

Nature Conservation (Eastern Bettong Nomination) Public Consultation Notice 2017

Notifiable instrument NI2017–548

made under the

Nature Conservation Act 2014, s 84 (Nominations—public consultation)

1 Name of instrument

This instrument is the *Nature Conservation (Eastern Bettong Nomination) Public Consultation Notice 2017*.

2 Commencement

This instrument commences on the day after its notification day.

3 Nomination—threatened native species list

The nomination for the Eastern Bettong (*Bettongia gaimardi*) to the threatened native species list is at schedule 1.

4 Public consultation details

(1) Anyone may give a written submission about the nomination to:

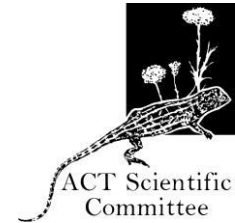
Scientific Committee
Environment, Planning and Sustainable Development Directorate
GPO Box 158, CANBERRA ACT 2601
Email: ScientificCommittee@act.gov.au

(2) Submissions may only be given during the public consultation period. The public consultation period begins on the day this notice is notified and ends on 8 December 2017.

(3) The nomination is available for inspection during business hours at Ground Floor South, Dame Pattie Menzies House, 16 Challis Street, Dickson. The nomination can also be accessed at: www.environment.act.gov.au.

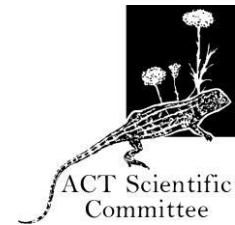
Note: As the listing eligibility criteria may only include scientific matters, under section 65 (2) of the *Nature Conservation Act 2014*, any submission made during the public consultation period must also be based on scientific matters.

Professor Arthur Georges
Scientific Committee Chair
23 October 2017



Threatened Native Species Nomination Eastern Bettong *Bettongia gaimardi*

Details																					
1. TAXON NAME																					
Scientific name:	<i>Bettongia gaimardi</i> (Desmarest 1822).																				
Common names:	Eastern Bettong, Rat Kangaroo, Tasmanian Bettong, Tasmanian Rat Kangaroo, Southern Bettong, Gaimard’s Bettong.																				
2. TAXONOMY																					
Provide any relevant detail on the nomination’s taxonomy. (e.g. authors of taxon or naming authority, year and reference; synonyms; Family and Order).																					
DIPROTODONTIA (Order) » PHALANGERIDA (Suborder) » MACROPODOIDEA (Superfamily) » POTOROIDAE (Family) » <i>Bettongia</i> Gray, 1837 (Genus) Family: <i>Potoroidae</i> – Bettongs, potoroos, Musky Rat-kangaroo																					
Wakefield (1967) consolidated two species (<i>Bettongia cuniculus</i> and <i>B. gaimardi</i>) into a single species with two subspecies: the extant Tasmanian Bettong (<i>Bettongia gaimardi cuniculus</i>) and the extinct Eastern Bettong (mainland) (<i>Bettongia gaimardi gaimardi</i>).																					
A genetic study (Haouchar et al., 2016) of fossilised bones and museum skins combined with an existing DNA dataset shows the Tasmanian Bettong, <i>Bettongia gaimardi cuniculus</i> , lies within the range of variation of the mainland Eastern Bettong, <i>Bettongia gaimardi gaimardi</i> . The analysis does not strongly support the separation of the two subspecies, which suggests a more thorough assessment of their taxonomy is needed. However listings are based on the currently accepted taxonomy.																					
3. CONVENTIONALLY ACCEPTED																					
Is the taxon conventionally accepted? Provide details. An accepted taxonomic authority for flora is the Council of Heads of Australasian Herbaria (CHAH) and for fauna, the Australian Faunal Directory (AFD)	If the taxonomy is not conventionally accepted, then provide a scientifically acceptable taxonomic description or evidence that the taxon is considered to be a new taxon. (refer to requirements in the guidelines attached)																				
<input checked="" type="checkbox"/> YES – Both the species and subspecies are accepted by the Australian Faunal Directory (AFD)	NO																				
4. NOMINATED CATEGORY																					
Note: for CR, EN, VU and RT categories: after completing questions and checking the guidelines sufficient evidence should be available to determine the category for listing.																					
<table border="0"> <tr> <td></td> <td>NATIONAL CATEGORY</td> <td><input type="checkbox"/></td> <td>REGIONAL CATEGORY</td> </tr> <tr> <td>Extinct</td> <td><input type="checkbox"/> Critically Endangered (CR)</td> <td><input type="checkbox"/></td> <td>Regionally Threatened (RT)</td> </tr> <tr> <td>Extinct in the wild</td> <td>Endangered (EN)</td> <td></td> <td>Regionally Conservation Dependent</td> </tr> <tr> <td></td> <td>Vulnerable (VU)</td> <td></td> <td>Provisional</td> </tr> <tr> <td></td> <td>Conservation dependent</td> <td></td> <td>Delist (refer attachment)</td> </tr> </table>		NATIONAL CATEGORY	<input type="checkbox"/>	REGIONAL CATEGORY	Extinct	<input type="checkbox"/> Critically Endangered (CR)	<input type="checkbox"/>	Regionally Threatened (RT)	Extinct in the wild	Endangered (EN)		Regionally Conservation Dependent		Vulnerable (VU)		Provisional		Conservation dependent		Delist (refer attachment)	
	NATIONAL CATEGORY	<input type="checkbox"/>	REGIONAL CATEGORY																		
Extinct	<input type="checkbox"/> Critically Endangered (CR)	<input type="checkbox"/>	Regionally Threatened (RT)																		
Extinct in the wild	Endangered (EN)		Regionally Conservation Dependent																		
	Vulnerable (VU)		Provisional																		
	Conservation dependent		Delist (refer attachment)																		



