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## Notice of 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 northern long-nosed potoroo, *Potorous tridactylus tridactylus* (Kerr, 1792) as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act and, as a consequence, to omit the listing of:

1. *Potorous tridactylus* (Kerr, 1792), long-nosed potoroo in Part 3 Division 1 of Schedule 1 (Vulnerable species) of the Act. Listing of Vulnerable species is provided for by Part 4 of the Act; and
2. The Cobaki Lakes and Tweed Heads West population of the long-nosed potoroo, *Potorous tridactylus* (Kerr, 1792) in the Tweed local government area in Part 2 of Schedule 1 (Endangered populations) of the Act, as provided for in clause 4.1(5)(a) of the Biodiversity Conservation Regulation 2017.

The NSW Threatened Species Scientific Committee is satisfied that the northern long-nosed potoroo, *Potorous tridactylus tridactylus* (Kerr, 1792) 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 DCCEEW (2022), the NSW Threatened Species Scientific Committee has made a decision to list the species as Vulnerable.

## Summary of Conservation Assessment

The northern long-nosed potoroo, *Potorous tridactylus tridactylus* (Kerr, 1792) was found to be Vulnerable in accordance with the following provisions in the Biodiversity Conservation Regulation 2017: Clause 4.2(1 c)(2 c,e) and Clause 4.3(c)(d)(e i,ii,iii,iv) because: 1) a moderate population reduction of 25-48% in the number of mature individuals has been inferred as a result of adverse fire regimes and predation by apex predators over three generations (12 years); 2) the subspecies has a moderately restricted geographic distribution with an Area of Occupancy (AOO) of 512 km<sup>2</sup>; 3) the population occurs across less than ten threat-defined locations (5-10); and 4) there is an estimated and inferred continuing decline in AOO, habitat quality, number of threat-defined locations, and number of mature individuals from adverse fire regimes and predation from introduced apex predators.

The NSW Threatened Species Scientific Committee has found that:

1. The northern long-nosed potoroo, *Potorous tridactylus tridactylus* (Kerr, 1792) (family Potoroidae) is one of three subspecies of the long-nosed potoroo *Potorous tridactylus* (Kerr, 1792). The long-nosed potoroo is a compact, medium-sized marsupial with a maximum body and head length of 31–34 cm, a tail length of 23 cm and a weight range of 660–1640 g (Johnston 2008). The hind limbs are 85–88 mm long and well developed, enabling the animal to hop at great speeds. The forearms are shorter and muscular with short, strong claws, well adapted to digging. The species has small, rounded ears, large eyes and, as its name suggests, a long muzzle with a bare tip. The body has two fur layers, a soft, short

## NSW Threatened Species Scientific Committee

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dark grey fur on its back with coarser hair protruding from it, which can range in colour from yellow-white to brown fur with a black tip. The underside of the animal is covered in coarse white fur, with a grey base layer. Females have a well-developed pouch that opens anteriorly and contains four mammae (Johnston 2008).

2. The three subspecies of the long-nosed potoroo *Potorous tridactylus* are *P. t. tridactylus*; *P. t. trisulcatus* (McCoy, 1865) and *P. t. apicalis* (Gould, 1851). Each was originally described as a valid species. The Tasmanian long-nosed potoroo, *P. t. apicalis*, occurs on the Tasmanian mainland and islands of the Bass Strait, while the two mainland subspecies, the northern long-nosed potoroo *P. t. tridactylus* and the southern long-nosed potoroo, *P. t. trisulcatus*, occur on the south-eastern mainland of Australia. Taxonomic division of *Potorous tridactylus* into northern and southern subspecies is supported by three mitochondrial and four nuclear genetic markers (Frankham et al. 2012; Frankham et al. 2016; ABRS 2020). *Potorous tridactylus tridactylus* has a larger average body size than the other subspecies and typically weighs over one kilogram (the other two subspecies weigh under one kilogram) (Norton et al. 2010; Frankham et al. 2011). *Potorous tridactylus tridactylus* also has a shorter and broader muzzle than the southern and Tasmanian subspecies (Johnston et al. 1976; Frankham et al. 2012).
3. *Potorous tridactylus tridactylus* has a broad and highly fragmented distribution. The subspecies occurs between sea level and the Great Dividing Range (generally up to 800m, with recent sightings up to 1000m) and is restricted to habitats receiving an annual rainfall greater than 760 mm (Johnston 2008). *Potorous tridactylus tridactylus* occurs across two major bioregions (Southeast Queensland and New South Wales North Coast) and between Many Peaks Range (near Gladstone) in the north, to the northern boundaries of the Sydney Basin in the south. In New South Wales, *P. t. tridactylus* is distributed from Cobaki Lake near the Queensland border to Mangrove Mountain (west of Gosford), where the southernmost records of occurrence have been made (Frankham et al. 2012).
4. The estimated Extent of Occurrence (EOO) for *Potorous tridactylus tridactylus* is 92,897 km<sup>2</sup> based on a minimum convex polygon, the method of assessment recommended by IUCN (2024). The estimated Area of Occupancy (AOO) is 512 km<sup>2</sup>. Estimated AOO is based on 2 km x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2024). Estimates of EOO and AOO were calculated based on data from The Action Plan for Australian Mammals 2012 (Woinarski et al. 2014).
5. Prior to the 2019-20 bushfires, the estimated population of *Potorous tridactylus tridactylus* was less than 10,000 (Range 7,750-70,144) mature individuals, based on expert opinion in The Action Plan for Australian Mammals 2012 (Woinarski et al. 2014).
6. Long-nosed potoroos are mainly nocturnal and utilise dense vegetative cover, making them difficult to survey (Norton et al. 2010). There have been no robust estimates of population size for *Potorous tridactylus tridactylus* (Martin and

