

Science for saving species

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Threatened Species Recovery Hub

**Why a
bettong in
the bush is
worth two in
the hand**

**Recovering the far
eastern curlew**

**Emergency care: which
species need it?**

**We need to talk about
feral cats**



Preventing extinction – why we should

Three vertebrate species became extinct in Australia during the last decade, but these losses had no perceptible impact on our nation's economy and were not even noticed by most people. Given this, what are the arguments for seeking to prevent the loss of species? TSR Hub Deputy Director **John Woinarski** responds to this question with ten justifications.

Most of those who are involved in research and management of threatened species take it as self-evident that we should seek to conserve those species, to prevent their extinction. That's not surprising. We are intrigued by them and we have devoted much of our lives to conserving them. But others in our society may have different values, and those investing in the recovery of threatened species may need a compelling rationale to justify such investment. Here are ten components of such a rationale.

1. Utilitarian value. Many plant and animal species provide food or pharmaceuticals; they can provide vital ecological services, such as giving us oxygen and increasing soil fertility; they can be of aesthetic value, helping to add wonder and joy to our lives. Of course, not all species may provide explicit benefit to us, but because we know little about most species, the extinction of any species carries the risk that we have lost something of potential value.

2. Legal obligation. Australia pledged to prevent extinction in various international and national agreements and laws (along with most other governments). For example, we signed up to the Convention on Biological Diversity which commits us to preventing the extinction of known threatened species. And we pledged our support to the 2015 United Nations Sustainable Development Goals which commits us to "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species." Reinforcing these commitments, the Australian Government produced the country's first ever national Threatened Species Strategy in 2015 which makes an explicit commitment to attempt to prevent any more species becoming extinct.

"Extinctions are a sign that our society cares too little for others."

3. Warning of dysfunction. Extinction is an *ipso facto* demonstration that we are not living sustainably. Extinctions provide an early warning sign that that the natural systems in which we live are fraying. Such ecological degradation and instability may eventually come to affect us too.

4. A full inheritance. We should gift to our descendants a world that is as diverse and beautiful as the world we inherited ('inter-generational equity'). This argument reflects a deeply entrenched human virtue that parents almost always seek to give to their children the opportunity of a better life, and not to debase the legacy that they themselves have inherited.

5. Intrinsic rights. All species have a basic right to exist, and we do not have the right to make them extinct. Most species have been on the earth for hundreds of thousands or millions of years; they belong here.

6. The 'greatness' of our society. Too frequently we mark our society's worth with economic parameters (and sporting success). Such narrowly based measures are a poor reflection on the value of our society. Stressing the virtue of altruism, Mahatma Gandhi noted that *the greatness of a nation and its moral progress can be judged by the way its animals are treated*, and similarly that *a nation's greatness is measured by how it treats its weakest members*. Extinctions are a sign that our society cares too little for others.

7. Our nature makes us distinctive. Australia and Australians are defined and distinguished by our culture and nature, and these two elements are indissolubly linked. Extinctions erode that identity. They make us less distinctive.

8. Understanding our country. The ecological workings of our land (and seas) are fascinating, and we will live uneasily in this land if we have too little knowledge of how our nature works. Every case of extinction denies us the opportunity to understand our country (after all, who wouldn't want to figure out the ecology of a thylacine?)



John Woinarski - on reflection there are many reasons to care and to invest in preventing the extinction of Australia's threatened species.

9. Respecting Indigenous people. Most of us have some liking for, or affinity with, some plants and animals. But for most Indigenous Australians, this affinity may be profound. In many Indigenous cultures, some plant and animal species are totemic, with that link binding individuals to the fate of those species. The connection is part of a long enduring responsibility for country and its welfare and productivity. This is an association that all Australians can learn from and should respect.

10. A spiritual gift. There is a long-established tradition in many religions, including Christianity, that the beauty of the world, and all of its inhabitants, is a sacred gift from a creator to us, and that we have an obligation to be good stewards of that creation.

What does this add up to?

Australia has an appalling record on extinctions. Over the last two centuries, more species of plants and mammals have become extinct in Australia than for any other country in the world. This wasn't because these species were an effete bunch of losers; it happened because of the changes we wrought to their environment.

For our own interests, for our ancestors, for our descendants, for society in general, for the wonder of our nature, we should strive more resolutely to prevent extinctions.

John Woinarski
Deputy Director, TSR Hub

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Reflections on 2016

Last year provided us with much to be proud of and I would like to acknowledge the NESP TSR Hub's significant contribution to the national effort. So much of this work is directly relevant to the Threatened Species Strategy and helps me make the best decisions and investments possible.

The Strategy celebrated its first year of implementation last year and I am pleased to report that through our collective national effort, including the work of the Hub, we have met the majority of the Strategy's targets for year one and are delivering some great outcomes for our threatened species.

The Hub has gone from strength to strength and is producing world-class science that informs my decisions, as well as the practitioners, managers and decision makers who are working to better understand, manage and conserve our threatened species.

There have been many highlights, but some that stand out include:

- The first annual showcase held in Canberra that offered the Department of the Environment and Energy and a broader audience an insight into the wide-ranging and collaborative research underway in the Threatened Species Recovery Hub.

