

WA'S PARKS, WILDLIFE AND CONSERVATION MAGAZINE

# LANDSCOPE

Volume 13 Number 2 Summer 2017-18 \$7.95

## SECOND CHANCES

Rehabilitating  
cockatoos

### Eyes in the sky

Using drones for  
conservation

### Rising from the ashes

Rebuilding our trails

### Rottnest Island

WA's island playground



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ON THE COVER

**Front cover** Known by the Nyoongar people as 'Karrak', red-tailed black cockatoos (*Calyptorhynchus banksii naso*) are distinguished by their spectacular red tail feathers. Female red-tailed black cockatoos have glossy black feathers with pale yellow spots. Their bills are pale greyish-white, while the males' bills are dark grey or blackish. These magnificent birds can live for between 30 and 40 years in the wild.

Photo – Sallyanne Cousans

**Back cover** Walpole Nornalup National Park.  
Photo – David Bettini

Aboriginal people have had a deep and rich connection with the lands and waters of Western Australia for thousands of years. As present-day land managers, we can benefit from the experience and wisdom that have been amassed over generations. In this issue of *LANDSCOPE* we look at a study carried out to merge traditional knowledge with modern science to better understand dugongs, or 'balguja' as they are locally known (see page 41).



Of course, today we have a range of tools available to us that have advanced the way we research and manage the lands and waters entrusted to us. In 'Eyes in the sky: New perspectives' (see page 28) we look at a number of ways the department is using remotely piloted aircraft (RPAs), or 'drones'. Many of these operations would have otherwise been unfeasible because of limitations imposed by cost, resources or geography.

Drones are proving particularly useful in fire management, as they can access areas that may be otherwise inaccessible. In 'Rising from the ashes' on page 50 we look at how devastating large, intense fires can be on our natural areas and infrastructure. However, through this, we also see the positive outcomes of when the department teams with businesses, communities and volunteers to rebuild our lost and damaged assets.

But effective conservation doesn't always require high-tech equipment or expensive infrastructure. In 'Reeling it in!' on page 18 we look at how a simple solution can help with a complex problem. Since it was launched in 2013, the *Reel it in* program has captured more than 50 kilometres of fishing line and thousands of hooks, sinkers and bait bags, making a significant difference to the health and well-being of our marine life.

I hope you enjoy the read.

**Peter Dans, Acting Deputy Director General Parks and Wildlife Service**  
Department of Biodiversity, Conservation and Attractions

Contributing

**Peter Bayliss** is a Principal Research Scientist with CSIRO's Oceans and Atmosphere Business Unit and manages the Western Australian Marine Science Institution dugong project. His research interests include management of coastal ecosystems, wildlife ecology and management, and ecological risk assessment. His work spans marine-coastal ecosystems across northern Australia, particularly working closely with Indigenous coastal communities to develop monitoring and assessment methods for sea turtles, dugongs and seagrass.



**Karen Smith** is a regional wildlife officer based in Perth. With a Bachelor of Science (Animal Science) with Honours, Karen began her career with the Department of Agriculture in a number of compliance roles. She joined the Department of Environment and Conservation in 2011 and is now responsible for the coordination of the black cockatoo rehabilitation program in Perth and is a member of the department's marine mammal disentanglement team. Karen loves the great outdoors and photography, and is a keen traveller.



**Kerstin Stender** is Parks and Wildlife Service's trails coordinator, and is responsible for managing the Bibbulmun Track and Munda Biddi Trail, as well as helping develop new trails and manage existing ones. Kerstin has recently completed her Masters in Tourism Management, which assessed and analysed trail business management models. Born in Germany, she has always been a keen outdoor enthusiast and has cycled through Sweden and Ireland, learned to kayak in Germany, explored Patagonia's wild rivers, and hiked throughout the world.



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*LANDSCOPE is printed on recycled paper which is certified carbon neutral, contains 55 per cent recycled fibre and is made from virgin pulp, which is derived from well-managed forests and controlled sources.*

**This page** The Basin, Rottneest Island.

*Photo – Rottneest Island Authority*



Department of Biodiversity,  
Conservation and Attractions

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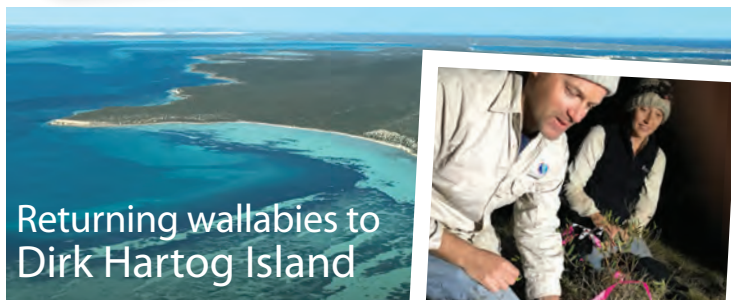
## READERS' PIC

### **Osprey**

Photographer Don Carter

"This is a photo of an osprey, which lives at Point Peron in Rockingham WA. There's a pair of them who are quite approachable to the extent they disregard people taking their pictures. I have been watching these delightful creatures for about five years."

**Have you got a fantastic nature photograph you would like to see published in LANDSCOPE?** Send it, along with a 100-word description of the species or how and where you took the shot, to [landscape@dbca.wa.gov.au](mailto:landscape@dbca.wa.gov.au).



## Returning wallabies to Dirk Hartog Island

Twenty-four threatened hare-wallabies have been reintroduced to Western Australia's largest island – Dirk Hartog, in the Shark Bay World Heritage Area.

Twelve banded hare-wallabies and 12 rufous hare-wallabies were released in August 2017, marking the start of the translocation phase of the *Return to 1616* ecological restoration project. *Return to 1616*

aims to return the fauna, vegetation and habitat of Dirk Hartog Island National Park to its pre-European settlement state, and is largely funded by the Barrow Island Gorgon Net Conservation Benefit Fund.

DBCA staff and volunteers trapped the 24 wallabies at nearby Bernier and Dorre islands, before releasing the animals over two nights into the southern part of Dirk Hartog Island.

Radio and GPS tracking in the months since the release has found that the hare-wallabies had dispersed widely across the southern part of the island, with some individuals moving up to 15 kilometres in a few days. Staff found one of the female rufous hare-wallabies had a pouch young – the first hare-wallaby to be born on the island since re-introductions began.

The translocation follows years of intensive baiting, trapping and monitoring to rid the island of feral cats, with no sightings for more than a year. There are no foxes on the island.

The next stage of the translocation project will see larger groups of hare-wallabies released in September–October 2018, along with a number of Perth Zoo-bred dibblers. During the next 12 years, 12 species of mainly threatened mammals, as well as a bird species will be released on Dirk Hartog Island National Park.



**Above** Dirk Hartog Island lodge owner Kieran Wardle and DBCA technical officer Kelly Rayner release a rufous-hare wallaby. Photos – Keith Morris/DBCA

## Protection for parrots at Cape Arid

The Parks and Wildlife Service is using prescribed burning to secure the future of one of the world's rarest parrots.

Once occurring along the entire south coast of WA, western ground parrots are now known to occur in only a handful of locations. Their largest stronghold – at Cape Arid National Park – experienced two bushfires in 2015, which burnt through 90 per cent of the western ground parrot's known habitat.

Following these catastrophic events staff, with funding through the National Landcare Program, carried out emergency feral cat baiting and trapping in the park to help protect remaining wild birds from predation by introduced predators.

Two years on, the Parks and Wildlife Service has completed the first of a series of prescribed burns at Cape Arid.

The strategically planned burns, which will continue to be carried out over the next few years, will create a buffer zone to help protect the critically endangered birds from bushfire throughout the southern bushfire season. The burns are part of a long-term plan to build a mosaic of fire ages in the park.

The work is part of a wider conservation program for the species being coordinated by DBCA's South Coast Threatened Birds Recovery Team, in partnership with BirdLife Australia, Friends of the Western Ground Parrot and South Coast NRM. Under the *Western Shield* wildlife recovery program, work to control foxes and feral cats is continuing.



Western ground parrot. Photo – Brent Barret/DBCA

Guest column

**Theresa Pierno**  
President and CEO  
of the National Parks  
Conservation Association



I recently had the pleasure of visiting Western Australia, where I was invited to speak at the Forum Advocating

Cultural and Eco-Tourism annual conference. The theme of the conference was 'Celebrating our parks'.

While our natural environments may be very different, the USA and Australia actually have a lot in common. We have vast, diverse and spectacular natural and cultural areas which, aside from the obvious environmental and cultural benefits they offer, also provide tangible economic benefits to the towns and cities around them. And, as people who advocate for and care about the environment, we have an important role to play in protecting our natural and cultural treasures, and connecting people to our parks.

This is crucial to our work because, as we know, parks are not islands, and in order to truly protect them, you have to manage the area around them, improve the connection with wildlife and safeguard the surrounding air and water quality. In many cases this means being involved in issues that exist outside the park boundaries and engaging with the local community. This is made significantly easier if the community has an appreciation for the areas we're trying to conserve. But the only way to achieve this is if everyone feels the parks benefit them and, in order to do that, they have to actually get out into these areas. In some places the National Parks Conservation Association (NPCA) has taken practical measures – such as free transport to and from the parks – to facilitate this.

In recent years, the NPCA has also focused on connecting with young people. Many young people do not have or take the opportunity to spend time in the natural environment and miss out on experiencing simple pleasures such as gazing up at the night sky or visiting the ocean.

As we face the effects of a changing climate and constricting government budgets, it is more important than ever that we look for ways to engage with other passionate individuals who can provide both financial assistance and help on the ground; as well as with corporate supporters and foundations. Together, I'm sure, we can all find ways of celebrating our parks.



*Record year for volunteering*

Western Australia's natural environment continued to benefit from a growing number of dedicated volunteers who clocked up a record number of volunteer hours in 2016–17.

A total of 5,410 department volunteers contributed a staggering 723,508 hours – an increase of 12 per cent on last year.

Volunteers of all ages, and throughout the State, took part in ongoing volunteer programs such as campground hosting, trail and park maintenance, as well as animal and plant monitoring to conserve, protect and care for the environment. Those manning the Wildcare Helpline took more than 11,800 calls from members of the public assisting with sick or injured native wildlife.

Volunteers also contributed their time and expertise to 21 new volunteer projects, including the North West Shelf Flatback Turtle Conservation Program and the department's Rare Flora Search and Rescue project. The Campground Host volunteers at the new Yanchep National Park campground contributed to its successful trial period.

A new corporate volunteer partnership with Bankwest has seen staff contribute to maintenance projects at Yanchep National Park.

**Above** Harry and Linda DeVries, and Adam and Shanti O'Neil at Francois Peron National Park. *Photo – Phil Arthur/DBCA*

**Below left** Mount Augustus National Park Campground Host volunteers Greg and Kim Woolley. *Photo – DBCA*

**Below right** Bankwest's Rachel Cronin pulling weeds at Yanchep National Park. *Photo – Karla Graham/DBCA*





## Rottnest Island

*Rottnest Island has been a holiday favourite for Western Australian locals and visitors for generations. Whether it's for a summer holiday, a winter getaway, special event or a fun-filled post-school celebration, visitors are drawn by the picturesque bays, pristine white sand and glistening blue water. And, of course, there are the endearing quokkas, for which the island is famous. Now, a new conservation and recreation initiative is guiding visitors around the island to discover these attractions and more.*

Just 19.5 kilometres offshore from Cottesloe, lies Rottnest Island – an 11-kilometre-long and 4.5-kilometre-wide haven. It is undeniably beautiful and has pristine beaches that are among the most spectacular in the world. In 2016–17 nearly 650,000 visitors explored the natural, historical, cultural and recreational highlights and bused, biked, walked, trained, kayaked, surfed, fished and swam their way around this magnificent island playground.

Catering to these visitors to ensure they are not spoiling the very attractions they've come to enjoy was the catalyst for the Wadjemup Bidi conservation and recreation initiative – an extensive

network of trails that guides visitors around the island. Work on the Wadjemup Bidi project was formally started in 2013 and is expected to be completed in 2018. It is the result of a collaboration between the Rottnest Island Authority and Rottnest Foundation in partnership with companies such as BHP and community groups such as the Winnit Club, the Rottnest Society, Conservation Volunteers and Rottnest Voluntary Guides Association together with a number of grants and support from Tourism WA, Lotterywest and Rottnest Express.

The network, which gets its name from the Nyoongar word for 'trail' or 'track' is designed to pay homage to

**Above** Enjoying the Gabbi Karniny Bidi – one of the five tracks that make up the Wadjemup Bidi.

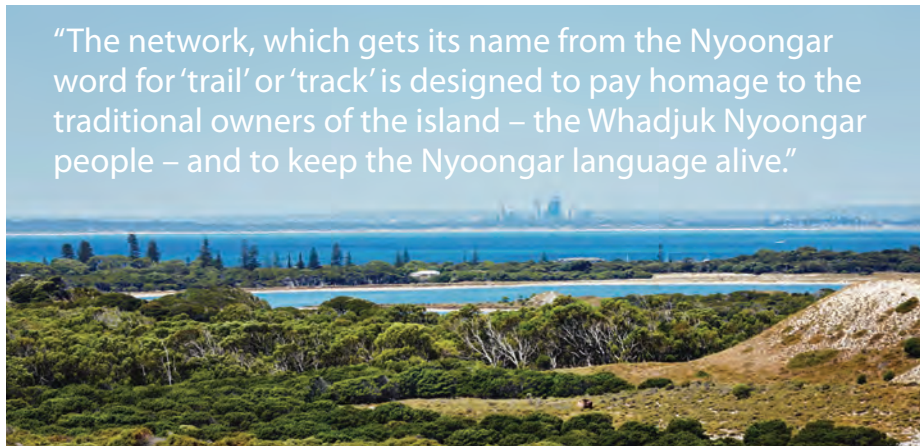
**Above right** A symbol of an osprey guides walkers on the Wadjemup Bidi.  
*Photos – Rottnest Island Authority*

**ROTTNEST IS**  
**Wadjemup Bidi**

- Toilets
- Drinking fountain
- Surfing
- Fishing
- Snorkelling
- Tennis courts
- Island Explorer bus stop
- Sanctuary Zone
- The Settlement

- Ngank Yira Bidi (9.4km)
- Gabbi Karniny Bidi (9.7km)
- Warden Nara Bidi (10km)
- Karlinyah Bidi (5.9km)
- Ngank Wen Bidi (7.6km)
- Bike Rides (via roads)  
See Island map

— Roads    - - - Tracks    + + + Train Line



“The network, which gets its name from the Nyoongar word for ‘trail’ or ‘track’ is designed to pay homage to the traditional owners of the island – the Whadjuk Nyoongar people – and to keep the Nyoongar language alive.”

the traditional owners of the island – the Whadjuk Nyoongar people – and to keep the Nyoongar language alive. When complete, the trail is expected to generate opportunities for eco and cultural tours and art exhibitions as well as host school excursions and holiday programs, corporate challenge activities, team building sessions and sporting events.

**NETWORKING FOR FUN**

The Wadjemup Bidi is a 45-kilometre-network of trails. It is made up of five separate trails, which explore different parts of the island and take in different

attractions and ecosystems. The trails have been designed to integrate with the Island Explorer bus system so users can get between the starting and finishing points with ease.

The Ngank Yira Bidi, a 9.4-kilometre one-way walk, starts at Thomson Bay and follows the south-east corner of the island past the Bickley Battery, before cutting inland to Oliver Hill. Here you can discover the WWII infrastructure, including two 9.2-inch guns and a maze of underground tunnels. There are also guided tours of the area. From here you can catch the Oliver Hill train back to the settlement.

Left Rottneest Island is just 19.5 kilometres offshore from Cottesloe.  
*Photo – Rottneest Island Authority*

Gabbi Karniny Bidi is a 9.7-kilometre loop that starts at Vlamingh Lookout, a spot that offers some of the best views on the island. This loop takes walkers past some of the island’s swamps, seeps and lakes, which cover more than 200 hectares, and are fed by rainfall and rising groundwater. Visitors have the opportunity to journey along a boardwalk that emulates walking on water, while trying to spot some of the reptiles, frogs and birds that live there. The trail then heads along the northern edge of the island, and past Little Parakeet, Geordie and Longreach bays, which are some of the most beautiful beaches on the island.

