



Rewilding Australia
securing the future of 25 threatened
and declining mammal species

AWC acknowledges the rich, cultural diversity of Aboriginal and Torres Strait Islander people across Australia who are the custodians of the land on which we live, learn and work. AWC recognises the continuing connection to land, water, wildlife, culture and community of Indigenous people and pays respect to Elders past, present and emerging.



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Executive Summary

Australia's wildlife is under pressure. Nationally, 489 vertebrates are listed as threatened, of which 20% are land mammals like the iconic Numbat, Mala and Brush-tailed Bettong. Since European colonisation, 33 mammal species have become extinct and Australia's recent mammal extinction record is widely regarded as the worst in the world. Pervasive threats such as unmanaged wildfire and predation by feral cats and foxes pose a significant risk to the persistence of Australia's wildlife.

Australian Wildlife Conservancy (AWC) is responding to this crisis by undertaking the most ambitious national rewilding program ever ventured in Australia.

The initiative to reintroduce threatened mammals to feral predator-free areas will make a crucial contribution to conservation in Australia by:

- Increasing the number of secure populations – and global population size – of threatened mammals.
- Restoring regionally extinct mammals to parts of their former range, thereby helping to maintain long-term adaptive potential.
- Playing a crucial role in the restoration of Australian ecosystems, as threatened mammals participate in a number of important ecological processes including herbivory, seed and spore dispersal, soil engineering and predation.

Reintroductions of locally extinct and threatened species are a defining component of AWC's work. This program is a proven conservation management strategy, informed by AWC's extensive experience in establishing feral predator-free fenced areas and translocating threatened mammals.

AWC's model is supported by the results of the *Threatened Species Index (TSX) for Mammals*, established by the National Environmental Science Program's Threatened Species Recovery Hub and managed by Australia's Terrestrial Ecosystem Research Network. The TSX takes a national approach, providing conservation managers and policy makers with rigorous, measurable trends of the relative change in Australia's threatened species. The TSX indicates that between 2000 and 2017 there was a 61% decline in mammals at unmanaged sites, but on feral predator-free islands and mainland fenced areas there was a more than 700% increase. These results are astounding and provide further evidence that the reintroduction programs undertaken by AWC and other organisations are making a major contribution to the conservation of Australia's threatened mammals.

The creation of feral-free safe havens and subsequent reintroductions provides protection for at-risk species, giving populations the space needed to recover and increase in numbers. Once key threats – principally feral cats – are excluded or subject to targeted management, native species are able to thrive. Managing feral predators and improving the trajectory of priority species are key actions in the Federal Government's *Threatened Species Action Plan*. Of the plan's 21 priority mammal species, six are part of AWC's reintroduction program and 10 are already protected on AWC sanctuaries and partnership areas.

AWC's extensive rewilding project aims to effectively counter the decline of more than 25 threatened Australian mammal species and subspecies, seeing populations restored and their futures secured. AWC is proud to be delivering the most ambitious national reintroduction program in Australia.

Further reading

Jiménez I, Basurto X (2022) An organizational framework for effective conservation organisations. *Biological Conservation* 267: 109471.

Kanowski J, Joseph L, Kavanagh R, Fleming A (2018) Designing a monitoring framework for Australian Wildlife Conservancy, a national conservation organisation. In: *Monitoring Threatened Species and Ecological Communities*. (Eds S Legge, DB Lindenmayer, NM Robinson, BC Scheele, DM Southwell, BA Wintle). pp 241-253. CSIRO Publishing, Melbourne.

Kanowski J, Roshier D, Smith M, Fleming A. (2018) Effective conservation of critical weight range mammals: Reintroduction projects of the Australian Wildlife Conservancy. In *Recovering Australian Threatened Species: A Book of Hope* (Eds S Garnett, P Latch, D Lindenmayer, J Woinarski). pp 269-280. CSIRO Publishing, Melbourne.

Radford JQ, Woinarski JCZ, Legge S et al. (2018) Degrees of population-level susceptibility of Australian terrestrial non-volant mammal species to predation by the introduced red fox (*Vulpes vulpes*) and feral cat (*Felis catus*). *Wildlife Research* 45: 645-657.