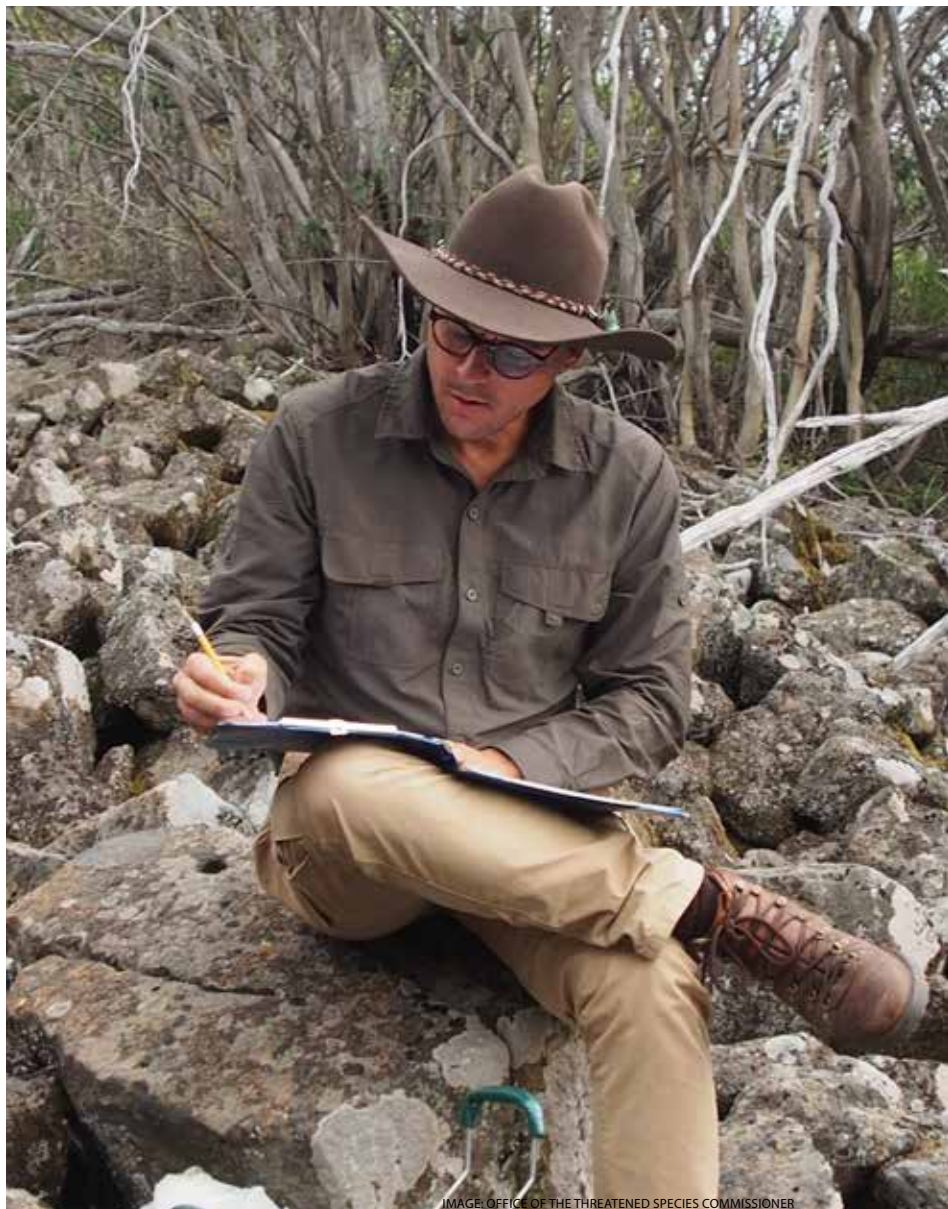


IMAGE: OFFICE OF THE THREATENED SPECIES COMMISSIONER

- The tremendous results achieved by Professor Rob Heinsohn and his team to boost Swift Parrot breeding success.
- Successful assisted climate change adaptation through the first translocation of the western swamp tortoise outside of their historical range.

We are now turning our attention to the years ahead and to meeting the Strategy's challenging three and five year targets. The TSR Hub will continue to support decision-

making, and the new Threatened Species Recovery Fund will open this year to help community groups undertake essential activities to protect and recover threatened species. We will be intensifying action where it is most needed, building the partnerships required to fight extinction and applying the knowledge gained in 2016 to enhance the effectiveness of the Strategy.

I am so proud and encouraged by the progress we have made in just one year and I am looking forward to continuing this important journey with Australia, and the Threatened Species Recovery Hub.

Gregory Andrews
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"We have met the majority of the Strategy's targets for year one and are delivering some great outcomes for our threatened species."



IMAGE: DEJAN STOJANOVIC



IMAGE: STEWART MACDONALD

Saving a migratory icon



IMAGE: AMANDA LILLEYMAN

Recovering the far eastern curlew

The far eastern curlew is a species of migratory shorebird, with a migration that can truly be described as spectacular. Every year they travel from their non-breeding grounds in the southern hemisphere to breed in boreal marshlands of the northern hemisphere. But, as **Micha Jackson** explains, this shorebird is in trouble on multiple fronts.

This is a story about saving a migratory shorebird called the far eastern curlew, though the challenges it faces are shared by many migratory bird species. Central to engaging with these challenges is an understanding of the animal's migration route. Different species of migratory shorebird have their own migration pathway and these routes criss-cross the globe. Different groups of species follow geographically segregated 'flyways'.

The flyway used by the far eastern curlew is referred to as the 'East Asian-Australasian Flyway' (EAAF). Its northern end (where migratory shorebird species breed) includes parts of Russia, China, Mongolia and Alaska, and its southern end (non-breeding habitat) includes parts of south-east Asia, Australia and New Zealand. Between these end points lies much of east and south-east Asia as well as the islands of the western Pacific (where some birds spend the non-breeding season).

More than 50 species of migratory shorebird use the EAAF, consisting of millions and millions of birds, and they pass through more than 20 countries every year.

The far eastern curlew is endemic to the EAAF. That means it occurs nowhere else on Earth. It breeds at relatively southern latitudes (compared with other shorebird species) in rather small marshy areas of Russia and northern China.

Tracking studies over the last 30 years have taught us much about its life-cycle. These studies include the resighting, and recording and reporting of bands and flags attached to the legs of curlews as they move through the flyway, and the use of geo-locators and satellite transmitters.

It turns out that as far as we can tell, the entire population of far eastern curlew passes through the Yellow Sea/Bohai Sea region (encompassing coastal areas of China, the Democratic People's Republic of Korea and the Republic of Korea) during both northward and southward migrations. This makes this region an absolutely critical stopover for curlews to rest and refuel during their gruelling long-distance migration flights.

During the non-breeding season, the birds congregate largely in Australia, with up to about three quarters of them waiting out the northern winter here (most of the rest go to the Philippines, Indonesia and PNG though non-breeding areas outside Australia require further study).

Under a dark cloud

Given its large size and striking appearance, the far eastern curlew is a surprisingly easy bird for the casual onlooker to miss. Highly sensitive to disturbance, it will generally flee from people and dogs when they are more

than a hundred metres away, and its brown mottled feathers mean that it blends in well with the sandy coastal habitats it generally inhabits in Australia.

ABOVE: The far eastern curlew flies thousands of kilometres each year as it migrates from the southern hemisphere to the northern hemisphere (and back again). It's numbers have plummeted in recent years.

And it's highly likely it will be harder to find in years to come as this amazing bird has suffered rapid and dramatic population declines in recent decades. The IUCN Red List, which assesses the global status of species, listed it as Least Concern in 2004, but it was rapidly upgraded to Vulnerable in 2010 and to Endangered in 2015. Recent research confirmed an annual decline of almost 6% and the far eastern curlew was listed as Critically Endangered in Australia in 2016. What's the story?

Key messages

The far eastern curlew is experiencing rapid and dramatic population declines

Research is under way in Australia to better understand the species use of non-breeding habitat

Like all migratory shorebirds, effective conservation requires coordination and cooperation all along its migratory path

A key driver in the decline of far eastern curlew is the extensive loss of mudflat habitat along its migration route, particularly in the Yellow Sea region. More than half of it has disappeared over the last 50 years. Large-scale coastal development, which includes reclamation of intertidal flats and their transition from soft, food-filled mud into hardened land surface capable of supporting housing developments, plays a large role in driving this loss of habitat. But this transformation is compounded by other factors including loss of sedimentation from rivers that have been extensively dammed, and escalating sea-level rise (predicted to be a major driver of additional mudflat loss in the future). Because the whole curlew population travels through this region, the bird is particularly vulnerable to changes occurring here.