The Warden Nara Bidi is 10 kilometres one way and starts at Porpoise Bay where the Ngank Yira Bidi trail heads inland. It climbs Tree Hill for spectacular views of southern coast, meanders through Watson Glade and then arrives at Parker Point. Between Parker Point and Strickland Bay there is Little Salmon and Salmon bays,



**Above** Walking the Wadjemup Bidi.  
*Photo – Rottnest Island Authority*



**Far left** The island is famous for its endearing quokkas.



**Left** Walking is not the only way to explore the island – cycling is also popular.  
*Photos – Campbell Jones*

Fairbridge Bluff and a link to Oliver Hill. The trail goes up past Wadjemup Lighthouse on its way to Strickland Bay. Whip out your smart phone and scan the QR code on the sign to hear about this island's surfing history. You can also admire Peter Farmer's Mammong Dreaming sculpture before the walk continues west to Narrow Neck, where you can board a bus to head back to the settlement.

At 5.9 kilometres one-way, Karlinyah Bidi is the shortest of the trails. Starting 200 metres west of Little Parakeet Bay, the trail ventures past Little Armstrong Bay – a haven for snorkelling where there are species such as western king wrasse, common scalyfin and even Port Jackson sharks and banded wobbegongs. Then the walk traverses the north-west side of the island, past the rugged Ricey Beach and then past the tern courting and breeding site at Stark Bay.

The final leg – Ngank Wen Bidi – will be completed in 2017–18 and will showcase the island's magnificent marine

mammals. The walk takes in the viewing platform at Cathedral Rocks and the West End boardwalk, which are prime spots for viewing New Zealand fur seals, dolphins, and the seasonal migration of humpback whales.

### TAKING YOUR WHEELS FOR A SPIN

Of course walking is not the only way to get around the island and, with no car traffic to worry about, visitors can enjoy the freedom of getting on a bike and making their way to one of the many other beaches and coves on the island or visit one of the many cultural, historical and family attractions. A cruise around the settlement will take you past a number of cafes and restaurants that cater to breakfast, lunch and dinner and the all-important mid-afternoon ice-cream, which can be eaten under one of the enveloping Moreton Bay fig trees while enjoying the antics of the quokkas that contentedly hop around the place.



See more of Rottnest Island

Scan this QR code or visit Parks and Wildlife's 'LANDSCOPE' playlist on YouTube.



### Do it yourself

**Where is it?** Rottnest Island is 19.5 kilometres offshore from Cottesloe.

**Total area:** 1,900 hectares of land and 3,800 hectares of marine reserves.

**Facilities:** Rottnest Island has a raft of attractions and facilities that cater to visitors who are looking for a range of experiences and opportunities. Visit [www.rottnestisland.com](http://www.rottnestisland.com) for more information.

**What to do:** Swimming, snorkelling, scuba diving, surfing, beach combing, cycling, walking, wildlife appreciation, playing golf, skydiving, lawn bowling, visiting one of the many cultural, historical and family attractions.

For more details and maps on the Wadjemup Bidi, visit [rottnestisland.com/wadjemupbidi](http://rottnestisland.com/wadjemupbidi). Wadjemup Bidi is also featured on Trails WA ([trails.wa.com.au](http://trails.wa.com.au)).

If you've ever wandered in the bush at night with a head torch on you have probably noticed peculiar reflections on the ground, silvery-yellow pin-pricks of light. And not just in the bush – these same lights can be seen on lawns in urban backyards. If you're very observant you'll see that these reflections move and if you get close enough you'll see the culprit, a wolf spider. The eyes of these spiders reflect light and even tiny spiderlings can be detected using this method. However, the light source must be near your eyes; a torch near your waist is ineffective.

Wolf spiders are among the most diverse spider families and occupy nearly all terrestrial habitats in the world, from the seashore to the slopes of the highest mountain ranges. They are instantly recognisable by the arrangement of their eyes, with four small eyes in a straight line near the front of the carapace (the 'head') and four large eyes arranged in a square just behind them. It's these large eyes that reflect light.

Despite their ubiquity, not all of the Australian species are described. Indeed, not all of the genera are named. Dr Volker Framenau from Phoenix Environmental Sciences and his colleagues have been chipping away at a series of taxonomic revisions aiming to provide descriptions of Australian wolf spiders. Recent publications include redescriptions of previously named species – a necessary component of modern taxonomic monographs – and descriptions of new species and genera. Many of these new species are from Western Australia, highlighting the great diversity of habitats and the relatively unexplored nature of our biological heritage.

A paper published in 2016 by Volker and his colleague Dr Barbara Baehr of the Queensland Museum, studied the Australian Union-Jack spiders of the genus *Tasmanicosa*, finding 14 species, of which six were new. These spiders are morphologically distinctive with a unique carapace colour pattern that resembles a Union-Jack flag. One species, *Tasmanicosa godeffroyi*, is extremely common in south-western and south-eastern Australia, where it occurs in gardens and native bushland. Another,



## Wolf spiders

*Tasmanicosa gilberta*, is equally widespread. Of the six new species they described, two were from WA – *Tasmanicosa salmo* from Salmon Gums, and *T. stella* from the drier regions of southern Australia.

Another publication by Volker and Peter Hudson from the South Australian Museum examined the wolf spiders of the genus *Tetrallycosa*. All members are salt tolerant, with the widely distributed *T. oraria* occurring on coastal beaches across southern Australia, and 12 other species including eight new species, from salt-lakes in arid Australia. The spiders dig shallow burrows on the salt pan and roam on the dry surface of the lake at night, where their pale or contracting colouration provides camouflage from predators.

Wolf spiders are vagrant hunters, and chase their prey at night. They prefer to eat insects but will also devour other invertebrates such as small spiders. Unlike many other spiders, they do not use webs to capture or subdue their prey, they simply pounce and inject their victim with venom before crunching them into a paste to suck in the juices.

Many dig a shallow burrow in the ground and some, like the Australian *Hoggicosa*, cover the entrance with a thin silken flap. It's easy to be fooled by these spiders – closer inspection of a shining reflection can just reveal a flap with the owner safely tucked in its burrow.

**Above** A female Forrest's wolf spider (*Hoggicosa forresti*).  
Photo – Jiri Lochman

Wolf spiders have some fascinating behavioural traits. Females carry their egg sacs attached to their spinnerets (situated at the end of the abdomen) and when the young emerge from the sac, they clamber onto their mother's back. This provides protection for a few weeks until they are a bit larger and able to fend for themselves. The juveniles of many species are capable of dispersing by ballooning, where they release a long silken thread that gets caught in a draught of wind, lifting the spider into the air. It's a game of chance, as they can't guarantee where they'll land. If it's at sea, they quickly become fish food. But if they land in a favourable habitat it provides a magnificent way of locating new environments. Their ability to scatter with the wind has enabled wolf spiders to colonise far-flung islands. Indeed, wolf spiders were among the first colonists on Krakatau after the cataclysmic eruption of 1883 that obliterated all life on the islands. This dispersal behaviour has resulted in some species having very broad distributions, even though others have smaller ranges, presumably limited by environmental factors.

So, pick up a torch and head into the night. There are plenty of silvery points of light out there to be seen – silent hunters lurking in the dark.



# *Second chances for* **black cockatoos**

Black cockatoos are some of Western Australia's best-loved and conspicuous birds. During the past few decades, Parks and Wildlife Service staff have been working with Perth Zoo vets and rehabilitation centres to rehabilitate black cockatoos that have fallen victim to the impacts of living in our modern-day landscape. This collaboration is working harder than ever as the number of injured cockatoos continues to rise.

by Karen Smith



Most Western Australians would be familiar with the loud and raucous call of native black cockatoos, which echo through the sky as they fly overhead. And many would also be acquainted with the wide-scale mess they can make when they descend on trees in backyards, parks, schools and even orchards, stripping the foliage before moving on again. The Nyoongar language has a word for lots of black cockatoos flying together – ngoorlak – indicating that they have been a feature of the Western Australian landscape for eons.

The iconic white-tailed black Carnaby's cockatoo (*Calyptorhynchus latirostris*) is one of three sub-species of black cockatoo endemic to WA's south-west. Often mistaken for the same species (in fact, they were considered the same species until 1979), the Baudin's cockatoo (*Calyptorhynchus baudinii*) has a longer bill and a distinctive call that resembles a 'whicher' sound, which is different to the 'wee-lar' of the Carnaby's. The third species is the red-tailed black cockatoo (*Calyptorhynchus banksia naso*), which is easily recognisable by its magnificent scarlet tail feathers.

## AT A LOSS

Unfortunately, population sizes of these species have significantly declined over the past few decades. Anecdotally, Carnaby's cockatoos were once described as capable of 'blackening the skies' in flocks of more than a thousand birds. But now observers are lucky to see flocks of more than 100 birds moving through the landscape. Officially, their range has declined by more than 50 per cent and both white-tailed species are classified as endangered, while the red-tailed black cockatoo is classified as vulnerable. The causes of these declines are varied and complex, and include habitat loss and fragmentation due to clearing for development and agriculture – particularly in the Wheatbelt; competition for hollows with feral European honey bees and other species such as galahs and long-billed corellas; attacks from species such as ravens; poaching; the effects of fire; and



injury and death caused by sharing the landscape with humans.

These factors have led to the reduction in numbers of black cockatoos in the wild and have altered their distribution and foraging behaviour. For example, where red-tailed black cockatoos once only occurred in the south-west forests, they have now developed an appetite for exotic species such as the fruit of Cape lilac trees and have descended onto the Swan Coastal Plain. Nowadays, red-tailed black cockatoos are commonly sighted gathering in trees in parks, schools and backyards in the Perth metropolitan area. And, while this might be an appealing sight for backyard bird watchers, it puts the birds at increased risk of coming into conflict with vehicles and ravens more than ever.

*Previous page*

**Main** Flocks of Carnaby's cockatoos were once described as capable of 'blackening the skies'.

**Above** Female Carnaby's cockatoos have a distinctive white patch on their cheek, which is duller on males.

*Photos – Rick Dawson/DBCA*

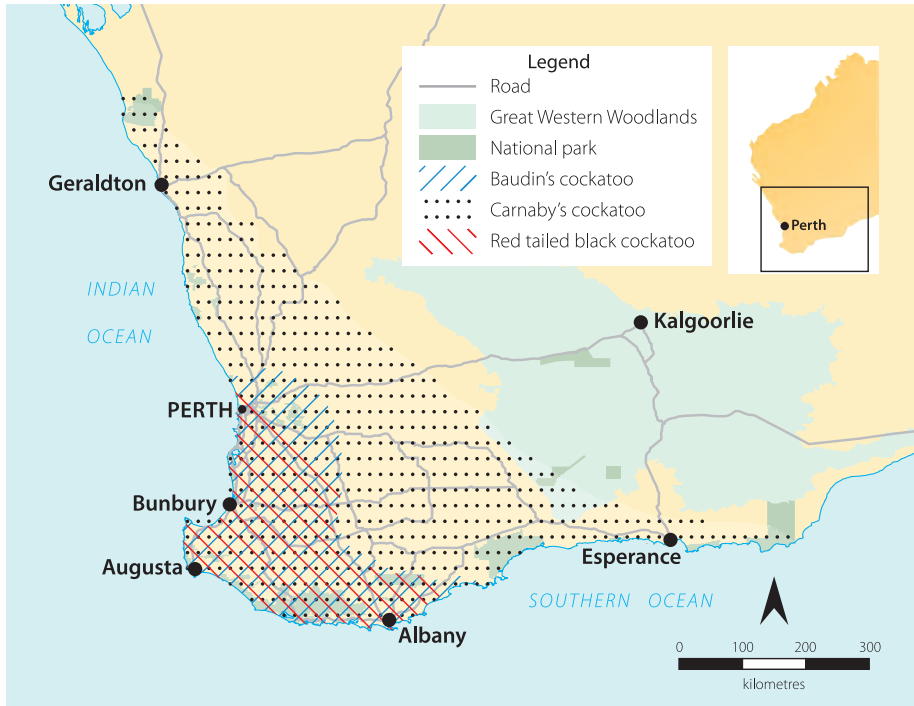
## REHABILITATION PROGRAM

In collaboration with Perth Zoo's veterinary department, DBCA Science and Conservation staff are responsible for overseeing the management of the Black Cockatoo Rehabilitation Program, which has been going since the mid-1990s. Since its inception, the program has engaged local wildlife rehabilitators to assist with the care and rehabilitation of black

### **Protecting cockatoos**

Carnaby's cockatoos, Baudin's cockatoos and red-tailed black cockatoos are protected under provisions of the *Wildlife Conservation Act 1950* and are classed as threatened or specially protected fauna. A maximum penalty of \$10,000 is imposed for offences including taking, harming or unlawful possession. The *Biodiversity Conservation Act 2016* replaces the *Wildlife Conservation Act 1950* and greatly increases the protection of threatened species, by increasing the maximum penalty of unlawful take to \$500,000 for an individual person or \$2.5 million for a corporation.

They are also listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC).



**Top right** Carnaby's cockatoos can live for 30 to 40 years and mate for life.  
 Photo – Rick Dawson/DBCA

**Right** Usually only one chick of each brood survives.  
 Photo – Kayley Griffiths

Discover more about  
 rehabilitating black  
 cockatoos

Scan this QR code or  
 visit Parks and Wildlife's  
 'LANDSCOPE' playlist  
 on YouTube.

cockatoos in the hope they can be returned to the wild.

In the early days, local fauna rehabilitator Yvonne Varris took on a significant portion of this work from her home in Perth. Around this time 'Jamarri', a non-profit organisation based in Nannup, was also established by rehabilitators David and Dee Patterson. In the late-1990s, a second not-for-profit, independent conservation organisation – the Black Cockatoo Preservation Society was founded by member Glenn Dewhurst. In 2008, the society outgrew Glenn's home so was relocated to Martin, in what is now called Kaarakin, named after the Nyoongar name for the red-tailed black cockatoo. In 2011, a third rehabilitation centre – Native Animal Rescue – opened its doors to black cockatoo rehabilitation.

Nowadays, the majority of black cockatoos that are found sick or injured are taken to the Perth Zoo to be assessed.

Every cockatoo that is admitted to the vet department is anaesthetised for a full veterinary evaluation, including radiography and clinical pathology, and many undergo surgeries for fractures and injuries. Once the bird has been assessed suitable for rehabilitation, it is microchipped and sent to one of the three rehabilitation centres. Ensuring cockatoos receive specialist care is important due to the threatened nature of the species and their specific care requirements, including specific diets and specialised enclosures that assist the birds with regaining their fitness.

The strong collaboration between DBCA and the three rehabilitation centres, is working harder than ever to uphold the black cockatoo rehabilitation process as the number of injured birds continues to increase. To put this in context, the number of injured red-tailed black cockatoos has risen steadily each year from 2007–08 when 27 birds were

### Did you know?

Black cockatoos can live for 30 to 40 years in the wild and partner with their mate for life.

Adult female white-tailed black cockatoos differ from adult males as they have a light grey bill, greyish eye ring and a large, distinctive white cheek patch. Males have a black bill, a pink eye ring (when sexually mature) and a smaller, duller cheek patch.

Carnaby's cockatoos are one of the few cockatoo species to migrate. Most breed in the Wheatbelt and Great Southern regions, and then migrate to the higher rainfall coastal regions, including the Swan Coastal Plain, for the winter.

Breeding black cockatoos generally lay two eggs, on average two to eight days apart, of which only one usually survives.



