

# wildlife matters

Issue 46 | November 2023

*Restoration  
and resilience*



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Australian Wildlife Conservancy (AWC) is a global leader in conservation, providing hope for Australia's wildlife with a science-informed, land management partnership model that delivers high impact results.

The mission of AWC is the effective conservation of all Australian animal species and the habitats in which they live.

To achieve this mission our actions are focused on:

- Establishing a network of sanctuaries which protect threatened wildlife and ecosystems. AWC owns sanctuaries, manages land or works in partnership to deliver conservation across Australia's vast landscape.
- Implementing practical, on-ground conservation programs to protect wildlife. These programs include feral animal control, fire management, weed eradication and the translocation of threatened species.
- Conducting (either alone or in collaboration with other organisations) scientific research that will help address the key threats to native wildlife.
- Hosting visitor programs at our sanctuaries for the purposes of education and promoting awareness about the plight of Australia's wildlife.

AWC is an independent, not-for-profit organisation with its head office in Perth, Western Australia. Donations to AWC are tax deductible.

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Cover image:

Effective fire management helps build ecosystem resilience, which is front of mind as we face this potentially significant fire season. *Brad Leue/AWC*

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## ***CEO MESSAGE***

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Australia's changeable environments challenge our wildlife and the people that call Australian Wildlife Conservancy (AWC) sanctuaries and partnership areas home. This year the AWC team has already experienced the impacts of significant floods and, with an active El Niño weather pattern declared, we are now heading into a potentially significant wildfire season. I greatly admire and respect the tenacity of our team dealing with these challenges on the ground and appreciate the empathy from those around them, including your dedicated support.

While I am often called upon to share the 'newsworthy' stories, much of the conservation work AWC delivers is in the day-to-day efforts of staff and volunteers across the country. From aerial burning to tracking feral cats to monitoring native species, these individually small steps cumulatively generate big outcomes. In the last financial year, 85% of AWC's total expenditure was invested directly in conservation programs. Over this time translocations of 13 native mammal species were achieved and more than 280,000 trap nights were undertaken. This investment of time and effort in monitoring is vital as it enables us to act when it's needed.

As a continent, Australia has been isolated from the rest of the world for tens of millions of years. This has made our biota vulnerable to introduced species such as feral cats, foxes and cane toads. These pervasive threats can interact with other environmental changes, including the altered fire regimes that followed European colonisation. For example, feral cats preferentially hunt along large-scale burn scars and kill 1.5 billion native vertebrates each year. Now, the impacts of climate change are being felt. It has never been enough to delineate an area as 'protected': we must manage threats and monitor outcomes. AWC's evidence-based approach is delivering robust monitoring and conservation land management at a scale that is unmatched nationally. It's about restoring what we can and building more resilient ecosystems that are able to persist in a changing climate.

This year has seen some much-needed government action including the initiation of an action plan to target feral cats and a focus on setting 'nature positive' objectives (where biodiversity is not just protected but improving). However, the already woefully inadequate allocation to the federal environment budget and funding to programs in the field continues to decline.

Representing 7–10% of the world's biodiversity, Australia's unique animals, plants and fungi must be protected. As the report into the nine planetary boundaries – representing processes vital to Earth systems – demonstrates, the need for the protection of our biodiversity is no longer an abstract issue, we must do it. The boundary for biodiversity loss and extinction in Australia has already been transgressed. A functioning ecosystem is vital for our health, our economy and our climate. AWC's work is recognised across Australia and around the world; we stand at the precipice of making significant changes to how Australia manages its land and biodiversity. Investment and management deliver results and AWC is uniquely placed to effect conservation outcomes at a continental scale.

While the world and society changes at a rapid pace, I am focused on strategic planning to ensure AWC's values are appropriate, and that our focus areas and priorities are relevant. Together, we are building an AWC that is sustainable and effective for the immediate future and beyond.

Thank you for your support and best wishes for the holiday season.

A handwritten signature in black ink, appearing to read "Tim Allard". The signature is stylized and written in a cursive-like font.

Tim Allard  
Chief Executive



# *Fire and flood*

*Resilient landscapes, ecosystems and people*

*DR HANNAH SHEPPARD BRENNAND, SCIENCE WRITER*



Australia is a land of harsh extremes, renowned for drought, flood, fire and cycles of boom and bust. Given this variation, Australia's ecosystems have evolved a remarkable resilience to disturbance and many of these natural extremes play an essential role in the lifecycles of our plants and animals: Banksias need fire to germinate, bettongs rely on fire to keep the forest understorey open for grazing, burrowing frogs wait deep underground only to emerge during flooding and nomadic birds form huge flocks around transient lakes. However, in the face of pervasive threats such as feral cats and foxes and mismanaged fire these landscapes are not as resilient as they once were. Biodiversity is in decline, the climate is changing at an unprecedented rate and extreme events are becoming more frequent and intense. By undertaking conservation management and restoring biodiversity, AWC is building *more resilient* ecosystems that have the vital capacity to adapt.



Healthy fire regimes benefit biodiversity. Brad Leue/AWC

## ***FIRE***

Fire has shaped this continent for tens of thousands of years. First Nations people use deliberate fire management to create a patchwork of vegetation types and fire ages. The dispossession of First Nations people and disruption to these fire regimes has contributed to the rise of intense and extensive wildfire. In northern Australia these altered fire patterns burnt over 10 million hectares each year, on average, prior to the resumption of deliberate management. Wildfires like these increase the predation success of feral cats, that preferentially hunt on burn scars where native animals are exposed.

Effective fire management is crucial for resilient landscapes and is a core focus of AWC's conservation land management actions. We work alongside our First Nations partners to incorporate traditional burning practices in a contemporary framework combined with technology and cutting-edge research, that is developed and delivered by AWC land managers, ecologists and our partners. The strategies are tailored to respond to diverse local systems – from desert to savanna to rainforest and eucalypt forests – with the overarching aims of conserving and promoting biodiversity, protecting life and property, and controlling invasive weeds at a landscape scale.

AWC's annual burn programs account for forecast fire weather conditions. Australia is currently facing a significant and worsening fire weather forecast. This is concerning and is considered in programs and planning across the vast 7.5 million hectares where AWC and our partners implement effective fire management.

### ***Managing fire in the desert***

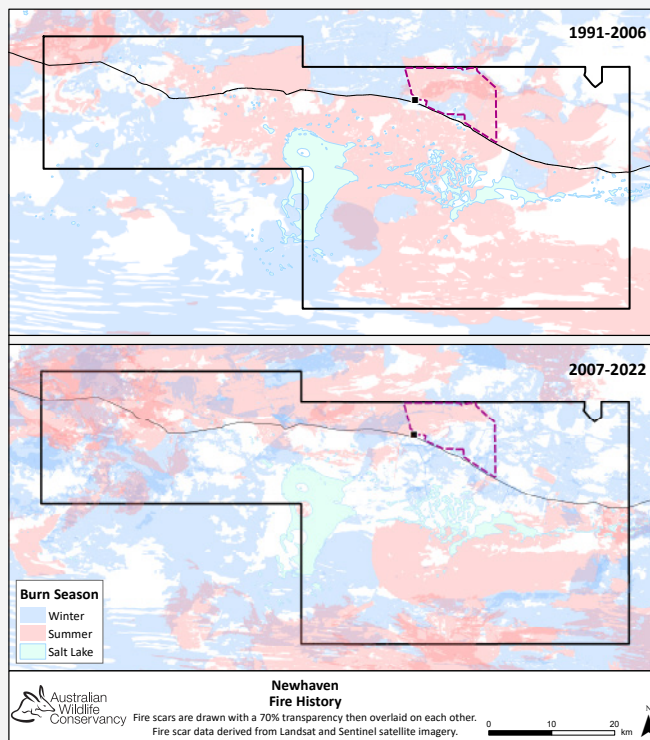
The boom-and-bust cycles of central Australia mean that years of wet are followed by years of widespread fire. On Ngalia-Warlpiri and Luritja Country, AWC land managers and Newhaven Warlpiri Rangers deliver fire management across Newhaven Wildlife Sanctuary's 262,000 hectares.

Fire management aims to shift landscape-scale fire patterns from intense, hot season wildfire to smaller, patchier, less severe fire patterns. Analysis collated by the Indigenous Desert Alliance-led 10 Deserts Project, in partnership with AWC, the Central Land Council, Kanyirninpa Jukurrpa, Bush Heritage and Desert Support Services, indicates that effective fire management is altering desert fire patterns, shifting fire seasonality towards the cooler months, reducing burnt-patch size and increasing fire age diversity. At Newhaven, AWC's Fire Management Program has seen wildfire extent and severity reduced by 9% and 47% respectively since 2007.



