NSW SCIENTIFIC COMMITTEE

Final Determination

The Scientific Committee, established by the *Threatened Species Conservation Act* 1995 (the Act), has made a Final Determination to list the Long-footed Potoroo *Potorous longipes* Seebeck and Johnston, 1980 as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1A of the Act, and as a consequence, to omit reference to the Long-footed Potoroo *Potorous longipes* Seebeck and Johnston, 1980 from Part 1 of Schedule 1 (Endangered species) of the Act. Listing of Critically Endangered species is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. The Long-footed Potoroo *Potorous longipes* Seebeck and Johnston, 1980 (family Potoroidae) is a large rat-kangaroo, grey-brown above, grey below, males weigh up to 2.3 kg and females up to 1.7 kg (NPWS 2002; Menkhorst and Seebeck 2013). It is distinguished from its closest relative the Long-nosed Potoroo (*P. tridactylus*) by its larger size and longer hind-foot in relation to head length, the presence of a small raised pad (posthallucal) on the sole of the foot between the heel and the base of the joined second and third toes and possession of 24 chromosomes (in *P. tridactylus* there are 12 chromosomes in females, 13 in males) (Seebeck and Johnston 1980; NPWS 2002; Menkhorst and Seebeck 2013).

2. The Long-footed Potoroo is restricted to three small disjunct populations within mainland south-eastern Australia (Woinarski *et al.* 2014). Only one of the known populations occurs in New South Wales, the remaining two are within Victoria (Nunan *et al.* 2000). Nunan *et al.* (2000) state that "A fourth sub-population may exist near Mount Drummer, east of Cann River, where part of a skull was discovered in a predator scat in 1990. A fossil skull has been found at Yarrangobilly Caves, south-west of Canberra, (Seebeck 1992a) and a museum specimen collected last century has its location as 'near Rosedale', which is in central Gippsland (Seebeck and Johnston 1980)". The NSW population is located in South East Forest National Park and possibly adjacent areas of private land or lands managed by the Forestry Corporation of NSW (Yambulla and Bondi State Forests) (NPWS 2002). Two records from predator scats from Yambulla State Forest indicate that this species potentially is found in Yambulla State Forest (Broome *et al.* 1997), however this is not definitive as canids have large home ranges and it is possible that wild dogs and foxes forage within South East Forest National Park and later defecate in the adjacent areas (Lunney *et al.* 1990). A record from 2003 in Coopracambra National Park in far eastern Victoria, adjacent to the New South Wales border, is reported in DOE (2014a). This record was identified with 95% certainty from hair samples from a trapped animal that escaped before it could be identified (Robley and Wright 2004).

3. Long-footed Potoroos have never been directly observed nor trapped in New South Wales despite intensive surveys for this species within areas predicted by a habitat model based on climate and vegetation (Broome *et al.* 1997; Claridge 2002; NPWS 2002). In New South Wales intensive surveys for this species in the period 1988–1996 yielded only 17 definite records, comprised of six predator scat records and 11 hair-tube detections (Broome *et al.* 1997). In contrast in Victoria the Long-footed Potoroo has been routinely trapped and in some Victorian locations it occurs in high densities (NPWS 2002; Claridge 2002; DSE 2009).

4. The habitat of Long-footed Potoroo is described in detail in the New South Wales Recovery Plan (NPWS 2002), largely based on studies of this species from Victoria. The Long-footed

Potoroo has been found in a range of vegetation types, although proximity to wetter forest types and the availability of dense ground cover for shelter appears to be an important habitat requirement (NPWS 2002). The species has been recorded at sites as low as near sea-level to around 1370 m a.s.l. (NPWS 2002; DSE 2009). In mainland south-eastern Australia wet forest types are generally widespread (Robinson 1991 cited in NPWS 2002), however, in south-eastern New South Wales, these forest types tend to be restricted to riparian areas (Saxon and Claridge 1995). Radio-tracking and trapping studies from Victoria have demonstrated that this species is active in a range of topographic positions from creeks to ridge tops (Hill and Triggs 1985; Scotts and Seebeck 1989; Green *et al.* 1998). The Long-footed Potoroo is considered to be a dietary specialist, dependent on the fruiting bodies of underground or truffle-like fungi (Claridge and May 1994; Green *et al.* 1999; NPWS 2002). Green *et al.* (1999) found that truffle-like fungi made up an average of 91% of the diet, with plant material and insects the remainder. Claridge and May (1994) suggested that the Long-footed Potoroo may be the most fungi dependant or mycophagist animal in Australia, and it likely requires an abundance of this food source year-round in suitable habitat (NPWS 2002). Areas with a regular high abundance of truffle-like fungi are thought to be rare and patchy, both in the present day and in recent geological history (NPWS 2002), which may explain the current patchy distribution of the Long-footed Potoroo. The processes driving fungal availability are not well understood, particularly in relation to disturbance history (NPWS 2002). Available evidence suggests that habitat in New South Wales is probably marginal (Claridge 2002).