**Left** Working with Rick Dawson, Perth Zoo's Anna LeSouef takes a swab from a black cockatoo.  
*Photo – DBCA*

**Above** Tail marking is used in studies.

**Below** 'Cilla Black' is a cockatoo that was tagged at 12 months old. Now six years, she has been observed laying eggs in an artificial hollow.  
*Photos – Rick Dawson/DBCA*

found to 137 in 2016–17. The number of injured Carnaby's cockatoos has also risen from 74 in 2007–08 to 106 in 2016–17. It is estimated that the cost of treating each bird starts at \$350–\$400, in addition to many thousands of dollars spent on rehabilitation, most of which is provided in-kind by the rehabilitation centres. Without the contribution and dedication of the volunteers, black cockatoos could not be rehabilitated and released on the scale they currently are.

## INTO THE WILD

The best outcome for any black cockatoo that presents with injuries is to be released back into the wild. Annual releases are carried out in areas known for wild flocks and super roosts, such as at Yanchep National Park and the Kensington/Bentley super roost. On the day of the release, wildlife officers flight test each suitable cockatoo, fit a uniquely numbered leg band to each bird and collect a DNA sample that is later used for genetic studies,

identification purposes and to assist with the detection of unlawful activity, such as poaching.

As the populations of black cockatoos continue to decline across WA, research projects undertaken in conjunction with the Parks and Wildlife Service, Perth Zoo (and other sponsors) and Murdoch University are incorporated into the release program to attain critical information to assist with long-term conservation management of the species and help guide urban planning.

### *Join the fight for black cockatoos*

Since 2003 every rehabilitated black cockatoo that has been released has been fitted with a uniquely numbered leg band. Carnaby's cockatoos and red-tailed black cockatoos wear their bands on their right leg, while Baudin's cockatoos are banded on their left.

DBCA encourages members of the community to provide information about where and when they see banded birds by visiting DBCA's website and filling out a report form. There is also the opportunity to contribute long-term data if you see black cockatoos frequently visiting your area. And, you can also assist with roost counts and surveys by taking part in the Great Cocky Count – an annual, community-based survey where volunteers count black cockatoos at night-time roost sites across the State's south-west on a single night in April. For more information visit [www.dbca.wa.gov.au](http://www.dbca.wa.gov.au).





### ***A happy ending***

In 2013 Parks and Wildlife Service officers banded a Carnaby's cockatoo nestling that hatched on private property in Glen Forrest. Less than 12 months later, the same bird was picked up by a member of the public and was taken to Perth Zoo with a gunshot wound to its head and a pellet wedged behind its left eye. Over the next seven months, the bird – which became known as 'Sweetie' – was rehabilitated at Kaarakin until he was deemed healthy and strong enough to be released into the Bentley super roost in June 2015.

In March 2016, Sweetie was resighted and photographed with a mate at the Glen Forrest property where it was originally hatched and banded. Since then, Sweetie and his mate have been sighted regularly and have even been observed prospecting for a hollow in which to lay eggs. There is hope that they will produce young, making Sweetie the first known rehabilitated cockatoo to successfully produce offspring.



**Top left** Artificial hollows have been installed in key areas to help support breeding.  
*Photo – Rick Dawson/DBCA*

**Above left** Releases are carried out in areas where known wild flocks and super roosts are.  
*Photo – Karen Smith/DBCA*

**Above** 'Sweetie' was first banded in 2013.  
*Photo – Kayley Griffiths*

**Below** A female red-tailed black cockatoo.  
*Photo – Rhianna King/DBCA*



**Karen Smith** is a Parks and Wildlife Service regional wildlife officer. She can be contacted on (08) 9219 9843 or by email ([karen.smith@dbca.wa.gov.au](mailto:karen.smith@dbca.wa.gov.au)).

## **“Without the contribution and dedication of the volunteers, black cockatoos could not be rehabilitated and released on the scale they currently are.”**

In 2012, Christine Groom, (formerly of DBCA) studied the roost site fidelity and resource use of Carnaby's cockatoos on the Swan Coastal Plain by tail marking and fitting satellite trackers to a number of cockatoos. Murdoch University researchers also fitted a number of released black cockatoos with a satellite transmitter and a solar powered GPS tracker. These trackers, which are naturally removed over time through feather moulting and preening, record the movements of the birds and greatly assist with obtaining information about their ecology, flock movements across the landscape, habitat use and, importantly, the identification of critical breeding, foraging and roosting habitat.

To date, the successful collaboration between DBCA Science and Conservation, Perth Zoo, Jamarri, Kaarakin and Native Animal Rescue, has seen the banding and release of more than nearly 500 black cockatoos, including

269 Carnaby's cockatoos, 58 Baudin's cockatoos and 139 red-tailed black cockatoos back to the wild.

### **ONGOING BATTLE**

As the behaviour and distribution of black cockatoos changes in response to the altered land uses in WA's south-west, we will no doubt continue to see an increase in birds that have been killed and injured. However, there are things we can all do to reduce our impact on these unwitting victims, such as taking care when driving through nesting areas; reporting any injured birds to the Wildcare Helpline; planting native trees that black cockatoos can nest in and feed on; and erect nesting hollows in breeding areas to help support populations. And, hopefully, these endearing creatures will continue to fill our skies with their rowdy and beloved calls en masse for generations to come.

# Reeling it in!

Each year, thousands of marine birds, mammals and fish are killed or injured due to discarded fishing line and tackle which can cause them to drown, lose limbs, starve or develop life-threatening infections. Specially designed collection bins are making a difference by significantly reducing the amount of fishing line and other waste making its way into the Swan-Canning river system. And now, thanks to a program expansion, they will be fitted along the coast as well.

*by Jason Menzies*





In April 2012 the then Department of Environment and Conservation received notification that one of the beloved Swan Canning Riverpark dolphins was entangled in fishing line. The dolphin was 'Gizmo' – a three-year-old calf who lived in the Swan Canning Riverpark with his mother 'Tupac'. The fishing line was tangled around Gizmo's dorsal fin, cutting into his flesh and causing potentially life-threatening injuries. Wildlife officers made several attempts over a two-month period to disentangle Gizmo, but his protective mother foiled their efforts to get close to her calf. With a long-term untreated flesh wound, Gizmo was at risk of developing an infection, which could lead to serious illness or death. And, as time went on, he collected seaweed and other debris, which hampered his swimming efforts and no doubt affected his ability to feed. Without the fishing line removed, wildlife officers believed Gizmo would have suffered the same fate as thousands of marine birds, mammals and fish that are killed or injured each year.

Fortunately, officers from the WA Water Police and the department were finally able to cut the fishing line and Gizmo was freed from his torturous confines. For those involved in the rescue who had seen too many animals falling victim to the impacts of fishing line, Gizmo's case was one too many. And so they were spurred to do something about the problem and the idea for a fishing line bin pilot project was born.

## A PILOT BEGINS

The *Reel it in* pilot project aimed to target the source of the problem by providing bins for people to responsibly dispose of their fishing line and other fishing

.....  
*Opposite page*

**Main** Gizmo was entangled for two months before finally being freed.

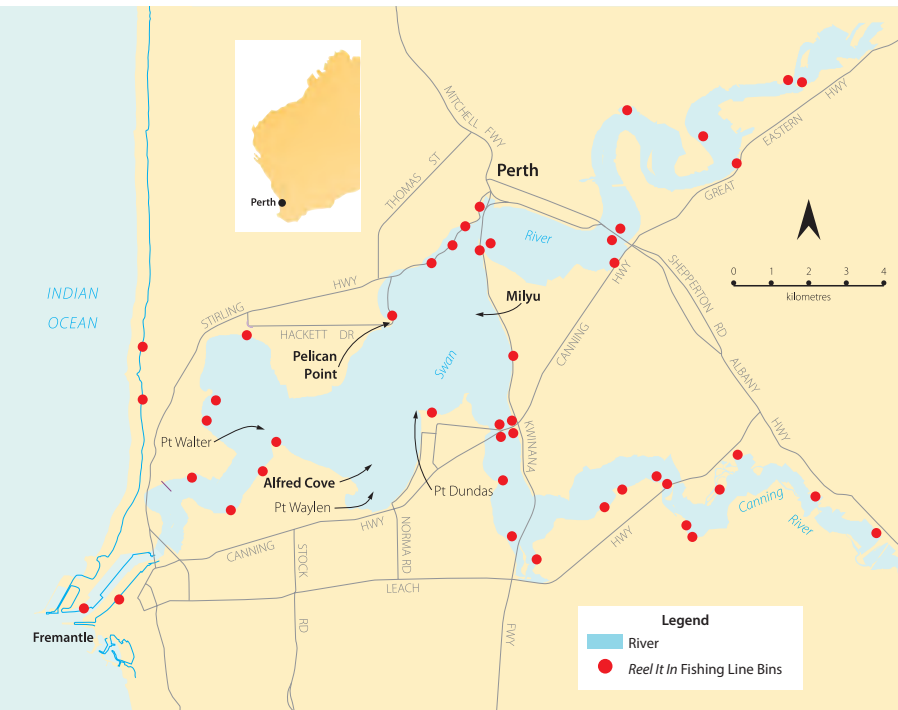
*Photo – DBCA*

**Inset** *Reel it in* bins are now being installed on the coast.

*Photo – Town of Cottesloe*

**Above** Gizmo and Tupac – two of the Swan Canning Riverpark's precious river dolphins.

*Photo – DBCA*



**More than a bin**

- *Reel it in* bins have captured more than 50 kilometres of fishing line and thousands of hooks, sinkers and bait bags since being launched in 2013.
- There are more than 70 fishing line collection bins at popular recreational angling locations across WA's coastline and waterways.
- More than 20 community and government groups have partnered with the *Reel it in* campaign to reduce the amount of waste in Western Australia's oceans and waterways.

**Above right** Specially designed bins enable rubbish to be discarded safely.  
*Photo – DBCA*

**Below** Volunteers empty and audit the bins each week.  
*Photo – Sue Harper*

waste. With the support of Keep Australia Beautiful WA, Recfishwest and Native Animal Rescue (NAR), the department developed and installed 40 custom-made fishing line bins at popular fishing spots along the Swan and Canning rivers.

Made of 100 per cent recycled materials, the *Reel it in* bins were designed to provide a safe and easy way to dispose

of unwanted fishing line and tackle. They were also created so that animals and weather couldn't pull the rubbish back out.

The two-year pilot proved incredibly successful with more than 15,000 metres of fishing line and 5,000 pieces of other fishing tackle and bait bags, as well as a raft of miscellaneous rubbish, collected, which would have otherwise ended up in our waterways. The project proved itself to be a simple, very cost-effective solution to the really serious problem of fishing line entanglement. The strong partnerships that were forged with community groups and volunteers indicated that the project would also be sustainable into the future.

**IT TAKES A VILLAGE**

The NAR group became involved in the pilot to help monitor, empty and audit the bins and gauge the effectiveness of the project. Each week, NAR volunteers empty the contents of each bin into specially labelled bags and take them back to their Malaga headquarters. They then sift through the contents of each bin and enter data about what they find into the *Reel it in* rubbish collection database.

NAR completes their weekly bin emptying of the fishing line bins with the assistance of the Youth Policing Division of WA Police, Police and Citizen Youth Clubs and at-risk youth. This means that as well as achieving significant environmental



**Get involved - Adopt-a-Bin**

Parks and Wildlife Services has a dedicated group of *Reel it in* volunteers who empty and audit their local fishing line bin on a weekly basis. Volunteers are provided with training and equipment and are registered with the Parks and Wildlife Service volunteer program.

Keep an eye on the *River Guardians* website at [www.riverguardians.com](http://www.riverguardians.com) and social media pages to see if there's a bin available for 'adoption' near you.

For other information, and to register your interest, please email [community@dbca.wa.gov.au](mailto:community@dbca.wa.gov.au).



**Above** Fishing line tangled around a pelican's bill.

Photo – Keep Australia Beautiful WA

**Above right** Mother and calf entangled.

Photo – Delphine Chabanne

**Below right** *Reel it in* bins are a simple, inexpensive solution for fishing waste.

Photo – DBCA

results, the *Reel it in* project is achieving positive social outcomes for Perth's youth.

Many *River Rangers* schools have also taken an interest in the *Reel it in* project and have incorporated it into their practical learning curriculum by helping to adopt and clean up foreshores at popular fishing sites.

## EXPANDING PROGRAM

Following the pilot project's resounding success, steps were taken to expand it. The department worked with 12 riverfront local governments to install 61 dedicated fishing line bins at popular jetties, fishing platforms, traffic bridges and foreshores throughout the Swan Canning Riverpark. In the past three years, the *Reel it in* bins have collected a staggering 50 kilometres of fishing line, 7,600 hooks and sinkers, 6,600 bait bags and 18,000 pieces of general rubbish.

In a further expansion, the department is now targeting popular



"In the past three years, the *Reel it in* bins have collected a staggering 50 kilometres of fishing line, 7,600 hooks and sinkers, 6,600 bait bags and 18,000 pieces of general rubbish."

Western Australian coastal fishing spots as potential locations. *Reel it in* bins have now been installed at the iconic Cottesloe Groyne, Hillarys Boat Harbour and boat ramps on the fringe of Shoalwater Islands Marine Park. They have also been installed at Victoria Quay; the North and South moles in Fremantle Port; Woodman Point Ammo Jetty; CY O'Connor Groyne in the City of Cockburn; Meelup Regional Park; and in the City of Mandurah through the Estuary Guardians program.

The data collected from the *Reel it in* bins is now being entered into the Australian Marine Debris (AMD) Database. This database was created by Tangaroa Blue to enable volunteers and organisations who were running beach clean-up events to collect data on what they found with a consistent methodology so it could be collated into a standardised national database on marine debris.

## NEVER-ENDING STORY

While the *Reel it in* project has made a significant contribution to reducing the amount of waste in and around Perth's river and coastal waters, ridding our environment of this rubbish completely is ongoing. Dolphins are still being impacted by discarded fishing waste and for each fishing line death or injury we know about, there are possibly hundreds that go unnoticed. However, we're undoubtedly making positive steps in the right direction.

### ***Have you seen sick or injured native wildlife?***

Please contact the Wildcare Helpline on (08) 9474 9055.

The Wildcare Helpline provides a service for the public who find sick or injured native wildlife and are seeking advice on what to do or where to find care for the animal.

You can download the new Wildcare Helpline app to your smart phone by visiting the App Store or Google Play (see also 'In Review' on page 37).




**Jason Menzies** is Parks and Wildlife Service's Volunteers and Community Unit manager. He can be contacted on (08) 9278 0932 or by email ([jason.menzies@dbca.wa.gov.au](mailto:jason.menzies@dbca.wa.gov.au)).





# Enduring quenda persistence on the Swan Coastal Plain



It is not uncommon to spot a quenda digging in the leaf litter in bushland throughout the Swan Coastal Plain, or scurrying around the suburbs of Perth. Their presence is reassuring when you consider that they are persisting despite living with the challenges brought by urban development and introduced predators. In fact, one population in Ellen Brook Nature Reserve is doing so well it is being used to bolster quenda numbers at several other locations throughout the State.

by Cheryl Lohr  
and Leonie Valentine

The quenda (*Isoodon obesulus fusciventer*), or southern brown bandicoot, is a medium-sized (400 to 1,800-gram) marsupial that is native to south-west Western Australia. The species has brown fur; a long, narrow face; a short tail; and moves around on all four limbs. Quenda are mostly nocturnal, but they can also be crepuscular (active at dawn and dusk), and during the cooler months they can be seen in the late afternoons. Like other species of bandicoots, quenda are omnivorous and dig distinctively shaped foraging pits while searching for underground invertebrates, tubers and fungi. They have also been observed digging for vertebrate eggs and may also consume small vertebrates. Some of their diggings are small, little more than ‘nose-pokes’ in the litter, while others can be well-excavated holes, nearly big enough for them to sit in. Quenda diggings are quite different to those created by the introduced European rabbit (*Oryctolagus cuniculus*), and tend to be more discrete and lack the piles of faecal pellets often associated with rabbit foraging.