There are numerous other impacts on the species during its migration and breeding stages, though many are poorly documented. These include a reduction in food availability in remaining mudflat habitat, losses in and changes to breeding habitat, hunting, accidental catch in fishing nets, deliberate poisoning, and pollution.

And, in addition to this, they are also facing significant threats in Australia during the non-breeding season. The most extensive is disturbance. Far eastern curlews occur almost exclusively in Australia's coastal strip, and therefore have to compete with human and canine recreational use. Coastal development also results in the loss of critical 'roosting' habitat, the places that curlews rest in during high tide periods when their mudflat feeding grounds are covered with seawater.

Strategic planning

To address some of the conservation concerns and knowledge gaps facing far eastern curlew in Australia, a new TSR Hub project, titled 'Strategic planning for the Eastern Curlew', has recently commenced. The project, based in Darwin, will enhance knowledge on the way that far eastern curlews use different habitats in order to assess how these can most strategically be conserved, particularly in the face of increasing coastal development.



The far eastern curlew is a striking bird. Standing at about knee-height, its astonishingly long down-curved bill, up to about 20cm in females, is long enough to scratch its tail. It uses this striking instrument to probe the soft mud of coastal intertidal flats to catch invertebrate prey like crabs and marine worms.



Partners come together: Managing an international flyway requires the involvement of multiple countries and organisations. The 9th Meeting of Partners of the East Asian-Australasian Flyway Partnership met in Singapore in January 2017. Partners include representatives from Partner governments, multilateral environmental agreements and non-government organisations.

Working in partnership with the Darwin Port, where significant numbers of far eastern curlew use the East Arm Wharf as a roosting area, the project's aim is to analyse feeding and roosting habitats. The East Arm Wharf is just one of the artificially created habitats that shorebirds make use of in the EAAF; other examples include commercial salt works and aquaculture ponds.

Our aim is to analyse the relationship between these habitats in the Darwin region in order to develop strategic guidelines for conservation that will provide greater certainty to developers, planners and regulators. Our hope is that improved management of 'accidental' habitats like East Arm Wharf, alongside conservation of intertidal mudflat habitat, could help species like the far eastern curlew recover.

This project will complement other NESP research, particularly a NESP Marine Biodiversity Hub project titled 'Seascape Approach to Managing and Recovering Northern Australian Threatened and Migratory Marine Species', which will take a whole-of-north approach to conserving migratory species groups reliant on the marine environment.

An international focus

This new TSR Hub project has commenced just as key stakeholders hailing from countries throughout the EAAF came together in Singapore at the 9th EAAF Partnership 'Meeting of Partners'. This biannual meeting is the decision-making forum of the Partnership, which commenced in 2006 and is a voluntary, non-legally-binding agreement allowing countries, local governments, NGOs, IGOs, and even corporations from throughout the flyway to work together on shorebird conservation initiatives. The Partnership also recognises a network of sites that meet criteria demonstrating their critical importance to migratory waterbirds.

Reflecting the dire situation currently facing the far eastern curlew, a special task force was established at the 2015 Meeting of Partners. At the 2017 meeting, a Single Species Action Plan for far eastern curlew was launched and endorsed by the Partners. It is hoped that this initiative will guide priority conservation actions aimed at helping this species recover throughout the flyway.

The launch of this plan and the research being done in Australia underscores the need for all countries along the migration route of this magnificent species to work jointly to conserve it. As with all migratory species, if any one critical area in the life cycle is left unprotected, it could spell the collapse of the entire population despite the best efforts elsewhere.

Given the current status of far eastern curlew and its recent dramatic declines, the survival of all individuals remaining in the population is crucial. For Australia, this means designing and implementing effective conservation measures at home by protecting non-breeding habitat from disturbance and loss of roosting habitat, and working cooperatively with other flyway countries.

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We need to talk about feral cats



Feral cats have a devastating impact on native Australian fauna. More than one third of the Earth's mammal extinctions in the last 200 years have been in Australia and feral cats are a prime culprit for many of these extinctions. Though it's not just the cute little furry marsupials that are copping it, each day we are losing millions of mammals, birds, reptiles and invertebrates to these alien predators. However, as **Richard Faulkner** from RMIT University explains, it's not that Australians aren't doing anything about it. It's just that we need to intelligently build on existing efforts.

When Europeans settled in Australia they brought cats with them. When you allow these little beasts to go wild they create problems because they are incredibly resilient, adaptive and highly efficient predators.

With the exception of some off-shore islands and fenced areas, feral cats now occupy the entire land mass of Australia. Australia has a whole suite of unique wildlife that had evolved without the pressure of these specialist predators. In combination with many other changes to our landscapes, Australia's small- to medium-sized native animals simply can't cope. Sadly, some of them are now gone forever.

What have we been doing about it?

Many people in many places around the country have been attempting to reduce the threat of feral cats but until recently we had no overall picture of what was being done. In an attempt to get a handle on how we, as a country, were going, I worked with colleagues at RMIT University to bring together information on the 'National effort going into feral cat control'.

The tally was a collation of several pieces of information including: all known repositories of data on feral cat control throughout the country; a survey that aimed to account for all individuals and smaller groups that were missed by these data sources; and an estimated 'knockdown' from all known baiting programs. The survey involved inviting anyone working on feral cats to tell us what they were doing. Around 3,400 respondents responded to this invitation.

The feedback we received and the numbers we collected confirmed that many within the broader community recognise that feral cats pose a big threat to wildlife and are doing something about it (or at least are very willing). Results from our survey suggest that, as a nation, we are culling between 130,000 and 290,000 feral cats a year. Survey responses showed that those active in the control of feral cats understood the threat posed by feral cats. Indeed, that was their reason for action.

Our survey showed that baiting and shooting are the preferred methods of feral-cat control (as opposed to cats being trapped and then euthanised); and that the effort over time hasn't changed.

Our survey also showed that controlling feral cats is not popular with some members of the general community. What's more, some people who actively worked to control feral cats reported they were often stigmatised for doing so (even pointing out the damage caused by feral cats sometimes drew an adverse response).

Guiding future effort

Given the threat posed by feral cats, this research is important. It establishes the baseline on what's happening at a national scale in regards to feral-cat control. This knowledge will hopefully inform further research and guide policy on effective feral cat control.