5. CURRENT LISTING CATEGORY

5.1 Listing in the ACT

In what category is the taxon **CURRENTLY** listed under the *Nature Conservation Act 2014* (NC Act) s.63)?

NATIONAL CATEGORY

REGIONAL CATEGORY

- | | | |
|--|---|---|
| <input type="checkbox"/> Extinct | <input type="checkbox"/> Critically Endangered | <input type="checkbox"/> Regionally Threatened |
| <input type="checkbox"/> Extinct in the Wild | <input type="checkbox"/> Endangered | <input type="checkbox"/> Regionally Conservation Dependent |
| | <input type="checkbox"/> Vulnerable | <input type="checkbox"/> Provisional |
| | <input type="checkbox"/> Conservation Dependent | <input type="checkbox"/> Protected (Data Deficient/Rare/Trade Restricted) |
| | | <input checked="" type="checkbox"/> Not listed |

5.2 Listing Category at the Commonwealth level

In what category is the taxon **CURRENTLY** listed under the Commonwealth's *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act)

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> Extinct | <input type="checkbox"/> Critically Endangered | <input type="checkbox"/> Conservation Dependent |
| <input type="checkbox"/> Extinct in the Wild | <input type="checkbox"/> Endangered | <input type="checkbox"/> Not Listed |
| | <input type="checkbox"/> Vulnerable | |

Notes: See Section 2 regarding species and subspecies information

Bettongia gaimardi gaimardi

- Commonwealth: Extinct (mainland population).

Other jurisdictions.

- NSW: Extinct, *Threatened Species Conservation Act 1995* (NSW), September 2016
- QLD: Extinct in the Wild, *Nature Conservation Act 1992* (Qld), August 2015
- VIC: Threatened, *Flora and Fauna Guarantee Act 1988* (Vic), April 2015
Non-statutory Listings
- VIC: Extinct (Advisory List of Threatened Vertebrate Fauna in Victoria: 2013 list)
- NGO: Extinct (The action plan for Australian mammals 2012)

Bettongia gaimardi

- NSW: Extinct, *Threatened Species Conservation Act 1995* (NSW), September 2016
- VIC: Threatened, *Flora and Fauna Guarantee Act 1988* (Vic), April 2015
- Tas: Protected under Schedule 2 of the Wildlife (General) Regulations 2010 (Tas), under Section 26 of the *Nature Conservation Act 2002* (Tas)
Non-statutory Listings
- NGO: Vulnerable (The action plan for Australian mammals 2012)
- IUCN: Near Threatened, February 2016² and 2008; Lower Risk/Near Threatened, 1996

² A threat to the Tasmanian sub-species of the Eastern Bettong (*Bettongia gaimardi cuniculus*) occurred between 1998 and 2001 with the supposed introduction of European Red Foxes (*Vulpes vulpes*) into Tasmania (Saunders *et al.*, 2006). Evidence of the introduction was through the discovery of four fox carcasses – one killed by a hunter in 2001 and roadkills in 2003, 2005 and 2006. Researchers also found fox DNA in various carnivore scats collected over a wide area (Saunders *et al.*, 2006; Sarre *et al.*, 2013). These events suggested an established fox population. The legitimacy of the DNA method was questioned (Gonçalves *et al.*, 2014) but has since been adequately defended (Sarre *et al.*, 2014). This, prompted the IUCN to act on the proposal by Menkhorst (2008) and raised the threat status of the Eastern Bettong to near-threatened. Although foxes are now considered extinct in Tasmania (Caley *et al.*, 2015).



