

WA'S PARKS, WILDLIFE AND CONSERVATION MAGAZINE

LANDSCOPE

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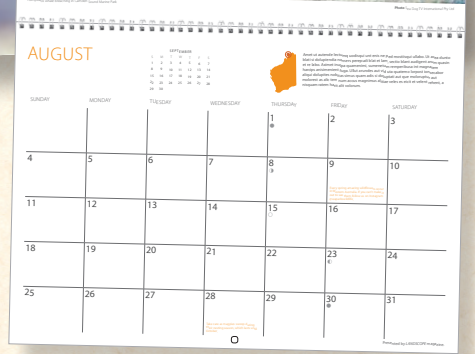
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Department of Biodiversity,
 Conservation and Attractions



ON THE COVER

Front cover The swamp starflower (*Calytrix breviseta* subsp. *breviseta*) blooms from October to November in winter-wet sandy soils near the base of the Darling Scarp. The shrub grows to 40 centimetres and has small leaves and, as its common name suggests, it produces beautiful star-shaped purple-blue flowers. Swamp starflower is considered critically endangered and there are currently only two populations.

Back cover Red-capped robins.
Photos – Sallyanne Cousans

Western Australia's natural biodiversity is world-renowned. We have an amazing abundance of native species, and a wide range of diverse environments in which they occur. Protecting and conserving these natural assets is an immense yet fulfilling responsibility.

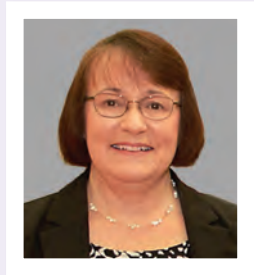
Our effort to achieve conservation of the nature of WA was bolstered on 1 July 2017 when the Department of Parks and Wildlife, Zoological Parks Authority, Rottnest Island Authority and the Botanic Gardens and Parks Authority were brought together to become the Department of Biodiversity, Conservation and Attractions. The new department provides an exciting opportunity for a more consolidated approach to conservation of our iconic biodiversity and to increase our capacity to build and share biodiversity knowledge.

Since the amalgamation, we have been working to capitalise on the opportunities we have to effectively and efficiently continue and expand our work. A significant part of this has been to develop the *Science Strategic Plan 2018–21*, which provides a framework to guide the department's science function that aims to deliver excellent science to inform effective conservation (see 'Strategic science: planning the future' on page 10). Biodiversity knowledge is critical to underpin conservation and management of our biodiversity, enable appreciation and enjoyment of our natural assets, as well as to inform decision-making for environmental sustainability and economic development.

Another significant milestone for conservation in WA in recent times has been the proclamation of the new *Biodiversity Conservation Act 2016*, which you can read about on page 28. This act provides the legal foundation for protecting and conserving WA's biodiversity and recognises the role of individuals, community groups and corporations in this endeavour. The Biodiversity Conservation Act replaces the outdated *Wildlife Conservation Act 1950*, and reflects modern-day approaches to conservation and land management.

Science is central to effective conservation and appreciation of our natural assets, as you'll see in the other stories contained within this issue. I am optimistic that by working with the community and other stakeholders, guided by the new *Science Strategic Plan* and within the parameters set by the new legislation, the department is well placed to protect and conserve our unique and diverse natural values.

Dr Margaret Byrne, Executive Director, Biodiversity and Conservation Science
Department of Biodiversity, Conservation and Attractions



Contributing

Sophie Moller is a DBCA principal policy officer. She has been working on the Biodiversity Conservation Act and its regulations since July 2013. Prior to that, she worked in a range of nature conservation programs. Before joining the department in 1999, she worked in the Commonwealth Government's environment portfolio. She has a Masters degree in Environmental Law and a Bachelor of Science degree from the Australian National University.



Sophie Henderson is a media relations officer with DBCA. Before starting her role with the department in 2016, Sophie worked as a journalist at a number of Western Australian publications including the *Guardian Express* and *Avon Valley Gazette* (Community Newspaper Group), and *The Sunday Times*. Sophie is passionate about journalism and has an interest in the history and cultural heritage of WA.



Carl Gosper is a research scientist working on projects jointly supported by DBCA's Biodiversity and Conservation Science, and CSIRO Land and Water. He is especially interested in investigating the effects of fire, particularly time since fire, on the composition and structure of plant and animal communities of the Great Western Woodlands and Wheatbelt, and the ecology and evolution of non-resprouting eucalypts.



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This page Karijini National Park.

