Nature Conservation (Mountain Skink) Conservation Advice 2023

Notifiable instrument NI2023–224

made under the

Nature Conservation Act 2014, s 90C (Conservation advice)

1 Name of instrument

This instrument is the *Nature Conservation (Mountain Skink) Conservation Advice 2023.*

2 Commencement

This instrument commences on the day after its notification day.

3 Conservation advice for Mountain Skink

Schedule 1 sets out the conservation advice for Mountain Skink (*Liopholis montana*)

Arthur Georges Chair, Scientific Committee 14 April 2023

CONSERVATION ADVICE MOUNTAIN SKINK – *Liopholis montana*

CONSERVATION STATUS

The Mountain Skink – *Liopholis montana* (Donnellan, Hutchinson, Dempsey & Osborne, 2002) – is recognised as threatened in the following jurisdictions:

International	Near Threatened, International Union for the Conservation of Nature Red List
National	Endangered, Environment Protection and Biodiversity Conservation Act 1999
ACT	Endangered, Nature Conservation Act 2014
NSW	not yet listed, Biodiversity Conservation Act 2016
VIC	not yet listed, Flora and Fauna Guarantee Act 1988

ELIGIBILITY

The Mountain Skink is listed as Endangered in the ACT Threatened Native Species List under IUCN Criterion B — B2ab(i,ii,iii,iv,v) due to a restricted area of occupancy (Area of occupancy (AOO) = 196 km²), severe fragmentation, ongoing loss and degradation of habitat and inferred decline in number of sub-populations and mature individuals at the national level (Attachment A). The Mountain Skink is reported as rare, declining, and its populations as fragmented (Coyne 2000, Donellan et al. 2002, Osborne and Evans 2015, Senior 2019, Clemann et al. 2018). Before the 2019–2020 fires burnt approximately 32% of the known and likely distribution, the Mountain Skink was assessed as Near Threatened on the IUCN Red List of Threatened Species, approaching Criteria B2a (Clemann et al. 2018).

DESCRIPTION AND ECOLOGY

The Mountain Skink is a stoutly built species with a squarish body shape in cross-section and adults size is attained at 74 mm snout-to-vent length (SVL) with mean adult SVL 92 mm and tail length around 160% of SVL translating to a total length of 240 mm (Donnellan et al. 2002). It has two distinct colour morphs including a



Mountain Skink (John Wombey - Canberra Nature Map)

patterned morph and a plain morph (Chapple et al. 2008, Robertson and Coventry 2019). The basic colour of the head, body, limbs, and tail is grey-brown with most individuals having a plain, reddish-brown back generally divided by a lighter or more greyish vertebral zone (Donellan et al. 2002).

The Mountain Skink is also known as the Tan-backed Skink and was previously considered the high-altitude form of White's Skink (*Liopholis whitii*, previously *Egernia whitii*). The Mountain Skink can be distinguished from White's Skink by the absence of dark-edged pale eye-like markings, particularly above the base of the forelimb and can be distinguished from the Guthega Skink (or Snowy Mountain Skink *Liopholis guthega*) by the absence of broad paravertebral stripes (Robertson and Coventry 2019).

It lives in colonies and appears to exhibit stable pair bonds (Senior 2019), with females giving birth to up to four young (Donnellan et al. 2002). It has an omnivorous diet that includes seasonal fruits (Donnellan et al. 2002).

DISTRIBUTION AND HABITAT

The Mountain Skink occurs in montane and subalpine areas extending from the Bimberi Range in Namadgi National Park, through the Snowy Mountains in New South Wales (NSW), into the Alpine National Park in Victoria and beyond to lower altitude areas further east and west (Green and Osborne 2012). The current distribution of the Mountain Skink is best reflected in Figure 1 as the 'species known to or likely to occur'.



Figure 1: Modelled Distribution of Mountain Skink (Source: DCCEEW 2022)

Source: Base map Geoscience Australia; species distribution data Species of National Environmental Significance database.

