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Notice and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the long sunskink *Lampropholis elongata* Greer, 1997 as a CRITICALLY ENDANGERED species in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that the long sunskink *Lampropholis elongata* Greer, 1997 has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Critically Endangered.

Summary of Conservation Assessment

The long sunskink *Lampropholis elongata* Greer, 1997 was found to be Critically Endangered in accordance with the following provisions in the Biodiversity Conservation Regulation 2017: Critically Endangered under 4.3 (a)(d)(e i,ii,iii,iv) because: i) the geographic distribution of the species is very highly restricted (EOO and AOO both 8 km²); ii) it occurs in one threat-defined location; and iii) continuing decline is observed, projected and inferred in the number of mature individuals and area, extent and quality of habitat due to adverse fire regimes, habitat loss from timber harvesting and pastoral activities, and loss of climatic niche due to climate change.

The NSW Threatened Species Scientific Committee has found that:

1. *Lampropholis elongata* Greer, 1997 (family Scincidae) is a small, superficially nondescript skink. Its snout-vent length (SVL) shortly after it hatches is approximately 20 mm, and it reaches approximately 55 mm as an adult. It has a long body with short legs (Greer 1997; Swan *et al.* 2022). *Lampropholis elongata* is shiny mid-brown to bronze. It has a darker 'lateral stripe' that runs from behind the eye, along the side, and onto the tail. This lateral stripe often has a thin and very dark brown to black edge above and below. Below the lateral stripe and edging there are often one or two faint pale stripes that have a dark brown edge. Above the lateral stripe and edging there is usually a pale break, then markings on the third scale row from the spine. These markings could be another thin and dark stripe or a series of dark dashes (Greer 1997; Swan *et al.* 2022). The belly of *L. elongata* is usually cream to grey and can vary from unmarked to an almost net-like pattern of dark brown and black markings. A male specimen had a bronze sheen on the underside, which was lacking in two females (Greer 1997; Swan *et al.* 2022).
2. Records of *Lampropholis elongata* are restricted to the southern edge of the Walcha Plateau in northeast New South Wales: specifically, the Ngulin Nature Reserve and surrounding areas at 1180–1455 m elevation (Greer 1997; Graham *et al.* 2023).

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3. *Lampropholis elongata* may plausibly occur in additional high elevation areas of the Walcha Plateau (Shea *et al.* 2018; Graham *et al.* 2023) including on private land. Reserved areas in the region that may provide habitat for *L. elongata* include Mummel Gulf and Nowendoc National Parks; Tuggolo Creek Nature Reserve; and Protected Forestry Management Areas. This species may also occur in other areas
4. *Lampropholis elongata* has a very highly restricted geographic distribution. The extent of occurrence (EOO) for the current recorded *L. elongata* distribution is 8 km² (range 2.3 km² to <1,500 km²) and the area of occupancy (AOO) is also 8 km² (range 8–12 km²). The minimum plausible EOO value is 2.3 km² while the maximum plausible value includes potential habitat in the region. The minimum plausible AOO value of 8 km² represents the recorded distribution of this species from 2010–2022 and is considered a representative value. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2 x 2 km grid cell method, based on the IUCN Red List Guidelines (2022).
5. *Lampropholis elongata* is known from one threat-defined location. As a fire-susceptible species (because it lives in grass tussocks) with a highly restricted range, a single fire could very plausibly impact the entire currently known population of the species.
6. The number of mature individuals of the *Lampropholis elongata* is estimated to be <160 across the four sites where it was confirmed to be extant in 2022. Targeted searches indicate that *L. elongata* is not common (Shea *et al.* 2018; Shea *in litt.* 2019; Farquhar and Graham pers. comm. 2022; Graham *et al.* 2023). Graham *et al.* (2023) detected 23 individuals across 4 sites during thorough and repeated surveys. Based on detection rates during these surveys, Farquhar and Graham (pers. comm. 2022) estimated <40 mature individuals per site to give a plausible total of <160 mature individuals across four known extant sites.
7. *Lampropholis elongata* has been recorded in tussock grasslands, grassy open-canopy areas of eucalypt woodlands, or grassy clearings and edges in forests and woodlands including plantations, on stony granite- and basalt-derived soils (Greer 1997; Graham *et al.* 2023). Large patches, or a continuous cover, of well-connected grass tussocks, primarily *Poa sieberiana* (grey tussock-grass/snow grass) are important for shelter (Greer 1997; Graham *et al.* 2023). Although *L. elongata* primarily shelters in grass tussocks, it has also been found sheltering under moveable rocks and occasionally under timber (Greer 1997; Graham *et al.* 2023).
8. *Lampropholis elongata* is likely to forage under and among ground cover during the day (Wilson and Knowles 1988; Cogger 2018). Like other species of *Lampropholis*, *L. elongata* is likely to forage for insects and other small prey (Wilson and Knowles 1988; Cogger 2018). The dispersal capacity of *L. elongata*, and all other species of range-restricted *Lampropholis*, is unknown.
9. *Lampropholis elongata* has an estimated generation length of 3.75 years. Males mature at 30 mm SVL, which is usually at one year of age, whereas females mature at approximately 30–40 mm SVL, or about two years of age. Females develop eggs beginning in late October and lay 2–6 eggs in November and December (Greer 1997). Embryos are well-developed when eggs are laid. Eggs incubated in captivity