While removing a couple of hundred thousand feral cats from the environment each year may sound a lot (and it certainly reflects that a lot of

effort is going into feral-cat control), it doesn't necessarily translate to benefits for species threatened by feral cats. For example, if current feral cat control efforts do not keep up with the rate at which these cats are reproducing, feral cat numbers may be unaffected because reproduction will simply replace the culled individuals. The survey results also suggest that feral cats are not necessarily being culled in areas (like the vast arid zones) where some of our most threatened species persist.

Finally, our research did not discriminate between what type of feral cats are being culled. We know that there are many high impact 'super' feral cats that are unlikely to be caught using traditional hunting, trapping and baiting methods. These are the cats that pose the greatest threat to some of our most critically endangered populations of threatened species.

Feral options

Scientists are continuing to explore the impact of feral cats and how best to manage it. Reducing cat numbers is one approach



IMAGE: MARK MARATHON CC-BY-SA-4.0

A feral cat with native prey (in this case a Major Mitchell's cockatoo). Feral cats exact a severe toll on our native animals.

Froggatt Award goes to the TSC cat campaigner

Someone who has been talking a lot about feral cats over the past year has been Gregory Andrews, Australia's first Threatened Species Commissioner. In recognition of his enthusiastic and fearless efforts in raising awareness about the impact of feral cats and other invasive species, the Invasive Species Council has awarded the Commissioner the 2017 Froggatt Award for Communication.

"He has reached out to local communities across Australia, listened to their concerns and found ways to help," says Andrew Cox, CEO of the Invasive Species Council. "He has patiently explained to cat lovers about the need for feral cat control and how pet owners can be part of the solution, not the problem."

The Froggatt Awards are handed out in honour of Walter Froggatt, a lone voice in the 1930s warning against the introduction of the cane toad (another invasive animal wreaking havoc on Australian ecosystems).

<https://invasives.org.au/projects/froggatt-awards/>



Threatened Species Commissioner Gregory Andrews was awarded the 2017 Froggatt Award for his efforts to raise awareness about feral cats.



Richard Faulkner with Sally the cat dog, one of Australia's few feral cat hunting dogs. Sally worked with Richard in the Kimberley when he was with the Australian Wildlife Conservancy.

but we also know that indirect management techniques can also be effective. An example of this is by maintaining habitat with careful fire and grazing management (making it more difficult for feral cats to hunt).

Supporting dingo populations can help because dingoes can suppress feral cat activity. Guardian dogs may also assist in protecting vulnerable populations of threatened wildlife.

In addition to this, there are more feral-free fenced areas being created that will provide safe havens (and some islands being cleared of ferals). These can be used to secure populations of species on the brink of extinction that have been entirely lost on the mainland.

New technologies and techniques are also being investigated. A sophisticated trap is currently

being trialled which specifically identifies and targets feral cats. Some researchers are beginning to experiment with the idea of toxic implants: small capsules of poison inserted under the skin of cat-prey. The capsule is safe for the native animal, but should it be killed and eaten by a cat, the capsule releases its poison, killing the cat and preventing it from hunting other native animals. Both these forms of control could be especially useful in targeting those evasive high-impact cats that more traditional techniques aren't working on.

We should also be aware of how important Indigenous knowledge and the associated land management practices are. In some areas Indigenous hunting of feral cats is known to have occurred more frequently in the past and there are current efforts to revive it. This was especially evident in remote and arid areas, the last refuge of many of our threatened species.

Traditional owners have sustainably managed the Australian landscape for thousands of years and this includes a period of time that includes cats. Encouraging a renaissance of traditional practices such as the hunting of feral cats and the appropriate use of fire could have great benefits for native wildlife and threatened species.

Key messages

Australians are culling between 130,000 & 290,000 feral cats a year

There is scope to save our threatened species from feral cats but there is more need to better engage the Australian public on the problem

Feral cats into the future

So, it's not all doom and gloom. There is the energy and scope to save our threatened species from the threat of feral cats.

First, we need to know how effective our efforts are and make sure we are using the right techniques. Next, we need to direct our efforts where they will be most useful.

And central to any future success, we need to send out the right messages to build up public awareness and understanding of the feral-cat conundrum. Education is essential. The public needs to appreciate the devastating impact feral cats are having on our unique and iconic wildlife.

We need to have sensible conversations about feral cats. So, if you care about our precious and threatened native animals, spark up a discussion today.

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Note: Richard carried out this research with Dr Georgia Garrard and Associate Professor Sarah Bekessy at RMIT University. The initial research to determine the number of feral cats culled across Australia was funded by the Australian Government National Landcare Programme.

Emergency care – which species need it, and what does it involve



The last decade has seen the loss of three of Australia's vertebrate species – a rodent (the Bramble Cay melomys), a bat (the Christmas Island pipistrelle) and a lizard (the Christmas Island forest skink). Despite recognition of their vulnerability and risk of decline, the actions taken to secure their future didn't work (they weren't necessarily the right things, or sufficient things). Their loss came as a shock but in retrospect it was clear they were in trouble. It's a situation we don't want repeated and, in many ways, these recent extinctions helped catalyse the creation of the Government's National Threatened Species Strategy and the formation of the NESP Threatened Species Recovery Hub.

ABOVE: An increasingly uncommon sight, orange-bellied parrots out in the field. The orange-bellied parrot has been rated as Australia's most at risk threatened bird species.

So, what information is necessary to prevent further extinctions? The TSR Hub has devoted one of its six research themes to answering this. Titled 'The Red Hot List – no surprises, no regrets', the research in this theme was conceived specifically to generate the knowledge our decision makers need to ensure our most threatened species won't be lost by surprise (because no-one was aware they were about to become extinct) or through inaction (because we didn't know what should be done to prevent it). Project 2.1 ('Emergency Care') focusses on animals* with an initial emphasis on birds and mammals.

What can we do to ensure that no more unexpected extinctions take place? TSR Hub scientists and other experts began by reviewing and compiling existing lists of threatened species and then used a number of different methods to determine which species on these lists were most at risk. They also reviewed all of the perceived threats, determined which ones were important using expert knowledge, and identified appropriate

management actions to alleviate the impact of these threats. The cost of these possible actions was another key piece of information.

"We used a range of different metrics to determine the mammal and bird species at highest risk of extinction," says Hayley Geyle, a TSR Research Assistant working on the 'Emergency Care' project.

"We reviewed traditional risk-ranking protocols (specifically the IUCN Red List and NatureServe), and then applied extinction-risk modelling to the species on these lists. The modelling was based on population parameters (birth and death rates), life history traits and the probability of catastrophic events.

"This analysis enabled us to prioritise the top bird and mammal species (ie, those species at greatest risk) which we then sent off to a number of experts for validation. These experts were also invited to suggest any high risk species that may have been overlooked in the initial phases and to verify the importance

of perceived threats while assessing overall progress with research and monitoring efforts in regards to the nominated species.

"The end result of this process will be for us to identify the birds and mammals at most risk of extinction in the next 20 years. But it's more than a simple list of species because for each species we also have a list of threats that need to be managed, and a list of actions that will best address these threats."