TERN. 2022 TSX – A Threatened Species Index for Australia. NCRIS & DAWE <tsx.org.au>

Woinarski JCZ, Burbidge AA, Harrison PL (2014) *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Melbourne.

Woinarski JCZ, Burbidge AA, Harrison PL (2015) Ongoing unravelling of a continental fauna: Decline and extinction of Australian mammals since European settlement. *Proceedings of the National Academy of Sciences of the United States of America* 112: 4531-4540.

Cover page: The Bilby is one of 25 species and subspecies being secured by AWC's ambitious translocation program. Brad Leue/AWC



The Extinction Crisis

Australia has the worst recent mammal extinction rate in the world – see Figure 1. Since European colonisation, 33 Australian mammal species have become extinct, compared to just one in North America since European colonisation. Extinctions are occurring at a rate of one to two per decade and, sadly, this decline is ongoing (Woinarski et al. 2015). One in three native mammals is extinct or currently threatened with extinction (Woinarski et al. 2014). Unmanaged wildfire, habitat loss, feral herbivores (i.e., rabbits, goats), feral cats and foxes, and interactions between these threats are driving Australia's wildlife to extinction.

In the absence of a landscape-scale solution for controlling feral cats and foxes, the re-establishment of wild populations of threatened mammals in feral cat and fox-free safe havens is a robust medium-term solution for securing the future of Australia's declining wildlife.

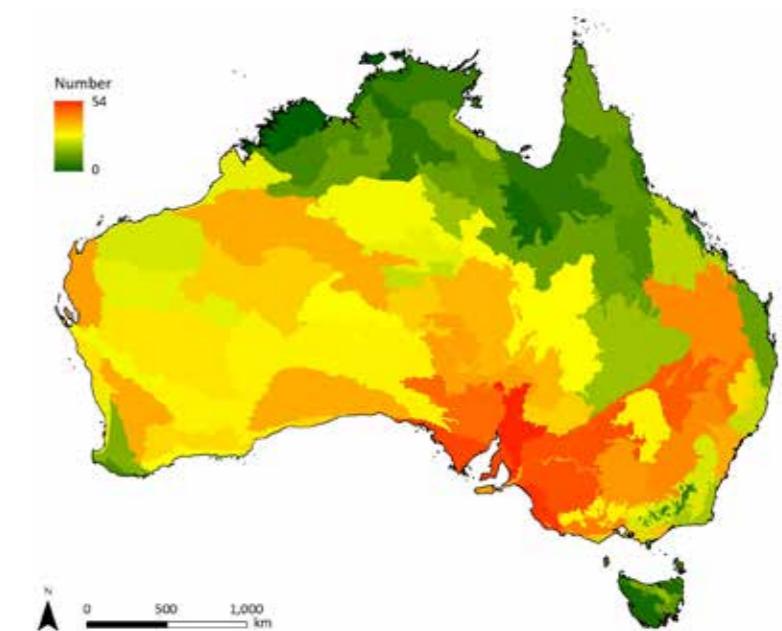


Figure 1. Map of the spatial pattern of the extinction and decline of Australian terrestrial mammals. Colours show the number of mammal species that have become extinct or declined by at least 50% in each bioregion. Data from Burbidge et al. (2008).

[Opposite] The Yallara (Lesser Bilby) once occupied Australia's sandplains and sand dune deserts. The species became extinct more than 60 years ago. The Yallara features on AWC's logo. Illustration: Peter Schouten.