Taxon Information

9. DESCRIPTION

Provide a description of the taxon including where relevant, distinguishing features, size and social structure

How distinct is this taxon in its appearance from other taxa? How likely is it to be misidentified? What are the look-a-like taxa for which it may be mistaken?

The Eastern Bettong is a small macropod, typically grey-brown above with a paler underside. Its legs are cream coloured. Pinkish flesh is noticeable around its mouth and naked brown nose, its forepaws and hind feet and the inside of the ears. In keeping with other bettongs, the hind feet are relatively long, while the forepaws have long, curved central claws.

The Eastern Bettong's prehensile tail is roughly the length of its body and often has a white tip. The tail is noticeably fleshy and an important storage organ for reserves, especially fat. Like most members of the family *Potoroidae*, little distinguishes male and female individuals although males may be slightly longer and slimmer.

Adult measurements (Claridge et al., 2007)

- Head and body length: 323 (315-332) mm
- Tail length: 326 (288-345) mm
- Body mass: 1660 (1200-2240 g)

Reproductive biology of the species (Rose, 1987):

- Gestation: 21 days
- Pouch life: 105 days
- Lactation after pouch vacation: 56-63 days
- Mass of young at pouch vacation: 279-370 g
- Mass of young at weaning: 1046-1350 g

Dentition

Molar teeth erupt in the usual manner for macropodids with each stage of molar eruption proportionately longer than the previous (Rose 1989). Eastern Bettongs are mature when the single sectorial premolar tooth – a premolar with a cutting edge, replaces the two deciduous premolars, an event that occurs between 40 and 52 weeks after birth. From there, molar progression, or replacement of molars, occurs more or less annually so they typically get their fourth molar when four years old. However, this process is variable so assessing tooth wear is the best method for aging wild Eastern Bettongs which may live for 3-6 years in the wild (Rose, 1986).

10. DISTRIBUTION

- Provide a succinct overview of the taxon's known or estimated current and past distribution, including international/national distribution. Provide a map if available.
- Provide separate details for any distinct population or area of occurrence including the degree of geographic separation between the sub-populations.
- Is the taxon protected within the reserve system (e.g. national parks, Indigenous Protected Areas, or other conservation estates, private land covenants, etc.)? If so, which populations? Which reserves are actively managed for this taxon? See attached guidelines, provide details.



National distribution

The Eastern Bettong now occurs naturally only in Tasmania where it is common over much of the eastern or drier half of the state from sea level to 1000 m. It occurs on Bruny Island and was reintroduced to Maria Island.

The species is listed as extinct on the mainland having disappeared around the 1920's and earlier from the ACT (Short 1998; Menkhorst 2008). Its prior distribution occurred in an arc from the south-eastern corner of South Australia through the tablelands of eastern Australia to south-eastern Queensland (Seebeck and Rose 1989).

ACT distribution

There are records of numerous Rat Kangaroos in the ACT region and these were almost certainly Eastern Bettongs (Gillespie, 1992; Smith, 1992). Aboriginals in the Goulburn district also kept Rat Kangaroos for food (Gillespie, 1992). The Eastern Bettong had probably disappeared from the ACT area by 1908³.

Additional observations of the Eastern Bettong on the lands that became the ACT and in surrounding regions, come from museum specimens, sub-fossil remains and bounty payments. Ford (in Ikin 2012) recently reviewed museum specimens of potoroine species (including sub-fossil remains) and found that all specimens south of Sydney were Eastern Bettongs, including records from eastern NSW that had been previously thought to be the Burrowing Bettong (*B. penicillata*). Sub-fossil remains of the Eastern Bettong in the ACT region, some of which date to less than 200 years old, come mostly from cave deposits such as at London Bridge in the Burra Valley, Wombeyan, Yarrangobilly, Wee Jasper, Cotter and Michelago (pers. comm. Dr Fred Ford, Australian Government).