The lists are still being finalised. Table 1 shows the top ten most imperilled bird and mammal species. The main threats to our most threatened birds and mammals are consistently emerging as feral animals, particularly cats, changed fire management, and the impact of farming for agriculture and livestock. Climate change and its associated impacts – increased prevalence of extreme weather events, droughts, habitat shifting and alteration – is also increasing the pressure on our most threatened species.



Table 1: Probability of extinction (%) in the next 20 years and rank of the top ten most imperilled bird and mammal species.

Rank	Birds		Mammals	
	Species	Probability of extinction in next 20 years (%)	Species	Probability of extinction in next 20 years (%)
1	orange-bellied parrot	90	Christmas Island shrew	87
2	Houtman Abrolhos painted button-quail	81	narbalek (Victoria River District)	77
3	King Island brown thornbill	64	central rock-rat	70
4	King Island scrubtit	62	Carpentarian rock-rat	65
5	Herald petrel	59	northern hopping-mouse	48
6	western ground parrot	53	narbalek (Top End)	45
7	Grey Range thick-billed grasswren	51	brush-tailed rabbit rat (Kimberley, Top End)	40
8	plains-wanderer	46	Gilbert's potoroo	39
9	New Caledonian fairy tern	45	western ringtail possum	38
10	regent honeyeater	42	northern brush-tailed phascogale	36

What do we need to do to prevent the loss of these species? There are a range of possible actions including captive breeding, habitat protection and restoration, appropriate fire management and effective predator (and competitor) control. Different species need different responses, though some responses benefit multiple species. On top of this there's a need for ongoing monitoring to track the trajectory of these threatened species and inform management about the effectiveness of different interventions.

With currently constrained resources, cost is an important factor. However, initial findings suggest a modest investment might go a

Key messages

Main threats to native birds and mammals are feral animals (particularly cats), inappropriate fire management and agricultural land management

Early estimates suggest it would cost \$10 million to greatly reduce the risk of extinction of the 10 most imperilled bird species over 5 years

Not all of the most threatened species are well monitored or adequately monitored. There is a risk we could lose something and not know until too late

long way in preventing many of our most threatened species slipping off the edge.

"We drafted some initial costings for the 10 most imperilled birds that suggest it would take no more than \$10 million to greatly reduce their risk of extinction," says Geyle.

"Of course, birds are only a small part of the threatened species picture. The Emergency Care project chose to concentrate on birds and mammals in its first year because they are two of the best studied groups, they have a high political profile and there are more resources available for their conservation.

"Unfortunately there is an astonishingly large number of species from other groups that are not yet recognised as threatened by our federal environmental legislation. Some groups are very poorly represented in threatened species listings, and we're likely to encounter more species on the brink of extinction that we did not know about as we shift our focus to other taxonomic groups.

"Monitoring is another major issue that needs to be tackled. Without effective monitoring it will be impossible to learn which interventions are working. What's more, most of the priority threatened species on our list are not monitored or inadequately monitored. Unfortunately that means that there is a risk we could lose something and not know until it's too late."

Australia has a tragic record of species loss. Efforts such as the TSR Hub's Emergency Care will hopefully make sure there are no surprises and no regrets in the coming decades.

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**Of course, extinction is just as big a challenge for our threatened plants. The TSR Hub's Project 2.4 is developing a Red Hot List for Australia's most imperilled plants.*



In recent years we have lost a small island rodent known as the Bramble Cay melomys (LEFT) and the Christmas Island pipistrelle (RIGHT), an insectivorous microbat.

Accounting for 'a home among the gum trees'



Ecosystem accounts for Victoria's Central Highlands

Threatened species are often found in landscapes where there are competing interests and views on how things should be managed. Different people place different values on different things. Farmers, foresters and conservationists, for example, would value things in a landscape from different perspectives. Who are you going to call to deal with these tensions? Ecologists? Engineers? Economists? TSR Hub researchers have called in the accountants, and their approach has highlighted that continuing with native forestry land use simply doesn't add up.

The critically endangered Leadbeater's possum has its 'home among the gum trees' up in the Central Highlands of Victoria. Unfortunately, any old gum tree won't do. These small striped possums need montane ash forests with large decayed trees with hollows to provide den sites, a dense wattle understorey for food, and a complex vertical structure to provide transport routes through the forest. This has been known for some time but fire and forestry practices in Victoria's ash forests have reduced the amount of suitable habitat to such an extent that the future of the Leadbeater's possum is looking bleak.

But their home among the gum trees serves many other uses too. They store carbon, provide timber, are a water catchment, and are used for recreation and bushwalking. How should this landscape be managed? Which values should be given priority?

There are many studies on each of these areas of value (eg, carbon, timber and water) but there's never been a framework that brings them all together. But that may be about to change. TSR Hub researchers at The Australian National University have recently attempted to create a set of ecosystem accounts that brings all these values together into one frame. This

research has been developed in consultation with experts and draws on feedback from Australian and international leaders in ecosystem accounting.

"The ecosystem accounting approach being applied in the Central Highlands describes an integrated accounting structure covering component accounts (for example, land, water,

timber, carbon and biodiversity), as well as accounts for ecosystem extent, condition and services," says Dr Heather Keith, the lead researcher on the ecosystem accounting project.

"Our approach uses the United Nations System of Environmental-Economic Accounting to calculate the value of ecosystem services and

Recommendations for land management in the Central Highlands

Based on this ecosystem accounting approach, ceasing native forest timber harvesting would provide the following benefits to Victoria:

Economic

- i) Increase the value of ecosystem services of provisioning for water, culture and recreation.
- ii) Re-direct government investment to land use activities with a higher rate of return.
- iii) Encourage private investment and employment in tourism, plantation forestry and agriculture

Social

- i) Improve the quality of the environment for residents and visitors, and services for recreation and aesthetic amenity.

Environmental

- i) Conservation of biodiversity
- ii) Climate change mitigation by maximising carbon stocks in forests
- iii) Maximise water yield and quality

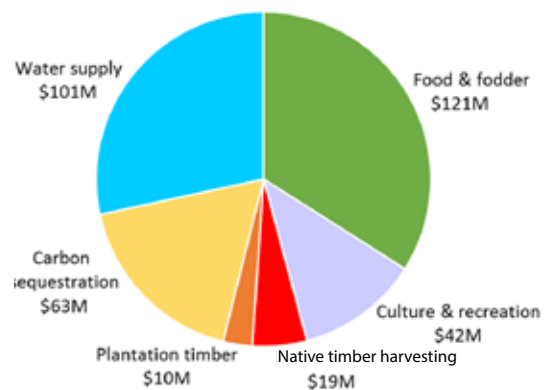


Figure 1: Value of ecosystem services (2013-14). If native forest harvesting ended there would be losses in native timber production but gains in carbon sequestration and water yield (as well as likely gains in other ecosystem services).