5. Data from Victoria suggest that reproductive timing varies among sites and can be either aseasonal (Green and Mitchell 1997) or peak in July-September (NPWS 2002). Pouch life is 140-150 days and young leave the pouch at about 113 days and become independent at about 20 weeks of age (Seebeck 1992b; NPWS 2002). After about a year, animals disperse from their natal territories (Green and Mitchell 1997) and become sexually mature at about two years old (Seebeck 1992b). Life span in the wild is unknown, however captive animals have lived more than 14 years (NPWS 2002). In the field life expectancy is presumably less. The Long-footed Potoroo is less fecund than the Long-nosed Potoroo (Seebeck 1992a) or bandicoots (Scott *et al.* 1999). Rapid population increases, as have been documented with bandicoots in areas with sustained fox control (Dexter *et al.* 2011), are therefore unlikely to occur.

6. Home ranges vary among sites (22–60 ha, 14–23 ha) and males have larger home ranges than females (Green *et al.* 1998; Scotts and Seebeck 1989; Seebeck *et al.* 1989). Long-footed Potoroos are thought to be monogamous and territorial, breeding pairs maintain exclusive home ranges, although the home range of juveniles is typically within the parental home range (NPWS 2002). It is thought that in NSW home ranges may be larger than in Victoria, due to lower resource availability in NSW compared with Victorian sites, although this has not been quantified (NPWS 2002). Although the dispersal ability of the Long-footed Potoroo is poorly understood (DSE 2009), there is no evidence that sufficient habitat linkages exist between the known NSW population and the next nearest known populations in Victoria (NPWS 2002). Frankham *et al.* (2014) found restricted male biased dispersal in the closely related Long-nosed Potoroo, along with high levels of female philopatry and limited gene flow between populations separated by 6–8 km of apparently suitable habitat. It is not clear if these findings from the Long-nosed Potoroo are applicable to the Long-footed Potoroo, since the former species is smaller in size and has a much smaller home range (around 1.4 ha for females and 2.0 ha in males; Bennett 1987),

compared with Long-footed Potoroo (14–60 ha) (Scotts and Seebeck 1989; Seebeck *et al.* 1989; Green *et al.* 1998).

7. The Long-footed Potoroo has proven difficult to detect within New South Wales (see Broome *et al.* 1997; NPWS 2002) making quantification of population size uncertain. Given that this species likely occurs in marginal habitat in New South Wales compared with Victoria (Claridge 2002; NPWS 2002) and only a single likely low-density population is known from the State, it can be inferred that the New South Wales population is a small proportion New South Wales of the total population of this species. It is likely the total population of this species in NSW is very low. The New South Wales population was stated to be "probably numbering less than a few hundred individuals (Saxon and Claridge 1995)." in the NSW Recovery Plan (NPWS 2002).

8. The geographic distribution of the Long-footed Potoroo is considered to be highly restricted. The area of occupancy (AOO) is estimated to be approximately 60–72 km^2 based on 15–18 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2014). The lower bound was calculated using the 17 verified records from Broome *et al.* (1997). The upper bound includes all records contained in the New South Wales OEH Atlas of Wildlife (accessed August 2014) although, as some of these records are likely to be erroneous, the upper bound is likely to over-estimate AOO. The extent of occurrence (EOO) in New South Wales is estimated to be between 122 km^2 and 915 km^2. The lower bound is based on a minimum convex polygon enclosing all reliable mapped occurrences of the species, the method of assessment recommended by IUCN (2014). The upper bound was estimated by encompassing all areas of potential habitat (see Claridge 2002) contiguous with plausible but unverified records from the New South Wales OEH Wildlife Atlas (accessed March 2014). The upper bound is likely to overestimate the EOO as available evidence suggests the majority of predicted habitat is not occupied by this species.