## FACING THREATS

Many of Australia’s medium-sized mammals, including the quenda, are impacted by a range of threats, including introduced predators – primarily cats (*Felis catus*) and red foxes (*Vulpes vulpes*), impact of fire and habitat loss. Quenda are considered a Priority 4 species, which means it is rare, near threatened and in need of monitoring. On the south-eastern coast of Australia, their closely related subspecies (*Isoodon obesulus obesulus*) is listed as endangered. In WA, the *Western Shield* wildlife recovery program has effectively used baiting to reduce fox numbers resulting in the recovery of quenda populations. In 1998, they were removed from the threatened species list. Today, they continue to persist in remnant habitat throughout the Swan Coastal Plain, including many reserves in the Perth metropolitan area.

Quenda are affected by inappropriate fire regimes. They prefer dense, low



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**Main** Quenda are considered medium-sized marsupials, usually weighing between 400 and 1,800 grams.

Photo – Simon Cherriman

**Inset** Craigie Bushland is one area that quenda have been translocated to.

Photo – Leonie Valentine

**Above** Predator-proof fences at Ellen Brook Nature Reserve help to protect native animals from cats and foxes.

Photo – Gerald Kuchling/DBCA

**Right** Quenda digging up an artificial turtle nest.

Photo – Helena Bowler



shrubland to forage underneath, and low grass trees with leaves that touch the ground provide refuges from predators and the elements.

Like so many other native animals, quenda have also been impacted by land clearing for urban development and agriculture. However, in recent years, housing developers have been engaging environmental consultants to trap and move quenda out of bushland before they clear it for housing. They then work in consultation with the Parks and Wildlife Service to translocate the quenda to appropriate habitat.

## TURNING THE TABLES

Ellen Brook Nature Reserve and Twin Swamps Nature Reserve, in Perth’s north-east, are home to the critically endangered western swamp tortoise (*Pseudemydura*

*umbrina*) – Australia’s rarest and most threatened reptile. Western swamp tortoises are targeted by red foxes so sections of the two nature reserves were fenced to offer them protection.

The fences have also afforded protection to quenda to such an extent that they have reached very high densities in these areas. And, despite the fences being fitted with a gate system that enables quenda to leave the reserve, this has had implications for the western swamp tortoises – especially those in the last self-sustaining wild western swamp tortoise population, located in Ellen Brook Nature Reserve. This is because quenda have enhanced olfactory senses, and are known to dig up western swamp tortoise nests and to consume the eggs. A camera-trap study carried out by Helena Bowler from The University of



**Far left** A quenda.  
*Photo – David Bettini*



**Left** Red foxes pose a grave threat to many native species, including quenda.  
*Photo – Jiri Lochman*

**Below left** Gates in the predator-proof fences enable native animals to freely travel in and out of the reserves.  
*Photo – Gerald Kuchling/DBCA*

**Below** During the past 10 years, quenda have been translocated to 15 locations.  
*Photo – Graham Zemunik/Sallyanne Cousans Photography*



Western Australia (UWA) even recorded quenda efficiently locating and extracting artificial tortoise nests.

To help minimise their predation on the turtles, Parks and Wildlife Service staff travel to Ellen Brook and Twin Swamps nature reserves twice a year to trap quenda and translocate them to other bushland reserves in the Perth region. Long-term data indicate this program improves juvenile recruitment of western swamp tortoises and the monitoring of the quenda populations indicates a sustainable number of quenda are being harvested from the reserves.

### WIN-WIN


Removing quenda from the reserves minimises the predation pressure upon the critically endangered western swamp tortoise, but it also provides an

opportunity to reintroduce or replenish quenda populations to fragments of natural habitat that still remain on the Swan Coastal Plain and further afield. During the past 10 years, quenda have been translocated to Thomsons Lake Nature Reserve, Shark Bay, Julimar State Forest, Wadderin Sanctuary Narembeen, Yellagonga Regional Park, Yalgorup National Park, Craigie Bushland, Dianella Regional Open Space, Maralla Road Nature Reserve, Star Swamp Nature Reserve, Melaleuca Park (proposed nature reserve), Woodvale Nature Reserve, Cottonwood Crescent Reserve and Dundas Nature Reserve.

To be a suitable translocation site for quenda, the bushland needs to have more than 60 per cent vegetation cover under one metre of understorey, be protected from foxes, be at least 10 hectares in

 **Learn more about the quenda**

Scan this QR code or visit Parks and Wildlife's 'LANDSCOPE' playlist on YouTube.



size, have remained unburnt for the past 10 years, and preferably have a wetland, or creek nearby. Unfortunately, there are few sites on the Swan Coastal Plain that meet all these criteria. But the presence of dense, connected understorey vegetation that will offer shelter to quenda from predation is the key factor for suitability.

## Digging up the dirt on Australia's diggers

Australia has many digging mammals, from tiny marsupial moles that weigh as little as 50 grams, up to 30-kilogram wombats, although most of the diggers belong to the bandicoot, bilby, bettong and potoroo groups, within the 400 to 2,000 gram weight range. Several of these digging mammal species are threatened by a combination of introduced predators, fire and habitat loss; and many have suffered range declines and reductions in population size. For example, the woylie (*Bettongia penicillata*) was once widespread throughout much of southern Australia, with anecdotal accounts from early settlers indicating they were once very abundant. Now the woylie is critically endangered and occupies less than one per cent of its former range. This bettong species creates numerous foraging pits while searching for underground fungi, its primary food source. Ecologist Dr Mark Garkaklis estimated that an individual woylie that weighs about 1.3 kilograms could turn over 4.8 tonnes of soil per year.

### The ecosystem services of digging mammals

When animals ingest soil or dig to create foraging pits, burrows, tunnels and mounds, they are manipulating the top layer of earth. Known as bioturbation, the movement of soils by animals, from earthworms to badgers, may be very important for long-term environmental processes and ecosystem health as it breaks the soil-surface layer, often mixing soil types and changing soil hydrophobicity (the water repellence of the soil) and water infiltration. Flow-on effects of digging can include nutrient recycling through the mixing of organic matter, altered microbial activity, changes to mycorrhizal fungal associations, the capture and retention of seeds and enhanced plant germination and recruitment.

The quenda and the echidna (*Tachyglossus aculeatus*), are the more commonly occurring digging mammals left in south-west WA. Research by scientists at Murdoch University and UWA has shown that an individual quenda can turn over nearly four tonnes of soil per year while digging for food. In addition, their foraging pits have lower soil-water repellency and higher soil moisture levels. The foraging pits may also increase native seedling recruitment. Current research on the translocated population of quenda at Craigie Bushland is examining whether quenda reduce the amount of litter on the substrate (by burying the litter with soil evacuated from their foraging pits) as well as the role of quenda in enhancing litter decomposition and nutrient cycling.

### Where to see digging mammals around Perth

If you'd like to see digging mammals in the Perth region, try bushwalking in some of the larger urban reserves where quenda have been translocated, such as Craigie Bushland or Thomsons Lake Nature Reserve. Quenda are also known to forage around Murdoch University and Beeliar Regional Park. During the cooler months you can sometimes see quenda in late afternoon; and at Lesmurdie Falls they've been spotted foraging around picnic tables. Although you may not see the quenda themselves, hopefully you'll find some of their foraging pits. Further afield from Perth, you have a good chance of seeing echidna, and their foraging tracks. Barna Mia Nocturnal Wildlife Sanctuary, nestled within Dryandra Woodland is an excellent place to take a night time tour and see digging mammals such as woylie and bilbies up close.



**Top** Quenda diggings vary in size from small nose pokes to holes deep enough for them to sit in.  
Photo – Simon Cherriman

**Above** Echidnas create diggings and provide an important service maintaining healthy soil.  
Photo – Sallyanne Cousins

**Below** Quenda can be spotted in many suburban backyards.  
Photo – Simon Cherriman



“... Perth and Mandurah residents with dense vegetation in their gardens, and pets that are kept inside at night, might find quenda in their gardens and they will continue to persist in our bushland areas for generations to come.”

## PROMISING SIGNS

The quenda population translocated to Craigie Bushland is doing particularly well. In 2013, 46 quenda were translocated to this City of Joondalup reserve from Ellen Brook and Twin Swamps nature reserves. Subsequent ongoing quarterly monitoring has recaptured almost half of these original source animals and identified about 80 new animals, indicating very successful recruitment to this population. Craigie Bushland is a predator-proof fenced reserve that excludes foxes, cats and dogs, but has pedestrian gates to ensure the public can still access this beautiful bushland.

Inside the fence, Dr Leonie Valentine from UWA is monitoring how quenda might be changing the soil, the decomposition of leaf-litter, and other aspects of the micro-habitat (see ‘Digging up the dirt on Australian diggers’ on page 26).

Meanwhile, in the nearby Woodvale Nature Reserve, Dr Cheryl Lohr is monitoring a new population of quenda using remote-sensing cameras. Sixteen quenda were released into the dense bushland in the north-east corner of the reserve in August 2016, followed by 22 more in May 2017. Although the Woodvale reserve is fenced, it is not predator-proof and foxes have been observed there. Domestic cats may also threaten the reintroduced quenda population, with at least three collared cats, one with recent signs of veterinary treatment, being recorded on camera in the past six months. The quenda population at this site is being closely monitored.

## PROVING THEIR STRENGTH

Quenda can survive in the metropolitan area, despite the threat of cats and foxes, as long as there is adequate vegetation for shelter, and they have been spotted outside Craigie Bushland and Woodvale Nature Reserve. In addition, recent diggings spotted by a Parks and Wildlife



Service scientist suggest they have moved into fragments of bushland around the Ocean Reef Road freeway off-ramps, bike paths, and at Edgewater train station. We assume the young quenda are squeezing out through the fences put in place to protect them and suspect the quenda living in bushland around Craigie came from the fenced bushland population. Quenda are known to have escaped from several fenced reserves in the south-west of WA, and a similar species, the golden bandicoot (*Isodon auratus*) is known to have escaped from a fenced enclosure at Matuwa in the northern Goldfields.

In early 2017 two male quenda were killed on the roads – one on the freeway near Craigie Bushland, and a second one on Ocean Reef Road between Woodvale and Edgewater. Both these animals were probably dispersing from existing populations into new territory. Scientists from UWA, with support from Main Roads, is researching the impact of roads on our native wildlife.

Quenda will use short underpasses to disperse and move under roads, particularly if there is vegetation for shelter. Scientists from Murdoch University have carried out research that indicates that quenda rely on sheltering in urban gardens and need to be close



to nature reserves. With a bit of luck, Perth and Mandurah residents with dense vegetation in their gardens, and pets that are kept inside at night, might find quenda in their gardens and they will continue to persist in our bushland areas for generations to come.

.....  
**Above left** A domestic cat recorded by a remote-sensor camera at Woodvale Nature Reserve.  
 Photo – DBCA

**Above** Parks and Wildlife Service’s Alice Revealey getting ready to release a quenda into Craigie Bushland.  
 Photo – Leonie Valentine

**Cheryl Lohr** is a research scientist in DBCA’s Animal Science program. She can be contacted on (08) 9405 5750 or email (cheryl.lohr@dbca.wa.gov.au).

**Leonie Valentine** is a research scientist at The University of Western Australia, funded by NESP – Threatened Species Recovery Hub.

Also contributing...

**Alice Revealey** is Parks and Wildlife Service’s Swan Coastal District fauna conservation officer.

**Gerald Kuchling** is a DBCA senior research scientist and a tortoise and freshwater turtle specialist.

# Eyes in the sky

*NEW PERSPECTIVES*



Remotely piloted aircraft, or 'drones' as they are colloquially known, are used across the world for a range of purposes. In Western Australia, DBCA staff are realising the potential for their use in a range of applications, while navigating the variables of this remarkable technology.

by Neil Burrows, Martin Dziminski, Ben Davies,  
John Mosaj, Kevin Bancroft and Liz Grant



Remotely piloted aircraft (RPAs), or 'drones' as they are known have been used in surveillance and military operations since WWI. In the years since, the associated technology has become considerably more advanced and the devices have become more affordable and easier to operate, making them popular for a range of uses in a variety of landscapes. Throughout the world, they are commonly used for search and recovery operations; photography and filming; shipping and delivery; auditing construction and agriculture; law enforcement; weather surveillance and in many other applications. In recent years they have also become an important tool in conservation, land and fire management, and research. As the technology becomes increasingly mainstream, more and more research undertaken by DBCA's scientists are making use of their capability, and realising their potential.

## SPYING BILBIES

The threatened greater bilby (*Macrotis lagotis*) occurs throughout the Pilbara and other arid areas of northern Western Australia. While this distribution is a fraction of what it used to be, their home ranges are large, individuals are sparsely distributed across a broad area and they are also known to move across the landscape. To make things even more challenging for those who are trying to research them, bilbies are nocturnal and cryptic by nature, so they are not easily observed and researchers rely on observations of signs such as tracks, scats, diggings and



*Previous page*

**Main** Mangrove communities, such as these in the Kimberley, will be subject of studies made more viable by the use of RPAs.

*Photos – Peter Nicholas/DBCA*

**Inset bottom** PhD student Elizabeth Bevan operates an RPA.

*Photo – Ryan Douglas/DBCA*

**Above** Diggings reveal the presence of cryptic animals such as the bilby.

**Right** A multi-rotor RPA being used to survey bilby habitat.

**Below** A comparison of what can be seen at 12 metres and 45 degrees (left) and 25 metres and 45 degrees (right).

*Photos – Fiona Carpenter/DBCA*

burrows. In the past, helicopters have been used to carry out aerial surveys. However, the cost and logistics of these operations have proved limiting, so scientists and field staff have often resorted to traversing the landscape on foot, by car and even on horseback.

At the end of 2016 a research team from the former Department of Parks and Wildlife began a trial of using the photographic capacity of RPAs to survey bilbies in the Pilbara. Twelve flights were carried out over an area known to be inhabited by bilbies to test variables such as altitude flown, flight speed and camera angles. The flights were all carried out



at midday to avoid shadows. The device used – a small multi-rotor RPA – was enabled with a live HD video feed onto a portable monitor, so research scientist Martin Dziminski and his team could watch in real time what the RPA was recording. The diggings observed by the RPA were then ground-truthed by staff and volunteers who travelled out to each sighting. While verification of the sightings was necessary for the trial, being able to watch the footage in real time while in the field avoided the need for lengthy post-processing of the footage.

The trial revealed that areas with bilby diggings rather than individual burrows,





which were often beneath a bush or spinifex clump, were more easily identified from aerial imagery. Martin and his team also found more signs of bilbies the slower and lower the RPA travelled. However, this style of flying used more battery power than if the RPA was flown higher and faster. In fact, they found that by increasing the speed of the RPA to eight kilometres per hour, increased the amount of ground covered by 30 per cent over a 20-minute flight. While this resulted in a slight cost in detectability, the team is confident that with the rapid development of RPA and battery technology, RPAs will soon become a critical tool in detecting the presence of species, particularly those that leave signs of diggings, in remote locations or across large areas.

## SPOTTING SEA TURTLES

RPAs are thought to also hold the key to help unlock some of the secrets of another cryptic creature – marine turtles. Little is known about the decades between when sea turtles emerge as hatchlings to disappear into the ocean and when the females reappear on beaches to lay eggs of their own. Learning about this phase of a sea turtle’s life cycle is

extremely challenging and scientists have long been searching for new ways to improve their understanding of this life stage (see also ‘Thevenard Island: Turtle stronghold’, *LANDSCOPE*, Winter 2017).

University of Alabama Birmingham PhD student Elizabeth Bevan spent time in WA in August 2017 working with department staff Scott Whiting, Tony Tucker and Ryan Douglas, Adrian Lane (Dambimangari ranger), Danny Barrow and Ben Corey to investigate the possible use of RPAs for turtle research and monitoring. As part of the trial for future surveys and behavioural studies, the team used RPAs to record turtles at sea. By observing turtles from the sky, researchers hoped to eliminate potential impacts on the turtles’ behaviour caused by boat traffic or water-based operations. Another aim of the trial was to determine the usefulness of RPAs to view turtles across multiple habitats, such as beaches, reefs and the open ocean, and to quantify if a turtle’s behaviour is altered when approached by a RPA.

