The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Potorous longipes

long-footed potoroo

Conservation Status

Potorous longipes (long-footed potoroo) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from the 16 July 2000. The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

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 http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

The main factors that were the cause of the species being eligible for listing in the Endangered category were its very restricted distribution and small, fragmented population.

The Committee notes that the Action Plan for Australian Mammals 2012 (Woinarski et al., 2014) reviewed the conservation status of all Australian mammals and considered the long-footed potoroo to be Vulnerable. This differs from the status determined when the species was grandfathered in from the *Endangered Species Protection Act 1992* (Cwlth). The Threatened Species Scientific Committee is using the findings of Woinarski et al., (2014) to prioritise future reassessment of the conservation status of each of threatened mammals listed under the EPBC Act.

Description

The long-footed potoroo was first described as recently as 1980 (Seebeck & Johnston 1980) and is one of the larger members of the rat-kangaroo family (Potoroidae). It is a ground-dwelling, mostly nocturnal marsupial with dorsal grey-brown fur above and grey fur underneath (NSW NPWS 2002; DSE 2009). It has a head and body length up to 400 mm and a tail length up to 320 mm and moves with a bi-pedal hop as well as using its forepaws in a slower gait. Males weigh up to 2.3 kg and females up to 1.7 kg. Its larger size and longer hind-foot in relation to head length physically distinguish it from its closest relative, *P. tridactylus* (long-nosed potoroo) (Seebeck & Johnston 1980).

Distribution

The long-footed potoroo was first described from specimens collected in East Gippsland and there are currently three known disjunct populations of the species; one in East Gippsland north-east of Orbost, another on the Barry Mountains in north-eastern Victoria, and a third centred in south-eastern New South Wales (Nunan et al., 2000). A fourth population was thought to exist near Mount Drummer, east of Cann River, where part of a skull was discovered in a predator scat in 1990, however surveys in the area have failed to confirm this (DSE, 2009). A fossil skull was found at Yarrangobilly Caves, south-west of Canberra (Seebeck 1992), and a museum specimen collected last century has its location in central Gippsland (Seebeck & Johnston 1980). These last records indicate the species may have been more widespread historically (NSW NPWS 2002).

The East Gippsland population has been reported from more than 60 separate sites (clusters of known records) in an area of about 1600 km^2 in the catchments of the Brodribb, Bemm, Rodger

and Yalmy Rivers. A 2009 record from Cape Conran has extended this range (DSE 2009) and dedicated surveying in the Goolengook Forest Management Block confirmed the species across the south and east, thus extending the eastern and southern boundary of the East Gippsland population (Elsner et al., 2012).

The north-eastern Victorian population, only discovered in 1995, has been recorded from more than 60 sites concentrated in the West Buffalo, East Riley and Tea Tree Range areas of the Barry Mountains. The current known range of the species in north-eastern Victoria is approximately 3000 square kilometres (DSE 2009). The expansion of long-footed potoroo distribution in Victoria since the species' discovery is a result of increased surveys rather than an increase in abundance (DSE 2009). Abundance and population dynamics are difficult to assess and the species is still considered rare (DSE 2009).

No animals have been trapped in south-eastern New South Wales (NSW), with only 17 definite records obtained from predator scats and hair samples (Broome et al., 1996). These records are distributed across the South East Forests National Park (Genoa and Waalimma sections) as well as Bondi, Nungatta and Yambulla State Forests. The known NSW populations are now found entirely within the South East Forests National Park (NSW OEH 2016). The NSW population appears to be at very low density.

Relevant Biology/Ecology

The long-footed potoroo inhabits a variety of vegetation classes from shrubby dry forest to warm temperate rainforest and wet forest. The elevation of confirmed sites ranges from less than 100m above sea level in East Gippsland to greater than 1000m in north-eastern Victoria. Sites on sheltered aspects with moist soils, supporting a mixed species overstorey and a dense understorey, are characteristic of preferred habitat. Dense understorey appears to provide shelter and protection from predators, especially wild dogs (*Canis lupus familiaris*), dingos (*Canis lupus dingo*) and foxes (*Vulpes vulpes*) (Scotts & Seebeck 1989), to which the potoroos are known to be susceptible (DSE 2009).

The long-footed potoroo is dependant on underground fruiting fungi as a food source (Nunan et al., 2000). A three-year study in East Gippsland, indicated that fungi comprise an average of 91 percent of their diet, with invertebrates and plant material making up the remainder; where the fungal component was lower, the proportion of invertebrates in the diet increased (Green et al., 1999). Together with other mycophagous mammals, the long-footed potoroo may play a significant role in maintaining the health of the forest by dispersing viable spores from the sporocarps (fruiting bodies) they eat, which subsequently form symbiotic associations with host eucalypt roots.