Key messages

Ecosystem accounts enable decision makers to compare multiple disparate land-use values in a common framework

When applied to Victoria's ash forests they reveal water and carbon values are many times more valuable than native timber harvesting



IMAGE BY D HARLEY

The critically endangered Leadbeater's possum could use a hand from a good accountant.

the value of an industry's contribution to Gross Domestic Product (GDP) for each land use."

Working with Professor David Lindenmayer and Dr Michael Vardon, Dr Keith has used publicly available data to calculate the value of water, timber, tourism, agriculture and carbon. And what they have found is that the provision of water, agriculture, carbon and tourism in the forests is far more valuable than native timber harvesting.

As one example, the industry value added of the water supply provided by the mountain ash forests is over \$100 million per year. Native timber harvesting, on the other hand, provides less than \$20 million per year. That's a fraction of the water value in the study area.

And when you factor in the role these forests play as critical habitat for the Leadbeater's possum as well as 37 other threatened species, the argument becomes compelling.

The current area of ash forest in the Central Highlands is approximately 171,000 hectares. Peer-reviewed models recently published by TSR Hub researchers suggest that preserving this entire area is important to ensure a stable outlook for the Leadbeater's possum in the face of future fire risk and ongoing habitat decline. This would also improve the outlook for other threatened species such as the greater glider and the sooty owl.

Fortunately, economic analysis shows that there are many alternatives to harvesting native timber. Tourism based on the natural assets of the region provides a viable and sustainable future for the Central Highlands.

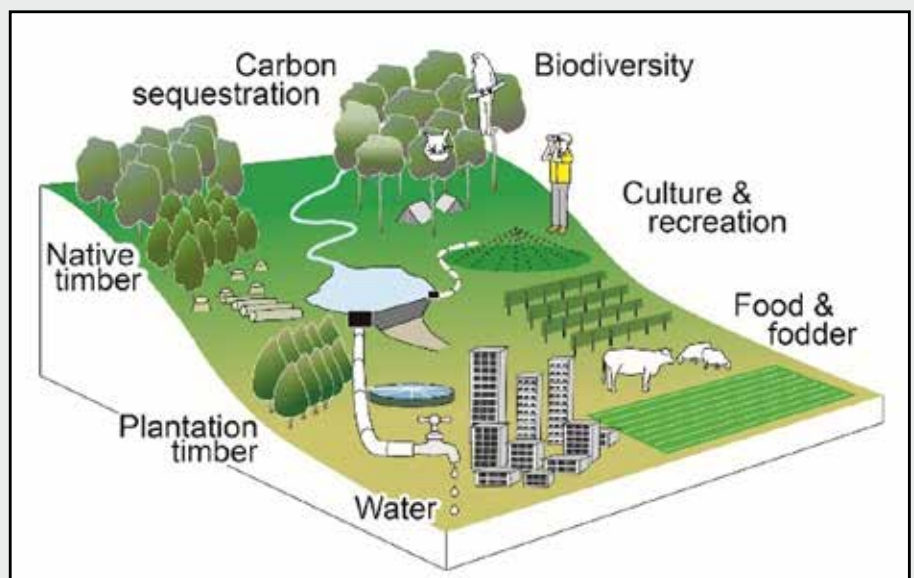
Accountants, it would seem, may be the Leadbeater's possum's best friend.

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Five cheers for ecosystem accounts

- **Ecosystem accounts provide information** in a format relevant to guide policy-making on regional land management.
- **Ecosystem accounts follow the internationally recognised statistical standard** of the United Nations System of Environmental-Economic Accounting (SEEA).
- **Accounts synthesise data** on ecosystem assets (extent and condition), the use of these assets by people (ecosystem services and derived products), track changes in state of ecosystems, link these changes to economic and other human activity, and the benefits they provide to society. It highlights the risks to ecosystems and the dependencies of economic activity on ecosystems.
- **Goods and services accounted include** those already within the market and calculations of GDP and the System of National Accounts, as well as those that lie outside these systems as unrecognised non-market contributions of ecosystems to economic activity and human well-being.
- **Evaluating ecosystem assets and services** for their contribution to human well-being is now considered a critical component for improving how decisions are made about natural resources.



Ecosystem accounts give ecosystem services a landscape context.



A bettong in the bush is worth...

The next step in re-introducing a long missing ecosystem engineer

IMAGE BY LANNON HARLEY

It is said that a bird in the hand is worth two in the bush but when it comes to bettongs it might actually be the reverse: a bettong in the bush is worth two in the hand. **Will Batson** from the Australian National University explains why. Will recently completed his PhD on the successful reintroduction of bettongs to the ACT which established populations at two predator-free fenced nature reserves; Mulligans Flat Woodland Sanctuary and Tidbinbilla Nature Reserve. But establishing bettongs within these enclosed environments is only the first step. Ultimately the aim is to restore bettongs to the broader landscape which would undoubtedly expose them to a number of threats including introduced predators.

The Limestone Plains around Canberra used to be home to the eastern bettong, a small 'rat-kangaroo' whose foraging habits played an important role in nutrient cycling and soil conditioning. Unfortunately the bettongs didn't fare well against introduced predators and by the 1920s bettongs had disappeared from mainland Australia and could only be found on fox-free Tasmania.

In recent years I was privileged to be part of a project to reintroduce bettongs to a fenced-in nature reserve called Mulligans Flat Woodland Sanctuary just to the north of Canberra. So far

the project has been a stunning success with numbers of bettongs increasingly dramatically, and our knowledge about how to manage these reintroductions increasing as we learn from experience.

We're now looking at introducing other threatened species at Mulligans but our success with the bettongs has us primed to begin the next phase of our work – reintroducing bettongs to the broader landscape – to beyond the fence.

After a long and detailed planning and risk assessment process, we began releasing bettongs into the Lower Cotter Catchment which lies to Canberra's west. We didn't simply let them go and cross our fingers, hoping for the best.

The area they were released into, around 8,000 hectares in size, has undergone a rigorous fox-control program over the past year with the ACT Government setting out fox baits. The local fox population has been significantly reduced in that time and the fox control will continue.

ABOVE: Jenny Newport releases an eastern bettong into the Lower Cotter near Canberra.

Each bettong released is fitted with a radio-collar and their movement and survival is monitored. Any deaths are forensically examined to evaluate the significance of various threats, and surviving bettongs are regularly captured to conduct health assessments.



IMAGE BY LANNON HARLEY

Open wide. A sedated bettong gets a full health assessment by Dr Tim Portas before being translocated to the Lower Cotter.