AWC's Conservation Model

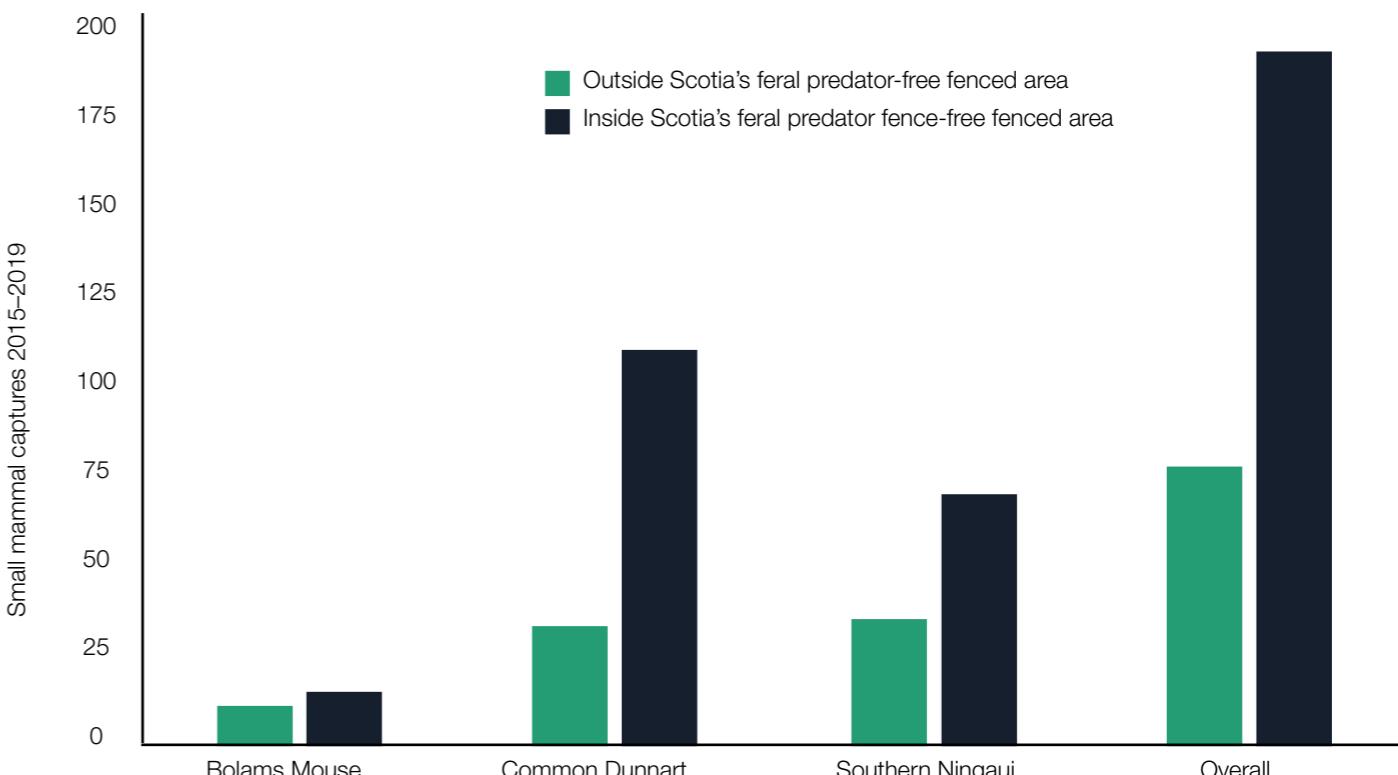
AWC has a proven track record in establishing fenced, feral predator-free areas and conducting threatened species translocations (Kanowski et al. 2018):

- AWC manages more than 41,000 hectares of feral cat and fox-free land;
- AWC's fenced areas assist extant, endemic species (Figure 2);
- AWC's reintroduction program spans 12 locations across Australia (Figure 3). This network of feral predator-free and feral predator-reduced areas has enabled the reintroduction of 20 threatened and locally extinct mammals to date.

The extinction and decline of mammals within the critical weight range (35 grams to 5.5 kilograms) has resulted in the decay of long-standing ecological processes. Many

small to medium-sized native mammals are 'ecosystem engineers' and their foraging and digging activities play a crucial role in ecosystem processes. The activity of these mammals influences the abundance of soil and leaf litter invertebrates, the transportation of seeds, plant recruitment and the retention of surface water and nutrients in semi-arid ecosystems. AWC's translocation program not only helps to re-establish populations of threatened species but also contributes to the restoration of ecological processes at each site.

In the existing program and over the next three years and beyond, reintroductions and translocations of locally extinct and threatened mammals are expected to secure populations and improve the trajectory of at least 25 mammal species.