While studies to date indicate that the overall proportion of fungi to plants and invertebrates in the diet is relatively constent , it is apparent that the spore classes making up the fungal component differ in their contribution over some seasons, years and localities. Climatic patterns have been shown to influence sporocarp abundance, as well as the occurrence of individual species of underground-fruiting fungi (Claridge et al., 1999a/b cited in Nunan et al., 2000). Logging and fire may also influence the diversity of fungi at a site, leading to the dominance of fungal species which may more easily survive desiccation and alteration of the soil/litter layer. The primary habitat requirements for the species, therefore, appear to be a diverse and abundant supply of underground fruiting fungi throughout the year and dense cover in a forested environment to provide shelter and protection from predators (DSE 2009).

Long-footed potoroos give birth throughout the year, though with some seasonal peaks. Pouch life is estimated to be between 140 - 150 days (Seebeck 1992). Young remain at-heel until they become independent at about 20 weeks of age. Thereafter, they may remain within their natal territory for at least 12 months before dispersing (Green & Mitchell 1997). Sexual maturity is reached at about two years of age (Seebeck 1992). Expected life span in the wild is not known, though mark and recapture studies in east Gippsland have recorded individuals reaching at least eight years, and individuals have lived for 16 years in captivity (DSE 2009).

In successional forest in East Gippsland, adult home range varied from 22 to 60 ha, with male home ranges being larger than females, while in north-eastern Victoria home ranges varied from 14 to 23 ha (Green et al., 1998). Juvenile home ranges reside lay within those of their parents. Long-footed potoroos show territorial behaviour and appear monogamous (Scotts & Seebeck 1989). Males and females may forage in pairs, with the female's home range generally being within the boundary of the male's. Little overlap occurs between individual adult males (Green et al., 1998).

Captive breeding

The National Recovery Plan (Nunan et al., 2000), as well as the Victorian (DSE 2009) and NSW (NSW NPWS 2002) recovery documents, refer to the captive breeding program at Healesville Sanctuary and note that captive individuals had survived up to 16 years. The program is credited with developing husbandry techniques and with refining radio-tracking, baiting and hair-tube surveying techniques for the long-footed potoroo. Healesville Sanctuary (Baker pers. comm., 2016) notes that the main issues with the program were that due to the small source populations with a low genetic diversity, the few animals involved were related and most likely immuno-compromised. The individuals, though living many years in captivity, did not thrive and eventually succumbed to a mycobacterium disease. The program ended when the last long-footed potoroo died in 2004 (DSE 2009).

All three recovery documents include captive breeding as part of identified recovery actions to either ensure the long-term viability of the species or to raise awareness and provide management research opportunities. However, Healesville Sanctuary has no plans at present to re-introduce a captive breeding program. The species is not identified as part of Zoos Victoria 20 priority species for captive breeding. Prior to deciding if a captive breeding program could contribute to species recovery, a small trial, if genetically distinct animals were available, would be suggested to see if mycobacterial disease is a significant health issue in captivity for the species or the result of a genetically narrow founder base. (Baker pers. comm., 2016).

Threats

The major threats for the long-footed potoroo are predation (especially by introduced species) and habitat destruction or degradation from fire and timber harvesting (DSE 2009). The majority of sites in Victoria are in designated State Forests and management prescriptions for the long-footed potoroo are included in relevant forest area management plans (Nunan et al., 2000). Known long-footed potoroo sites in Victoria are protected by a Special Management Area designation. Logging, new roads and all other new development activities are not permitted in SMAs (Nunan et al., 2000).

In NSW, known long-footed potoroo sites are all contained within wet and damp forest types in the South East Forests National Park where logging is no longer permitted. As in Victoria, the species is threatened by predation by introduced species and habitat disturbance from fire. Unique to the NSW sites is the additional threat of competition for food resources from feral pigs (*Sus scrofa*) (NSW NPWS 2002).

Table 1 – Threats impacting the long-footed potoroo in approximate order of severity of current risk, based on available evidence (Nunan et al., 2000; NSW NPWS 2002; DSE 2009).