Key messages

Eastern bettongs have been successfully reintroduced to fox and cat exclosures near Canberra

The next step is to see if they can be brought back to the broader landscape



IMAGE BY LANNON HARLEY

A bettong held by Mel Snape with a newly fitted radio-collar at Mulligans Flat Woodland Sanctuary ready to be translocated to the Lower Cotter.

Bettongs bounce back

Eastern bettongs are proving to be amazingly adaptable little animals making them good reintroduction candidates. In fact, they did so well post-release that most of the original 60 animals translocated from Tasmania actually improved their body weight and reproductive activity soon after they arrived in the ACT. Coupled with an increased survival rate, the population at Mulligans Flat has grown to approximately 200 individuals and the population at Tidbinbilla has grown to around 75. This currently represents the entire population of eastern bettongs on mainland Australia.

The establishment of these viable populations now enables us to attempt more challenging reintroductions. Encouragingly, the improvements to body condition and reproductive activity are also being observed in the individuals released beyond-the-fence, and their experiences with exotic predators beyond-the-fence may help them to evolve behaviours that further improve their ability to avoid these threats.

The bettongs are also having an amazing effect on the environment, digging over 200 holes per night and moving 3 tonnes of soil per year. This activity has a positive effect on the broader environment and helps to speed up the restoration of degraded ecosystems, like those in the Lower Cotter that were severely impacted during massive fires in 2003.



IMAGE BY ADAM MCGRATH

Young eastern bettong at Mulligans Flat Woodland Sanctuary.

The data collected from this trial will be used to make an evidence-based decision on whether it is biologically and economically feasible to move to a full bettong reintroduction program in the near future.

Establishing a population of bettongs beyond-the-fence would produce a number of benefits. It would help to lift the conservation status of the species, and assist us in managing the population densities within fenced reserves

(as excess bettongs could simply be moved to a suitable location outside of the enclosure). And because these little marsupials are important ecosystem engineers it's believed their activities in the broader landscape will improve the health of the surrounding bush.

This trial is also designed to provide a model of best practice for similar challenging reintroduction projects whereby the outcomes of a trial are used to determine whether to subsequently conduct a full-reintroduction.

Which is why a bettong in the bush, is really worth two (or maybe more) in the hand. 'In the hand' is a fitting metaphor for our work in the fenced enclosures where we can control the threats that originally led to the demise of these species (ie, foxes).

We've achieved that and learnt a lot in the process. But the real challenge is the broader reintroduction outside of the fence – to 'the bush'.

If our trials work we may once again have wild bettongs in our landscape, after almost a hundred years of their absence. But even if these trials fail, it's important that we learn in the process in order that our next trial might be successful, and avoid the unnecessary loss of valuable individuals by releasing them into environments without the conditions required to enable them to persist. The results of our trial will be released as a published article in the near future.

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Establishing bettongs beyond-the-fence is a project supported by the Woodlands and Wetlands Trust, ACT Government, ANU and the Threatened Species Recovery Hub.



IMAGE BY DON FLETCHER

Will Batson, Sam Wellings Booth and Jeff Collins releasing an eastern bettong in the Lower Cotter Catchment.



Why engage?

Because we want our research to make a difference

Achieving results for threatened species often seems daunting. It involves complex interactions of management capacity, policy and regulatory frameworks, community opinion, business activities, cultural understandings, economic developments, financial priorities... and scientific knowledge. Dealing with this complexity means more than simply delivering scientific knowledge fully formed to end-users. What does that mean in practice for researchers wanting to make a real difference? TSR Hub's Knowledge Broker **Rachel Morgain** sets out the basics – the AEIOU of stakeholder relationships.

Studies consistently show that strong and enduring partnerships are the key to affecting change. Co-created research and research that is responsive to public values gives us our best chance of turning research insight into effective action. But good engagement takes time and effort. It demands skills quite different to those needed for good science. It is as much about relationships as it is about research.

So what are the elements that drive effective partnerships? And what are the benefits? Here are a few basics:

Acknowledgment. TSR Hub research fundamentally depends upon collaborative networks: with other researchers, landholders, parks, land managers, non-government agencies (NGOs), government experts, Indigenous owners, zoos, citizen science groups, industry partners, funding bodies and many more. Acknowledging and celebrating these partners – and the generous resources, time and support they provide – helps build trust and lay a strong foundation for future collaboration.

Exchange. Research is built on the exchange of ideas. Studies of science engagement highlight its value in fostering brilliant research. Knowledge exchange with Indigenous partners and land managers vitally enriches research and can generate benefits for all. Research collaborations that work across domains – eg, between policy and research agencies – can

“In a complex and ever-shifting world, the only way to achieve results is to have as many key players as possible moving generally in the same direction.”

produce more robust and better-targeted findings. Engagement between researchers, business, political leaders, NGOs and the public can provide insights into socially pressing issues, the values that impact environmental action, and where research can inform real solutions.

Influence. A diversity of engagement strategies amplifies the impact of the knowledge being shared. For researchers, this often means investing time and effort in building networks, delivering effective results for partners, building collaborative programs to generate robust science, learning skills in communications and media, and reaching out beyond their comfort zone to potentially interested parties. Balancing these activities against the demands of advancing a career in science can be extremely challenging. But bringing researchers together with business and political leaders, land managers, NGOs and other stakeholders also offers the greatest chance for informed decision-making and the greatest potential for transformative action.

Opportunities. Investing time and effort in research partnerships and engagement can open up new opportunities. Small collaborations lead to large programs. Discussions generate new avenues for mutually beneficial research. For researchers, investing in partnerships can be career enhancing, leading to grants, consultancies, or invitations to give advice or to sit on boards. Engagement with stakeholders or with the public can sharpen a research program and inspire new questions. For practitioners, policy and business leaders, engaging with researchers – including young and emerging researchers – can identify emerging research of key value and brings skills, insights, technologies and vital knowledge to support actions and decisions.

Uptake. When environmental research is co-designed (for example between researchers and land managers or policy end-users), it is more effective in leading to changes in practice. Many studies have shown this. Co-designed research generates solutions which are quickly applicable, and allows for adaptive management or experimental approaches as new findings are produced. Even where it doesn't lead to immediate change (policy cycles can take years, even decades) research that has been built from the start with end-users is more likely to survive the long-haul.

I'm not saying that any of this is easy; indeed, there are many challenges to overcome. More institutional investment is needed in supporting researchers to move between government, NGOs, industry and academia. Researchers need to be given time and training necessary for effective engagement. And practitioners in partner agencies – government, non-government and private – need the resources and time to invest in research partnerships. However, this has to be the way we go if our science is to make an enduring difference.

Australia's threatened species are everyone's concern. Traditional owners, business leaders, city planners, farmers, land managers, policy advisers, community leaders, politicians and school kids: we all have a stake in protecting our rich natural heritage. In a complex and ever-shifting world, the only way to achieve results is to have as many key players as possible moving generally in the same direction. By placing partnerships at the centre of our research, we have the best chance of putting the best research at the heart of decision-making and action.