Reintroduced species

- Banded Hare-wallaby ● ●
- Bilby ○ ○ ○ ○ ○ ○
- Black-footed Rock-wallaby ○
- Bridled Nailtail Wallaby ○ ●
- Brown Antechinus ○
- Brushtail Possum ○ ● ○
- Brush-tailed Bettong ○ ○ ○ ○ ○ ○
- Burrowing Bettong ● ○ ○ ○
- Bush Rat ○
- Central Rock-rat ○
- Eastern Pygmy Possum ○
- Greater Stick-nest Rat ● ○
- Mala ○
- Mitchell's Hopping-mouse ○
- Numbat ○ ○ ○ ○ ○
- Quenda ○
- Red-tailed Phascogale ○ ○ ○
- Shark Bay Mouse ● ○
- Tammar Wallaby ○ ○
- Western Barred Bandicoot ● ○

Extant species protected by a feral predator-proof fence

- Black-footed Rock-wallaby ○
- Kangaroo Island Dunnart ●



[Above] A Pututjurru, the local Warlpiri name for the Brush-tailed Bettong, bounces into Newhaven Wildlife Sanctuary in Central Australia, watched on by Newhaven Warlpiri Ranger Christine Ellis and Regional Operations Manager Josef Schofield. Brad Leue/AWC

Figure 2. Small mammals captured inside versus outside the fence at Scotia Wildlife Sanctuary in NSW from 2015 to 2019.

Figure 3. Map indicating AWC's network of feral predator-free and feral predator-reduced areas.



Reintroductions To Date

To date, AWC's reintroduction program has involved restoring and protecting 17 species of threatened and locally extinct mammals across nine feral predator-free areas. A further three species have been reintroduced at North Head in Sydney, where feral predators are controlled. This multi-site and multi-species program makes a major contribution to threatened mammal conservation in Australia.

By establishing new populations, AWC aims not only to increase the global population size of each species, but to reduce the risk of extinction by conserving diversity and protecting against rapid declines elsewhere. For species that were once widespread, reintroducing animals into a range of environments will help conserve genes specifically suited to diverse conditions.

Feral predator-free safe havens on AWC sanctuaries and partnership areas currently support secure populations of six of the 12 species of Australian mammals rated 'extremely vulnerable' to feral cats and foxes (Radford et al. 2018), and 12 of the 48 species rated 'highly vulnerable'; another 9 species from these categories are planned to be protected in coming years. This program is one of the few success stories in Australian native mammal conservation. For example:

- The Greater Bilby was once widespread across arid and semi-arid Australia, but over the last 100 years has declined

and retracted northward. To secure the species, AWC has founded six populations to date within the species' former range, reintroducing the iconic marsupial to Mt Gibson (WA), Scotia (NSW), Newhaven (NT) and Yookamurra (SA) Wildlife Sanctuaries and to Pilliga State Conservation Area and Mallee Cliffs National Park (NSW), where they have been absent for 90 years.

- Numbats had disappeared from most of their former range by the 1970s and have now declined to fewer than an estimated 3,000 individuals in remnant populations in south-west Western Australia. AWC has founded four Numbat populations to date, at Mt Gibson (WA), Scotia (NSW) and Yookamurra (SA) Wildlife Sanctuaries and at Mallee Cliffs National Park (NSW).
- The Bridled Nailtail Wallaby has been reduced to one remnant population, at Taunton National Park in Queensland. To date, AWC has established populations at Scotia Wildlife Sanctuary and Pilliga State Conservation Area (NSW).

At sanctuaries where translocations have occurred, ecosystems are being restored – the many signs of animal activity within the fenced area are clearly visible, with burrows and foraging pits excavated by 'ecosystem engineers' such as Bilbies, Bettongs and Numbats. Research has shown wide-ranging impacts of reintroductions on plant and animal assemblages (including invertebrates), and ecosystem processes.

[Opposite] AWC field ecologists Rhiannon Khouri and Grace Hornstra release a Bilby into the largest feral predator-free fenced area on mainland Australia at Mallee Cliffs National Park in south-western NSW. Wayne Lawler/AWC



Planned Reintroductions

Over the next three years and beyond AWC plans to undertake translocations to eight sanctuaries and partnership areas. Species to be reintroduced and/or populations to be supplemented are indicated in Table 1 below. Four of these species are listed on the Federal Government's Priority Mammal Species list.