Anecdotally, rat kangaroos were reported as a severe pest by Samuel Schumack who lived on "Spring Vale" at [Weetangera](#) from 1866 to 1915 (Schumack, 1967). It is likely that the species was *Bettongia gaimardi* and the Rufous Rat kangaroo, *Aepyprymnus rufescens* may also have been present in the lands that were later to become the ACT (Gillespie, 1992).

11. BIOLOGY/ECOLOGY

Include information on:

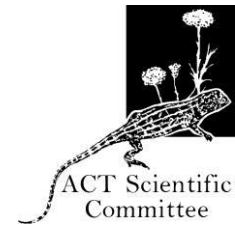
- life cycle including age at sexual maturity, life expectancy, natural mortality rates
- specific biological characteristics
- habitat requirements for the taxon
- for fauna: feeding behaviour and food preference; and daily and seasonal movement patterns
- for flora: pollination and seed dispersal patterns

Eastern Bettongs⁴ were once thought to be solitary animals, coming together only to breed. However, observations from Mulligans Flat Woodland Sanctuary suggest communal habitation (pers. comm. Prof Adrian Manning, Fenner School, Australian National University). Breeding occurs continuously with females producing two or three young per year for which she does all of the caring (Rose and Johnson, 2008).

The Eastern Bettong inhabits well drained, open eucalypt and woodlands with grassy or healthy ground cover. The species also occurs in *Casuarina* forests with a similar groundcover. These *Casuarina* habitats, however, are apparently of secondary importance because the two main *Casuarina* species in

³ The year the region was selected as the site of the nation's future capital city.

⁴ The Eastern Bettong disappeared from the mainland long before much was known about its biology. Therefore a lot of knowledge of the species comes from studies in Tasmania and from information on closely related species. However, increasingly more knowledge of the species is coming from research at Mulligans Flat Woodland Sanctuary and Tidbinbilla Nature Reserve.



Tasmania tend to be restricted to specific places, notably coastal fringes and drier places in the case of *Allocasuarina verticillata*, and watercourses for *A. littoralis*. However, Eastern Bettongs can persist in highly modified landscapes, as was observed in Tasmania when trapping the animals for the Mulligans Flat Woodland Experiment (pers. comm. Prof Adrian Manning, Fenner School, Australian National University).

The eucalypt and *Casuarina* habitats that occur in the eastern half of Tasmania probably resemble forests that the Eastern Bettong once occupied on the mainland. Likewise, the regions where it occurs in Tasmania and those it once occupied on the mainland encompass similar altitudes, with much suitable habitat between sea level and 1000 m above sea level in Tasmania and possibly slightly higher on the mainland.

Eastern Bettongs are strictly nocturnal, spending the day in nests constructed from plant material that they harvest and carry to the nesting site using their prehensile tail. Bettong's habitat must provide cover where they can build nests in which they spend the daylight hours. Environments with low shrubs, tussock grass and fallen timber provide ideal places for the animal to conceal the nest (Rose, 1986), while the nest itself plays an important role in thermoregulation (Rose and Rose, 1998). Most relatively undisturbed forest is likely to provide suitable areas for nesting for the Eastern Bettong⁵.

Members of the *Potoroidae* are obligate mycophagists⁶. Similar to other potoroids, the Eastern Bettong relies heavily on the fruiting bodies of ectomycorrhizal hypogeous fungi⁷ to meet its nutritional requirements. Eucalypt forests support a high diversity of hypogeous fungi⁸. In environments with sporadic rainfall, however, these fungi may not always be available and it is likely that the bettong then relies on foods such as roots, tubers, seeds, fruit and invertebrates (Maser et al., 2008; Munro et al., in prep). Bettongs are well equipped for this strategy, being mobile (as shown by large home ranges of 65–135 ha and traversing long distances to feeding areas); having powerful claws for digging; and having highly developed olfactory regions in the brain (Wallis, 1990; Rose and Johnson, 2008; Munro et al., in prep).

Threats

12. KNOWN THREATS

Identify any **KNOWN** threats to the survival of the taxon, and state clearly whether these are **past, current, actual future or potential future** threats.