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Wildlife in the city

Threatened species are found everywhere. They occur in national parks, on remote islands or in the heart of Australia's arid interior, but what's often overlooked is that they are also present where most of us live – in and around our cities. For some species, that's the only place they are found. So, if we are to have any success at securing their futures, we need to come up with effective strategies for their conservation in our urban spaces. Which is why the TSR Hub in conjunction with our NESP cousin, the Clean Air and Urban Landscapes Hub, has launched the 'Threatened Species in Cities' project. Research fellow **Kylie Soanes** is leading the work and here she explains what they hope to achieve.

Urban living can be pretty risky for native plants and animals. The mean streets of the city might be noisy and bright, full of vehicles that can run over you, pets that want to eat you and introduced species trying to crowd you out.

And yet, you can still find native threatened species hanging on (and sometimes doing quite well) in urban environments. On a typical urban safari, you might spy fantastically-coloured frogs, cheeky marsupials, ornate orchids, diminutive dragons and majestic eucalypts. Some of these urban dwellers are tough. Some of them are just lucky. Some no longer occur anywhere else.

Part of my job is to find ways that we can improve their chances of sticking around. This means better understanding the range of threats at play, and identifying the unique opportunities that cities and towns could provide our very special natives.

On the other hand, let's not pretend that we always roll out the welcome mat when native species turn up in our backyards. If we think they seem dangerous, damaging or just generally annoying, things can turn from 'friend' to 'foe' very quickly. So another aspect of my work involves managing these conflicts to get good outcomes for native species and people.

What we're really trying to do is highlight the opportunities for conservation within urban environments, showing people that very cool native species (including threatened species) occur on their doorstep, and finding practical ways to help them survive. So, watch this (urban) space.

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IMAGE BY DAVID SALT



IMAGE BY KYLIE SOANES



IMAGE BY BILL WALLACE



IMAGE BY RICHARD FULLER



IMAGE BY LIANA JOSEPH

Wildlife and nature within our cities and suburbs sustain and nurture us. Consider the importance of Kings Park (pictured above) right next to the centre of the growing metropolis of Perth. These spaces sustain us, in return we need to sustain and nurture them. And when it comes to threatened species, that responsibility is even greater. Pictured here (from bottom up) are koalas, threatened by cars, dogs and disease; striated pardalotes, which require tall trees to do well; growling grass frogs, under threat from the loss of urban wetlands; and brush-tailed phascogales, seen here crossing a highway on a wildlife bridge.

"You can still find threatened species hanging on (and sometimes doing quite well) in urban environments."

Threatened species in city spaces

- **376 EPBC-listed threatened species** have some part of their distribution in at least one Australian city or town.
- **At least 30 of our threatened species** are entirely restricted to within a city or town. That is, many of our threatened species occur nowhere else. So if we can't conserve them in cities/towns, we might not be able to conserve them at all.
- **Of the 70 species** prioritised for recovery in the Threatened Species Strategy, around 26 have some or all of their distribution in an urban area. So urban environments will likely play an important role in their recovery.
- **In and around our national capital** (Canberra-Queanbeyan) 26 threatened species have been recorded. This includes the Canberra Spider Orchid and Ginninderra Peppercross, which aren't found anywhere else.

Science grounded in conservation

TSR Hub Researcher Profile

Natasha Robinson is passionate about science and Australia's unique flora and fauna. She believes that for research to have meaning it needs to be applied and have impact, and towards this end she has devoted her science to improving the status of our threatened species. Natasha is a TSR Hub Research Fellow at ANU, working on monitoring and adaptively managing threatened species. Here she describes her love for conservation science.

I've always had a keen interest in the environment and loved the great outdoors. It's something that was encouraged in me from an early age when growing up on a farm in northern New South Wales where constantly being outdoors fostered a sense of adventure and an engagement with the natural world.

My love of the natural world steered me into a career in conservation and land management. My first job out of university was working as a Research Officer in Tam Dao National Park in northern Vietnam (facilitated through the AusAID Youth Ambassador for Development program). I was lucky enough to work on a project that had multiple benefits: conservation, cultural, social, health and economic. I collaborated with park staff to conduct research trials into the propagation of increasingly rare native medicinal plant species. Besides reducing the wild harvest of these threatened plants, the objectives were to improve the health and economic prospects of the local people by creating medicinal plant nurseries.

From Vietnam, I moved to Victoria to work in fire and land management. During my time in state government I was blessed in having the opportunity to work in a diverse range of ecosystems including Victoria's towering wet forests, the dry Mallee scrub, foothill woodlands and box ironbark forests. Working

with fire in these diverse systems, however, got me thinking more and more about the impact of fire on fauna. Ecological fire management at the time was strongly skewed towards managing flora. But I was interested to know what the needs of animals were. Thus, after several years in land management, I returned to academia to complete a PhD in fire ecology and bird conservation at La Trobe University. My study site for this research was located in Victoria's Central Highlands, a region that had just endured one of Australia's greatest disasters – the 2009 Black Saturday wildfire.

Black Saturday was a devastating event causing tremendous damage and loss of life. However, for an ecologist trying to understand the connection between landscape processes and bird conservation, it was also a great opportunity to learn about disturbance and the role of unburnt patches as refuges for birds. We seized that opportunity and our research generated many insights on the importance of fire, vegetation and landscape properties to the persistence of birds after wildfire events.

While I'm fascinated by the workings of ecosystems and species interactions, I've always believed that research needs to be

grounded by how it informs management and conservation decision making. The learnings from my PhD were then applied in my subsequent role as a Senior Biodiversity Officer for the Victorian Government. In this role, I led the development of a five-year Monitoring, Evaluation and Reporting Plan for the East Central Bushfire Risk Landscape. I advised on ecosystem and species management in relation to fire, and assisted in planned burning and bushfire responses.

These experiences have prepared me well for my current role in NESP. I understand the complexities of conservation land management and my field and research experiences have encouraged my love of Australian plants and animals. I'm thrilled to be working on conservation outcomes for some of Australia's most threatened biodiversity, including monitoring the reintroduction of southern brown bandicoots to Booderee National Park.

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IMAGE: NICK SHORE

ABOVE: Natasha with Wanda the bandi-cute (bandicoot) who is about to be released into Booderee National Park.

The Threatened Species Recovery Hub is supported through funding from the Australian Government's National Environmental Science Programme.



www.nespthreatenedspecies.edu.au

COVER IMAGE: JENNY NEWPORT RELEASES AN EASTERN BETTONG INTO THE LOWER COTTER NEAR CANBERRA. IMAGE: BY LANNON HARLEY.

Science for saving species

A quarterly publication of the Threatened Species Recovery Hub

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