Photo – Mark Wassell



Department of Biodiversity, Conservation and Attractions

Features

- 8 Parks for People: Shannon National Park**
Showcasing the giants of the southern forests.
- 10 Strategic science: planning the future**
A new focus for WA biodiversity science and conservation.
- 18 Collecting seeds and capturing culture**
Supporting a time-honoured tradition.
- 22 Remote refuges: Pilbara inshore islands**
Havens for threatened and protected species.
- 28 New future for biodiversity conservation**
Greater protection for Western Australia's natural values.
- 37 Menacing or misunderstood?**
Understanding the behaviour of swooping magpies.
- 41 Highlighting heritage**
Riverpark trail celebrates Australia's Sikh history.
- 46 Adventure out: Geikie Gorge National Park (Danggu)**
A new way to discover an ancient landscape.
- 49 Touched by nature: Doug Coughran**
Remembering WA's 'Wildlife Warrior'.

Regulars

- 3 From the desk of Dr Margaret Byrne**
A foreword from the Executive Director, Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions.
- 6 Bush telegraph**
Short stories from around the State, readers' pic and a guest word.
- 27 Discovered**
Using ants to find a butterfly.
- 40 In review**
A collection of books and applications.
- 53 Kaleidoscope**
Connecting kids with nature.
- 54 Nature's pin-up**
Red-winged parrot (*Aprosmictus erythropterus*).





READERS' PIC

White punk fungus (*Laetiporus portentosus*)

Photographers Martyn and Judi French

"We took this photograph of a white punk fungus (*Laetiporus portentosus*) while walking in Perry Lakes, Floreat with our grand-daughter Mica (aged two-and-a-half). These fungi can be found on quite a few trees in the park during winter and we like to look at their different shapes and talk about what they look like. This one reminded us of a shark's head, which Mica thought was very exciting. Nature observation with children is much more effective and enjoyable when fun is involved."

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.

Rehabilitated cockatoos take to the skies

The 500th rehabilitated red-tailed black cockatoo has been released back into the wild.

The cockatoo was treated by vets at Perth Zoo before spending time at Kaarakin Black Cockatoo Conservation Centre. It was then released at a farm site near Boddington, fitted with satellite and GPS tags.

This monitoring, which is a collaboration with Murdoch University, revealed that the cockatoo joined a large resident flock of black cockatoos at Hotham Farm, a 450-hectare restoration area about 120 kilometres south-east of Perth. Hotham Farm is owned by project co-funder Newmont Boddington Gold.

The tail-mounted satellite tags gather data eight times a day, while the back-mounted GPS transmitters provide valuable data every two-and-a-half minutes. This precise tracking enables researchers to closely follow the birds.

Newmont Boddington Gold and South32 Worsley Alumina provided financial support for the project. Murdoch University



Above Rehabilitated cockatoos being released.

Photo – Keith Lightbody

researchers are collaborating with staff from DBCA's Parks and Wildlife Service and Perth Zoo and the Kaarakin Black Cockatoo Conservation Centre.



Wildflower wonderland at Kings Park

Thousands of stunning wildflowers from all over Western Australia will be on show at Kings Park and Botanic Garden during September.

Now in its 55th year, the month-long Kings Park Festival is one of Australia's longest-running festivals and will feature free guided walks, exhibitions, live music, science talks and other activities.

Iconic WA wildflowers like kangaroo paws, fairy orchids, Qualup bells and masses of pink everlastings are just some of the 3000 plant species growing in the park.

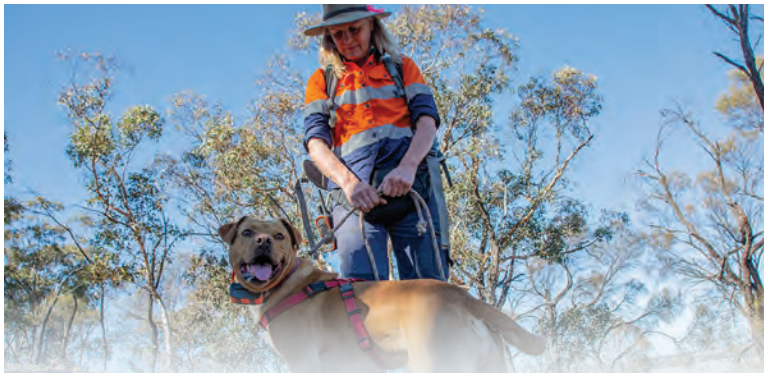
The festival is proudly hosted by the Botanic Gardens and Parks Authority and the Friends of Kings Park, with the generous support of Lotterywest.



Left and right Kings Park Festival showcases WA's spectacular wildflowers and attracts thousands of visitors each year.

Photos – Jason Thomas and DBCA

Guest column



Feral cats sniffed out in the Wheatbelt

Expertly trained dogs are being used in a trial to detect feral cats in the Wheatbelt, as part of a new measure to protect threatened species such as numbats and woylies.

Three dogs – a Malinois, a Terrier cross and a Labrador cross – and their handlers have been working in Tutanning Nature Reserve, near Pingelly, to test the dogs' effectiveness in detecting feral cats and identifying areas of high cat activity. The dogs are trained to detect only and not harass the cats or native animals.