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hatched after 33–34 days, which is shorter than other species of *Lampropholis* and may be an adaptation to cool, high-elevation conditions (Greer 1997). Nest sites of *L. elongata* have not been recorded. *Lampropholis* species often share communal nests of up to 500 eggs – but usually less than 50 – that may be used by at least two different species within this genus (Wilson and Knowles 1988; Couper and Schneider 1995; Cheetham *et al.* 2010; Wilson 2012). Communal and solitary nests of the garden skink (*L. guichenoti* (Duméril & Bibron, 1839)), which broadly co-occurs with *Lampropholis elongata* (Farquhar and Graham pers. comm. 2022), have been recorded in areas with more canopy cover, less solar radiation, and higher humidity than sites where *Lampropholis elongata* occurs (Cheetham *et al.* 2010).

10. *Lampropholis elongata* is threatened by habitat loss and degradation by timber harvesting activities and pastoral activities, severe and frequent fire, climate change, and habitat degradation from feral pigs. The major land uses in the region where this species occurs are timber harvesting, cattle grazing, and conservation (NSW NPWS 2012). ‘Clearing of native vegetation’, ‘High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition’, ‘Anthropogenic Climate Change’, and ‘Predation, habitat degradation, competition and disease transmission by feral pigs, *Sus scrofa* Linnaeus 1758’ are listed as a Key Threatening Processes under the Act.
11. Habitat loss from timber harvesting activities is inferred to be contributing to continuing decline in *Lampropholis elongata*. Timber harvesting is a major industry in the region with a mix of softwood plantations and native harvest areas that include large reserved areas (Commonwealth DCCEEW 2023, Slade and Law 2018). *Lampropholis elongata* is recorded from open grassy areas that have been historically used for machine storage and product handling and processing during timber harvesting operations. As such, there is a significant risk of disturbance to these areas of known habitat during these operations (Farquhar and Graham pers. comm. 2022). Development of snig tracks during timber harvesting operations causes loss of vegetation, as well as soil compaction that can take >3–6 years to restore to support healthy vegetation communities (Cambi *et al.* 2015; Naziri *et al.* 2021). In 2022, all sites occupied by *L. elongata* had areas of habitat that were <1 ha in extent, and they were all in active forestry areas in the planning and suspended phases of imminent logging (FCNSW 2022; Graham *et al.* 2023). Therefore, it is inferred that timber harvesting operations have contributed to significant degradation and loss of *L. elongata* habitat in the past, and they have the potential to have a major – or potentially catastrophic – impact on this species in the near future.
12. Habitat loss from pastoral activities is also inferred to be contributing to continuing decline in *Lampropholis elongata*. The species’ distribution occurs within a matrix of highland areas where native grasslands, grassy eucalypt woodlands, and forests have been converted to native and exotic pastures. This has resulted in historical and ongoing losses of contiguous areas of native tussock grass that provide habitat for *L. elongata*. Pastoral conversion of the area began in 1837 and was well established by the 1900s (NSW NPWS 2012). Native grasslands adjacent to key areas of habitat were replaced with exotic pasture grasses after 1996, when this species was first detected in them (Graham *et al.* 2023).