9. The Long-footed Potoroo in New South Wales faces a range of threats including: predation by foxes and dogs and perhaps cats; disturbance to habitat resulting in loss of ground cover or diminished food resources; competition for food resources with the feral pig (*Sus scrofa*); extinction of smaller colonies through lack of breeding opportunity or success; disease (e.g. Cryptococcosis, Balanoposthitis, Bairnsdale Ulcer) and browsing, grazing and trampling by feral deer (various species) may alter the composition and structure of habitat (NPWS 2002; Vaughan *et al.* 2007; DSE 2009; Vaughan-Higgins *et al.* 2011). Climate change may change the availability (both quantity and seasonality) of the fungal food source for this species (DSE 2009; Kauserud *et al.* 2010; Bateman *et al.* 2012*a* and 2012*b*) although this remains unstudied in the habitats used by this species and the potential impacts are unknown. The New South Wales population is at the eastern extreme of the known range of this species and the habitat is likely to be marginal (Claridge 2002), increasing vulnerability to climate change impacts. 'Anthropogenic climate change', 'Herbivory and environmental degradation caused by feral deer', 'Predation by the European red fox *Vulpes vulpes* (Linnaeus, 1758)', 'Predation by the feral cat *Felis catus* (Linnaeus, 1758)' and 'Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*, Linnaeus, 1758)' are listed as Key Threatening Processes under the Act.

10. Long-footed Potoroo *Potorous longipes* is listed as an Endangered species under the *Environment Protection and Biodiversity Conservation Act* 1999.

11. Long-footed Potoroo *Potorous longipes* Seebeck and Johnston, 1980 is eligible to be listed as a Critically Endangered species as, in the opinion of the Scientific Committee, it is facing an extremely high risk of extinction in New South Wales in the immediate future as determined in accordance with the following criteria as prescribed by the *Threatened Species Conservation Regulation* 2010:

Clause 8 Low numbers of mature individuals of species and other conditions
The estimated total number of mature individuals of the species is:

(a) very low,

and:

(d) a projected or continuing decline is observed, estimated or inferred in either of the key indicators:

(a) an index of abundance appropriate to the taxon, or

(b) the geographic distribution, habitat quality or diversity, or genetic diversity.

Dr Mark Eldridge
Chairperson
Scientific Committee

Exhibition period: 02/10/15 – 27/11/15 Proposed Gazettal date: 02/10/15

References:

Bateman BL, VanDerWal J, Williams SE, Johnson CN (2012*a*) Biotic interactions influence the projected distribution of a specialist mammal under climate change. *Diversity and Distributions* **18**, 861–872.

Bateman BL, VanDerWal J, Johnson CN (2012*b*) Nice weather for bettongs: using weather events, not climate means, in species distribution models. *Ecography* **35**, 306–314.

Bennett AF (1987) Conservation of mammals within a fragmented forest environment: the contributions of insular biogeography and autecology. In 'Nature conservation: the role of remnants of native vegetation'. (Eds DA Saunders, GW Arnold, AA Burbridge, AJM Hopkins) pp. 41–52. (Surrey Beatty & Sons: Chipping Norton, NSW)

Broome LS, Blackley S, Tennant P (1997) Long-footed Potoroo *Potorous longipes* research plan in south-eastern NSW (NPWS). ANCA Endangered Species Program, Project Number 448a. Annual Report, May 1996.

Claridge AW (2002) Use of bioclimatic analysis to direct survey effort for the Long-footed Potoroo (*Potorous longipes*), a rare forest-dwelling rat-kangaroo. *Wildlife Research* **29**, 193–202.

Claridge AW, May TW (1994) Mycophagy among Australian mammals. *Australian Journal of Ecology* **19**, 251–275.

Dexter N, Hudson M, Carter T, MacGregor C (2011) Habitat-dependent population regulation in an irrupting population of long-nosed bandicoots (*Perameles nasuta*). *Austral Ecology* **36**, 745–754.

Department of Environment (2014*a*) Species Profile and Threat Database, Australian Government Department of the Environment. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=217 accessed 20/3/14

Department of Sustainability and Environment (2009) Action Statement, Flora and Fauna Guarantee Act 1988, No 58 (revised in 2009) (DSE, Victoria)

Frankham G, Handasyde K, Norton M, Murray A, Eldridge MDB (2014) Molecular detection of intra-population structure in a threatened potoroid, *Potorous tridactylus*: conservation management and sampling implications. *Conservation Genetics* **15**, 547–560.

Green K, Mitchell AT (1997) Breeding of the Long-footed Potoroo, *Potorous longipes* (Marsupialia: Potoroidae), in the wild: behaviour, births and juvenile independence. *Australian Mammalogy* **20**, 1–7.

Green K, Mitchell AT, Tennant P (1998) Home range and microhabitat use by the long-footed potoroo, *Potorous longipes*. *Wildlife Research* **25**, 357–372.