Throughout its range it occurs in a series of apparently isolated subpopulations at elevations ranging from 620 m (Wombat State Forest, VIC) to 1800 m (Mt Gingera, ACT) (Green and Osborne 2012, Wilson and Swan 2013, Cogger 2014, Clemann et al. 2018, Farquhar et al. 2021). The Mountain Skink overlaps slightly in elevational distribution with both White's Skink (*Liopholis whitii*) and the Guthega Skink (*Liopholis Guthega*) (DCCEEW 2022). Whilst there is a broad zone of distributional overlap between the Mountain Skink and Guthega Skink at 1600–1700 m, the

two species have never been found in the same habitat at the same time in any area throughout their range (Senior et al. 2021).

In the north of its range, the Mountain Skink occupies montane and subalpine conditions above 1400 m (DCCEEW 2022). In the ACT, the Mountain Skink is at the far north-eastern edge of its range and has been recorded at Mt Gingera, Ginini Flats, Mt Ginini, Stockyard Spur, Mt Scabby, Rolling Ground Gap, Square Rock in Namadgi National Park (Osborne 2021).

The Mountain Skink shelters in deep burrow systems beneath rocks and are found in high country woodlands where it is associated with mostly granitic rocky habitats such as rock outcrops, screes, tors or large logs (Donnellan et al. 2002, Cogger 2014) and was initially recorded at Cotter Source, Jacks Creek and Bimberi (Helman et al. 1988).

THREATS

The Mountain Skink is primarily threatened in the ACT by climate change related threats such as increased frequency, extent and severity of wildfires (Ward et al. 2020) and predation by invasive predators (Watson 2006, Woinarski et al. 2018, Stobo-Wilson et al. 2021) especially post-fire by feral cats (*Felis catus*) and by loss of foraging habitat (DCCEEW 2022). If feral herbivores, including horses and deer are allowed to make incursions into Mountain Skink habitat in the ACT they will likely degrade this habitat and reduce the availability of shelter and food for the Mountain Skink, as has occurred for other skinks/reptiles in other areas (Driscoll et al. 2019, Hampton and Davis 2020).

In other parts of its range, it is threatened by logging and timber harvesting and clearing of habitat (Clemann et al.2018). In a study, conducted in the forests and subalpine woodlands of Namadgi National Park, Dixon et al. (2018) found that long-unburned forests and woodlands can be more important for reptile richness and abundance than areas with prescribed burning (Dixon et al. 2018).

MAJOR CONSERVATION OBJECTIVE

The primary objective in the ACT should be to maintain viable, wild populations of the Mountain Skink within the scope of climate limitations as it is at the edge of its range (altitude, latitude and longitude), taking into account any projected changes to distributional limits under climate change.

CONSERVATION PRIORITIES

Conservation and management priorities for the Mountain Skink in the ACT should be to:

- ensure core habitat and projected core habitat under climate change are protected from disturbance (including trails or park infrastructure), planned burns and fragmentation
- in collaboration with other stakeholders and jurisdictions, conduct targeted surveys to improve understanding of the species occurrence in the ACT and habitat requirements
- undertake climate modelling to predict future distribution of the species within the ACT under a range of climate change scenarios
- work with other jurisdictions and stakeholders to support the research priorities for the species where practical, including studies of population genetic structure and diversity, microhabitat requirements, minimum tolerable fire intervals and potential to create safe havens from predators and herbivores
- incorporate the ecological needs of the Mountain Skink into ecological guidelines (e.g., ACT Government 2019)

- undertake targeted control of invasive predators and weeds within the habitat around skink colonies, particularly post fire, if feasible, to manage impacts on populations
- ensure active surveillance programs are in place to detect the presence of feral horses and invasive predators (including pigs and deer) around known colonies of Mountain Skink, and undertake control as needed
- explore the implications of climate change for population persistence and conduct climate sensitive management actions where feasible. Systematic monitoring and collection of population data, including reproduction and survival data when available, should be used to assess population viability and species distribution. For species whose physiological limits are known, biophysical models can provide a predictive understanding of the habitats required for persistence in the face of climate change through an integration of data on climate and other environmental variables with measures of morphology, behaviour, physiology and life history of the species. Opportunities to address knowledge gaps for this species to establish climate change ready management actions may include university and interjurisdictional research collaborations.