NB – CLIMATE CHANGE AS A THREAT. If climate change is an **important** threat to the nominated taxon it is important that you provide **referenced** information on **exactly how** climate change might significantly increase the nominated taxon's vulnerability to extinction.

The Eastern Bettong is one of ten recently extinct potoroids on mainland Australia. This group of mammals have recorded a high number of extinctions in the last 100 years.

The placement of bounties on 'rat-kangaroos' (potoroine species) resulted in about three million being killed in New South Wales between 1880 and 1920.⁹ Given the Eastern Bettong was the main potoroid

⁵ Wallis et al (1989) showed that the closely related Rufous Bettong often travels hundreds of metres from a nesting site to feeding grounds and may nest in open areas.

⁶ Obligate mycophagists obtain most of their nutritional requirements from fungi.

⁷ Those that form a symbiotic relationship with plant roots and that produce underground fruiting bodies – truffles.

⁸ Maser et al (2008) note that it is not unusual to identify 50 of fungi species during scat analysis.

⁹ For example, in 1897 Pasture Protection Boards paid bounties on 52,611 rat kangaroos in the Central Tablelands and on 10,959 in the Southern Tablelands (Short, 1998).



in the Southern Tablelands region, it is therefore likely that most of these payments were for that species, indicating it was once common in the region.

Sheep and cattle grazing dominated the ACT region following the first European settlements in 1824. Extensive clearing of the region's lowland eucalypt forests coincided with the spread of rabbits and foxes causing the decline of potorooids. Short (1998) considered the factors (land clearing, pastoralism, bounties, rabbits, drought and predation) that could explain the demise of three of the five species of rat kangaroos that are extinct in NSW. He concluded that their decline was closely associated with the northward expansion of the fox, which was introduced to Victoria in 1855, was well established by the 1870s and invaded NSW in the 1890's. By the middle of the twentieth century the fox had spread across the country inhabiting most regions south of the tropics, largely mirroring the spread of European Rabbits (*Oryctolagus cuniculus*).

The decline of potoroines due to fox predation is supported by the presence, in some cases re-establishment, of potoroines in areas where foxes are absent¹⁰.

In the latter half of the twentieth century the threats to Eastern Bettong abundance were typical of many species occurring on private land – clearing of land, overgrazing, forestry operations and secondary kill from 1080 baits targeting other species, particularly Bennett's Wallabies (*Macropus rufogriseus*) on pasture and Common Brushtail Possums (*Trichosurus vulpecula*) in forestry plantations.

The threat from 1080 poisoning largely disappeared with the Tasmanian Community Forest Agreement (TCFA). When this document was signed in 2005, 8.1 kg of 1080 poison was being used annually on 155 farming properties and 279 forestry coupes in Tasmania. By 2009-10, farmers and foresters used only 0.74 kg of 1080 while in the latter half of 2010 foresters did not apply it to any plantations and only 22 farming properties used 1080 poison (DPIPWE, 2011).

Disease outbreak is a potential threat to any population. In 2016 the Mulligans Flat Woodland Sanctuary population had a loss of at least 21 animals from an unknown viral disease, potentially encephalomyocarditis (EMCV). While disease is of obvious concern it must be accepted as a natural part of populations. It regulates population size and contributes to selection. The Mulligans Flat population subsequently increased after this 2016 decrease.

Dingoes and potoroines co-existed on the mainland for at least 4000 years so the threat to reintroduced bettong populations from dingoes would not be great. Dingoes and wild dogs are known to contribute positively to management of fox and cat numbers (Johnson and Van Der Wal, 2009).

13. IMPACT OF THE THREATS

What is the level of risk to the taxon?

Identify how and where the taxon is affected by the threats.

The Eastern Bettong has become extinct on the mainland most likely due to a combination of the threats detailed above.

The Eastern Bettong now only occurs naturally in Tasmania where it is common over much of the eastern and drier half of the State.

¹⁰ Healthy populations of two potorooids (the Eastern Bettong and the Long-nosed Potoroo) are present in Tasmania where the fox is absent. Populations of other potorooids that were once widespread in mainland Australia now persist on relatively few islands where foxes are absent (e.g., the Burrowing Bettong, Short and Turner, 2000). Short and Turner (2000) attribute the successful reintroduction of this species at Shark Bay, Western Australia to the effective control of Red Foxes and feral cats (*Felix catus*).