Species name*	EPBC status	Current status	AWC reintroduced populations	Number of populations to be founded and/or supplemented***
Brushtail Possum <i>Trichosurus vulpecula</i>	Not listed	In severe decline with regional extinctions in semi-arid Australia.	Mt Gibson (WA) Paruna (WA)	1 Newhaven (NT)
Brush-tailed Bettong <i>Bettongia penicillata</i>	Endangered	Restricted to remnant populations and has experienced a recent major decline.	Karakamia (WA) Mallee Cliffs (NSW) Mt Gibson (WA) Newhaven (NT) Pilliga (NSW) Yookamurra (SA)	2
Burrowing Bettong <i>Bettongia lesueur</i>	Vulnerable	Restricted to three remnant island populations and five reintroduced populations.	Faure Island (WA) Newhaven (NT) Scotia (NSW) Yookamurra (SA)	1 Mallee Cliffs (NSW)
Northern Bettong <i>Bettongia tropica</i>	Endangered	Restricted to one secure population and one small population in decline.		1 Mount Zero–Taravale (QLD)
Bridled Nailtail Wallaby <i>Onychogalea fraenata</i>	Endangered	Restricted to one remnant population and three reintroduced populations.	Pilliga (NSW) Scotia (NSW)	2 Mallee Cliffs (NSW)

* Species may change to align with conservation priorities

** Priority mammals identified in the *Threatened Species Action Plan*

*** Translocations are contingent on availability of founders

Species name	EPBC status	Current status	Reintroduced populations	Number of populations to be founded and/or supplemented***
Brown Antechinus <i>Antechinus stuartii</i>	Not listed	Locally extinct. Supplementary translocation to reintroduced population.	North Head (NSW)	1
Central Rock Rat** <i>Zyzomys pedunculatus</i>	Critically Endangered	Restricted to four small remnant sub-populations. Vulnerable to fire and feral cats.	Newhaven (NT)	1
Eastern Pygmy Possum <i>Cercartetus nanus</i>	Vulnerable in NSW	Range contraction and patchy distribution in NSW. Supplementary translocation to reintroduced population.	North Head (NSW)	1
Golden Bandicoot <i>Isoodon auratus</i>	Vulnerable	Once widespread, now close to extinction on mainland Australia.	Newhaven (NT)	1
Western Barred Bandicoot <i>Perameles bougainville</i>	Endangered	Restricted to two remnant island populations and reintroduced populations.	Faure Island (WA) Mt Gibson (WA)	2 Mallee Cliffs (NSW) Pilliga (NSW)
Mitchell's Hopping-mouse <i>Notomys mitchellii</i>	Not listed	Highly restricted remnant distribution.	Mallee Cliffs (NSW)	1
Plains Mouse <i>Pseudomys australis</i>	Vulnerable	Highly restricted remnant distribution.	Pilliga (NSW)	1
Shark Bay Mouse (Djoongari) <i>Pseudomys gouldii</i>	Vulnerable	Restricted to one remnant island population and reintroduced populations.	Faure Island (WA) Mt Gibson (WA)	2 Newhaven (NT)
Northern Quoll** <i>Dasyurus hallucatus</i>	Endangered	Residual populations are highly fragmented. Rapid range contraction in association with the spread of cane toads.	Mount Zero–Taravale (QLD)	1
Western Quoll (Chuditch)** <i>Dasyurus geoffroii</i>	Vulnerable	Restricted to remnant populations.	Mallee Cliffs (NSW) Mt Gibson (WA) Newhaven (NT) Pilliga (NSW)	4
Numbat** <i>Myrmecobius fasciatus</i>	Endangered	Highly restricted and fragmented remnant populations.	Mallee Cliffs (NSW) Mt Gibson (WA) Scotia (NSW) Yookamurra (SA)	2 Newhaven (NT)
Red-tailed Phascogale <i>Phascogale calura</i>	Vulnerable	Restricted to remnant woodlands in south-west WA and reintroduced populations.	Mallee Cliffs (NSW) Mt Gibson (WA) Newhaven (NT)	1