The team also tested RPAs as an alternative to traditional beach surveys to check for turtle tracks and nesting turtles, which are typically carried out



See some examples  
of RPA use  
in WA



Scan this QR code or visit Parks and Wildlife’s ‘LANDSCOPE’ playlist on YouTube.

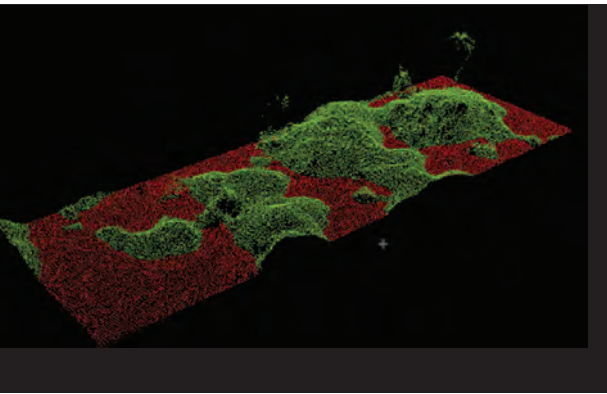
**Above left** An RPA was used at Cape Domett in an attempt to unlock the secrets of marine turtles.

*Photo – Peter Nicholas/DBCA*

**Above** PhD student Elizabeth Bevan with the RPA she and the research team used to monitor the turtles at sea.

*Photo – Ryan Douglas/DBCA*

on foot. Until now, dedicated volunteers and scientists walk, often in very difficult conditions in extreme heat and at night, to record the number and activity of hatchlings and females by counting their tracks. The trial showed that using RPAs to survey beaches and the ocean saved staff and volunteer time in the field, helped cover a greater survey area, provided a safer survey alternative for some hazardous sites – such as those that may be inhabited by crocodiles – and enabled turtle behaviour to be viewed without the impacts of the observers themselves. RPAs also provided the opportunity to



**Above** Data derived from the RPA imagery in the spinifex meadows at Millstream Chichester National Park. The small clouds floating above the hummocks are seed heads.  
Photo – Paul Rampant/DBCA

**Right** Patch burn pattern of spinifex.  
Photo – Jiri Lochman

**Far right** RPAs are used in a variety of landscapes.  
Photo – DBCA



view the turtles in the context of the entire landscape, which cannot be done at ground-level.

Staff from the department's Marine Science Program have teamed up with Murdoch University colleagues to follow humpback dolphins (*Sousa sahulensis*) using small quadcopters to determine how much time dolphins spend submerged, versus how long they can be seen from the air. This information will be applied to more accurately estimate the sizes of dolphin populations from the series of traditional surveys conducted from planes during the past three years. These aerial surveys provide a population census, but it's a minimum count, given that the dolphins can't be counted when they're underwater and not visible from the sky. Researchers can attach tags to the dolphins to quantify dive times, or use helicopters to follow them from the air, but both operations are more expensive and invasive.

Another collaboration between the department and Murdoch University has used an RPA, which takes off and lands vertically like a quadcopter but then flies a survey pattern as a fixed-wing aircraft, to survey dugongs. Murdoch University started trialling the unmanned survey approach for dugongs in 2012 in Shark Bay.

This information is being married with a study into the density and condition of seagrass, which is being undertaken by Edith Cowan University. One of the main advantages of using RPAs for this type of research is that it eliminates the risk for people flying at low altitude over water to record dugongs.

### 'DRONES' IN THE DESERT

In yet another application, the department has been using RPAs to better understand WA's spinifex deserts, where each year lightning-caused megafires sweep through. These fires, clearly detectable on satellite imagery, can burn as much as 100,000 square kilometres of the desert in some years, but are barely noticed by people other than those who live there. WA's deserts are sparsely populated, so unlike the south-west of the State, the bushfire threat to human life is relatively low. However, the desert megafires can threaten remote communities, Aboriginal cultural values, visitors to the region and infrastructure associated with mining, pastoralism and tourism. They also contribute to wildlife losses and are a significant contribution to Australia's greenhouse gas emissions. Given the remoteness, the vast expanses

and limited resources, most of these fires are not able to be suppressed and eventually burn themselves out by running in to recently burnt country, or extinguish when weather conditions abate.

It was not always like this. For thousands of years before European settlement, Aboriginal people used fire regularly and skillfully for a myriad of reasons. This resulted in a fine grain patchwork of vegetation at different growth stages. Most of the landscape was made up of patches of young spinifex, which were a buffer to the development and spread of megafires. With the departure of traditional Aboriginal burning across much of the desert following European settlement, the fire pattern changed dramatically and quickly. The small, cool patchy fires lit by Aboriginal people gave way to large, hot lightning-caused fires. This changed fire pattern has been implicated in the decline of mammals and some bird species, as well as fire-sensitive plants such as cypress pine (*Callitris* spp.) and mulga (*Acacia aneura*).

Concerned by the damage caused by hot megafires, Aboriginal and non-Aboriginal landholders are looking to reintroduce cool patch burning. To safely plan and implement this form of

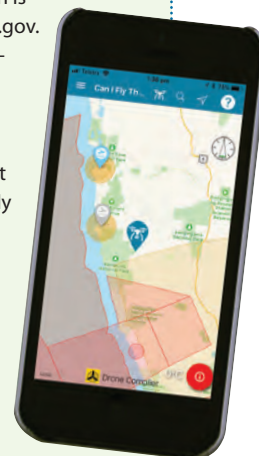
“Not only are the results more accurate than ground sampling, but using this technology has significantly reduced the sampling and processing time and cost.”



## Did you know?



All RPA users need to obtain authority to operate RPAs on the lands and waters the department manages. More information is available at [www.dpaw.wa.gov.au/management/remotely-piloted-aircraft](http://www.dpaw.wa.gov.au/management/remotely-piloted-aircraft). CASA has developed an easy-to-use app – *Can I fly there*, which provides information about where you are allowed to fly RPAs and which areas are no-fly zones. It is available from the Apple App store, Google play and as a web app. More information about CASA is available from [www.casa.gov.au](http://www.casa.gov.au).



prescribed burning on lands managed by the department, a firm knowledge of spinifex fire behaviour is essential. We need to know the weather and fuel conditions under which spinifex fires will ignite and spread, and when they won't. And when conditions are right for fire to spread, we need to know how fast it will spread so we can predict where it might go and what values it might threaten. To this end, scientists have been studying the characteristics of spinifex as a fuel for bushfires, and setting experimental fires to understand how they behave under different fuel and weather conditions. The aim is to provide fire and land managers with guidelines on how to forecast the fire danger rating and predict the behaviour of spinifex fires.

The cover of spinifex, together with wind speed, are important for determining whether fires will spread. The proportion of the ground that is covered by spinifex is largely dependent on the age of the spinifex (how long since the last fire), the soil conditions, and the amount of rain since the last fire. Historically, researchers have used slow and tedious methods of assessing spinifex cover using ground-based sampling techniques. But, in 2016, senior principal research scientist Neil

Burrows and his team used an RPA to take aerial photographs over different spinifex communities and then used a computer-automated process to calculate spinifex cover and the area of bare ground from the photos. Not only are the results more accurate than ground sampling, but using this technology has significantly reduced the sampling and processing time and cost. What would normally take several people a whole day, can now be done in under an hour using the RPA and computer technology.

## SEEING THE TREES AND THE FOREST

The department has long used aerial surveying to map vegetation to inform silvicultural management, carry out assessments on old-growth forest, dieback mapping and assessment, and to help inform reserve planning in the south-west. Traditionally, they mounted a camera to a Cessna 172 that they used to take aerial photographs, which were interpreted as a single frame, viewed in stereo or combined to create a photo mosaic.

Recent advances in technology and photogrammetric software is enabling the department to create datasets from aerial photographs that have been captured

**Above left** Point cloud data is used to construct an impression of the forest, which enables the department to carry out tree measurements and other assessments.

*Photo – DBCA*

by RPAs for use in photo interpretation, photogrammetric measurement and statistical analysis.

A significant development in this work is the processing of RPA-captured aerial images into photogrammetric 'point cloud data', which can construct spatially accurate three-dimensional images of the forest based on a very large number of points. Point cloud data can also be used to carry out accurate tree measurements, including height and crown cover.

Going forward, RPAs are set to also play a role in the way the department manages forest fires. The ability to use thermal imaging to detect hotspots on the perimeter of a fire will help fire managers predict weak containment lines and areas of vulnerability. Using RPAs to survey the fire perimeter will lessen the current dependence on the favourable weather conditions needed to fly over the boundary and will provide more accurate



**Left** An RPA provides an aerial view of the diminished mangrove forests of Shark Bay.

**Above** View of The Gap, Albany from above.  
Photos – Peter Nicholas/DBCA

information on the location and security of the fire boundaries and hot spots. They will also enable surveillance to be carried out at night, when conventional aviation activities are limited by operation factors and visibility.

Department researchers have also been using RPAs to survey the ‘forests’ of Shark Bay along the Carnarvon Coast, which few people know is the southern-most substantial area of mangrove in WA. The current method for surveying this area, which supports rich and diverse fauna, including birds and invertebrates, is to use satellite imagery which generates 15-metre pixels. These images are then verified with ground-truthing of individual tree canopy cover at a number of locations with various densities.

Using RPAs to survey mangrove communities enables researchers to carry out targeted investigations of tree and canopy densities and facilitates quick data collection. Avoiding the need for ground-truthing also eliminates the risks associated with entering areas that are populated by midges, mosquitoes, flies, snakes and, in particular, crocodiles in the Kimberley; avoids hazards associated with travelling in a muddy substrate such as getting bogged; reduces the potential for personal injury; and negates the challenges associated with changing tides and currents.

In 2016 a team investigated the substantial loss of mangroves in the Carnarvon Coast in Shark Bay Marine Park and World Heritage Area. The RPAs used as part of this study provided substantial verification imagery of this loss,

which researchers suspect was caused by a combination of environmental pressures such as increasing seawater temperature, air temperature and sediment salinity, and decreasing rainfall. There are also future plans to use RPAs to provide ground truth data at numerous sites in the 140,000 hectares of mangroves in the Kimberley.

## THE SKY'S THE LIMIT – OR IS IT?

As with any rapidly emerging technology, the common and widespread use of RPAs has led to the development of associated regulations. These ensure that RPAs do not impact on the safety or security of individuals, infrastructure or the natural environment and the department operates within the perimeters outlined by the Civil Aviation Safety Authority.

When used in parks and reserves by visitors, RPAs can pose a potential threat to other visitors, other air users and operators if they crash. They can affect vegetation and wildlife and, in some cases, they may even pose a fire risk. They may also detract from other visitors’ experiences, places of cultural significance as well as impact on visitor privacy. Traditional owners have also raised concerns over the impact of RPAs on cultural values.

So, while the benefits of RPAs in a range of applications are numerous, and the department continues to use the technology in research projects and as part of its other management responsibilities, there is much to consider when it comes to their use. However, we can be sure

that as the battery power, technology and supporting software continues to improve, RPAs will be incorporated into an increasing number of departmental projects in the future, and the impact they will make on our ability to carry out science and conservation, which may not have otherwise been possible, will undoubtedly increase.

**Neil Burrows** is a DBCA senior principal research scientist and has been working with RPAs to survey spinifex. He can be contacted on (08) 9219 9000 or by email (neil.burrows@dbca.wa.gov.au)

**Martin Dziminski** is a DBCA research scientist. He is currently undertaking research on bilbies across large parts of the Pilbara, Kimberley and deserts in Western Australia.

**Ben Davies** is a DBCA Forest and Ecosystem Management Division project officer. He can be contacted on (08) 9725 4300 or by email (ben.davies@dbca.wa.gov.au).

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*The bilby survey was made possible by funding from Fortescue Metals Group, Millennium Minerals and Roy Hill. Fiona Carpenter, Matthew Williams, Francis Morris and other volunteers provided invaluable assistance.*







## WILDCARE HELPLINE



The *Wildcare Helpline* app has been developed by the Parks and Wildlife Service to provide information for members of the public who have come across sick or injured native wildlife in Western Australia. The app is designed to support the phone referral service, which is operated by volunteers out of Perth, and is a handy pocket guide for anyone who is travelling through areas where they may encounter wildlife.

This easy-to-navigate app contains information about how to help native wildlife, how to determine whether a native animal is sick or injured, and what to do if they are. It even works to dispel myths, such as that adult birds will abandon their young if they have been touched by a human, to ensure that well-meaning carers are acting under correct advice.

Perhaps the most helpful component is the comprehensive 'Find help' section that provides a list of affiliated vets and wildlife carers who will be able to offer help and advice should you need it.

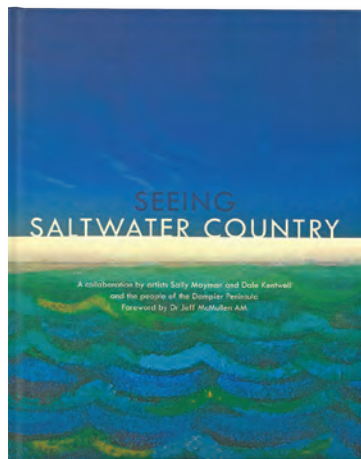
*The Wildcare Helpline app is available free from the App Store.*



## SEEING SALTWATER COUNTRY

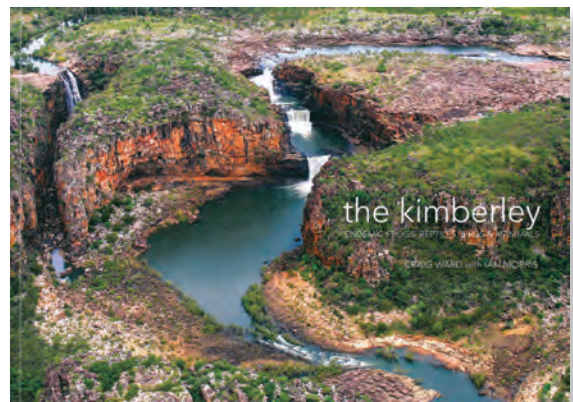
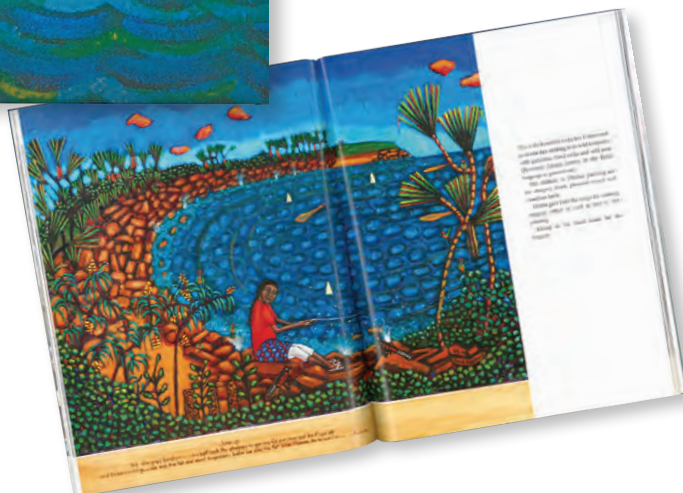
This beautiful book is a collaboration between artists Sally Mayman and Dale Kentwell, and the people of the Dampier Peninsula. It offers a truly personal perspective of the region and marries the stories and words of the local people with their photos and bold, but poignant, portraits. These offer an insight into the present lives of the people living in this area, as well as information about their history and the local words for the plants and animals.

The common theme that emerges from the stories is the deep and inherent connection that the traditional owners have for the terrestrial and marine environment, and the plants and animals that live there. But there



is also a recurring narrative about the fragility of the environment, especially in light of developments in the area, and the keen desire to maintain the traditions that have been with the local people for thousands of years.