These metrics deliver real-world biodiversity benefits such as increasing the persistence of fire-sensitive species and communities like the threatened Great Desert Skink. At Newhaven, effective fire management, coupled with targeted feral cat control, has seen a significant increase in activity and breeding success of the Great Desert Skink (Warrarna in the Warlpiri language) – a social lizard that builds and inhabits elaborate communal burrow systems.

At present, only a fraction of Australia’s central deserts are being effectively managed with fire, highlighting how much scope and urgency there is to scale up conservation land management. Lessons being learnt at Newhaven and other AWC properties are being incorporated into the actions being taken by Indigenous rangers and other land managers across the deserts. The Indigenous Desert Alliance, Central Land Council and other Indigenous organisations are actively collaborating to deliver outcomes based on these lessons. In 2022, Traditional Custodians, the Central Land Council and AWC partnered to deliver conservation outcomes at scale across Ngalurrjtu Aboriginal Land Trust (320,000 hectares) – contiguous with Newhaven – and 2023 marks the first year of fire management. This partnership is a step in the right direction: ‘working two-ways to protect country and culture.’



AWC’s fire management at Newhaven Wildlife Sanctuary in the Northern Territory is seeing fire seasonality shift towards the cooler months and an increase in fire age diversity and reduction in burnt-patch size. 1991–2006: before AWC fire management; 2007–22: with AWC fire management. Maps created by Terry Webb/AWC

## FLOOD

For many parts of Australia there is a relationship between fire and flood. In northern Australia, wet season rains mark the end of the intense peak of the build-up and dry season. It also marks the start of wet and early dry season burning when AWC uses prescribed burning to reduce the impact of wildfires across the landscape, increase the mosaic of fuel ages and address weed infestations and woody encroachment into grasslands. As the climate continues to change, extreme rainfall events are expected to increase, particularly in northern and central Australia.

AWC land managers pay a significant amount of attention to the potential impacts of flood. One of the biggest challenges is the timing of programs, such as Ecohealth monitoring and feral predator management, to maximise efficiency and outcomes against investment. A range of measures are undertaken to manage operational infrastructure priorities including maintenance and residential resupply (in anticipation of sanctuary roads becoming impassable), and fence and road maintenance including flood-proofing and preparation for flood response.

## After the floods

The significant impacts of the 2023 Kimberley floods are still being felt. In January, record flooding inundated Mornington–Marion Downs and Charnley River–Artesian Range wildlife sanctuaries, with the waterline reaching the roof of the research office at Mornington. Despite the devastation, AWC staff were well prepared and everyone was kept safe.

The effects of the floods may take years to recover from, but AWC staff are back on the ground, repairing, restoring and future-proofing operations in northern Western Australia as best we can. Several staff members have returned to full-time life at Mornington (others are based out of Broome), Purple-crowned Fairywren researchers (from Monash University) are back on site and the program is in full swing. At Charnley, upgrades to infrastructure continue as part of the critical Kimberley Conservation Hub. Great Bowerbirds are making the most of minimal humans on sanctuary and stealing roof screws, Green Tree Frog populations are booming and Endangered Purple-crowned Fairywren fledgling numbers are high. This year, Wilinggin Aboriginal Corporation's Darran.gu Wulagura (Strong Women) Rangers and



Green Tree Frogs outnumber people at the Mornington Campground in the Kimberley. Lyn Anderson/AWC Volunteer





Kalamurina Wildlife Sanctuary rapidly turning from dry to flood. Brad Leue/AWC

AWC ecologists undertook population surveys of the threatened Golden Bandicoot for the first time on Willinggin Country in the Artesian Range. In August, the Ngarinyin People, the Traditional Custodians of Willinggin Country, gifted a founding population of Golden Bandicoots to Newhaven's mammal restoration project, restoring the threatened species to Australia's arid interior.

### ***Boom and Bust***

During cycles of boom and bust the landscape fluctuates from periods of rain and abundance to periods of extreme dry. During 'bust' times, AWC's vast Kalamurina Wildlife Sanctuary in South Australia is one of the driest properties in the country. During floods, water gushes in along the Warburton River turning the dusty, arid landscape into pools of shimmering wet. During boom times, rainfall closes all roads and tracks, isolating the sanctuary and the managers that call it home.

In July, Kalamurina Sanctuary Managers Luke Playford and Annemarie van Doorn were 'flooded out' and 'flooded in' after Luke nipped out to pick up their son from boarding school. 'The landscape at Kalamurina changes significantly with the rain,' says Annemarie. 'Since we arrived two years ago, rainfall always seems to coincide with the school holidays and this time was

no different. We received over 25 millimetres in 24 hours which turned a dusty sanctuary into a very wet one and resulted in Luke being away for two and a half weeks. Up north 25 millimetres is not a lot, but here in clay soil country it certainly is.'

### ***BUILDING RESILIENCE***

The impacts of climate change are already being felt around the world and Australia is experiencing more extreme fire seasons, floods and drought. These extremes are pushing our ecosystems beyond known limits. Through effective fire management and by restoring and protecting biodiversity, AWC aims to strengthen the capacity to adapt. The call to increase investment in the natural world and scale up our efforts to build more resilient ecosystems has never been louder.

***Help build resilient landscapes***

Your gift can support effective fire management across 7.5 million hectares





Kalamurina Wildlife Sanctuary sits at the intersection of three deserts and is dominated by cycles of boom and bust. *Wayne Lawler/AWC*

## Supporter story

AWC's work is only made possible by the generosity of our wonderful supporters. It is a pleasure to be able to share their experiences and the varied reasons they stand with us.

Long-time supporter Mike Hawker AM considers himself privileged to have visited AWC's Kalamurina Wildlife Sanctuary in South Australia during flood. Every so often, floodwaters from Queensland's Channel Country make a 1,000-kilometre journey into South Australia, travelling through Kalamurina – a vast 679,000-hectare remote desert wilderness – to Kati Thanda–Lake Eyre. In 2010, this coincided with rainfall four times the annual average.

### ***What was it like seeing the desert in flood?***

It was a surreal flight by light aircraft to Kalamurina. On one side there was water everywhere and on the other, not a speck.

We camped on the high bank of the Warburton River. Under normal circumstances you can walk across the dry riverbed, in doing so crossing from the Tirari to the Simpson Desert. We swam across; an unusual feat swimming between two deserts in this country.

The birdlife was unbelievable. I saw Bustards for the first time (the heaviest flying birds in Australia and a bird I'd never heard of), Wedge-tailed Eagles, Red-backed Kingfishers, Purple-backed Fairywrens nesting on the trees overhanging the waterways and thousands of Pelicans.

The dunefields were covered in wildflowers and the sunsets were extraordinary. I felt incredibly lucky to be in such an isolated and wild landscape, one you wouldn't normally see.

### ***How long have you been an AWC supporter?***

I've been supporting AWC for almost 20 years now. My philanthropic efforts are focused on education,

conservation and health, and they're all interlaced. My friend [and former AWC Board Director] Ross Grant introduced me to AWC and after the first sanctuary visit, I was hooked. It was one of the best things I've ever done and there's truly nothing like it. You learn so much about our native wildlife and the science AWC is undertaking. More importantly, you learn why it's being done. The work is extraordinary and at a scale which is just huge.

Apart from Kalamurina, I've now been to Charnley River–Artesian Range, Mornington–Marion Downs, Newhaven, Pungalina–Seven Emu, Piccaninny Plains and Mount Zero–Taravale wildlife sanctuaries and Bullo River Station, and seen parts of Australia that you would otherwise never see.

### ***Why do you support AWC?***

Sitting on the escarpment above the camp at Mornington in the Kimberley, overlooking a huge valley, it feels like there should be huge animals there (it's easy to imagine dinosaurs roaming the plains). We have tiny animals in this massive landscape and our biodiversity is diminishing. The loss of Australia's animals over the last 50 years has been unacceptable.

Visiting AWC's sanctuaries lets you see the scale and beauty of the Australian landscape. Seeing the science and land management in action gives you the information needed to understand why conservation is so important and to understand that it's only going to get more important. There's a huge amount of value in what AWC is doing for the future... they just get stuff done.