Understanding why a species became locally extinct is a necessary part of its reintroduction and failure to identify or address the management of key extinction processes can lead to failure of translocations. Reasons for the demise of species are typically complex and thus controversial but this is probably less so for the potoroines, which have all fared poorly since European colonisation.

Eastern Bettongs have thrived in Mulligans Flat Woodland Sanctuary, indicating that their primary threat is predation from foxes (pers. comm. Prof Adrian Manning, Fenner School, Australian National University). Outside of fenced reserves or controlled environments threats to Eastern Bettongs still exist on the mainland, including in the ACT.

14. THREAT ABATEMENT/MITIGATION

Give an overview of recovery and threat abatement/mitigation/conservation actions that are underway and/or proposed.

Survival of the Eastern Bettong in the ACT requires two main factors – suitable habitat and the absence of the factors that led to its extinction.

Re-establishment of the Eastern Bettongs in the ACT requires the woodlands to provide suitable habitat (sometimes highly modified – see Biology above), predator control and enough hypogeous fungi and other foods to meet their nutritional requirements.

The reintroduction of the Eastern Bettong into Mulligans Flat Woodland Sanctuary (MFWS) began with a pilot population in 2011. In 2012, 60 animals were translocated from Tasmania to both the MFWS and the Tidbinbilla Nature Reserve. In February 2017 a rigorous capture-mark-recapture population assessment of Eastern Bettongs in MFWS estimated there to be at least 160 individuals (Manning et al., in prep). A further population survey in November 2017 will provide more information on the animal numbers. This indicates that the woodlands of the ACT are suitable habitat, and provide adequate food resources, for the species population to increase.

The Eastern Bettong is surviving within the fenced sanctuary at Mulligans Flat, however, significant human intervention would be required for populations to be maintained outside of the Sanctuary. Apart from the bounties, the combination of factors that led to the demise and ultimate extinction of the Eastern Bettong in the ACT still exist. Among these, the key threat is the Red Fox, and populations of this introduced predator can be significant with estimates of 15 foxes per square kilometre in urban areas of the ACT (Francis, 2015).

The fox has been declared a pest under the *Pest Plant and Animal Act 2005*. A Pest Animal Management Plan may be prepared to outline the approach to management and is required before compliance and enforcement activity can be undertaken.

Reintroducing any mammal whose mass falls within the critical range for decline and extinction (35-5500g) (Burbidge and NMckenzie, 1989), without the ability to reduce predation on these mammals by foxes and, to a lesser extent, feral cats (Fancourt, 2014) is likely to fail.

Controlling foxes to protect a viable population of Eastern Bettongs requires substantial ongoing human intervention in the form of large areas enclosed in fox-proof fencing or intensive control of foxes over large areas.

There are difficulties managing foxes in urban areas. The most common means of fox control (one that scientists have used successfully in WA in relation to Brush-tailed Bettongs) is baiting with 1080, a Schedule 7 poison that requires special handling and training for users, and is not appropriate to use in urban areas due to the proximity to human dwellings and domestic animals.

Reintroductions outside of predator proof fencing needs to be sufficient distance from urban areas so that baiting can occur.



The preparation of a Disease Management Protocol would be required by a suitably qualified person and be distributed to those working on bettongs. This would need to include roles and responsibilities including who is responsible for post mortems.

Eastern Bettongs have been released as a research trial in the Lower Cotter Catchment.

- The aim of the trial is to evaluate the feasibility of reintroducing Eastern Bettongs ‘beyond-the-fence’ in a controlled area subject to intensive predator control. This trial is an essential first step to understand the threshold of fox predation that Eastern Bettongs can withstand. Depending on the results of this trial it will be decided whether it is appropriate to release more bettongs in an attempt to establish a viable population in the wild.
- A full research proposal was written and approved by the Conservator of Flora and Fauna before the trial started.
- An intensive ongoing fox and dog control program has been running over an area of 8000 ha from mid-2015. This program has been very effective at reducing the number of predators inside the control area. In accordance with the ethics approval bettongs were only released when fox detections were maintained at very low levels.
- A full risk assessment was undertaken as part of the planning process. The risk assessment used the framework set out by the Department Prime Minister and Cabinet: Guide to Preparing Implementation Plans (<http://pandora.nla.gov.au/tep/53572> Source: Licensed from the Commonwealth of Australia under Creative Commons Attribution 3.0 Australia Licence).
- The entire project is approved by the ANU Animal Experimentation Ethics Committee. Bettongs were only released when pre-determined levels of fox activity were met.
- All bettongs received a health check before release and have been fitted with a VHF radio collar which allows movement and survival to be assessed. The first bettongs released were monitored daily for six weeks, and all bettongs are now monitored at least twice per week.

