely that the impacts of the fires on the swamp skink will be negligible by three generations. These projection estimates are conservative, as they do not include the potential for future large-scale fire events which would cause additional declines (Legge et al. 2021). While this elicitation project suggests that the swamp skink is facing ongoing threats which are predicted to cause ongoing declines, the estimate of a 15 percent decline over three generations after the 2019-2020 bushfires is insufficient to qualify the swamp skink for listing under Criterion 1. At this time, there are no other available data on past, ongoing or future declines.

#### Conclusion

Following assessment of the data, the Committee has determined that the species is not eligible for listing in any category under this criterion as the past, current or future population declines are thought unlikely to exceed 30 percent in any three-generation period (21 years). However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

		Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited	
B1.	Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 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>	
AND	at least 2 of the following 3 conditi	ons:			
(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)	(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals				

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

# **Criterion 2 evidence**

Eligible under Criterion 2 B2ab(ii,iii,iv,v) for listing as Endangered

The Extent of Occurrence (EOO) for the swamp skink was estimated using record data from 2002 to 2021 and applying the shortest continuous imaginary boundary which can be drawn to encompass these records as outlined in the IUCN guidelines (IUCN 2019). The EOO of 109 000 km<sup>2</sup> does not meet the criteria for listing in any category under Criterion 2 B1.

The estimated Area of Occupancy (AOO) for the species was calculated using the standard 2 x 2 km grid cell method outlined in the IUCN guidelines (IUCN 2019) using record data from the same 20-year time period (2002 to 2021). The AOO is estimated to be 444 km<sup>2</sup> which is under the threshold for Endangered (restricted) under Criterion 2 B2. The Committee's standard approach is to use the most recent 20 years of record data in calculating EOO and AOO, unless there is evidence that a different time period is more appropriate. It is recognised that the swamp skink is a relatively conspicuous species and that there are areas of habitat which have not been subject to targeted survey. The species occupies specific habitats, is subject to considerable ongoing threats, and the status of many subpopulations is unknown (Robertson 1998; SAC 2000 cited in SWIFFT 2021). Additionally, the species has a short generation length (seven years) (Gillespie et al. 2019). Consequently, a longer period of record data was not considered appropriate to estimate the EOO and AOO for the swamp skink. An AOO of <500 km<sup>2</sup> (Endangered) also aligns with the outcomes of the 2019 IUCN Red List assessment (Gillespie et al. 2018) and *The Action Plan for Australian Lizards and Snakes 2017*.

The geographic distribution of the swamp skink has been described as severely fragmented (Gillespie et al. 2019; N Clemann 2021. pers comm 6 August). The remaining subpopulations in the west and centre of the species range are small and isolated. While larger tracts of natural habitat exist within East Gippsland, survey work in the aftermath of the 2019–2020 bushfires

demonstrated that, where it actually occurs in these habitats, the species usually persists in low numbers, and many areas of apparently suitable habitat in East Gippsland do not seem to support the species (Clemann and Atkins 2021, unpublished data). Furthermore, surveys by Clemann and Atkins (2021, unpublished data) suggests that an absence of characteristic burrows in a substantial proportion of such habitats indicates that many of these habitat patches did not contain the species prior to the fires. Additionally, increasing pressure from ongoing threats and information on the species' ecology suggest that the swamp skink's distribution is likely to be fragmented in this East Gippsland (Gillespie et al. 2019). Little information exists on the species' dispersal ability, however one survey report estimated a core activity range of 10 to 35 m<sup>2</sup> around a skinks burrow and juvenile dispersal up to 200 m (Robertson 1980). Robertson (1998) described individuals as being largely sedentary, rarely moving more than 5 m from capture sites; these apparently small home ranges and defence of occupied territory are corroborated by numerous other surveys for the species (Clemann 2000; N Clemann 2021. pers comm 6 August).