### ***Become a regular giver***

Regular gifts are crucial for planning and implementing cost-effective conservation at scale





A little fledgling Dumbi (Northern Masked Owl) in the first confirmed nest tree on Dambimangari Country. Brad Leue/AWC



## *Searching for Dumbi*

*Bird surveys yield new discoveries*

LARISSA POTTER, SENIOR FIELD ECOLOGIST

*» Dumbi is an important story for all three Wandjina-Wunggurr People. He's associated with the flood story, the first story... this is a story we all heard since we were little. «*

*Kirsty Burgu, Dambimangari  
Director and Cultural Advisor*



It was day one of the fieldtrip on Dambimangari Country and the chopper slowed as we neared our intended camp – a stretch of river selected from satellite imagery. Here, rugged sandstone ranges slope down to a broad watercourse, lined with galleries of tall joongoonbeem paperbark trees and stands of dense jarliwunarn wunu *Pandanus*. Most of the riverside was rocky and vegetated, but a large open area of white sand was the perfect place to camp, providing a safe chopper landing site, shade and plenty of freshwater.

We had several aims for this survey, one being to deploy an array of acoustic recorders to detect the threatened and culturally important Dumbi, the Northern Masked Owl. We did not know if the species occurred here, but the habitat looked suitable and camera surveys nearby showed a healthy mammal population, the owl's preferred prey.

Dumbi, the white owl, is a sacred animal: 'Dumbi is an important story for all three Wandjina-Wunggurr People' says Dambimangari Director and Cultural Advisor Kirsty Burgu. 'He's associated with the flood story, the first story... this is a story we all heard since we were little,' she adds.

### ***An unexpected discovery***

After deploying several recorders south of camp, we headed north to set the remainder of the array. It was here, just 500 metres upstream, that we experienced our first exciting bird encounter. There in a tall joongoonbeem

was a Garr garr, Red Goshawk, mainland Australia's rarest bird of prey! This species was recently uplisted to Endangered due its disappearance from over a third of its breeding distribution within the last 40 years and is a priority species in the Federal Government's Threatened Species Action Plan 2022–32.

The Garr garr is a striking bird of prey, with a streaked upper chest and, as the name implies, a rich rufous colouration to the body and wings. After watching us for a few minutes, this female bird flew to land next to a nest – a large assemblage of sticks in a joongoonbeem. This is the first scientific confirmation of the Garr garr on Dambimangari Country and only the tenth nest recorded in the Kimberley. Although the landscape contains ideal habitat, the remote, rugged and vast nature of the region makes it challenging to survey its rich biodiversity.

### ***A sacred animal***

Exhausted after a big first day we crawled into bed... only minutes later to hear an unexpected, loud and haunting screech cut through the night air. Was that Dumbi the Masked Owl... or Yuwurn the similar Eastern Barn Owl? All was quiet for a few hours until the calls were heard again... and again... and again, so loud they must be nearby. So, bleary eyed, we poked our heads out of tents and shone torches into trees, only to find the majestic form of Dumbi perched just 15 metres from the campfire – confirmed by its large body and strong taloned feet with thick furred legs.

The next morning, it was the talk of camp. ‘I was so excited, it was amazing’ said AWC–Dambimangari Biodiversity Ranger Azarnia Malay. ‘I’d heard lots of stories about the owl and then I saw it, and it was good to see it in the wild.’ It was great news for the survey too, we now knew they were here. But it got even better.

As we sat around the fire the following night, a series of soft trills and ‘chirrs’ could be heard coming from a hollow in a dead joongoonbeem. Upon investigation, a young Dumbi was seen poking its head out, making this the first confirmed nest tree for the Northern Masked Owl in Western Australia! For the remainder of the trip, we were entertained and enthralled each night by the young owl and its parents, as they fed and attended to their chick. ‘Oh the little owl got me so excited, I couldn’t believe it, we saw a whole little group, a family, not just the baby, but the mother and father,’ said Azarnia.

The Northern Masked Owl is listed as Vulnerable and very little is known about the subspecies in the Kimberley. PhD researcher Nigel Jackett has been studying the only other known nest area in the region at Yampi Sound Training Area where AWC works in partnership with Dambimangari Traditional Owners and the Department of Defence. The abundance of mammals (particularly

Golden Bandicoots, Common Rock-rats and Pale Field-rats) found at Yampi has led to a pair of Northern Masked Owls raising chicks during three of the last four years. Acoustic recorders deployed in this area have revealed further insights into the year-round calling behaviour and movements of the owls within the landscape, which has helped detect owls in other remote locations across northern Australia.

### **Healthy Country**

To have found the nests of two enigmatic threatened bird species within a kilometre of each other is incredible. As Dambimangari Ranger Peter Cooper said, ‘seeing a lot of threatened species, it’s telling us how healthy Country is, and how lucky we are to have Country like that.’ According to Kirsty ‘the moral of the story of Dumbi is... you have to have respect for animals.’ ‘By knowing the job that we’re doing, we’re keeping all these species safe’ adds Peter.

The Dambimangari–AWC team are looking to monitor the success of both nests which will provide important information for the conservation of these threatened and enigmatic species. We will continue to work together to look after Country, protecting and respecting its wildlife.



[Top] The Garr garr (Red Goshawk) is one of Australia’s rarest birds of prey, making the sighting and nest discovery on Dambimangari Country all the more exciting. Brad Leue/AWC

[Bottom] Dambimangari Ranger Peter Cooper, AWC Senior Field Ecologist Larissa Potter and AWC–Dambimangari Biodiversity Ranger Azarnia Malay on Dambimangari Country. Brad Leue/AWC



## *Spotlight on quolls*

*The quest to save Australia's disappearing dasyurids*

- DR ALEXANDER WATSON, REGIONAL ECOLOGIST*
- DR GABRIELLE BECA, WILDLIFE ECOLOGIST*
- DR TOM SAYERS, WILDLIFE ECOLOGIST*
- DR SKYE CAMERON, REGIONAL ECOLOGIST*
- DR JOHN KANOWSKI, CHIEF SCIENCE OFFICER*
- JESS TEIDEMAN, SCIENCE WRITER*
- JOEY CLARKE, SENIOR SCIENCE COMMUNICATOR*





Australia's four species of quolls are the largest marsupial carnivores on the mainland. As predators at or near the top of the food chain, they play an outsized role in the ecosystems of which they're a part and their conservation is considered important for the overall health of ecosystems. Despite their sharp teeth and feisty temperament, they have not fared well since European colonisation. Direct persecution, the impacts of changed fire regimes and the introduction of cats, foxes and cane toads have resulted in all quoll species being threatened with extinction across all or parts of their range. Quolls are in the spotlight of conservation efforts across Australia: Northern, Western and Eastern Quolls are listed as Priority Mammals in the Federal Government's Threatened Species Action Plan 2022–32. However, while some populations of quolls are confronting new threats, others are making an assisted comeback.

## ***NORTHERN QUOLLS***

Northern Quolls, the smallest of the four Australian quoll species, are known by many different names across northern Australia (including Barkuma as the Yolgnu People of Arnhem Land know them and Wijingarra in the west Kimberley on Dambimangari Country), where they were once widespread. Their distinctive life history (common across small dasyurids), where males die off annually after breeding, has allowed them to thrive in ecosystems that change dramatically between wet and dry climates on a seasonal basis. This strategy, successful over evolutionary time, was challenged by the introduction of cattle, changed fire management and predation by feral cats following European colonisation. Then further catastrophe struck in the form of a toad. The spread of introduced cane toads across Queensland in the 1930s–90s and, more recently, across the Top End and into the Kimberley, has significantly reduced the distribution of Northern Quolls, with many local extinctions of populations, especially in the more arid and less rocky parts of their range (similar impacts have been experienced by other frog-eating predators, such as goannas and snakes, in the wake of the toad invasion). As a result, Northern Quolls are listed as Endangered.

While it is well known that cane toads have caused a devastating decline in Northern Quolls across most of their range, it is less widely recognised that small populations of Northern Quolls have hung on in areas infested with toads. This includes the western section of AWC's Brooklyn Wildlife Sanctuary in Queensland.



Although the mechanism is still unknown, scientists have observed that these remaining populations are able to coexist with toads, simply by not eating the poisonous invader. Research has also shown that declines in toad-infested areas tend to be in flatter parts of the terrain, with a greater chance that Northern Quolls persist in rocky areas. Differences in survivorship may be due to differences in fire regimes, grazing pressure and cat predation between the relatively protected escarpment country and the flatter, more open savanna woodlands, and perhaps also to differences in toad abundance.