Conservation Dependent Categories

23. NOMINATED CD CATEGORY

[NATIONAL CATEGORY](#)

A fish taxon known to occur in the ACT or surrounding bioregion subject to a statutory long-term active management plan

[REGIONAL CATEGORY](#)

The taxon must occur in the ACT and be subject to long-term active management

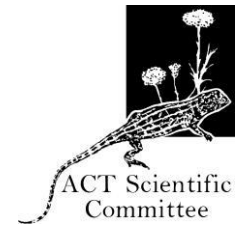
Near threatened

The taxon satisfies the IUCN criteria for Near Threatened (it nearly meets the Vulnerable criteria - the rationale for listing should include a discussion of the criteria above that are nearly met.)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future. The Eastern Bettong was listed as ‘near threatened’ by the IUCN in February 2016. See Burbidge, A.A., Woinarski, J. & Johnson, C.N. 2016. *Bettongia gaimardi*. The IUCN Red List of Threatened Species 2016: e.T2783A21960911. <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T2783A21960911.en>. Downloaded on 17 January 2017.

Previously threatened

In which jurisdiction(s) and when?



Reintroduction to historic range

When was the taxon last seen naturally in the ACT?

No verifiable records of the species, as the common name rat-kangaroo was used to refer to various potoroid species in historical accounts (Short 1998). However the sub fossil record for the ACT and surrounding region includes *B. gaimardi* (Aplin et al., 2010; Ikin 2012, Haouchar et al., 2016; Ford unpublished data).

The reintroduction of the Eastern Bettong into Mulligans Flat Woodland Sanctuary (MFWS) began with a pilot population in 2012. In 2011/2012, 60 animals were translocated from Tasmania to both the MFWS and the Tidbinbilla Nature Reserve (TNR). A 2017 population estimate for the number of Eastern Bettongs is at least 160 individuals within the MFWS (Manning et al., in prep).

The original management plan (Ikin 2012) and two specific papers (Batson et al., 2016a; Batson et al., 2016b) describe the translocation from the planning stage in 2010 through to the release of Eastern Bettongs at MFWS in 2012. This can be summarized as follows:

A total of 60 adult Eastern Bettongs and 29 pouch young were translocated from five regions of Tasmania to the ACT. Healthy animals from a range of populations and locations were selected for maximising genetic diversity of future offspring. Thirty two were released at MFWS and 28 at TNR. Four bettongs died within 90 days of translocation, two from trauma, one from an undetected suspected disease, and another from unknown causes (Portas et al., 2014).

Conservation initiative introduction/translocation

See above

24. CONSERVATION PROGRAM

Give details of the conservation program/ plan of management for which this taxon is a focus.

The initial translocation was guided by a management plan: (Ikin, K., 2012).

The future management of the species is the subject of an ACT Native Species Conservation Plan for the Eastern Bettong (in preparation).

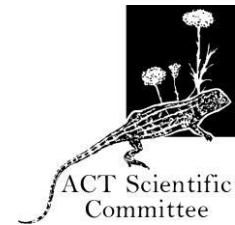
Explain the effect on the taxon if the program/plan were to cease and provide details of how the taxon would become vulnerable, endangered or critically endangered.

The ACT provides a critical insurance population for Eastern Bettongs with the only other population occurring in Tasmania.

The ACT provides areas of suitable habitat for the species to expand. However, foxes (the likely primary cause of its original extinction), are still abundant in the ACT. Foxes are widespread including in urban areas. Foxes are difficult to control in rural areas and more difficult to control in urban areas.

The urban fox populations and areas outside the baited zones are likely to provide a continuous source of fox immigration into control zones. An ongoing fox control program is required to provide for the maintenance of Eastern Bettong populations outside of predator proof fencing.

The Eastern Bettong can only persist in areas where fox population are very low, such as within predator-proof enclosures or within intensively baited fox-control areas. Without such human intervention to control foxes, it is almost certain the reintroduced populations would rapidly decline and be eligible to meet the category of vulnerable, endangered, critically endangered.