Under the IUCN Guidelines, "a taxon can be considered severely fragmented if most (>50 percent) of its total area of occupancy is in habitat patches that are (1) smaller than would be required to support a viable population, and (2) separated from other habitat patches by a large distance" (IUCN 2019). Information available from the species' range in Victoria (the state with the greatest number of occurrences of the species) indicates that the species is extant at approximately 66–67 sites. At 38 (57–58 percent) of these sites, the area of suitable habitat is so small that these subpopulations are unlikely to be viable in the long term. The status of the species at a further 22 of these sites is uncertain (SAC 2000 cited in SWIFFT 2021). Further, due to the likely limited dispersal ability of the species and specialist habitat requirements, subpopulations of swamp skink are likely to be isolated from one another across the species range. As such, the swamp skink's distribution is considered to be severely fragmented under the IUCN definition.

Continuing decline in the number of mature individuals of the swamp skink has been projected by expert elicitation (see information under Criterion 1). It has been projected that three generations (21 years) after the 2019–2020 fire event, the overall population is likely to have declined by 15 percent of its pre-2019 level, but plausibly as much as 32 percent (lower 80 percent confidence bound). Further, due to the number of range-wide threats which continue to operate on habitat for the swamp skink (see Table 1), a continuing decline in the area of occupancy, area, extent and/or quality of habitat, and number of locations or subpopulations for the species is inferred. Only 12 of the 72 Victorian subpopulations occur in nature conservation reserves and state forest (Robertson 1998). All subpopulations, including those that are potentially secure are subject to a range of threatening processes (Robertson 1998). Recent examples where habitat has been impacted include the construction of the Peninsula Link Freeway on the Mornington Peninsula and roadside beautification in the Kilsyth area (N Clemann 2021. pers comm 6 August).

The estimated AOO for the swamp skink (444 km<sup>2</sup>) meets the threshold for Endangered under Criterion 2B2 (<500 km<sup>2</sup>). The swamp skink is considered to have a severely fragmented distribution (a) and continuing decline (b) has been projected in the number of mature individuals as a result of the 2019/2020 bushfires and other threats. Decline is also inferred in the area of occupancy, the area, extent and/or quality of habitat, and the number of locations or subpopulations due to the number of range-wide threats to habitat (subcriteria ii,iii,iv,v).

Therefore, the species appears to meet the relevant elements of Criterion 2 to make it eligible for listing as Endangered. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. We are seeking any additional information on the species distribution or targeted surveys to assist in the estimation of AOO. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
<b>C1.</b> 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)
<b>C2.</b> An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90 - 100%	95 - 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

### **Criterion 3 Population size and decline**

## **Criterion 3 evidence** Insufficient data to determine eligibility

The population size of the swamp skink is unknown and cannot be estimated due to the lack of studies on the size of subpopulations.

Hence, as there are no data on population size or number of mature individuals, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

### **Criterion 4 Number of mature individuals**

	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
<b>D.</b> Number of mature individuals	< 50	< 250	< 1,000
<b>D2.</b> <sup>1</sup> Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time			D2. Typically: area of occupancy < 20 km² or number of locations ≤ 5

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

#### **Criterion 4 evidence** Insufficient data to determine eligibility

There are no data on population size or number of mature individuals. The swamp skink does not meet the thresholds under D2.

As there are no data on population size or number of mature individuals, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

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

### **Criterion 5 Quantitative analysis**

### **Criterion 5 evidence** Insufficient data to determine eligibility

No population viability analysis appears to have been undertaken for the swamp skink, and therefore there are insufficient data to demonstrate if the species is eligible for listing under this

Criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered tentative at this stage, as it may be changed as a result of responses to this consultation process.

#### Adequacy of survey

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

Threatened Species Scientific Committee



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#### **Cataloguing data**



This publication is available at the SPRAT profile for Lissolepis coventryi (swamp skink).

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#### Acknowledgements

#### Version history table

Document type	Title	Date [dd mm yyyy]
-	-	-
-	-	-