Green K, Tory MK, Mitchell AT, Tennant P, May TW (1999) The diet of the Long-footed Potoroo (*Potorous longipes*). *Australian Journal of Ecology* **24**, 151–156.

Hill FAR, Triggs BE (1985) Ecology and distribution of the Long-footed Potoroo (*Potorous longipes*) - a second preliminary examination. State Forests and Lands Service, Victoria, Research Branch Report No. 310.

IUCN Standards and Petitions Subcommittee (2014) Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee. http://www.iucnredlist.org/documents/RedListGuidelines.pdf

Kauserud H, Heegaard E, Semenov MA, Boddy L, Halvorsen R, Stige LC, Sparks TH, Gange AC, Stenseth NC (2010) Climate change and spring-fruiting fungi. *Proceedings of the Royal Society B: Biological Sciences* **277**, 1169–1177.

Lunney D, Triggs B, Eby P, Ashby L (1990) Analysis of scats of dogs *Canis familiaris* and foxes *Vulpes vulpes* (Canidae: Carnivora) in coastal forests near Bega, New South Wales. *Australian Wildlife Research* **17**, 61–68.

Menkhorst PW, Seebeck JH (2013) Long-footed Potoroo *Potorous longipes*. In 'Field Companion to The Mammals of Australia.' (Eds S Van Dyck, I Gynther, A Baker) pp. 94. (New Holland Publishers: Sydney)

NSW National Parks and Wildlife Service (2002) Approved Recovery Plan for the Long-footed Potoroo (*Potorous longipes*). NSW National Parks and Wildlife Service, Hurstville, NSW.

Nunan D, Henry S, Tennant P (2000) National Long-footed Potoroo (*Potorous longipes*) Recovery Plan. Department of Natural Resources and Environment, Victoria.

Robinson, RW (1991) An analysis of the vegetation at ten sites where the Long-Footed Potoroo has been recorded. Unpublished report to the Department of Conservation and Environment, Victoria.

Robley A, Wright J (2004) Adaptive Experimental Management of Foxes. Parks Victoria Technical Series NUMBER 20 Annual Report: July 2003–2004. Parks Victoria, Melbourne.

Saxon MJ, Claridge AW (1995) A proposed interim management strategy for the conservation of the Long-footed Potoroo (*Potorous longipes*) in New South Wales. Draft for public comment, May 1995. Internal Report, NSW NPWS.

Scotts DJ, Seebeck JH (1989) Ecology of *Potorous longipes* (Marsupialia: Potoroidae); and preliminary recommendations for management of its habitat in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series Number 62. Melbourne, Victoria.

Scott LK, Hume ID, Dickman CR (1999) Ecology and population biology of long-nosed bandicoots (*Perameles nasuta*) at North Head, Sydney Harbour National Park. *Wildlife Research* **26**, 805–821.

Seebeck JH (1992*a*) Sub-fossil potoroos in southeastern Australia; with a record *of Potorous longipes* from New South Wales. *Victorian Naturalist* **109**, 173–176.

Seebeck JH (1992*b*) Breeding, growth and development of captive *Potorous longipes* (Marsupialia: Potoroidae); and a comparison with *P. tridactylus*. *Australian Mammalogy* **15**, 37–45.

Seebeck JH, Bennett AF, Scotts DJ (1989) Ecology of the Potoroidae – a review. In 'Kangaroos, Wallbies and Rat-Kangaroos.' (Eds G Grigg, P Jarman, I Hume) pp. 67–88. (Surrey Beatty and Sons: Sydney)

Seebeck JH, Johnston PG (1980) *Potorous longipes* (Marsupialia: Macropodidae); a new species from eastern Victoria. *Australian Journal of Zoology* **28**, 119–134.

Vaughan RJ, Vitali D, Eden PA, Payne KL, Warren KS, Forshaw D, Friend, JA, Horwitz, AM, Main, C, Krockenberger, MB, Maliki, R (2007) Cryptococcosis in Gilbert's and Long-nosed Potoroos. *Journal of Zoo and Wildlife Medicine* **38**, 567–573.

Vaughan-Higgins RJ, Buller N, Friend JA, Robertson I, Monaghan C, Fenwick S, Warren K (2011) Balanoposthitis, Dyspareunia, and Treponema in the critically endangered Gilbert's potoroo (*Potorous gilbertii*). *Journal of Wildlife Diseases* **47**, 1019–1025.

Woinarski JCZ, Burbidge AA, Harrison PL (2014) 'The Action Plan for Australian Mammals 2012.' (CSIRO Publishing: Collingwood, Victoria)