The ongoing threat of the introduction of the Red Fox to Tasmania and the rapid demise of the recently common Tasmanian Devil (*Sarcophilus harrisii*) (Hawkins et al., 2008) indicate that populations should be established in parts of the former range as surety for the species' continued existence. This further highlights the importance of the ACT insurance population of Eastern Bettongs.

25. MANAGEMENT PLAN'S LEGISLATIVE BASIS

Is the plan of management (or some component/s of it) in force under Commonwealth or State/Territory law? If so, provide details. If not, see [Attachment](#) for further directions.

The plan is to be prepared as a Native Species Conservation Plan under Part 5.3 of the *Nature Conservation Act 2014*. Native Species Conservation Plans are a flexible management tool that can be applied to any species that requires management to be outlined in a Statutory Plan. A plan is being drafted and will be available by the end of 2017.

Additional Information

26. ADDITIONAL COMMENTS/INFORMATION

Include any additional comments or information on the taxon such as survey or monitoring information, maps that would assist with the consideration of the nomination.

The Eastern Bettong also holds significant cultural, educational, and fundraising value within the ACT. The Woodlands and Wetlands Trust have a program of twilight tours and in school education programs focused on bettongs which aim to inspire the community to value bettongs and the environment. Significant funding assistance from Government and private donations have been secured by the Trust through interactions with Eastern Bettongs.

27. FURTHER STUDIES

Identify relevant studies or management documentation that might relate to the taxon (e.g. research projects, national park management plans, recovery plans, conservation plans, threat abatement plans).

A key reason for reintroducing bettongs to the ACT is the role they play in the environments they once occupied due to their feeding ecology. Biologists consider potoroids as "ecosystem engineers", whereby they have ecological functions that benefit a range of other species. In particular, as specialist feeders on the sporocarps (truffles) of hypogeous fungi, they spread the spores or reproductive cells of these truffles throughout the landscape. Some of these spores then germinate and produce a new fungus. These fungi associate with the roots of plants, often in species-specific symbiotic relationships, that directly benefit both the plant and the fungus with indirect benefits that flow through the ecosystem.

The feeding by bettongs also benefits the ecosystem in other ways through the sheer number of diggings an animal must make to obtain its nutrient requirements. Most fungal sporocarps are small (< 1g) and to meet their daily nutrient requirements Eastern Bettongs must dig up dozens of fruiting bodies as well as the roots and tubers that are also important dietary components (Munro et al., in prep).

In a study at Dryandra Woodland in Western Australia, bettongs dug between 38 and 115 holes per night which amounts to each animal excavating about 5 tonnes of soil each year (Garkaklis et al., 2004). This activity leaves an environment with as many as 3000 holes per hectare, each a few centimetres



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deep. These holes accumulate water, minimise erosion, counter the hydrophobic nature of eucalypt chemicals, capture fallen seeds, help aerate the soil and ultimately concentrate nutrients. Although other species, such as the swamp wallaby (*Wallabia bicolor*) and the Bush Rat (*Rattus fuscipes*), also seek small amounts of hypogeous fungi, they are not the ecosystem engineers to the extent that potoroids are. Thus, returning Eastern Bettongs, the native potoroid of the ACT, is one of the important steps to restoring the territory’s threatened grassy box-gum woodlands to a semblance of their condition before European settlement.

Reintroducing species also provides the opportunity for testing of scientific hypotheses that fall broadly under the heading of “Restoration Ecology” and enables us to better understand ecology. The obvious hypotheses are those that relate to the feeding ecology of potoroids and the effect of this feeding behaviour on ecosystem function and woodland/forest health.

28. IMAGES OF THE TAXON

Attach referenced images of the taxon if available.



Woodlands and Wetlands Trust

Reviewers and Referencing

29. REVIEWER(S)

Has this nomination been peer-reviewed? Have relevant experts been consulted on this nomination? If so, include their names, current professional positions and contact details.

Professor Adrian D. Manning
Associate Director (HDR)



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30. REFERENCE LIST

List key references/documentation you have referred to in your nomination.

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Nominator's Details

Note: Your details are subject to the provisions of the Privacy Act 1988. If there are multiple nominators include details below for all nominators.

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34. DECLARATION

I declare that, to the best of my knowledge, the information in this nomination and its attachments is true and correct. (See [Attachment](#))

Name of Signatory: Dr Margaret Kitchin

Signature:

** If submitting by email, please attach an electronic signature*

Date: 17/10/2017