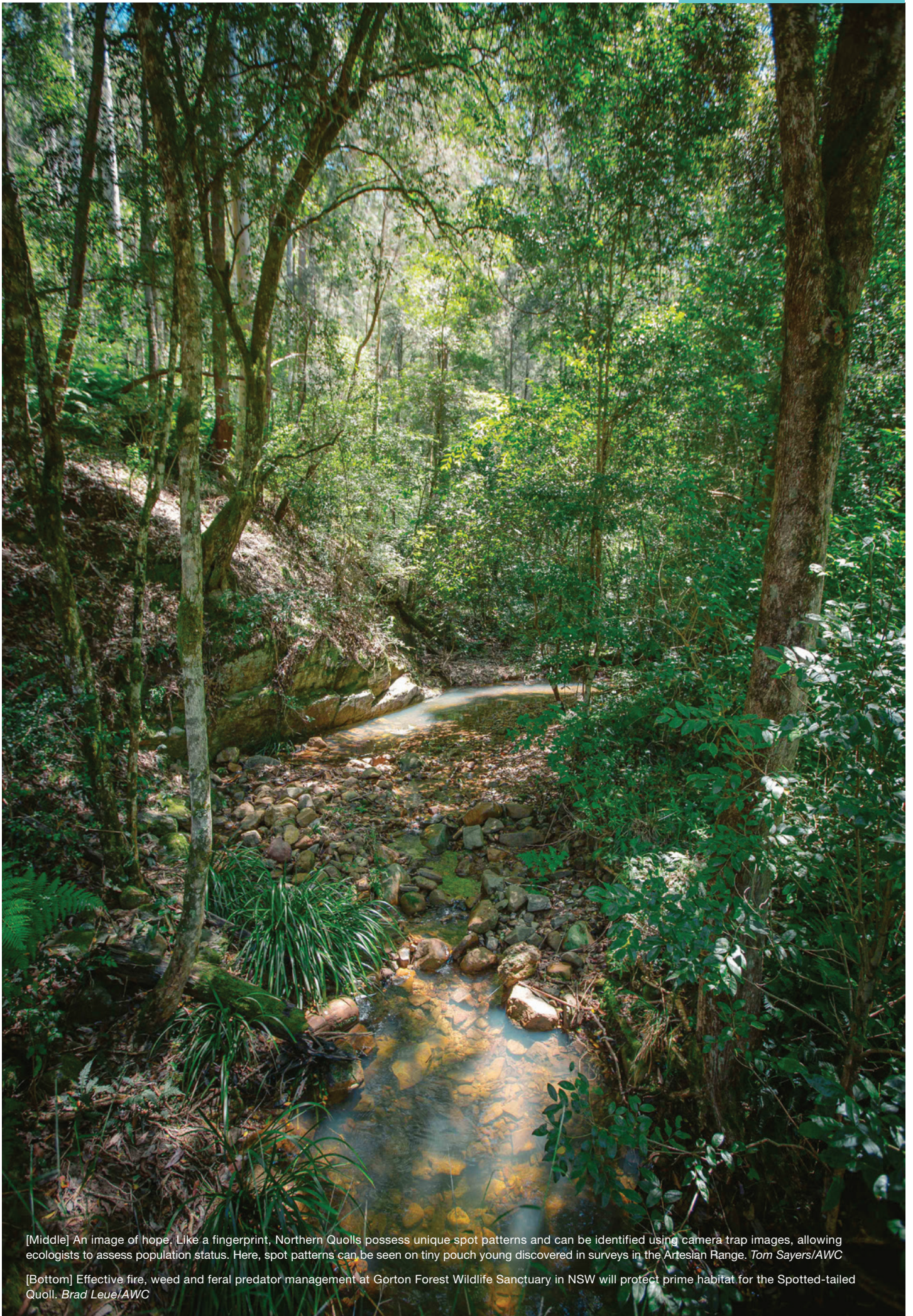
## ***Dens by design***

In 2022, AWC began working on an innovative project at Brooklyn to expand the number of areas currently occupied by Northern Quolls. The project has been partly funded by the Australian Government's Environment Restoration Fund and conducted in collaboration with Western Yalanji Traditional Owners and scientists from Terrain and Gulf Natural Resource Management. Twelve artificial dens were designed and built on the margin of habitats currently occupied by Northern Quolls on Brooklyn. We are waiting until the end of the next wet season (summer 2023–24), when young Northern Quolls are likely to disperse and encounter these artificial homes, to determine whether the artificial dens will assist quolls to extend their range into savanna woodlands on Brooklyn.

In the last 12 months, AWC has also worked closely with Western Yalanji Traditional Owners to undertake fire management on Brooklyn in the vicinity of the artificial dens. These fires are designed to create a mosaic of vegetation at different ages since fire to maintain a balance of fire-stimulated resources and vegetation cover, to help limit feral cat predation. AWC has also been taking genetic samples from Northern Quolls at Brooklyn to better understand what impact recent declines and fragmentation have had on the genetic diversity of remaining populations, which will be central to informing future translocations planned for the species.

## ***The march of the cane toads***

The Northern Quoll is a focal species for AWC's conservation efforts in the Kimberley. Knowing how serious the impacts of toads have been on quoll populations elsewhere, AWC ecologists have been closely monitoring populations of the Northern Quoll before and after the arrival of cane toads as they spread west across the region. At Mornington–Marion Downs Wildlife Sanctuary, AWC ecologists collaborated with



[Middle] An image of hope. Like a fingerprint, Northern Quolls possess unique spot patterns and can be identified using camera trap images, allowing ecologists to assess population status. Here, spot patterns can be seen on tiny pouch young discovered in surveys in the Artesian Range. *Tom Sayers/AWC*

[Bottom] Effective fire, weed and feral predator management at Gorton Forest Wildlife Sanctuary in NSW will protect prime habitat for the Spotted-tailed Quoll. *Brad Leue/AWC*

external researchers to test and deploy cane toad sausages, laced with a nausea-inducing compound, in an attempt to teach quolls not to eat toads. Unfortunately, that approach didn't work (see Indigo et al. 2023), so we changed tack at Charnley River–Artesian Range Wildlife Sanctuary, focusing on managing existing threats (such as wildfire and feral animals) in the hope of assisting some quoll populations to survive the invasion of toads.

In the Artesian Range, surveys were conducted in the two wet seasons before toads invaded the area (2018–19, 2019–20) and again in 2020–21 following the arrival of toads. These data revealed a 73% decline in quoll abundance across eight sites after the toad's arrival. Encouragingly, however, the most recent survey conducted during the 2022–23 wet season confirmed the persistence of Northern Quolls at most survey sites. Further analysis of the data will be conducted to quantify changes in the abundance of the population.

There are several reasons why quolls might be persisting here, in contrast to more drastic declines that have occurred at Mornington and elsewhere in the southern and eastern Kimberley:

- 1) The topographic complexity in the Artesian Range means there is a reduced abundance of toads and feral cats, particularly in habitat away from major creek lines and rivers.
- 2) The Artesian Range receives higher rainfall than the southern and eastern Kimberley, which (all else being equal) translates to higher productivity and hence higher levels of recruitment in quoll populations, enabling them to 'bounce back' faster from population declines.

Regardless of the reason, the hope now is that remaining quoll populations become more averse to eating toads, for example because 'toad smart' individuals are persisting and passing on their genes, or because 'toad smart' mothers are passing on toad-aversion behaviours to their young.

AWC ecologists will continue to monitor Northern Quoll populations in the Kimberley, and threats to the persistence of those populations, as part of our Ecohealth Monitoring Program. Data from the program will help inform development of a conservation management plan for the species in the region.

## ***RETURN OF THE CHUDITCH***

The Chuditch (Western Quoll) was once one of the most widespread predators in Australia, occupying 70% of the continent, in diverse landscapes ranging from forest to grassland to desert. As with so many of Australia's small and medium-sized mammals, this species was wiped out from inland Australia after European colonisation and the resultant changes to ecosystems, particularly the introduction of feral predators and changes to fire regimes. The Chuditch is now extinct across 95% of its former range.

In 2023, AWC began the reintroduction of the Chuditch to Mt Gibson Wildlife Sanctuary in Western Australia.

In the first two tranches of the reintroduction, a total of 34 quolls were released at the sanctuary, sourced from two locations in south-west Western Australia. All animals were released outside the 7,800-hectare fenced safe haven, facilitated by an increase in ongoing efforts to control feral cats and foxes. This important reintroduction marked the first time a top-order marsupial carnivore has been restored to a part of its former range by AWC. It follows the successful release of Brushtail Possums outside the fenced area at Mt Gibson in 2021–22.

Monitoring of the quolls will continue for up to 12 months post-release using an advanced drone radio-telemetry system from Wildlife Drones. This new technology enables ecologists to track multiple individuals simultaneously and over large areas, as they settle into the new environment.

The Chuditch is the tenth species AWC has reintroduced to Mt Gibson, setting a new benchmark for reintroduction programs across the country. Plans to introduce quolls inside the fence will be considered once populations of the other reintroduced species have successfully established and grown in numbers, sufficient to tolerate the additional level of predation.