## NSW Threatened Species Scientific Committee

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Temple-Smith 2012; Woinarski *et al.* 2014). Subpopulations of *P. t. tridactylus* range in abundance from 20 to 255 individuals per km<sup>2</sup> (Seebeck *et al.* 1989; Mason 1998; Frankham *et al.* 2011; Andren *et al.* 2013). Despite the current and historical survey efforts, no combined efforts have been made to elucidate either status or trends at a population level (DCCEEW 2022). Forest patches with a fire-free period of more than 20 years were found to have the greatest abundance of long-nosed potoroo (Claridge and Barry 2000; Martin and Temple-Smith 2012). *Potorous tridactylus tridactylus* is susceptible to mortality during and after bushfires due to their limited ability to flee, use of understorey vegetation as shelter and high vulnerability to introduced predators in the post-fire environment.

7. *Potorous tridactylus tridactylus* inhabits a range of vegetation types, including open forest, rainforest, wet and dry woodland, scrubland, and coastal heathlands, often near creeks or gullies which provide refuge during fire and drought (Martin & Temple-Smith 2012; Andren *et al.* 2013; Trent 2015). Subpopulations are often separated by large areas of unsuitable habitat (Seebeck 1981; Short 1998; Frankham *et al.* 2016). The optimum habitat has a dense understorey layer to provide cover, but with sufficient open space beneath the sub-canopy to allow foraging (Norton *et al.* 2010; Andren *et al.* 2013). In low altitude and coastal habitats, *P. t. tridactylus* occurs in habitats including *Eucalyptus racemosa* (Scribbly Gum) woodlands with a heathy understory (Andren *et al.* 2013). Sighting data (between 1987 and 2015) were used to model suitable habitat and identify key environmental variables, which were (in order of importance): mean annual temperature, nearby (within 1 km) areas of vegetative cover (more than 2 km<sup>2</sup> of vegetation); dense undergrowth cover (remnant habitat units where more than 25 percent of the undergrowth is densely vegetated); and mean annual precipitation (Trent 2015). Habitat patch size is important, as the long-nosed potoroo rarely occurs in remnant vegetation patches smaller than 0.1 km<sup>2</sup>. Martin and Temple-Smith (2012) report that whilst some occurrences are in habitats of 0.16–0.40 km<sup>2</sup>, most occurrences are in habitats 0.41–1 km<sup>2</sup>.
8. All subspecies of the long-nosed potoroo are omnivorous, feeding on fruits, seeds, leaves, roots and flowers, and invertebrates (Bennett and Baxter 1989). The most significant food source (contributing between 30–90% of the diet) is hypogean sporocarps (fruiting bodies of underground fungi) (Claridge *et al.* 1993, 1994). Long-nosed potoroo are nocturnal feeders and locate the underground fungi by smell and dig them up with their sharp front claws, leaving characteristic diggings in the soil (Martin and Temple-Smith 2012). The diet of the long-nosed potoroo varies seasonally. Southern long-nosed potoroos feed on underground fungi less in spring and summer, and more in autumn and winter (Claridge *et al.* 1993), when fungi contribute as much as 80–90% of the southern long-nosed potoroo diet (Tory *et al.* 1997). Similar studies have not been conducted on *Potorous tridactylus tridactylus*, but it can be assumed that underground fungi are an essential dietary item for the subspecies and the ecological processes surrounding the consumption of fungi are also important for forest health.
9. Long-nosed potoroos become sexually mature at one year of age, producing a single young that remains with the mother for four months (Johnston 2008). Mature

## NSW Threatened Species Scientific Committee

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adults have between two and three offspring per year (Seebeck *et al.* 1989; Woinarski *et al.* 2014). They may breed throughout the year but more frequently in late winter to early spring and late summer (Johnston 2008). The species has a promiscuous genetic mating system, though with some repeat paternity (Frankham *et al.* 2012). The long-nosed potoroo lives up to seven years in the wild and can survive up to 12 years in captivity (Johnston 2008).