Threat factor	Threat type and status	Evidence base
Invasive species		
Predation by wild dogs, dingos and foxes, and feral cats	known current	This threat is common to all long-footed potoroo sites in Victoria and NSW. A quarter of all records of long-footed potoroos in Victoria are from remains in canid scats (DSE 2009). Both Victoria and NSW have undertaken intensive 1080 baiting programs that include long-footed potoroo sites and have noted positive responses not only for the long-footed potoroos but also for other small ground-dwelling mammals. Feral cats are considered a potential predator (Saxon et al., 1994) though this is probably an underestimate of the threat (DSE 2009).
Feral pigs - competition for food resources and habitat degradation	known (NSW sites) current	Feral pigs are common in the forests where long-footed potoroo sites are known and they consume a wide variety of underground-fruiting fungi in large quantities (NSW NPWS 2002). Foraging for fungi and other food resources by feral pigs also causes damage to surrounding ground cover and leaf litter/soil layers. Reducing feral pigs in the National Park area is a priority for NSW Office of Environment & Heritage.
Fire		
Large-scale intense wildfire and fuel-reduction burns	known current	All long-footed potoroo sites in Victoria are in forest that is susceptible to periodic wildfires and the 2003 and 2006/07 fires in the Great Dividing Range have burnt extensive areas of the long-footed potoroo's distribution (DSE 2009). The main impact from fires is removal of the dense understorey that provides shelter, as well as reducing available fungi food resources. NSW sites in the South East Forests National Park are also susceptible to extensive wildfires (NSW NPWS 2002). The last large-scale wildfire occurred in 2009 though it is unknown if the known long-footed potoroos sites were affected.
Habitat loss and fragmentation		
Forestry operations	known current (VIC) and historic (NSW)	In Victoria, 60 percent of long-footed potoroo sites are within State Forests where logging occurs, though if potoroo sites are identified then management measures to protect the sites are established (DSE 2009). In NSW, all known sites are now within the South East Forests National Parks and logging is no longer permitted.

Conservation Actions

Conservation and Management priorities

Invasive species

- Continue 1080 baiting program in Victoria and NSW including post-baiting monitoring to assess impact of management on ground-dwelling mammals within program area.

- Control feral pigs in South East Forests National Park NSW through continuation of trapping program at identified activity sites and in adjacent state forests. The ongoing program should include monitoring to assess effectiveness of trapping and should be adapted in response to these results.

Fire

- As results of research into impacts of fire on the species, information on their habitat and food sources, becomes available. This information should be incorporated into an appropriate fire management regimes for protecting key habitats in both Victoria and NSW. These regimes should include ensuring buffers can prevent wildfire or managed fire from impacting habitat and food sources; having a carefully planned weed management strategy and post-fire introduced predator control program, a post-fire population monitoring program, and demonstrated funding to facilitate all these components.
- Provide maps of known long-footed potoroo sites to local and state Rural Fire Services and seek inclusion of mitigation measures in bush fire risk management plan/s, risk register and/or operation maps.

Habitat loss, disturbance and modifications

- Maintian Victorian, in the East Gippsland and Great Dividing Range known potoroo sites are identified as 'Core Protected Areas' within State Forest Special Protected Zones/Special Management Areas and in National Parks or other conservation reserves. Implement management measures within Core Protected Areas including control of logging operations and associated road increases; establishment of unavailable areas for logging and buffer zones.
- Maintian long-footed potoroo sites within the South East Forests National Park NSW. Incorporate management measures for the Park and including identification of habitat and mapping.

Stakeholder Engagement

- Ensure information on long-footed potoroos and their habitat is shared between state forest managers and environment staff both in Victoria and NSW. Results of research programs (identified below) should be available to all stakeholders to continue to implement best-practice land management that minimises impacts on the species.
- Where research identifies potential habitat for the species in areas that are leasehold or privately-owned, liaise with landholders and provide information on the species and habitat requirements. Investigate opportunities for conservation covenants with landholders to promote land management practices that benefit the species.

Captive Breeding (If genetically distinct animals were available)

- Undertake discussions with approrpiate bodies on the opportunity of a small captive breeding trial. A trial should consider risks of disease; benefits for conservation; and specific educational material to promote increasing awareness of the species and their habitat.

Survey and Monitoring priorities

- Continue to survey in and around known long-footed potoroo sites to increase knowledge of the geographic extent of the species utilising surveying techniques developed specifically to detect this species.

- Prioritise surveys in suitable long-footed potoroo habitat, especially in areas where there is an identified abundance of underground-fruiting fungi.
- Undertake ecological niche mapping of fruiting fungi sites provide potential inhabiting area for the potoroo

Information and research priorities

- As the species is found in three disjunct areas, a connectivity analysis should be undertaken to prioritise important areas for conservation, identify the location of critical habitat linkages and barriers to the movement of individuals and gene flow. Collection of data on individual-based movement, or genetic diversity in the population is important for this analysis to take place (McRae et al., 2008).
- Identify the species' response to differing fire regimes including controlled forest management burns and extensive wildfires. The Great Dividing Range fires of 2003 and 2006/07 were events that destroyed many long-footed potoroo sites and identified habitat for the species. These areas should be investigated and results would help establish an appropriate fire regime that minimises impacts to the species and its habitat.
- Undertake research into the ecology of underground fruiting fungi particularly with regard to the impact of timber harvesting, slash-burning practices, wildfire and prescribed burning.
- More precisely assess the impact of feral cat predation on the species and, if appropriate, incorporate cat-control measures into predator control programs.
- The collection of a reasonably sized data-set of species presence information plus the range of environmental variables that are known to influence the species distribution is important in order to develop predictive models for the species' geographical distribution (Phillips et al., 2006).

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