## ***SPOTTING THE POSSIBILITIES***

The Spotted-tailed Quoll is the largest of the Australian quoll species. Populations in south-east Australia and North Queensland are listed as Endangered, while the Tasmanian population is listed as Vulnerable.

Research has shown these quolls need large patches of forest with adequate denning resources: areas with relatively high densities of hollow-bearing trees, fallen timber and medium-sized mammalian prey. As a top-order predator and the largest carnivorous marsupial on mainland Australia, the Spotted-tailed Quoll plays an important ecosystem role.

AWC's Gorton Forest Wildlife Sanctuary in NSW is home to a host of forest-dwelling species and primary vegetation communities of wet and dry sclerophyll forests, providing the perfect habitat for the quoll. Spotted-tailed Quolls are known to occur in the area and there has been a recent sighting of the species on the property. Inventory surveys planned to commence at Gorton Forest in 2023 will provide more information.

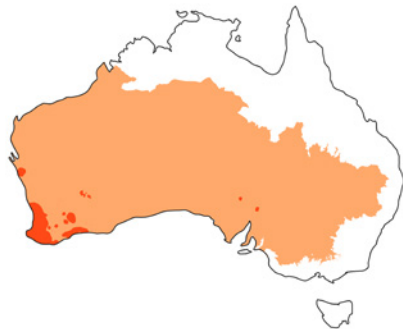
AWC will protect quoll habitat at Gorton Forest by maintaining and restoring native vegetation through fire and weed management. Feral predator management, aimed at foxes and cats, will reduce predation on quolls and competition with invasive species.

Across the country, these projects show that while quolls have suffered widespread declines, it's not too late for some populations to recover, or for new populations to establish.

## Species profiles and maps showing current and historical distributions

● Historical distribution ● Current distribution

### Chuditch (Western Quoll) *Dasyurus geoffroii*



**Size:** 700 g – 2.2 kg (male);  
700 g – 1.1 kg (female)

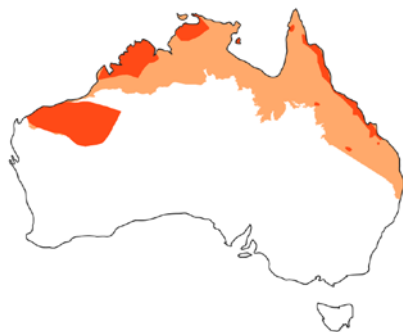
**Conservation status:** Vulnerable

Chuditch have brown fur with numerous conspicuous white spots on their back and sides. They also have a black brush on the tail, extending from halfway down their tail to the tip.



Brad Leve/AWC

### Northern Quoll *Dasyurus hallucatus*



**Size:** 300 g – 1 kg (male);  
200 – 500 g (female)

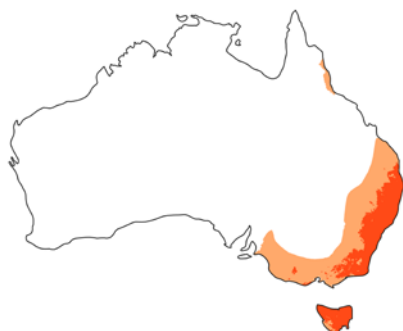
**Conservation status:** Endangered

The smallest of the Australian species, the Northern Quoll has reddish-brown fur, with a cream underside and no spots on the darker-coloured tail.



Brad Leve/AWC

### Spotted-tailed Quoll *Dasyurus maculatus*



**Size:** 2.5 – 4 kg (male);  
1.5 – 2.5 kg (female)

**Conservation status:** Near threatened

Also known as the Tiger Quoll, the Spotted-tailed Quoll is the largest species. It has rust-brown fur with white spots that continue down its bushy tail.



Tim Henderson/AWC

### Eastern Quoll *Dasyurus viverrinus*



**Size:** 900 g – 1.9 kg (male);  
700 g – 1.1 kg (female)

**Conservation status:** Endangered

Once found across much of the south-eastern mainland the species is now only found in Tasmania. Their fur can vary from light fawn to near-black with spots that do not extend onto the tail.



Dave Watts/Alamy Stock Photo



AWC has been monitoring the threatened Yellow-footed Rock-wallaby at Buckaringa Wildlife Sanctuary in South Australia for 12 years. *Wayne Lawler/AWC*

## *Cueing conservation*

### *How long-term monitoring can inform action*

**DR HOLLY SITTERS, SENIOR WILDLIFE ECOLOGIST**  
**DR LIANA JOSEPH, NATIONAL SCIENCE MANAGER**  
**DR JOHN KANOWSKI, CHIEF SCIENCE OFFICER**

The Ecohealth Monitoring Program underpins AWC's effective model of science-led conservation management. The program aims to address fundamental questions relevant to the achievement of AWC's mission, such as 'Are species persisting?', 'Are habitats being conserved?' and 'Are threats being managed adequately?'

Each year, an immense effort by AWC staff, interns and volunteers goes into monitoring biodiversity on sanctuaries and partnership areas nationwide. In 2022, the Ecohealth program comprised over 280,000 trap nights (camera and live trapping) and almost 2,000 bird surveys, making it Australia's most extensive field monitoring program. In July, AWC released the 2022 Ecohealth reports and scorecards, marking the third consecutive year of publication.

AWC's Ecohealth program uses established, targeted techniques to collect detailed information on species of high conservation value, such as threatened and reintroduced species. It is crucial, however, that we also monitor and evaluate conservation outcomes for the broader species assemblages.

A key issue is that changes in the abundance or distribution of a species reflect a combination of responses to threats, to management and to a range of natural phenomena, such as fluctuations in weather patterns. This is particularly evident in Australian ecosystems, where species increase and decline in response to pulses of rainfall and drought; such boom-and-bust dynamics are a natural feature of arid, semi-arid and sub-tropical environments. Deciphering which declines are of concern, because they reflect a threatening process, from the declines that occur naturally is a key challenge in evaluating monitoring data. If we can disentangle these factors, the data can provide early warning of declines that are of conservation concern, enabling timely action to mitigate threats and promote the persistence of species.

AWC's National Science Team has been working on ways to address these issues, utilising long-term datasets collected on AWC sanctuaries.



### *Long-term monitoring at Kalamurina Wildlife Sanctuary*

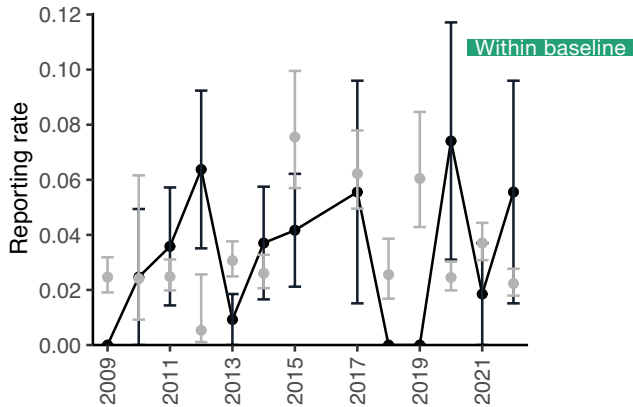
AWC has 15 years of Ecohealth monitoring data on birds, mammals, reptiles and frogs from Kalamurina, a vast desert landscape adjacent to Kati Thanda–Lake Eyre National Park and Munga-Thirri–Simpson Desert Reserve in South Australia (together protecting an area larger than Tasmania). Analysis has shown that several species were thriving in 2022, after persisting at very low densities during drought conditions in previous years. In 2022, Crest-tailed Mulgara abundance was much higher than in most previous years, the Mayaroo (Long-haired Rat) was caught for the first time in 10 years, while a dozen Dusky Hopping-mice were caught – by far the most since surveys began. At the same time, the activity of feral cats and foxes on Kalamurina remained low. Based on this evidence, the increased abundance of mammals in 2022 is likely a reflection of AWC land management, prevailing wet conditions and low densities of introduced predators.

### *Long-term monitoring at Buckaringa Wildlife Sanctuary*

At Buckaringa in semi-arid South Australia, AWC has 12 years of Ecohealth monitoring data. This long-term dataset was used to test the application of two methods for evaluating changes in abundance of 15 bird species (the threatened Southern Whiteface and 14 common species) and the threatened Yellow-footed Rock-wallaby. We first examined whether abundance was correlated with rainfall over the baseline period (roughly the first 10 years of data). If it was, we compared the 2022 abundance results with predicted values based on a rainfall model derived from the baseline data, to determine whether abundance was higher, lower, or similar to expectations given recent rainfall. For species where abundance was not well correlated with rainfall, we compared 2022 results with the range of values observed in the baseline data.