[Opposite left] An Eastern Pygmy Possum. Holly Nelson/AWC

[Opposite right] A Northern Bettong. Wayne Lawler/AWC

Key Actions and Accountability

Each reintroduction involves development of species-specific formal translocation plans, relevant to ecological attributes of the species and the site of the reintroduction (e.g., vegetation type and structure, extant faunal assemblages). However, translocations broadly involve:

- establishing and/or maintaining feral predator-free areas (or, where relevant, predator-controlled areas)
- assessing impacts on and monitoring population numbers at source location/s
- trapping animals to be translocated (often over several nights)
- general health assessments on every individual (and, where required, veterinary assessment)
- microchipping of individuals
- transportation to the reintroduction site (for example by boat, helicopter, charter plane or air-conditioned vehicle)
- where source populations are small, translocation may initially be to a captive breeding facility to build up numbers, ahead of translocation to the site of the reintroduction
- pre-release health checks
- typically, radio and/or GPS-collaring of a sample of individuals
- release into the site of reintroduction
- intensive monitoring of survival in the first few weeks after release, followed by ongoing monitoring to assess condition, dispersal and population growth
- long-term genetic monitoring to inform any requirement for supplementation with additional individuals to maintain genetic diversity.

Monitoring translocated animals is a vital part of measuring the success of each reintroduction. Animals are monitored using some combination of radio-tracking, live trapping, camera traps and/or transect surveys (depending on the species), to provide data on survival, habitat use, health status, condition, breeding and recruitment (Table 2).

Table 2. Typical metrics for monitoring outcomes of translocations and associated survey methods.

Timeframe	Survey methods available	How success is measured
Short (<1 year)	Survival of translocated individuals	Radio-tracking, live trapping, cameras
Medium (1–5 years)	Population size, recruitment (breeding)	Live trapping, cameras, transect surveys
Long (>5 years)	Population size, genetic diversity	Live trapping, cameras, transect surveys, genetic analysis

AWC ecologists also measure key habitat variables, including vegetation structure and composition, and digging activity, as part of AWC's Ecohealth monitoring program. This program is one of the most extensive biodiversity monitoring programs in Australia, measuring and reporting on the status and trends of species, ecological processes and threats at each sanctuary and partnership area. AWC also collaborates with external researchers to study the restoration of other components of the ecosystem, such as invertebrate assemblages.

Monitoring allows AWC to determine the success of each translocation and to respond rapidly in critical situations. Importantly, ongoing monitoring provides a measure of the success of conservation efforts and allows quantification and reporting on the return on investment. This accountability sets AWC's conservation model apart from other existing strategies.



'More important than their ability to grow or persist in the long-term, the four organisations standout for their ability not only to conserve but to restore threatened populations and habitats in ways that changed the previous unfavourable status quo.'

Jiménez and Basurto 2022, discussing Australian Wildlife Conservancy, African Parks, Rewilding Argentina and Mauritian Wildlife Foundation.



How You Can Help

You can join AWC and invest in this ambitious translocation and rewilding program, vital to restoring Australia's lost and declining biodiversity and securing the future of at least 25 threatened and declining Australian mammal species.

AWC is a global leader in conservation and Australia's leading proponent of the establishment and rewilding of fenced, feral predator-free areas in Australia. The scale of this translocation program is without parallel in Australia and the trajectories of at least 25 Australian mammal species and subspecies will be improved as a result, representing an outstanding ecological return on investment.

[Above, clockwise from top left] Senior Wildlife Ecologist Keith Bellchambers and Newhaven Warlpiri Ranger Christine Ellis and her family release a Mala at Newhaven Wildlife Sanctuary in Central Australia. Wayne Lawler/AWC

A critically endangered Central Rock-rat – one of Australia's most endangered mammals – is released into the fenced feral predator-free area at Newhaven. Brad Leue/AWC

A young Numbat at Scotia Wildlife Sanctuary in New South Wales. Wayne Lawler/AWC

A close-up, shallow depth-of-field photograph of a wet, reddish-brown ground surface. The surface is covered with small, dark particles and some green, leafy plants growing through the soil. The lighting is soft, creating a moody atmosphere.

Australian Wildlife Conservancy

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