OTHER RELEVANT ADVICE, PLANS OR PRESCRIPTIONS

- Commonwealth Conservation Advice Mountain Skink (DCCEEW 2022)
- Namadgi National Park Plan of Management (ACT Government 2010)

LISTING BACKGROUND

The Mountain Skink is listed as an Endangered species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), effective 10 August 2022. It is assessed as Endangered under Criterion 2 (B2ab(i,ii,iii,iv,v)) of the EPBC Act. In 2022, under the *Nature Conservation Act 2014*, the ACT Scientific Committee recommended the Mountain Skink be listed in the Endangered category in the ACT Threatened Native Species List to align with the EPBC Act listing.

ACTION PLAN DECISION

The ACT Scientific Committee does not recommend that the Minister for the Environment should make the decision to have an action plan for the species in the ACT under the *Nature Conservation Act 2014* at this time. The key habitat areas of the species in the ACT are along the ACT/NSW border in Namadgi National Park (above 1400 m above sea level) and its habitat is protected there.

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FURTHER INFORMATION

Further information on the related Action Plan and Woodland Strategy or other threatened species and ecological communities can be obtained from the Environment, Planning and Sustainable Development Directorate (EPSDD): Phone: (02) 132281, EPSDD Website: https://www.environment.act.gov.au/

ATTACHMENT A: LISTING ASSESSMENT (DEECCW 2022)

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the Environment Protection and Biodiversity Conservation Act 1999

The Threatened Species Scientific Committee finalised this assessment on 18 June 2021.

Attachment A: Listing Assessment for Liopholis montana

Reason for assessment

This assessment follows prioritisation of this species for assessment as a result of the impacts of the 2019/2020 Bushfires.

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 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	Not known			Unknown
Trend	Declining			A structured expert elicitation process conducted in the absence of monitoring data for this species predicted a population size decline in <i>L. montana</i> of up to 10.7% ten years post the 2019/2020 fires, with a lower 80% confidence bound of 32%. These estimates assume no further extensive fire events in the range of the species (Legge et al. 2021).
Generation time (years)	4-5 years			The two most closely related congeners of the mountain skink mature at 2-3 years (<i>L. guthega</i> ; Atkins et al 2020) or 2-4 years (<i>L. whitii</i> ; Chapple 2005). The lifespan is 5-6 years in <i>L. guthega</i> (Atkins et al 2020) and up to 8 years in <i>L. whitii</i> (Chapple 2003), thus the generation length in the mountain skink can be assumed to be 4-5 years (Chapple and Farquhar 2021).
Extent of occurrence	34,942 km ²			Based on records from 1965-2017 (DAWE 2021).

Table 3 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Trend	Decreasing			Much of the mountain skink's range is within areas targeted for timber harvest, and both harvest and associated road building are ongoing within its range. The extent of clear- fell logging is projected to expand within the species' range as new logging coupes are approved (N. Clemann and P. Robertson pers. comm. 2017 cited in Clemann et al. 2018).
Area of Occupancy	196 km²	<196 km ² Given records dating back to 1965 were used in the estimate.	Unlikely to be greater than 500 km ²	Based on records from 1965–2021 (DAWE 2021). Extensive survey work across its distribution has produced few additional records (Clemann et al. 2018), however a recent survey effort outside of its formerly predicted range revealed new locations extending the species range in Victoria (Chapple and Farquhar 2021) The AOO is however considered highly likely to be remain below the threshold for Endangered (<500km ²).
Trend	Contracting due to logging and likely loss of colonies and habitat degradation from 2019/2020 bushfires.		5,389 km ² of the known / likely distribution of <i>L. montana</i> was burnt in 2019/2020 bushfires equating to 32% of its known/likely distribution. Of this 2550 km ² (approximately 49 per cent) was burnt with a high to very high severity equating to 15% of its known/likely distribution (National Indicative Aggregated Fire Extent Dataset Mapping 2020).	
Number of subpopulations	>10			
Trend	Contracting due to logging and likely loss of colonies and habitat degradation from 2019/2020 bushfires.			
Basis of assessment of subpopulation number				
No. locations	1	1	<5	
Trend	Contracting			
Basis of assessment of location number	The species is restricted to alpine woodlands and forests 900-1700 m above sea level which was subject to severe fire in 2019/2020 and skink habitats are predicted to be exposed to increased frequency and intensity of wildfires under climate change (Love et al. 2019; (National Indicative Aggregated Fire Extent Dataset Mapping 2020). The mountain skink's ecology also makes it highly vulnerable to predation from feral cats' post fires (Woinarski et al. 2018).			