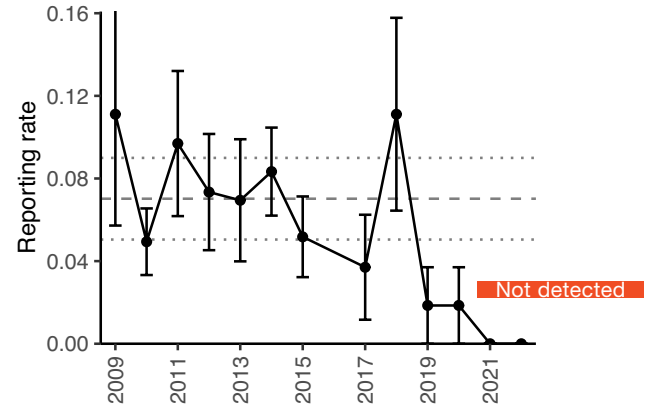
Abundance of the Yellow-footed Rock-wallaby was strongly associated with rainfall; it declined over the

### Southern Whiteface *Aphelocephala leucopsis*



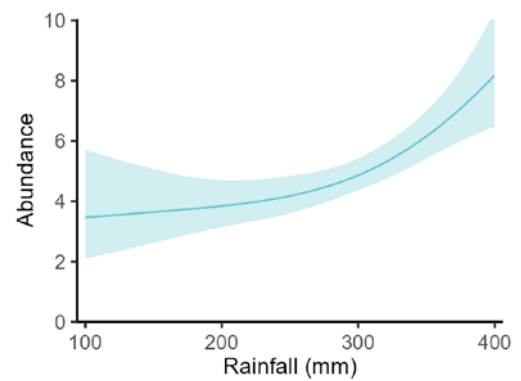
Southern Whiteface reporting rate at Buckaringa. Black: mean reporting rate  $\pm$  error. Grey: predicted reporting rate based on the rainfall model. Reporting rate is the proportion of repeat surveys during which a species was detected and provides an index of abundance.

### Purple-backed Fairywren *Malurus assimilis*

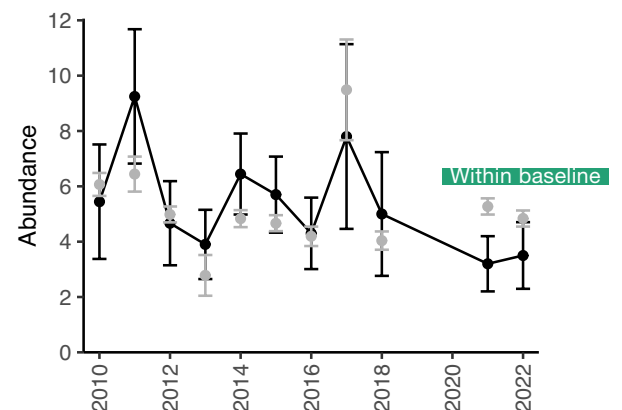


Purple-backed Fairywren reporting rate at Buckaringa. Black: mean reporting rate  $\pm$  error (SE). As there was no correlation with rainfall, baseline data were calculated from the first 10 annual surveys. Grey: baseline mean and 2 SE.

### Yellow-footed Rock-wallaby *Petrogale xanthopus*



Yellow-footed Rock-wallaby abundance shows a strong association with rainfall.



Yellow-footed Rock-wallaby abundance at Buckaringa. Black: mean ( $\pm$  error) number of individuals per site. Grey: baseline for comparison, predicted abundance based on the rainfall model.





The fauna survey team at AWC's remote Kalamurina Wildlife Sanctuary in South Australia. Alice Si/AWC

2018–19 drought but has since stabilised, indicating that higher rainfall since 2020 has benefitted the population. However, abundance in 2022 was at the lower end of the range predicted from rainfall, implying the population has been suppressed by threatening processes. Survey results showed that foxes and feral cats have been maintained at low to moderate densities, but that the Euro (Common Wallaroo) population has increased. Euros may compete with rock-wallabies for food, particularly during dry periods when resources are scarce. AWC will continue to carefully monitor and manage threats that may affect the sanctuary's rock-wallabies.

The Southern Whiteface was among seven bird species that returned a 'within baseline' evaluation in 2022. The Southern Whiteface is generally considered sedentary but may move outside its normal range during drought; it was not recorded on Buckaringa in the 2018–19 drought but was abundant in 2022. In contrast, the White-winged Fairywren and Rufous Whistler returned a 'below baseline' score and several other species were not detected at all in 2022. Of particular concern are two species, the Purple-backed Fairywren and Inland Thornbill, which have both declined at Buckaringa since 2009. While the Purple-backed Fairywren is considered stable across its range, the Inland Thornbill is among many species of woodland birds that are declining regionally.

### *Cues for conservation action*

Both the Kalamurina and Buckaringa long-term-monitoring datasets are a testament to the expertise and commitment of Senior Wildlife Ecologist, Keith Bellchambers, who has led field data collection and reporting at both sanctuaries since 2008. A network of AWC scientists, like Keith, and volunteers are working tirelessly to ensure we are equipped with the knowledge required to take prompt action for the benefit of wildlife. These methods of evaluation will continue to be refined using other datasets, before being implemented across the AWC estate.

Many threatened species were once common. Long-term monitoring is helping us to understand why declines happen. Being able to identify early warning signals of decline will provide opportunities for rapid conservation action to prevent more species from becoming imperilled or extinct.

*Scan here to read  
AWC's Ecohealth  
reports for  
sanctuaries and  
partnership areas*



## *Evolutionary resilience in the face of climate change*

*DR JENNIFER PIERSON, SENIOR ECOLOGIST*

Climate change is no longer just a threat of the future that we need to plan for, it is happening now and already impacting biodiversity. Faced with this, what can we do to provide resilience to species and ecological communities?

Species' adaptive capacity, in the context of climate change research, is their ability to avoid or adapt to climate change impacts. A species can move to a new location that is more suitable, if they have good dispersal capabilities and there are suitable corridors in the landscape for them to move through. Alternatively, a species can persist where they are. There are a few primary mechanisms that allow a species to persist in place:

- Evolutionary adaptation – genetic changes based on the selection of observable (phenotypic) traits that are heritable, and the focus of this article.
- Phenotypic plasticity – variation in expression of traits from the same genotype.
- Microhabitat buffering – use of local habitat features that protect an individual from exposure.

From a management perspective, options are limited in what we can do to help species adapt to climate change.

***One of the most powerful actions we can take is to give populations the best chance for natural evolutionary processes to help them cope with rapid environmental change. In other words, enabling evolutionary adaptation.***

Evolutionary adaptation needs genetic variation for selection to act upon. Active management of genetic variation, and the ecological processes that interact with genetic variation, can give species a fighting chance to respond to change. In AWC's Reintroduction Program, which spans 12 locations and 23 species, there are two main actions we are implementing to enable evolutionary adaptation by managing genetic variation.

First, when establishing new populations, we can put a mix of genetic variation into the population, or we can genetically supplement small, isolated populations that have lost variation. Species that have declined into small,

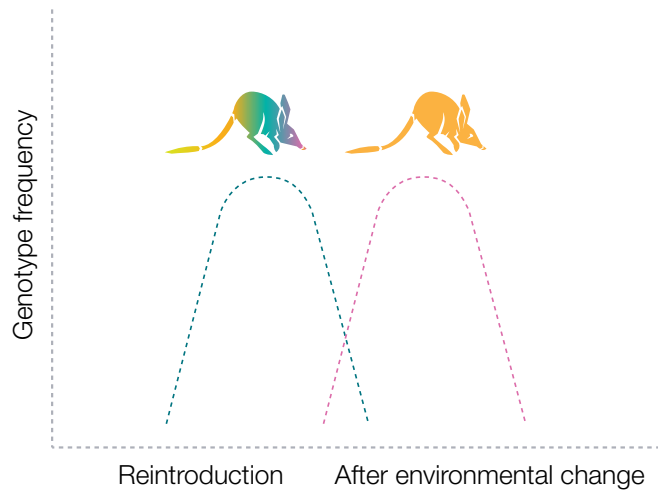
isolated populations often have low genetic variation, however, different populations often have maintained a different range of genotypes than each other. By mixing individuals from different populations, we can try to maximise variation so that when changing conditions present themselves, there might be a genotype that helps individuals or their offspring survive better in new conditions.