*Seeing Saltwater Country is available for \$45 and all royalties for the book are being donated back to the community. For more information visit [fremantlepress.com.au](http://fremantlepress.com.au).*



## THE KIMBERLEY: ENDEMIC FROGS, REPTILES, BIRDS AND MAMMALS

As indicated by its title, *The Kimberley: Endemic frogs, reptiles, birds and mammals* celebrates the unique and magnificent wildlife of this spectacular area. Right from the outset, this book provides a context of how many species are found nowhere else – 230 of the 2,000 plant species, 12 of the 42 frogs, two of the 295 birds and five of the 76 mammals. These species have been evolving for more than 1.5 billion years.

The book showcases the area with stunning photos accompanied by descriptions of various and fascinating species of frogs, reptiles, birds and mammals. If the length of the bibliography at the back of the book is anything to go by, author Craig Ward has sure done his research. And, the comprehensive glossary makes the content accessible to a range of readers.

*The Kimberley: Endemic frogs, reptiles, birds and mammals is available for \$49.95 at a range of bookstores, visitor centres, selected Australia Post and newsagent outlets or by visiting [www.eternalendemism.com](http://www.eternalendemism.com).*



# RUNNING FOR THE HILLS

**Trail running is growing in popularity, with people of all ages taking part in events in national and regional parks in and around Perth. For DBCA's Lauren Cabrera, a Perth Trail Series event in Serpentine National Park provided the perfect opportunity to head off-road and see what attracts new and seasoned competitors to the trails.**

**BY LAUREN CABRERA**

**W**hile most people were enjoying a weekend sleep in, I joined some spirited folk for a run through the bush; jumping over logs and clambering up hills as part of an organised trail running event in Serpentine National Park on a sunny Sunday morning.

As an admittedly averagely paced runner, I've participated in almost all the major road running events in Perth over the years and was curious to try trail running because I'd heard it's softer on the body; attracts a smaller, less competitive crowd; and is less focussed on time and pace.

For the uninitiated, trail running involves running distances of 10, 25 and 50 kilometres, even up to 100 kilometres, on established trails in national and regional parks. Also known as 'fell running' in the United Kingdom, trail running is different from cross-country running, which involves running over shorter off-road distances (five to 10 kilometres) and not necessarily always on marked trails.

The entry-level distance of 10 kilometres with a generous cut-off time was an easy





sell, although the most popular distance for events like the one I embarked on is 25 kilometres.

### IT'S ALL IN THE PREPARATION

Under strict instructions from the organisers, I arrived at the event with my newly purchased hydration backpack, which I had filled with the minimum required 750ml of water, to join a group of adventurous individuals who clearly enjoyed exercising off the beaten track in nature.

Conversation flowed easily with those around me as we waited for the starting horn. Some were new to trail running; while others were regular off-road runners and generous with their advice, especially about the impending hills.

Any pre-race nerves I had were allayed by speaking to Wicus Du Pleases, a mature trail runner who travels from his rural home in the south-west to attend every event in the Perth Trail Series. Admirably, he focuses on enjoying the events, rather than being overwhelmed by the physical challenge.



“We do a fair bit of walking up hills. My motto is, ‘see a hill, walk a hill’. I’m here to enjoy myself.”

### AND THEY'RE OFF ...

As my wave set off, I left my ego at the starting line and set off into the bush in no particular hurry. I passed the serious runners who were looping back on their second lap of an intimidating 50-kilometre course and paid homage to the variety of competitors, who represented every shape, size and age you can imagine, each with a commendable amount of



Discover more about trail running in WA

Scan this QR code or visit Parks and Wildlife's 'LANDSCOPE' playlist on YouTube.



*Previous page*

**Main** Trail running tests the physical and mental endurance of competitors.

**Inset left** Volunteers are an important part of the event.

**Inset below left** The trails are rich in plant life. Photos – Rory and Lauren Cabrera/DBCA

**Above** Hills are part of the challenge. Photo – Lauren Cabrera/DBCA

athleticism and fortitude to complete such a feat of endurance.

The competitors exchanged smiles and words of encouragement as we took a sharp left up the first long, gently sloped hill.



**“The smell was incredible and I couldn’t hear a single man-made sound except our shoes on the sand, loam and clay, and the puff of our breath as we traversed through the scenic beauty ...”**

I was pretty sure the kookaburras were laughing at me when I finally made it to the top of the hill but I was too distracted by the beauty of the bush. The smell was incredible and I couldn’t hear a single man-made sound except our shoes on the sand, loam and clay, and the puff of our breath as we traversed through the scenic beauty of the lush jarrah, marri and wandoo forest of the Darling Scarp, past the granite outcrops and along the water line that feeds Jarrahdale from the dam.

## NATURAL DRAWCARD

Perth Trail Series director Melina Mellino runs 12 events in national and regional parks near Perth each year, and says trail running gives participants a unique experience in nature and attracts those with a sense of adventure.

“We tend to attract an authentic bunch of individuals who are more about sharing the experience than actual competition,” Melina said.

“There’s so much support and encouragement along the way, especially when it comes to the big hills and obstacles that you typically don’t find on the roads.”

For Wicus, the wildlife en route and the spectacular views were the main drawcards.

“It makes you feel awesome. Tomorrow I’ll feel the pain but today I’m so happy.”

The majority of volunteers helping along the course are runners themselves.

Volunteer Aaron Mathers is a seasoned runner who got introduced to trail running by a friend.

“I find a real connection to nature when I run in the bush,” Aaron said.

“I used to run on the streets but once I hit the trails I didn’t look back.

“My favourite would be John Forrest National Park. I could run the Eagle View Trail with my eyes closed these days.”

## FORWARD MOTION

Trail running has recently been recognised as an official sport in WA with support from the departments of Local Government, Sport and Cultural Industries, and Biodiversity, Conservation and Attractions.

The events are run by a handful of specialised event companies and take place in most major national and regional parks within an hours’ drive from Perth and a small number of regional locations.

I finished the course, muddy and sweaty, but on top of the runner’s high you get from spending time in nature and with a steadfast commitment that I would be back on the trails again before long.

## Do it yourself

Trail running events in WA include:

### **Perth Trail Series**

[www.perthtrailseries.com.au](http://www.perthtrailseries.com.au)

- Yanchep, Walyunga, Serpentine, John Forrest and Lesmurdie Falls national parks
- Wungong, Mundy and Banyowla regional parks

### **Ultra-series**

[www.ultraserieswa.com.au](http://www.ultraserieswa.com.au)

- Bibbulmun Track, Australind/Leschenault Peninsula, Yellagonga Regional Park, Avon Valley, Neerabup National Park

### **Phat Runners**

[www.phatrunners.org](http://www.phatrunners.org)

- Perth Hills

### **Margaret River Trail Runners**

[www.mrtrailrunners.org.au](http://www.mrtrailrunners.org.au)

- Cape to Cape Track, Wharnccliffe Mill, Busselton to Dunsborough, Tom Cullity Trail

### **Waterous Trail on Foot (WTF) Ultra**

[www.wtfultra.com](http://www.wtfultra.com)

- Various parks from Jarrahdale to Dwellingup

### **6 inch trail marathon ultra**

[www.6inchtrailmarathon.com](http://www.6inchtrailmarathon.com)

- Munda Biddi Trail from North Dandalup to Dwellingup

**Above left** Trail running sees competitors traverse a range of terrains.

*Photo – Perth Trail Series*

**Below** Competitors come from all walks of life to enjoy exercising in nature.

*Photo – Lauren Cabrera/DBCA*



**Lauren Cabrera** is a DBCA project officer – editorial. She can be contacted on (08) 9219 9814 or by email ([lauren.cabrera@dbca.wa.gov.au](mailto:lauren.cabrera@dbca.wa.gov.au)).

# Protecting the Balguja

merging traditional knowledge and science

Arguably one of the world's most endearing and charismatic marine creatures, the dugong has deep cultural value to traditional owners in the State's north-west. A CSIRO study being carried out in partnership with Indigenous rangers in the Kimberley is merging traditional knowledge with science to gain a better understanding of the ecology of this magnificent species to help guide their future management.

by Peter Bayliss, Marlee Hutton, Jo Myers and the Balanggarra, Wunambal Gaambera (Unguu), Dambimangari and Bardi Jawi North Kimberley ranger groups



The dugongs (*Dugong dugon*) of northern Australia and the Torres Strait have a well-deserved recognition factor: they are an important species in coastal marine ecosystems; have 'iconic' conservation status; and they have high cultural value within Indigenous coastal communities. Despite this, they are listed as 'vulnerable' because populations throughout the world and the seagrass habitats on which they depend have declined due to human impacts.

## SCIENCE MEETS TRADITIONAL KNOWLEDGE

'Balguja' – as they're called by the Wunambal Gaambera saltwater people in the North Kimberley – are found in shallow coastal waters in protected bays, nearly always where you find extensive seagrass habitat. All of these suitable dugong areas in the Kimberley occur in 'Sea Country' and, in the north-west of WA generally, within the area that incorporates the North Kimberley (currently excluding intertidal waters), Lalang-garram / Camden Sound, Lalang-garram /Horizontal Falls, Nagulagun / Roebuck Bay, Eighty Mile Beach, Montebello Islands, Ningaloo, and Shark Bay marine parks. In fact, the coastal waters of north-western Australia, spanning from the Kimberley, through the Pilbara to Shark Bay, are home to one of the largest remaining stable populations in the world.



Dugongs have important cultural and social values for Indigenous communities living in coastal areas of the Kimberley and, indeed, right across northern Australia and Torres Strait. While dugong hunting provides a valuable source of protein in isolated regions where fresh food is difficult to obtain, its cultural value is beyond bush tucker. Cultural dugong and marine turtle harvests help maintain family relations and social structure, and they have important deep ceremonial, spiritual and community purposes.

The knowledge held by Indigenous communities about dugongs, including observations about seasonal changes in their distribution, has been gathered over many generations. However, until recently, limited information on the distribution and abundance of dugongs in the Kimberley and their dependent seagrass habitat has been documented in modern science. In an effort

to remedy this, and to support current Indigenous management and monitoring of Indigenous Protected Areas (IPAs) and their Healthy Country Planning process, a three-year Western Australian Marine Science Institution (WAMSI) project was started in 2013 by CSIRO researchers to form long-term partnerships with Indigenous rangers in the Kimberley, to share knowledge and skills in the gathering of data on dugong distribution, abundance and movements. This information will help guide future conservation and marine planning efforts as development pressures in the region inevitably increase.

## WORKING TOGETHER

As a first step, CSIRO scientist Dr Peter Bayliss developed a research partnership with the Balanggarra, Wunambal Gaambera (Unguu), Dambimangari and Bardi Jawi people in the North Kimberley, who had already articulated their aspirations to better manage dugongs through the merger of scientific and traditional knowledge systems as reflected in the following passage from the *Wunambal Gaambera*

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*Previous page*

**Main** Dugong at Shark Bay.

*Photo – Jess Hadden*

**Above** Plumes of disturbed mud and sand often indicate the presence of foraging dugongs.

*Photo – Kelvin Aitken/MarineThemes.com*

**Left** Dugongs can grow to three metres.

*Photo – Karen Willshaw/OceanwideImages.com*



### Dugongs

Dugongs are shy in nature but their location is often given away by the plumes of disturbed mud and sand they create as they use their horseshoe-shaped mouth to forage for seagrass. They are primarily herbivores, but when seagrass is scarce they occasionally eat jelly fish and other invertebrates.

They are light brown with a rotund body. Adults can grow up to three metres long and weigh more than 400 kilograms. They have a flattened fluked tail like a dolphin but, unlike dolphins, they do not have a fin on the upper back. They also have paddle-like flippers and a distinctive head shape with a blunt face. Their nostrils are near the front of the head.



**Above** An intensive aerial survey training course was held for rangers taking part in the study.

Photo – Peter Bayliss, TJ Lawson and Glenn Dunshea/CSIRO

**Above right** The abundance scale is relative, ranging from zero to the maximum number sighted, with red colours indicating the areas with the highest numbers and the blue colours indicating the lowest.

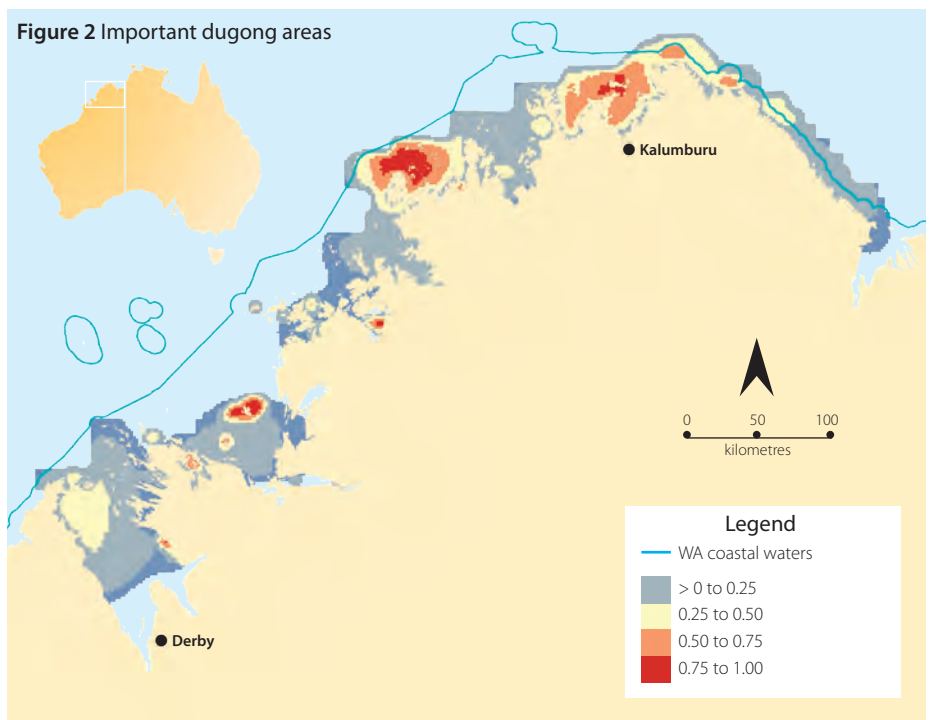
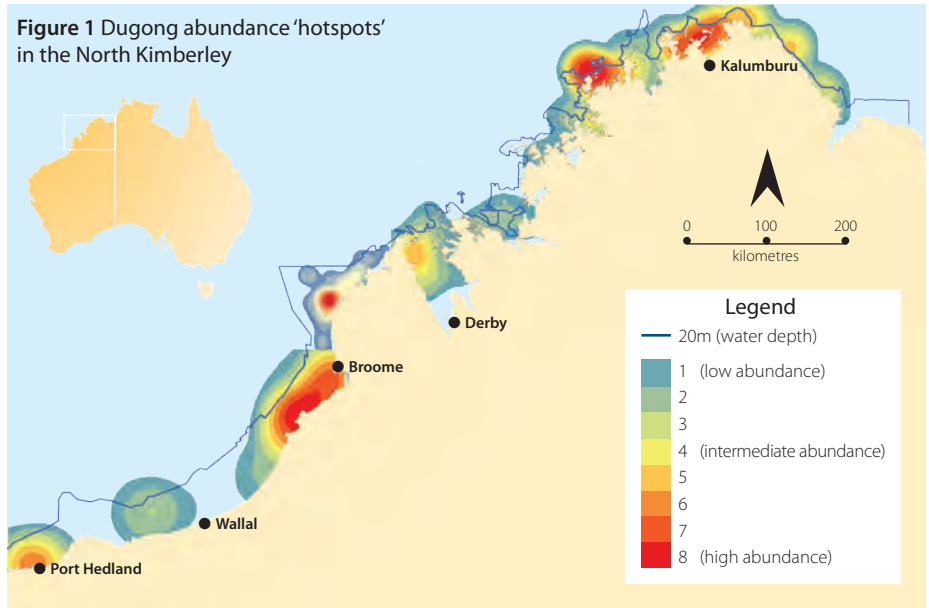
**Right** Identifying important dugong areas in the Kimberley using a ‘Bayesian’ likelihood map of dugong occurrence that combines traditional ecological knowledge (cultural hunting sites), a ‘first pass’ map of seagrass extent derived from Landsat satellite imagery and the results of the 2015 aerial survey.