Threatened Species Scientific Committee

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Fragmentation	Referred to as set the skink (Atkins landforms outsid Islands' (Atkins e reptiles. The isola suggests recoloni pressure in a par subpopulations, v Preliminary mole amongst populat (2005) demonstr the ACT and NSW montana sample indicates that his confirms that the	verely fragmented et al. 2018; Koum e of its elevational t al. 2018) which p ation of known sub zation of sites und ticular alpine regic with a large fire ev cular evidence sup ions of the mounta ated that there wa 7 populations (2.4- s from Victoria we torically there has species is severely	(Clemann et al. 20 oundouros et al. 20 niche such as lowl provide the suitable populations and the ler threat scenario: on is highly unlikely ent putting the ent ggests there is a su in skink (Chapple is 4.8–5.4% ND4 m -4.1 million years ar e included in this been limited genei y fragmented (Chap	19) likely due to limited dispersal of 009; Olsson & Shine 2003) across and valleys to areas referred to as 'Sky e habitat and thermal niche for alpine heir presumed limited dispersal ability s such bushfires and or high predation y and poses an extinction risk to ire population at risk of extinction. bstantial amount of genetic divergence and Farquhar 2021). Chapple et al itochondrial DNA divergence between go) of the mountain skink. No <i>L.</i> phylogeny, however this result flow amongst the populations and pple and Farquhar 2021).
Fluctuations	Not subject to ext mature individua fire.	treme fluctuations ls – no parameter	in EOO, AOO, num was changed by an	ber of subpopulations, locations, or 1 order of magnitude by the 2019/20

Criterion 1 Population size reduction

Reduction in total numbers (measured over the longer of 10 years or 3 generations) based on any of A1 to A4					
	Critically Endangered Very severe reduction	Endangered Severe reduc	tion	Vulnerable Substantial reduction	
A1	≥ 90%	≥ 70%		≥ 50%	
A2, A3, A4	≥ 80%	≥ 50%		≥ 30%	
 A1 Population reduction observed, estimal past and the causes of the reduction arounderstood AND ceased. A2 Population reduction observed, estimal past where the causes of the reduction be understood OR may not be reversibl A3 Population reduction, projected or sust to a maximum of 100 years) [(a) canno A4 An observed, estimated, inferred, proje reduction where the time period must i future (up to a max. of 100 years in futur reduction may not have ceased OR may 	ted, inferred, or suspected in e clearly reversible AND ted, inferred or suspected ir may not have ceased OR ma le. bected to be met in the futur <i>t be used for A3</i>] cted or suspected population include both the past and th ure), and where the causes or r not be understood OR may	n the a the ay not re (up Based any o follow n e of not	(a) (b) (c) f the ving (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 Insufficient data to determine eligibility

The generation length in the mountain skink can be assumed to be 4-5 years (Table 3) and so three generations is 12-15 years

Given limited documented evidence of fire-affected species' population declines as a result of the 2019/2020 fires, Legge et al (2021) undertook an analysis to estimate the proportions of the distributions of species that overlapped with the 2019/2020 fires, and carried out a structured expert elicitation to estimate the proportional population change after fires of different severity, and the ensuing rate of population recovery. The expert judgements were then combined with the spatial analyses to generate estimates of overall population change from before the 2019-2020 fires, to immediately after, then out to three generations after the fires.