The other action we can take is to try to maintain the range of genetically based phenotypic variation by exposing the species to as wide a range of selection pressures as possible. An evolutionary process called directional selection can shift phenotypes along the possible spectrum of a trait under environmental conditions. When there are multiple populations that are experiencing directional selection from different conditions, the process is called diversifying or divergent selection. An example of this is Darwin's famous finches, where different island populations evolved different beak shapes based on what food was available. AWC is actively translocating species to sites that experience different environmental conditions to try to ensure that potential genotypes and associated traits that may be important in the future are maintained in the species. More than half of the species involved in AWC's Reintroduction Program have been translocated to more than one sanctuary or partnership area. For example, the iconic Bilby has been restored to six sites across four states and territories including Newhaven Wildlife Sanctuary in Australia's arid zone. Places like Newhaven play an important role by exposing reintroduced species to intense desert conditions.

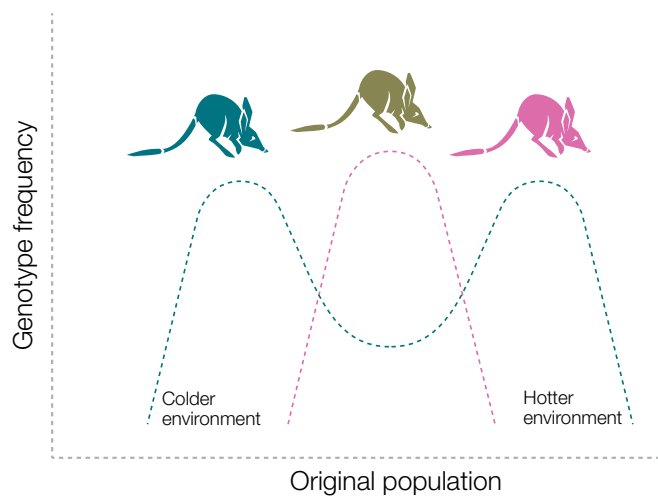
By combining these two actions – creating genetically mixed populations across a range of environmental conditions – we hope to provide reintroduced species with evolutionary resilience into the future under a range of climate conditions. AWC's Reintroduction Program already makes a major contribution to the conservation of Australia's threatened mammals and is embedding an eco-evolutionary approach to resilience as species face an uncertain future with a changing climate.

This simplified figure demonstrates how AWC's Reintroduction Program aims to provide reintroduced species with evolutionary resilience into the future.

- A** Reintroducing genetically mixed individuals so that there might be a genotype that helps individuals or their offspring survive better in new conditions.



- B** Exposing species to different selection pressures (inherent at different locations and with varying climate change impacts) to maintain the range of genetically based phenotypic variation.



- C** Reintroducing the same species at different locations means that there are different ranges of genotypes across populations that could suit changed conditions.





In the arid Channel Country landscape, specialist remote sensing equipment requires protection from curious Dingoes and wiring has to be encased in braided hose to stop the investigations of native Long-haired rats. *Richard Seaton/AWC*



## *The new technologies transforming wildlife research*

*ALANA BURTON, DEVELOPMENT OFFICER, GRANTS  
ANDREW HOWE, SENIOR FIELD ECOLOGIST  
RICHARD SEATON, SENIOR ECOLOGIST -  
PASTORAL PARTNERSHIPS  
JESS TEIDEMAN, SCIENCE WRITER*

Innovations in technology are rapidly changing the way AWC's team of scientists are working. The use of Artificial Intelligence (AI) programs is increasing efficiency in processing camera trap images, and thermal imaging and drones are improving the monitoring of reintroduced mammals. Most recently, drone technology has been used to track reintroduced Chuditch (Western Quolls) at Mt Gibson Wildlife Sanctuary in Western Australia. This is the first drone sensor in the world that can track many animals at once in real time. Now, advanced acoustic monitors, environmental DNA processing and ground-penetrating radar are improving our ability to monitor species in remote and rugged landscapes.

### *Sampling environmental DNA*

Biodiversity monitoring can be challenging, particularly when the focus is on animals that are difficult to detect using traditional methods or when a species' distribution is unknown. To complement existing survey methods, AWC ecologists are collaborating with external researchers to deploy innovative detection techniques using environmental DNA ('eDNA').

When animals move through their environment, they leave behind little traces of DNA in the form of shed skin cells, scales, hair, faeces, or bodily fluids. This genetic material can be extracted from environmental samples and processed in the laboratory to determine its originating species. This is a rapidly developing field with the potential to greatly increase the efficiency of inventory surveys.



Water sources, such as the Hann River at Mornington–Marion Downs Wildlife Sanctuary in the Kimberley, contain an invisible list of the species that use them. *Wayne Lawler/AWC*

AWC is currently working on several eDNA projects. In the Kimberley, AWC ecologists and Dambimangari Rangers are collecting eDNA water samples to test for the presence of invasive cane toads across Dambimangari Country. Samples have been collected at a variety of sites, including Yampi Sound Training Area and a number of islands and rivers. Positive eDNA results are being recorded, supported by the subsequent detection of cane toads on camera traps. These results are allowing AWC and our partners to monitor the spread of cane toads in the region.

While it is often used to detect a specific species of interest, eDNA can also be used for broad-scale biodiversity assessments to discern multiple species (a process known as ‘metabarcoding’). A few small samples can contain the DNA of dozens of species and yield a detailed snapshot of an ecosystem quickly and efficiently. At Karakamia Wildlife Sanctuary, AWC is hosting a PhD project from Curtin University which is examining the use of spider webs as passive eDNA filters to detect vertebrate species. At Newhaven Wildlife Sanctuary, AWC is collaborating with a researcher from the University of Adelaide to detect historical vertebrate assemblages using eDNA extracted from soil. AWC is also progressing a collaboration with a researcher from the University of Queensland on a project using airborne eDNA to survey vertebrate fauna at sites in eastern Australia.

### ***Raising the BAR for audio recording***

Taking advantage of the uninterrupted skies and abundant sunlight in western Queensland, AWC is using solar-powered Bio-Acoustic Recorders (BARs) to monitor threatened species on North Australian Pastoral Company’s (NAPCo) Coorabulka Station.

Funded in part by a Queensland Threatened Species Grant and built by specialist bioacoustics company Frontier Labs, the BARs will be modified to tolerate the large temperature variations typical of the Channel Country’s desert environment. In situ, the BARs will also need to be protected from cattle and native animals like the abundant Long-haired Rat and Dingoes that love to investigate anything shiny.

Sixty monitoring stations, each comprising an acoustic recorder and a camera trap will be established across this 629,000-hectare cattle station. Both the acoustic recorders and cameras will be set to record data 24 hours a day for 12 months, resulting in a huge dataset targeting the threatened Plains-wanderer, Kowari and Bilby. The data will also provide insight into the broad-scale biodiversity values present across this remote outback station.

By deploying this specialist remote sensing equipment, coupled with information collected on rainfall, vegetation and stocking rates, we hope to uncover the mystery of when and where species like the Plains-wanderer, Kowari and Bilby occur in this landscape and, most importantly, how we develop management strategies to conserve them into the future.

### ***Mapping the underground with radar***

Researchers have deployed the latest in ground-penetrating radar (GPR) technology to map out burrows belonging to one of the world’s rarest mammals, the Critically Endangered Northern Hairy-nosed Wombat. This notoriously shy species only emerges from burrows for up to six hours a night to forage for food. This makes the Northern Hairy-nosed Wombat a challenging species to study.



AWC, The Wombat Foundation, Subsurface Mapping Solutions and Queensland's Department of Environment and Science (DES) are now using GPR to explore the wombats' burrows, which can extend several metres below the ground. In late August 2023, the team spent three days deploying an advanced GPR system developed by Subsurface Mapping Solutions at Richard Underwood Nature Refuge in south-west Queensland. The system uses GPR pulses, which the wombats can't feel or hear, to develop a real-time 3D map of burrows naturally dug by the wombats and DES-created 'starter' burrows.

The system has enabled the development of the most detailed subterranean mapping of the Northern Hairy-nosed Wombat burrows to date. This study is part of the Northern Hairy-nosed Wombat Recovery Action Plan developed as part of the DES Threatened Species Program 2020–40 framework. The purpose of the plan is to identify the priority actions required to recover the species, and deepening our understanding of the wombats' habitat requirements will aid in the conservation of the Critically Endangered species.

### ***Transforming conservation***

The promising trajectories of eDNA capabilities, networked sensors, radar, AI, thermal cameras and drones represent new frontiers in wildlife conservation. When used with consideration, technology can vastly increase capacity and consistency and reduce ecosystem disturbance. As conservation technology becomes more accessible and user-friendly, the applications expand as far as human ingenuity can take them.