*Healthy Country Plan– Looking after Wunambal Gaambera Country 2010–2020:*

*“We need to find out more about mangguru (marine turtles), balguja (dugongs) and other saltwater animals including diigu (birds). We need to know more about where they travel, their habitats in our country and how to look after them. Working together with other saltwater traditional owner groups across northern Australia using our traditional knowledge, doing surveys, tagging and looking after saltwater animals, fish, diigu and their habitats, will help us keep these animals healthy in our country as well as keeping our saltwater traditions strong.”*

## SEARCHING FOR ANSWERS FROM THE AIR

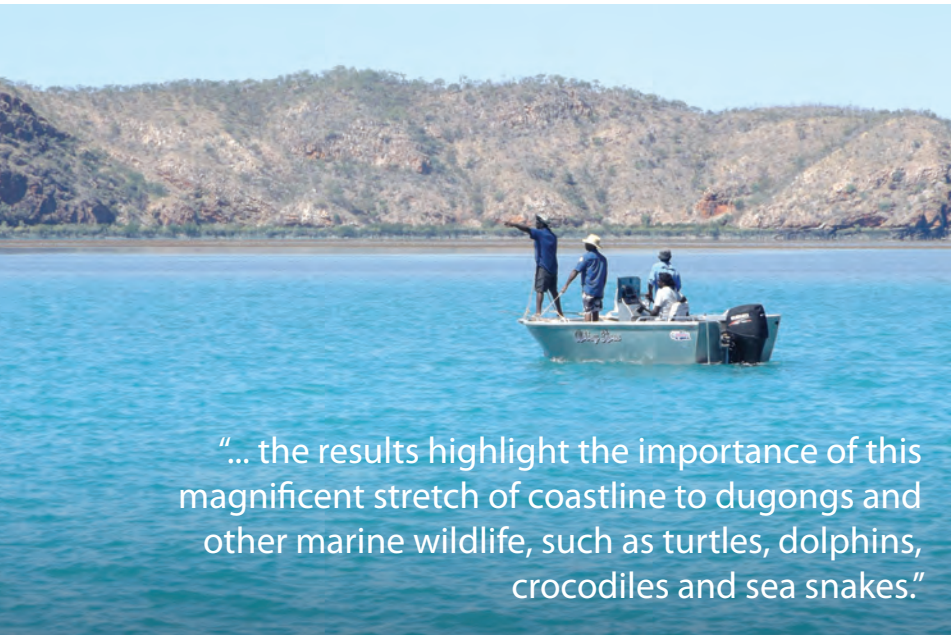
Aerial surveying is the conventional scientific method used to map and monitor



changes in the distribution and abundance of those wildlife species that can be detected, including marine mammals at the water’s surface. Aerial surveys were undertaken with Indigenous rangers between September and October 2015, and resulted in the first baseline assessment of the distribution and abundance of dugongs in the North Kimberley using standardised survey methods. Before the start of the survey, an intensive four-day aerial survey training course was run for Kimberley rangers on the survey team

at Garmbemirri ranger station, and was hosted by Wunambal Gaambera Aboriginal Corporation. Then cultural maps of important dugong areas were combined with a water depth (bathymetry) map and a map of the extent of seagrass derived from satellite images. This sharing of knowledge enabled the costly survey effort to be focussed on culturally important areas and areas of extensive seagrass most likely to have dugongs.

The results of this survey showed that dugong abundance was very patchy across



“... the results highlight the importance of this magnificent stretch of coastline to dugongs and other marine wildlife, such as turtles, dolphins, crocodiles and sea snakes.”



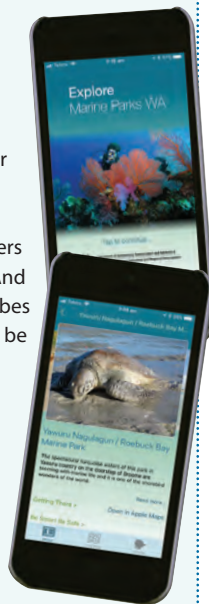
**Above** Lalang-garram / Horizontal Falls Marine Park, Talbot Bay, Dambimangari sea country.

**Above right** Researchers bring the dugong to the side of the boat to measure and tag it.  
*Photos – Jarrad Holmes*

## Explore

For more information about dugongs and other marine species, download Parks and Wildlife Service's *Marine Parks WA* app. This handy app includes a section on how to 'Explore Marine Parks' where users can toggle between the app and Apple Maps to plan their routes and check their locations. Information about zones enables users to plan their activities. And a 'wildlife' section describes the key species that can be found in each area.

*Marine Parks WA* was developed with support from the Department of Primary Industries and Regional Development Fisheries Division and Exxon Mobil Australia, and is available for free for iPhones and iPads. Search for 'Marine Parks WA' on the app store.



the North Kimberley, with distinct areas of high ('hotspots') and low ('coldspots') abundances (see Figure 1, see page 43). The overall density estimates found were similar to those in other regions of northern Australia that also have large areas of seagrass habitat in clear shallow coastal waters, generally less than 20 metres deep. A very strong relationship was found between estimates of dugong abundance and the extent of seagrass, which can be used to assess the future health of both dugong populations and their seagrass habitats.

With a study like this, it is necessary for researchers to adjust the results to correct the inevitable underestimation errors that occur by using the best available scientific knowledge obtained over decades of research. In a nutshell, no matter how good your eyesight, it's physically impossible to detect all dugongs at the waters' surface when flying as fast as 100 knots and as high as 500 feet altitude, and then there are those under the water that you just cannot see. Nevertheless, through rigorous standardisation of surveys, the counts are ideal as an indication of actual numbers because they can be used to reliably monitor trends, such as whether or not numbers are increasing, decreasing or remaining the same.

While aerial surveys provide much-needed data over large areas rapidly, the information represents only a snap shot in

time. Collecting animal observation data over a short timeframe, even when using standardised science-based methods, can still result in uncertainties due to differences in seasonal conditions at the time and how these may affect how many animals are seen where and when. As such, combining Indigenous knowledge of dugong ecology accumulated over millennial time-scales across all seasonal conditions with scientific survey data paints a more comprehensive picture. This approach, which is known as a 'Bayesian' approach, recognises alternative knowledge domains and also allows for continual knowledge updates necessary to underpin adaptive management programs. Figure 2 (see page 43) illustrates a combined knowledge map that serves to highlight important dugong areas in the North Kimberley.

## PAINTING A BIGGER PICTURE

The 2015 aerial survey targeted areas where the least information on dugong populations was available in the North Kimberley – the coastal waters between the north and east of Dampier Peninsula (including King Sound) to the NT border. Dampier Peninsula and Roebuck Bay had already been surveyed by Woodside Pty Ltd in 2009, and the Shark Bay–Ningaloo–Exmouth Gulf regions in north-western Australia had been previously surveyed many times by government and industry



between 2004 and 2016. Until May 2017, however, the coastal waters between Broome and Port Hedland, which encompass Eighty Mile Beach Marine Park, was the only section of coastline not surveyed from the air. So the WAMSI dugong project was extended to fill that survey gap, and also to re-survey Roebuck Bay. The results of this survey have recently been analysed. Figure 1 shows that while dugongs occurred along Eighty Mile Beach Marine Park, there were not as many as at Roebuck Bay and the rest of the North Kimberley. Most likely this is because there are no deep bays and hence no shelter from storms along this entire stretch of coastline. Nevertheless, the results highlight the importance of this magnificent stretch of coastline to dugongs and other marine wildlife, such as turtles, dolphins, crocodiles and sea snakes.

## MOVEMENT STUDY USING SATELLITE TAGS

An understanding of the seasonal movement patterns of dugongs in relation to the condition of their seagrass habitat, and the secrets of their long-distance movements, are essential for managing them both on and off conservation reserves and sea country. Insights are required into how big an area is needed to maintain healthy and resilient populations; their seasonal use of different habitats; their foraging, diving

and breeding behaviours in relation to seagrass condition; their dispersal patterns when environmental conditions get good or bad; and to what extent Indigenous groups and other jurisdictions share the same dugongs, which has implications for regional-scale management versus more local management. CSIRO scientists teamed up with the Bardi Jawi and Dambimangari Indigenous rangers to carry out a long-term movement and diving behaviour study in their sea country, which included the Lalang-garram / Horizontal Falls Marine Park. Bardi Jawi rangers undertook the very first satellite tracking study of dugongs in the Kimberley in 2010, and were keen to share their knowledge and skills with other researchers and Indigenous ranger groups.

As part of the CSIRO study, five dugongs – one adult female (in Talbot Bay, Lalang-garram / Horizontal Falls Marine Parks) and four adult males (all on the Dampier Peninsula just north of Pender Bay) – were caught and tagged with satellite transmitters in August 2016. Daily GPS (latitude and longitude) locations and dive data (time under the water and number of dives every six hours) were downloaded from the ARGOS satellite. Results show that the tag of one male dugong transmitted data for five months (167 days) before its battery ran out, while one tag detached from a male dugong after just two weeks but drifted around

**Above left** The satellite transmitter (white floating buoy with short antenna) is fitted to a 1.5-metre tether line that is attached to a harness or belt around the dugongs' tail. Its head is kept above water with a swimming pool noodle so it can breathe.

*Photo – Jarrad Holmes*

**Above** Mother and calf dugong.

*Photo – Bob Halstead/Oceanwidemages.com*

with the currents near Timor Leste until its battery ran out after five months. Three tags detached at various times and have since been retrieved for re-use.

Unfortunately, most of the location and dive data are short-term (one to five months) because the tags detached earlier than expected. Nevertheless, the results are fascinating as they reveal that all tagged dugongs moved large distances over very short periods of time. One young male moved more than 100 kilometres down the Dampier Peninsula from his capture site just north of Pender Bay Bardi Jawi sea country (Figure 3, see page 46). He accumulated 1,160 kilometres in his travels over 78 days, moving backwards and forwards between offshore patches of seagrass to forage. The adult female (without a calf) that was caught in Talbot Bay Dambimangari sea country moved 75 kilometres in a straight line distance from her capture point over 14 days, and ended



Figure 3 Tracking of a young male dugong



up in a large bay opposite Montgomery Reef. She travelled 325 kilometres before her tag detached in mangroves – an average of 23.2 kilometres per day. The 1.5-metre tether line attached to the tail harness of the dugong at one end and the transmitter buoy at the other, has an intentionally weak link that breaks to release the tracking gear should it become entangled in mangrove roots or reef, preventing the dugong from drowning.

Continuing movement studies in sea country and jointly managed marine parks is possible by recycling retrieved transmitters and replacing lost ones, and will provide valuable long-term data on seasonal movement and activity patterns, particularly in relation to the condition of seagrass habitat and other environmental conditions.

### POSITIVE BEGINNINGS

These results are providing a fascinating insight into the lives of dugongs. Combining this data with knowledge held by Indigenous people, which has been collected over eons, has enabled the identification of key ‘hotspot’ areas for future monitoring and assessment purposes. This information is critical to better understanding future changes in dugong populations and how they respond to a range of potential pressures, such as climate change, increased coastal development and human activity, and sustainable Indigenous harvests.

Researchers are optimistic that the trialled partnership model has a great future because the Indigenous rangers

**Above** Rangers measuring and attaching a satellite transmitter to the dugong’s tailstock before releasing it 15 minutes later in good health.

*Photo – Jarrad Holmes*

**Above left** (Figure 3) A young male dugong was tracked for 78 days in August 2016 in Bardi Jawi sea country (just north of Pender Bay on the Dampier Peninsula).

**Below** Dugong at Monkey Mia.

*Photo – Emily Hamley*

have long championed the critical two-way learning process. And, while this joint venture has only just started, it has already produced some exciting new insights into dugongs at both the individual and regional population levels.

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*If you would like to know more about CSIRO’s research in the Kimberley visit [www.csiro.au](http://www.csiro.au).*

*Thanks to all the Indigenous rangers in the North Kimberley who took part in field studies, and their Healthy Country managers on the project steering committee (Tom Nagle – Balanggarra; Tom Vigilante – Wunambal Gaambera-Uunguu; Jarrad Holmes and James Mansfield – Dambimangari; Daniel Oades and Phillip McCarthy – Bardi Jawi). For project support, thanks also to the Kimberley Land Council, WAMSI (Stuart Field and Kelly Waples) and DBCA marine parks staff (Leah Pearson and Chris Nutt), Yawuru (Dean Matthews) and Karajarri (Sam Bayley) ranger groups for input into the Roeback Bay and Eighty Mile Beach dugong surveys, CSIRO staff (Emma Woodward, Rich Pillans, TJ Lawson) and consultants (Glenn Dunshea, David Waayers, Daniella Hanf, Richard Campbell). Thanks also to Woodside Pty Ltd (Ben Malseed) for providing WAMSI with access to the 2009 aerial survey data for dugongs.*

*The \$30 million Kimberley Marine Research Program is funded by a major State Government investment through WAMSI partners and supported by the traditional owners of the Kimberley.*

*This dugong study was made possible through a collaborative approach to conservation in the Kimberley in partnership with WAMSI and CSIRO and with support from the traditional owners of the Kimberley*



*Touched by nature*



# Following families traditions

For the past 23 years, ecoguide Gary Muir has run the famous WOW Wilderness EcoCruises in the heart of the Walpole Nornalup National Park and the Walpole and Nornalup Inlets Marine Park. Through his business and connection with the community, he is able to share his passion for this remarkable part of the world, which he and his family have been connected to for generations.

*by Tracy Shea*

photos supplied by Gary Muir



The Muir family is undeniably part of the fabric of the south-west. Even those who are not familiar with the pioneering family, are at least familiar with the iconic infrastructure and geographic features that bear the famous name.

The family's association with the area extends back to 1844, when Andrew and Elizabeth Muir – Gary Muir's great, great, great grandparents – moved to Western Australia from Scotland. The Muirs carried out backbreaking work in a hostile and unfamiliar landscape to develop agriculture on the south coast.

## NATURE LOVERS

While they were pioneering the landscape, the family amassed a knowledge about the local biodiversity. They also unravelled many of the issues associated with farming on this unique landscape, including some – such as the poison 1080 – that are still used in conservation and land management today. The family also developed a special relationship with the local Indigenous people and many of the Muirs could speak the local dialects of the Murrum, Minang and Bibbulmun people. This affinity with and respect for the natural environment has been passed down from generation to generation and has shaped the way the Muir family continues to carry out its business.

## NEXT GENERATION

Gary Muir was born on a remote farm on the Muir Highway surrounded by jarrah forest. During his high school years, a bushfire threatened the family farm and Gary worked alongside forestry firefighters to protect the property – marking his first interaction with the Forests Department. It was around this time that Gary made another significant connection – this time with DBCA Director General Mark Webb, who was working for the Department of Agriculture and encouraged Gary to pursue biology. Over the next few years, Gary connected with department alumni Per Christensen, Neil Burrows and Greg Mair. Initially bonded by a love of long-distance running, it was their shared interest of the natural world that influenced



Gary's decision to pursue forestry. In particular, weekly drives to running training with Per Christensen through dieback-infested areas helped Gary appreciate the interconnectedness of forest ecosystems. His passion was fostered by the science and geography teachers of Manjimup Senior High School and led to him joining the Forestry Cadet School, alongside his best friend Brad Ellis, in 1984.

## GROWING A CAREER

After completing Forestry Cadet School, Gary was posted to the Department of Conservation and Land Management (CALM) offices in Jarrahdale and Manjimup before moving to Walpole. It was here that he helped design and develop sites significant to his family's heritage, including at Hilltop Tingle Tree, John Rate Lookout, Conspicuous Cliff, Harewood Forest Walk, Hilltop Lookout and Mandalay Beach as well as the Bibbulmun Track. A particular highlight was working on the site at Fernhook Falls, which was transformed from a gravel parking area to a completely redeveloped and interpretive day-use area, canoe launch and new camping area with huts and slow-combustion fire places.