10. The main threats to *Potorous tridactylus tridactylus* are habitat loss and fragmentation; predation by invasive species, particularly European red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*); and adverse fire regimes and habitat degradation including through native plant pathogenic response (DCCEE 2022). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition', 'Clearing of native vegetation', 'Predation by the European red fox *Vulpes vulpes* (Linnaeus, 1758)', 'Predation by the feral cat *Felis catus* (Linnaeus, 1758)', 'Infection of native plants by *Phytophthora cinnamomi*', 'Forest eucalypt dieback associated with over-abundant psyllids and bell miners' and 'Competition and habitat degradation by feral pigs *Sus scrofa* (Linnaeus, 1758)' are listed as Key Threatening Processes under the Act.
11. *Potorous tridactylus tridactylus* is considered to occur in 5-10 threat-defined locations considering the threat of adverse fire regimes. The minimum plausible value for the number of threat-defined locations is five based on the most recent effects of the 2019-2020 bushfires, which burnt 41% of the subspecies' plausible distribution (Legge *et al.* 2021) and is projected to have caused a loss of 24-33% of the population within one year after the fire. Given that bushfires are predicted to increase in frequency and intensity under climate change scenarios (CSIRO & Bureau of Meteorology 2015), it is reasonable to predict that the available habitats offering optimum habitat (20+ years unburnt) will continue to decrease in number. Thus, the maximum number of threat-defined locations is considered less than ten.
12. Continuing decline is estimated and inferred in the AOO, habitat quality, number of locations, and number of mature individuals of the northern long-nosed potoroo due to adverse fire regimes, habitat loss and fragmentation, predation from introduced apex predators, particularly European red foxes and feral cats and habitat degradation (due to, for example, forestry activities, livestock, feral herbivores, weeds). The preferred food source of *Potorous tridactylus tridactylus* (underground fungi) is at risk from additional threats, including drought, consumption by native and feral species, and forest dieback from either *Phytophthora cinnamomi* or bell miner associated dieback. Threats can work synergistically and can be cumulative e.g., inappropriate fire management can result in loss of refugial habitats and also loss of shallow subsurface food resources. The sequence of events is also likely to be important, as increased foraging activities into open post-burnt areas by *P. t. tridactylus* can co-occur with an increase in predator activity, which may increase threats to a point where subpopulations disappear entirely (Robey *et al.* 2016).

# NSW Threatened Species Scientific Committee

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13. *Potorous tridactylus tridactylus* populations are inferred to have declined by 24–33% in the year following the 2019-2020 bushfires. In the three generations (12 years) following the bushfires, populations are predicted to decline 25–48% from pre-2019 levels (Legge *et al.* 2021). This estimate does not include the potential for future catastrophic bushfires, as may be expected under climate change (CSIRO and Bureau of Meteorology 2015).
14. Due to the effects of the above threats, *Potorous tridactylus tridactylus* is estimated to have undergone a moderate reduction in the number of mature individuals since 2019, and this decline is expected to continue over three generations (12 years) and the causes, especially adverse fire regimes, habitat loss, and predation from introduced species, have not ceased.
15. *Potorous tridactylus tridactylus* (Kerr, 1792) is not eligible to be listed as an Endangered or Critically endangered species.
16. *Potorous tridactylus tridactylus* (Kerr, 1792) is eligible to be listed as a Vulnerable species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term 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: Vulnerable under Clause 4.2(1 c)(2 c,e) and Clause 4.3(c)(d)(e i,ii,iii,iv)**

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

**Assessment Outcome: Vulnerable under Clause 4.2(1 c)(2 c,e)**

<b>(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:</b>		
(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.
<b>(2) - The determination of that criteria is to be based on any of the following:</b>		
(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

# NSW Threatened Species Scientific Committee

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**(Equivalent to IUCN criterion B)**

**Assessment Outcome: Vulnerable under Clause 4.3(c)(d)(e i,ii,iii,iv)**

<b>The geographic distribution of the species is:</b>		
(a)	for critically endangered species	very highly restricted, or
(b)	for endangered species	highly restricted, or
(c)	for vulnerable species	moderately restricted.
<b>and at least 2 of the following 3 conditions apply:</b>		
(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: Not met.**

<b>The estimated total number of mature individuals of the species is:</b>		
(a)	for critically endangered species	very low, or
(b)	for endangered species	low, or
(c)	for vulnerable species	moderately low.
<b>and either of the following 2 conditions apply:</b>		
(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,

# NSW Threatened Species Scientific Committee

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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: Not met.**

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: Not met.**

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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Senior Professor Kristine French  
 Chairperson  
 NSW Threatened Species Scientific Committee

**Supporting Documentation:**

Department of Climate Change, Energy, the Environment and Water (DCCEEW)  
 (2022) Conservation advice for *Potorous tridactylus tridactylus* (northern long-nosed potoroo), Canberra, ACT.

# NSW Threatened Species Scientific Committee

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## NSW Threatened Species Scientific Committee

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## NSW Threatened Species Scientific Committee

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