Ground-penetrating radar is helping us to understand the habitat requirements of the Critically Endangered Northern Hairy-nosed Wombat. *Nahrain John/AWC*

### ***Invest in new technologies***

Your gift can support research and technology to improve conservation outcomes





One of Australia's many intriguing species is the Palm Cockatoo that uses a tool to drum during courtship. This magnificent bird is pictured here at AWC's Piccaninny Plains Wildlife Sanctuary in Cape York. *Helena Stokes/AWC*



# *The case for conservation*

## *An international perspective on Australia's biodiversity*

**LIZZY CROTTY, NATIONAL DEVELOPMENT MANAGER UK/EUROPE**

One of the questions I am most asked is 'why am I talking about Australian wildlife all the way over in the United Kingdom?' I believe the question stems from three knowledge gaps. Firstly, an unfamiliarity with the unique array of species Australia is home to (with the exception being Kangaroos, Emus and, of course, the iconic Koala). Secondly, the lack of awareness of the severity of threats facing biodiversity across the country and the shameful title of having the worst rate of mammal extinctions globally. Finally, Australia is a wealthy country with an extensive national parks system and not generally seen as a country which requires further assistance from philanthropy overseas.

One of the best parts of my job is seeing faces light up when people learn about bizarre species like the Numbat, Palm Cockatoo or Northern Bettong. It's thrilling to share the way these animals manage to survive (and thrive!) in extreme environments, adapted to a particular niche in the Australian ecosystem.

However, if it's not in your country, if it's not likely you will ever travel to Australia to see these creatures or the vast landscapes, why should people care?

I argue there is a broader case for the international community to contribute to conservation in Australia, outside of the nice feeling of knowing these places and animals are safely protected. Biodiversity is unevenly distributed across the globe and areas with exceptional abundance and relatively intact diversity are becoming less common. Australia is one of 17 megadiverse countries globally, with many plants, animals and ecosystems found nowhere else in the world. For example, more than 80% of Australia's mammals and plants occur nowhere else. Loss of Australia's wildlife poses risks to our food security and to the economy.

### ***Global food security***

The past three years have demonstrated that the global food system is not resilient to shocks. Only a handful of countries, such as Australia, USA, Canada, Russia and some in the European Union produce large food surpluses for international trade. Many countries are heavily dependent upon imports for food security.

A recent publication in the scientific journal *Nature* suggests that the risk of synchronised harvest failures across major crop-producing regions has been underestimated in climate and crop model projections (Kornhuber et al. 2023). The risks emerge from changes in the jet streams during Northern Hemisphere summers, increasing the likelihood of extreme flooding or drought events, resulting in significant yield reduction and therefore supply of global food.

Biodiversity is critical to ensuring the provision of ecosystem services and to maintaining high and stable agricultural production in Australia in the face of these identified risks. Evidenced by the 2022 IPCC report, which identified Australia as one of the most at-risk regions for biodiversity loss with increased warming, a pragmatic approach to sustainable food production is required. AWC's partnerships with Bullo River Station and NAPCo see conservation and pastoralism working side by side for the benefit of biodiversity. Collaborating with food producers contributes substantially towards AWC's mission and has the potential to improve the outlook for food security in the face of a changing climate.

### ***Risks to the global economy***

Loss of nature poses a severe financial risk to the global economy. Central banks around the world are beginning to assess the potential economic and financial risks posed by the degradation of nature, in addition to the work they have already been doing to address the threats posed by climate change. The destruction of nature jeopardizes the resources that currently generate around half of global GDP, or an estimated AUD\$68 trillion.

The numbers are staggering. Approximately half of Australia's GDP (49.3% or \$893 billion) has a moderate to very high direct dependence on ecosystem services. Sectors that have a high or very high direct dependency on nature are responsible for more than three quarters of Australia's export earnings, with resources currently accounting for 68.7% of Australia's export share and agricultural exports another 11.3%.

A breakdown of this system could result in severe consequences across the globe. In every scenario modelled by the world's scientists, except those that incorporate transformative change, the trajectory of nature decline will continue through to 2050. Transformative change to halt and reverse nature destruction requires a shift to production and consumption patterns that not only fit within planetary boundaries but result in a net gain in biodiversity and planetary health, alongside traditional and innovative conservation approaches. AWC's practical, science-informed land management model that is restoring threatened species and ecosystems, expanding protected areas through innovative partnerships, and including First Nations knowledge and rights into conservation outcomes, is needed now more than ever.

Protecting Australia's intrinsic natural values – that can't be found anywhere else – is just the right thing to do.



wildlife matters  
34

*Dr Jack Baker generously dedicated his legacy to help educate budding ecologists and conservationists like Abbey and Alex (pictured).*

AWC interns Abbey Dean and Alex Neilson (now an AWC Land Management Officer) retrieve camera traps at Mornington-Marion Downs Wildlife Sanctuary in Western Australia. *Katrin Lowe/AWC*



## *A legacy for conservation*

*Vale Jack Baker – teacher, conservationist, poet*

During his lifetime, Dr Jack Baker was many things – a teacher, a conservationist and a poet, to name a few. Following his passing, his story continues in many ways.

After teaching maths and science for two decades, Jack had an epiphany and converted to a career in conservation. By 2004, he was the Manager of Biodiversity and Conservation Science with the NSW Department of Conservation. For Jack, this was the pinnacle of his career.

Jack sat on the Council of Birdlife Australia during the transfer of Newhaven Wildlife Sanctuary from Birdlife to AWC in 2006, when he became deeply passionate about AWC's philosophy and conservation model. Jack and his wife Jeannie became dedicated supporters, giving steadily and even volunteering at Newhaven and Scotia wildlife sanctuaries.

With a long list of accomplishments and by then a PhD under his belt, Jack became a poet. Under the pseudonym 'Jack Oats', he wrote of family, values, humour and sorrows. He wrote of the many birds he saw with Jeannie all around Australia. These poems tell us about Jack – the wonderfully warm, deeply thoughtful, bloody-minded man with the cheeky grin and the twinkling eyes.

Fundamentally, Jack stayed loyal to his beginnings and remained a teacher throughout his life. He believed education at all levels was central to conservation.

It is very fitting that, as both conservation educator 'Dr Baker' and philosopher 'Jack Oats', he chose to dedicate his legacy to the same passions he had dedicated his life to. Jack generously included a gift in his will to support AWC, driven by a specific intention to ensure the continuation of the Internship Program, where budding ecologists gain invaluable field knowledge that will shape the rest of their careers.

Join us in celebrating Jack's legacy, which will continue in the lives of the young interns he's supporting and the wildlife he's protecting.

Vale Jack.

*If you'd like your own story to continue with AWC like Jack's, please get in touch with our team.*

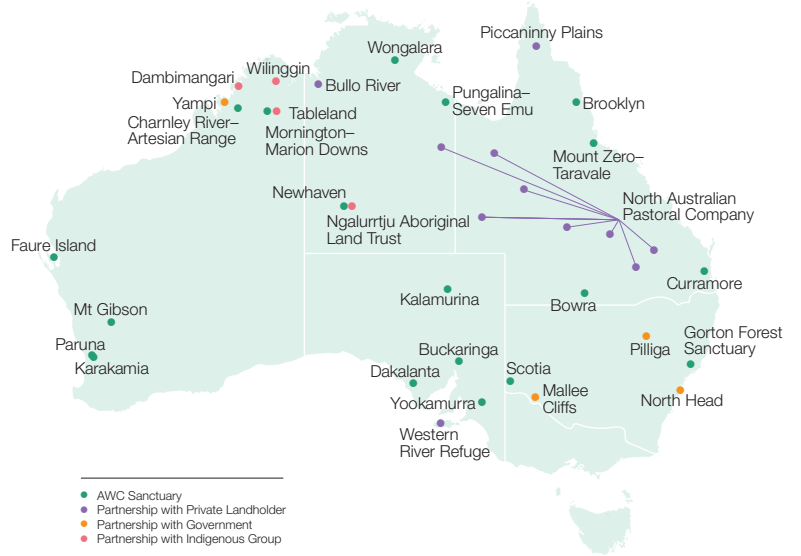
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- You may terminate your monthly donation to Australian Wildlife Conservancy at any time by giving written notice directly to us (PO Box 8070 Subiaco East WA 6008), by phone (08 9380 9633), by email ([donations@australianwildlife.org](mailto:donations@australianwildlife.org)) or through your nominated Financial Institution.
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- Where you consider a charge has been initiated incorrectly (outside the monthly donation to Australian Wildlife Conservancy arrangements) you may take the matter up directly with us on (08) 9380 9633, or through your nominated Financial Institution.

### Your commitment to us, your responsibilities:

- It is your responsibility to ensure that sufficient funds are available on the due date. You may be charged a fee by your Financial Institution if there are insufficient funds in the nominated account or the credit card is overdrawn when we attempt to deduct donations.
- It is your responsibility to advise us if the account or the credit card nominated for transactions with the Australian Wildlife Conservancy Fund is cancelled or changes.