*Previous page*

**Main** The stunning Walpole Wilderness Area.

**Inset top** Gary Muir.

**Inset left** Gary leads school groups as part of the UR Walpole EcoEducation Program.

**Inset right** Local Aboriginal men boating with the Muir family at the Nornalup Inlet in the 1900s.

*Photo – Settler footprints from Star: Muir Family: Pioneers of the South West and Eucla, Western Australia, 1844–2005.*

**Above** WOW Wilderness EcoCruises are popular among visitors to the area.

Gary took every opportunity to spend time in different parts of WA. He travelled through the State's north where he saw first-hand the potential for water-based experiences at Geikie Gorge. He also spent time with Aboriginal communities in the Top End. After Gary returned to the south coast, a chance meeting with then CALM regional manager Kevin Vear led to a job as the project leader for the Valley of the Giants Tree Top Walk development team. Gary spent a year working with the department's landscape architects, engineers and an environmental artist to design the magnificent new attraction.

## THE NEXT CHAPTER

Gary left the department to manage his farm and establish his own ecotourism business with his parents Ross and Marion. They began with 4WD safaris in the Walpole Nornalup National Park and then bought the two vessels operating on the Walpole and Nornalup inlets. With Gary and Ross's depth of knowledge, and their gift of the gab, what is now known



“To share these places and their stories with friends, to me is the secret for enjoying life.”

as WOW Wilderness EcoCruises soon became legendary.

Gary’s tours are reflective of his belief that communication is one of the most important tools for effective environmental management, and he revelled in the opportunity to enhance visitors’ experiences through interpretation. He also invested time and resources into local natural and cultural heritage through ‘ecoprojects’. This resulted in WOW taking part in a five-year research project to look at the impact of fire on biodiversity following a bushfire that burnt through the Nuyts Wilderness Area in 2001, which involved volunteer community members collecting the data. Then, in 2002, Gary embarked on a gruelling record-breaking attempt to run the entire Bibbulmun Track to raise money for the project. In 17 days, Gary completed the 1,000-kilometre track in harsh winter conditions. While the run took its toll on Gary physically, it boosted the resources available to research and conservation.

The same year, he received the inaugural EcoGuide of Australia Award and the 2003 Forum Advocating Cultural and Eco-Tourism (FACET) Golden Guide Award for his ecotourism and education ventures.

Gary continues to give back to the local community through the award-winning UR Walpole EcoEducation Program, which aims to involve local community, government and industry in the education of local kids. Further afield, he has been sponsored by Rotary as part of an international ambassadorial team to plan an international peace park – a partnership

between Australia and Turkey – at Gallipoli; been involved in a renewable energy project in Nicaragua, park management in St Lawrence National Park in Canada; and taken an intriguing expedition to Russia to trace the origins of some photos and papers involving Russian writer Leo Tolstoy that were found in a boatshed at Rest Point in Walpole. But that’s a story for another day!

Always up for adventure, Gary has also attempted to cross the Gobi Desert on a folding bike; kayaked from the Pacific to the Atlantic from Lake Nicaragua to the Caribbean while fending off spider monkeys, camping with jaguars, kayaking alongside crocodiles and snowboarding down a live volcano; kayaked and biked across Sweden; lived off the land while white-water kayaking through Finland; and mountain biked in the Austrian Alps. He even makes a point of camping out every Thursday night, no matter where he is in the world.

In 2017, Gary also joined a team of managers and scientists on *Project Dieback*, which led to the development of the Phyto Fighter 1,000 Dieback Boot Cleaning Station. The Phyto Fighter 1,000 was a finalist in the United Nations Environment Award in 2012 and Gary’s work in dieback contributed to him being awarded the Great Southern Development Commission’s National Research Management Medal of Excellence in 2014. The PF 1,000 units, which are made by

Gary’s cousin Rob Pernich, are now being used in special protected areas in WA, Tasmania, Queensland, NSW and New Zealand.

### THOROUGHLY COMMITTED

Gary continues to be motivated by the legacy left by his forefathers. He believes that it was through the stewardship of many unsung heroes of the past, who were so moved by WA’s uniqueness, beauty, biodiversity and long natural and cultural history that they worked to influence others to conserve these natural areas.

“WA’s parks really are priceless, filled with so many jewels that lay hidden, and safeguarded, yet there are endless ways to explore and discover them time and time again. To share these places and their stories with friends, to me is the secret for enjoying life. This is why I love WA parks. To see these areas really change people and build their own appreciation for our wild places is amazing and will hopefully lead to us recognising we may have still more unprotected wild places to be respected and reserved,” he said.

.....  
**Above from left** Gary has fond memories of his time at the Forestry Cadet School; Gary helped develop the Tree Top Walk; Gary helped create the Phyto Fighter 1,000 Dieback Boot Cleaning Station.

*Photo – Tracy Shea/DBCA*

**Tracy Shea** is the Parks and Wildlife Service assistant director policy and planning. She can be contacted on (08) 9219 8755 or by email ([tracy.shea@dbca.wa.gov.au](mailto:tracy.shea@dbca.wa.gov.au)).

# RISING FROM THE ASHES: REBUILDING OUR TRAILS

In February 2015, several large, intense fires burnt in the State's south-west. After the flames had been extinguished and the mopping up completed, the long recovery phase began to rebuild two of WA's most iconic trails.

*by Kerstin Stender*



**Inset top** The historic Long Gully Bridge that once extended over the Murray River was destroyed by fire.

**Inset above** Numerous signs and markers were damaged by the fires and a number of camp sites were lost.

*Photos – DBCA*

In early February 2015 a low-pressure system and its associated thunderstorm activity passed through the State's south-west sparking numerous fires. The fires stretched the resources and capacities of both the former departments of Parks and Wildlife and Fire and Emergency Services and, at the peak of the firefighting efforts, firefighters from New South Wales, Victoria and Queensland were flown in to assist our exhausted crews. Three of the fires – the Helena National Park fire east of Armadale, the Lower Hotham fire in Lane Poole Reserve and State forest between Dwellingup and

Collie, and the O'Sullivan fire between Northcliffe and Walpole – caused significant damage to visitor facilities on the Bibbulmun Track and the Munda Biddi Trail. The O'Sullivan fire alone burnt through more than 98,000 hectares of national park, State forest and private property, including almost 40 kilometres of the Bibbulmun Track and 70 kilometres of the Munda Biddi Trail.

## SURVEYING THE DAMAGE

For several weeks fire crews worked to contain the fires and mop up the boundaries to ensure the fires did not



**Above** The historic Long Gully Bridge (also known as Asquith Bridge) was built between 1949 and 1952.

*Photo – Rail Heritage WA*

**Top far right** The remains of Brookton camp site after the fire.

*Photos – DBCA*

re-ignite or escape containment lines. Once the fires had been put out, work shifted to the recovery phase when the magnitude of the damage could be assessed. Department staff inspected the damage, including the impacts on the two trails, once the roads and access tracks had been checked and cleared of fallen trees and other dangers.

It was obvious from the outset that large sections of the two trails would be closed for an extended period, due to the damaged infrastructure and the risks of trees falling or limbs dropping. So work began immediately to put in temporary diversions around the large fire grounds and re-connect the affected sections.

As the smallest fire, the Helena National Park fire was the first fire ground to be inspected. This revealed that the Brookton camp site – located 2.5 kilometres from the Brookton Highway – on the Bibbulmun Track had been completely destroyed.

The initial inspection of the Lower Hotham fire was completed in early March. This confirmed the loss of the Bibbulmun Track shelter at Possum Springs camp site. And, unfortunately, revealed that the fire had also consumed the

beautiful and historic Long Gully Bridge, which extended over the Murray River.

The Northcliffe fire was both the largest and most difficult to assess, with access severely restricted due to safety concerns and damaged highways, roads and bridges. Initial reports from the air had indicated that the Dog Pool camp site on the Bibbulmun Track was still standing. But ground crews found no walls under the steel roof that was visible from the air. While the Gardner and Dog Pool camp sites on the Bibbulmun Track were lost, the Yirra Kartta camp site on the Munda Biddi Trail had repairable, albeit substantial, damage. Several bridges were affected, including the bridge across the Shannon River, with some requiring replacement and others only minor repairs. Countless trail markers were burned beyond recognition, which necessitated an extensive remarking of all of the burned sections.

## GETTING DOWN TO BUSINESS

As well as carrying out the initial inspections, coordinating insurance claims and site visits with the assessors, department staff began progressing the rebuilding program, so works could start as soon as funds became available.

The fires highlighted the resilience of the steel shelters on the Munda Biddi Trail, which sustained only damage, compared to the total loss of so many timber shelters on the Bibbulmun Track. As such, a new fire-resistant shelter design was developed for the Bibbulmun Track based on the design of the track's southern Nornalup camp sites. This saw the timber frame and walls replaced with

more fire-resistant rammed earth and all flammable materials replaced with non-flammable, with the exception of the plywood bunk bases, which were retained to preserve sleeping comfort. Work on these shelters began in January 2016 and was undertaken by contractors with support from department staff and volunteers.

The impact of these fires, and the devastation they caused to the two trails, created significant community interest. Offers of assistance were received and the department, the Bibbulmun Track Foundation and the Munda Biddi Trail Foundation engaged the community in the process of rebuilding the two damaged trails, including harnessing donations for the works not covered by insurance. The fires and extensive trail closures resulted in loss of visitors to the fire-affected areas so visitor information was put together to identify and promote the open sections of the trails.

## NEW BEGINNINGS

Recovery and rebuilding after the fires took up a good part of 2015, with several bridges reopened and camp sites rebuilt and repaired. Many of these projects were still underway when, in January 2016, fires again impacted the trails across several locations. A devastating fire burnt through more than 70,000 hectares, claimed two lives, decimated the town of Yarloop and destroyed more than 160 houses. The fire had a perimeter of 400 kilometres and it also damaged the Murray camp site on the Bibbulmun Track and the Munda Biddi Trail's Bidjar Ngoulin camp site. Several



**Above** Volunteers from the Bibbulmun Track Foundation helped rebuild the Brookton camp site.

**Above right** Volunteer Ross Simpson places a marker on the new alignment of the Bibbulmun Track near the Bilya Djena Bidi. Photos – Kerstin Stender/DBCA

major bridges on the Munda Biddi and Waterous trails were also destroyed.

A smaller fire a bit further north, in Ashendon, also destroyed a major boardwalk on the Bibbulmun Track. However, amazingly, the Canning camp site survived the fire, which destroyed the adjacent tent site signs only metres away.

After the flames had been extinguished, department staff got back to work doing post-fire infrastructure assessments, insurance claims and rebuilding camp sites, bridges and steps. Again, more than 100 kilometres of trail had to be checked and remarked.

Most of the infrastructure losses were covered by insurance, but the most expensive, the historic Long Gully (Asquith) Bridge was excluded. The Long Gully Bridge, which stretched over the Murray River, was a key connection for the Bibbulmun Track in Lane Pool Reserve. The 128-metre-long timber trestle bridge was built between 1949 and 1952 as a railway extension to service the harvesting operation of the Asquith Timber Companies. It was eventually closed to rail and vehicles and became part of the Bibbulmun Track in 1997–98.

## BUILDING A BRIDGE

It was quickly apparent that the historic Long Gully Bridge would not be repaired, so plans began to replace it with

### ***To assist with the prevention of fires and to stay safe during the bushfire season:***

- Plan your visits for cooler periods of the year, avoiding the hot summer months.
- Check the Fire Danger Rating at [www.emergency.wa.gov.au](http://www.emergency.wa.gov.au) and do not go on the trails if the forecast is Very High or above.
- Do not do extended multi-day trips as it is not possible to keep up with the changing conditions as there is extremely limited mobile phone coverage and it is difficult to self-evacuate from the trail at short notice.
- Avoid remote sections of the trail where there is limited vehicle access.
- Abide by all trail closure signage, and any instructions from Parks and Wildlife Service and other emergency services staff and volunteers.

a new state-of-the-art suspension bridge. The location for the new bridge was selected several kilometres downstream of the Long Gully Bridge site and plans were developed. With an overall length of 92 metres, or 82 metres between the towers, the design included two 12-metre towers that hold the bridge deck six metres above the summer river level. Weathering, a form of rusting steel, was used for the main part of the structures, including the towers and hangers to help it to blend in with the environment. The Gnaala Karla Booja traditional owners named the bridge Bilya Djena Bidi (pronounced beel-ya jenabidi), which means (swinging) river foot bridge.

The historic value of the Long Gully Bridge, and its role in guiding walkers on the Bibbulmun Track, helped generate community support for its replacement, which was provided in the form of donations and volunteer contributions during the fire clean-up and rebuilding phase. The Bibbulmun Track Foundation, through its members and friends, was able to fundraise a substantial contribution

towards the new bridge, while the Peel Development Commission and Alcoa Australia also provided financial assistance. All of the bridge contractors – BG&E Pty Ltd, Duratec Australia and Bocol Constructions – provided in-kind donations of their work.

The new bridge was opened to hikers in the beginning of July 2017, just before the winter river water level rose, which would have made the Bibbulmun Track impassable at the diversion crossing point.

While the 2015 and 2016 fire seasons were unprecedented in their severity and destruction, fire is an inevitable part of our landscape. It is hoped that the new infrastructure will be more resilient to fires and will enhance the experiences of the walkers and riders on these two great trails for years to come.

**Kerstin Stender** is the DBCA tracks and trails coordinator. She can be contacted on (08) 9219 8382 or by email ([kerstin.stender@dbca.wa.gov.au](mailto:kerstin.stender@dbca.wa.gov.au)).

## Activities galore at Perth Zoo

Kids of all ages are getting up-close to some of the world's most interesting and endearing animals, as part of the Perth Zoo's Discovery and Learning programs.

These programs are designed to educate and inspire children to develop a love and appreciation of wildlife and wildlife conservation.

As part of the 'Keeper Kids' activity, kids between five and seven are given a fun introduction to wildlife, including hands-on experiences and games and trails around the Zoo.

In 'Zoo Crew', eight to 13-year-olds help keepers assemble enrichment items for some of the animals and learn about what is involved in caring for them.

Eleanor, aged 10, and Tom, aged 12, had the opportunity to create enrichment items to keep the Zoo's inquisitive gibbons amused.

"We could choose if we got a parcel or a bag and we filled it with a few treats, like primate mix," Tom said.

"The gibbons need to be doing something fun and interesting, it was sort of funny and made me happy seeing them get to the food," said Eleanor.



### Did you know?

- Since its opening almost 120 years ago, the Perth Zoo has not closed one single day!
- Perth Zoo is home to more than 1,400 animals representing 169 different species.

'Wild Vets' gave students aged between 14 and 18 the opportunity to spend the day with an experienced zoo veterinarian. The session takes aspiring vets behind the scenes to learn how the Zoo cares for wildlife, with a variety of activities and animal encounters along the way.

Perth Zoo's discovery and learning manager Kelsie Prabawa-Sear said it was wonderful to give young 'keepers' and vets-to-be an opportunity to learn about conservation and for them to see what role they could play.

"They develop a love of and appreciation for all wildlife, and can connect with the animals they love and those who work with them," Kelsie said.

Along with the educational programs, the Zoo also has two close encounter experiences that are suitable for people of all ages. 'Bush Buddies' includes a behind-the-scenes visit with the Zoo's most popular native animals, such as 'Nolga' the western grey kangaroo and 'Alia' the quokka. 'Scaly Mates Eye to Eye' is a fun way to meet and have a gentle hands-on encounter with a selection of reptiles, including snakes, lizards and tortoises.

To find out more about the school holiday programs and close encounter experiences at Perth Zoo, visit [perthzoo.wa.gov.au](http://perthzoo.wa.gov.au)





## Carnaby's black cockatoo (*Calyptorhynchus latirostris*)

Carnaby's black cockatoos feed on the seeds of a range of native and introduced plants, including eucalypts, banksias, hakeas and grevilleas. They use their strong beaks to open the seeds and often leave a mess of seeds on the ground under where they've been feeding.

Illustration by Gooitzen van der Meer

Reference photo by Rick Dawson



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