13. Adverse fire regimes, particularly severe and frequent fire, are inferred to be contributing to continuing decline in habitat quality and the number of mature individuals of *Lampropholis elongata*. The species shelters under grass tussocks in grasslands, grassy eucalypt woodlands and grassy clearings and edges within woodlands and forests. These areas are susceptible to severe fire, causing mass mortality (Ensbey *et al.* 2023). As such, reptile experts identified *L. elongata* as one of three species (of 27 reptile species assessed) most likely to be adversely affected by severe and widespread fires in southeast Australia (Legge *et al.* 2021). The 2019/20 fires came within 5 km of key habitat areas for the species and burnt areas in the surrounding region that were significantly larger than the entire recorded distribution of *L. elongata* (Bushfire Recovery Project 2022). It is not known if *L. elongata* occurs, or occurred, undetected in these burnt areas e.g., eastern parts of Riamukka State Forest, Mummel Gulf National Park. Populations and subpopulations of the two most common and widespread species of *Lampropholis* (Delicate Skink *L. delicata*, Garden Skink) readily recover after fire (Lunney *et al.* 1991; Hannah *et al.* 1997; Penn *et al.* 2003). However, two less common and more restricted species of *Lampropholis* are adversely impacted by fire in the long-term: they are present in dry sclerophyll forests with approximately 50-year fire intervals but absent from matched areas with annual or periodic burns of up to 5-year intervals (Hannah *et al.* 1997). This includes the Friendly Sunskink (*L. amricula* Ingram & Rawlinson, 1982), a close relative of *L. elongata* (Greer 1997). In 2022, the entire Ngulin Nature Reserve was mapped as an area 'below fire thresholds', with the recommendation that 'a prescribed burn may be advantageous' (NSW NPWS 2022). A prescribed burn regime that does not consider the potential susceptibility of *L. elongata* and its habitat to frequent or severe fire has the potential to significantly impact this range-restricted species. As the species is dependent on grassy vegetation communities, the long exclusion of fire may also be detrimental to the species through changes in vegetation structure.
14. Habitat disruption due to human intrusion is suspected to be contributing to continuing decline in *Lampropholis elongata*. *Lampropholis elongata* is rarely observed or photographed, and it is recorded from a few small areas that are mostly accessible to the public. This combination of rarity and accessibility make it an attractive species for recreational reptile enthusiasts and photographers, i.e., people who aim to see rare reptiles. Further systematic and unregulated searches for *L. elongata* by reptile enthusiasts, as has occurred in the past, has the potential to cause significant damage to critical shelter structures (grass tussocks) and microhabitats (under tussocks, rocks, and timber) leading to population decline (see Goode *et al.* 1998; Webb *et al.* 2002).
15. Loss of climatic niche is inferred and projected to contribute to continuing decline in the habitat extent and number of mature individuals of *Lampropholis elongata*. All records of *L. elongata* are from highland areas >1180 m above sea level (ASL), with post 1972 records all from areas >1260 m ASL (Greer 1997; Graham *et al.* 2023) and on a peak of the Great Dividing Range (NSW NPWS 2012). The climate conditions in this area, which currently support *L. elongata*, are projected to move upwards and subsequently contract in size as climate change impacts continue (La Sorte and Jetz 2010; Maclean and Wilson 2011). Cabrelli and Hughes (2015) identified that *L. elongata* has a moderate susceptibility to climate change based

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on its traits. Their climatic niche modelling, based on limited location data available for this species and using climate projection models from 2007, indicated a complete loss of climatic niche by 2050.

16. Continuing decline in habitat quality for *Lampropholis elongata* has been observed and is inferred due to degradation from feral pigs (*Sus scrofa*). Feral pigs are a significant pest across the Northern Tablelands area. The southern Walcha Plateau, including Ngulin Nature Reserve, Riamukka State Forest, and adjacent private land where *L. elongata* occurs, supports a medium-to-high abundance of feral pigs compared to the rest of the Northern Tablelands (NT LLS 2018). Farquhar and Graham (pers. comm. 2022) observed habitat damage and degradation by feral pigs at sites where *L. elongata* occurs, and across the broader area. This included vegetation, soil, and rock disturbance. Rooting by feral pigs has the potential to cause significant damage to habitat and microclimates for *L. elongata* (Farquhar and Graham pers. comm. 2022).
17. The long sunskink *Lampropholis elongata* Greer, 1997 is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the Biodiversity Conservation Regulation 2017:

Assessment against Biodiversity Conservation Regulation 2017 criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Critically Endangered under Clause 4.3 (a)(d)(e i,ii,iii,iv).

Clause 4.2 – Reduction in population size of species (Equivalent to IUCN criterion A)

Assessment Outcome: Data deficient.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 – Restricted geographic distribution of species and other conditions

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(Equivalent to IUCN criterion B)

Assessment Outcome: Critically Endangered under Clause 4.3 (a)(d)(e i,ii,iii,iv).

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 – Low numbers of mature individuals of species and other conditions

(Equivalent to IUCN criterion Clause C)

Assessment Outcome: Data deficient.

The estimated total number of mature individuals of the species is:			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low.
and either of the following 2 conditions apply:			
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
		(i)	for critically endangered species very large, or
		(ii)	for endangered species large, or
		(iii)	for vulnerable species moderate,
	(e)	both of the following apply:	
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and
		(ii)	at least one of the following applies:
		(A)	the number of individuals in each population of the species is:
			(I) for critically endangered species extremely low, or
			(II) for endangered species very low, or
			(III) for vulnerable species low,
		(B)	all or nearly all mature individuals of the species occur within one population,

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		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.
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Clause 4.5 – Low total numbers of mature individuals of species (Equivalent to IUCN criterion D)

Assessment Outcome: Endangered under Clause 4.5 (b).

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 – Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)

Assessment Outcome: Data deficient.

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 – Very highly restricted geographic distribution of species– vulnerable species

(Equivalent to IUCN criterion D2)

Assessment Outcome: Vulnerable under Clause 4.7.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
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Supporting Documentation:

Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2023). Conservation advice for *Lampropholis elongata* (long sunskink). Australian Government, Canberra, ACT.

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