The mountain skink was predicted to have a population size decline of up to 10.6% three generations post the fires, with a lower 80% confidence bound of 32%. These estimates assume no further extensive fire events in the range of the species (Legge et al. 2021). These figures suggest the species could be eligible for listing under Criterion 1 A2 or A4, but additional data on population trends is required to confirm this. Although impact of the 2019/2020 bushfires and predictions of decline warrant concern for the mountain skink, the Committee has determined that the species is not eligible for listing under this criterion because there is insufficient data to determine eligibility.

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



Criterion 2 evidence

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

The mountain skink has an area of occupancy of 196 km² based on records from 1965–2021 (DAWE 2021) meeting the threshold for Endangered under Criterion B2. Confidence in this estimate (and likelihood of it actually being lower given records dating back to 1965 have been used) is considered high, as extensive survey work across its distribution has produced few additional records (Clemann et al. 2018). The recent discoveries extending its western and southerly range in Victoria (Chapple and Farquhar 2021) are not likely to be followed by further discoveries to that would cause the AOO to exceed the Endangered threshold of >500km². The

species Extent of Occurrence is 50,496 km² and the area of known and likely distribution was mapped by the Department and estimated to be 17,118 km² (See Map 2).

Information on population demographics is lacking but the species appears to be uncommon, occurring in disjunct colonies with small subpopulations consisting of only one or two warrens each containing a small number of lizards (Senior 2019; Clemann et al. 2018). This represents a smaller colony size than the related *L. guthega* and *L. multiscutata* (N. Clemann and P. Robertson pers. comm. 2017 cited in Clemann et al. 2018). Like other alpine skinks, the mountain skink is likely to have poor dispersal ability (Atkins et al. 2018; Koumoundouros et al. 2009; Olsson & Shine 2003) and coupled with the isolation of subpopulations, suggests that recolonization of sites under threat scenarios such bushfires and or high predation pressure is highly unlikely and poses an extinction risk to subpopulations.

Due to the small size of subpopulations, their isolation from one another, and limited ability of skinks to disperse, the population is considered to be severely fragmented (B2a) as outlined in Clemann et al. (2018).

The number of locations is assessed as one given that it is plausible for a single fire to impact a large portion or even the entire range of the mountain skinks habitat in alpine and subalpine woodlands and forests between 600-1700 m above sea level. This elevational zone is exposed to the known and continued future threat of bushfires under climate change and post fire predation by invasive predators would occur across this entire area given the rocky refuge available to predators during fire. The combined effects of these threats could plausibly result in the population being eliminated or severely reduced within a single generation.

The mountain skink is also projected to have continuing decline in extent of occurrence due logging (Clemann et al. 2008) and has an estimated decline in area of extent and occupancy and quality of habitat (see Map 2) including an estimated decline in the number of mature individuals as estimated by Legge et al. 2021 of up to 10.6 per cent immediately post fires, or up to 32 per cent within the next three generations.

The Committee considers that the species' area of occupancy is restricted, it occurs in one location, is severely fragmented, and has continuing decline in area, extent and or quality of habitat, number of subpopulations and number of mature individuals. Therefore, the species has met the relevant elements of Criterion 2 to make it eligible for listing as Endangered.

Map 2 - Modelled distribution and 2019-20 bushfire extent (DAWE 2021)



Criterion 3 Population size and decline

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

Criterion 3 evidence

Insufficient data to determine eligibility

The population size of the mountain skink has not been estimated. The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 4 Number of mature individuals

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

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

Criterion 4 evidence Insufficient data to determine eligibility

The Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 5 Quantitative analysis

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

Criterion 5 evidence

Insufficient data to determine eligibility

Population viability analysis has not been undertaken. Therefore, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Adequacy of survey effort

The current survey effort for the mountain skink does not allow estimation of the number of mature individuals. This requires more detailed investigations as outlined in the conservation priorities.

Public consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 30 business days between 16/08/2021 and 27/09/2021.

Listing and Recovery Plan Recommendations

The Threatened Species Scientific Committee recommends:

- (i) that the list referred to in section 178 of the EPBC Act be amended by including Liopholis montana in the list in the Endangered category.
- (ii) that there not be a recovery plan for this species.