Data collected during this trial will help inform decisions about how, when and where to target feral cats. The work complements broad-scale fox and feral cat baiting under DBCA's Western Shield wildlife recovery program.

Tutanning Nature Reserve is home to several threatened species that are vulnerable to feral cat predation, including numbats, woylies, chuditch and red-tailed phascogales.

The trial is funded by the Foundation for Australia's Most Endangered Species (FAME), with a matching grant from the Australian Government, and is being carried out by DBCA's Parks and Wildlife Service, and Biodiversity and Conservation Science.

Above Dog handler Dr Sue Robinson from Latitude 42 with one of the detector dogs.

Photo – Peter Nicholas/DBCA

Addendum

Last issue we brought you the story of work being carried out to monitor birds at Matuwa (see 'Monitoring Matuwa and Kurrara Kurrara: a labour of love', LANDSCOPE, Winter 2018). In it, we acknowledged the contribution of consultant and founder of Insight Ornithology Simon Cherriman. However, we failed to acknowledge that Simon's environmental education and research into wedge-tailed eagle population is endorsed by Martu elders and made possible thanks to major sponsorship provided by the Goldfields Environmental Management Group (GEMG). LANDSCOPE apologises for this omission.

Right Simon Cherriman on Martu Country.

Photo – Renae Boyd



Professor Peter Klinken AC
Chief Scientist of Western Australia

One of my primary roles as Chief Scientist of Western Australia is to enhance and encourage collaboration on a local, national and international

level. Indeed Western Australia has some outstanding scientific minds – scientists who have produced world-class research and exciting and significant discoveries. These people have usually shared their journey with numerous colleagues, collaborators and mentors in a collaborative approach to excellence. In the same way, government departments, universities and research institutes are joining forces to expand innovative science and technology.

One significant step towards this collaborative approach for biodiversity science and conservation of WA's natural environment was the creation of the new Department of Biodiversity, Conservation and Attractions that builds on existing partnerships and presents exciting opportunities to ensure biodiversity knowledge underpins effective biodiversity conservation. So it is pleasing to see that the department's new *Science Strategic Plan* provides a strong vision for how this scientific excellence will be delivered and achieved.

Biodiversity and marine science are priorities in WA where scientific knowledge is essential to ensure we conserve, appreciate and value add to the unique biodiversity we have around us. Science and research underpins Western Australia's future as a thriving place to live and work, enables us to value our natural assets and to effectively and efficiently manage those assets for the benefit of all Western Australians.

In biodiversity and marine science we have successful collaborations established through the Western Australian Marine Science Institution (WAMSI) and the Western Australian Biodiversity Science Institute (WABSI), which are joint ventures among research institutions, State Government bodies and industry. These alliances are focussed on delivering high quality, relevant biodiversity knowledge that is widely available to support decision-making and management.

These are just a few examples of the fantastic science collaborations that exist around the State that demonstrate we are embracing our shared responsibility of valuing and conserving our natural environment by working together through innovation, collaboration and creativity.



Shannon National Park

Located at the north-western end of the Walpole Wilderness, Shannon National Park provides a perfect setting for exploring the giant trees of the southern forest and can be used as a base for discovering all this area has to offer. And now, thanks to a new campground and facility upgrades, it's even better than ever.

There's no doubt that Western Australia houses an abundance of beautiful places to visit. But there's something inherently soul-enriching about standing at the base of an ancient tree that soars into the sky – it gives you the humbling sense that you are one tiny part of a gigantic landscape, while providing you with a sense of belonging to something much bigger than yourself. Just a little more than 350 kilometres from Perth and 55 kilometres from Manjimup, Shannon National Park boasts some of the State's most magnificent old-growth forest and provides a range of ways for visitors to experience it.

Above The stunning Shannon National Park.
Photo – Bron Anderson/DBCA

Opposite page

Top Exploring Mokare's Rock.

Photo – Brett Dennis/Lochman Transparencies

Centre Purple-crowned lorikeets are one species found in the park.

Photo – John Anderson

Right The new Shannon Campground.

Photo – Damon Annison

STEP BACK IN TIME

What is now known as Shannon National Park was locally important to the Wagyl Kaip people, the traditional custodians of the area. There are 21 sites of significance registered under the Aboriginal Heritage Act in Shannon National Park and the neighbouring D'Entrecasteaux National Park.

The European name given to Shannon National Park comes from the HMS *Shannon*, an English Royal Navy ship that defeated an American frigate in 1813. The area was one of the last in the south-west to be opened up to logging and it was largely untouched until the mid-1940s when a shortage of timber during WWII led the State Government to begin timber cutting there. By the late 1940s, the town and timber mill were established. During the 1950s and 1960s, the town had 90 houses as well as a butcher, baker, general store, post office, nursing station, church, school and a town hall. The government-owned mill was sold in 1961 and then closed in 1968 when the new owners rationalised their timber



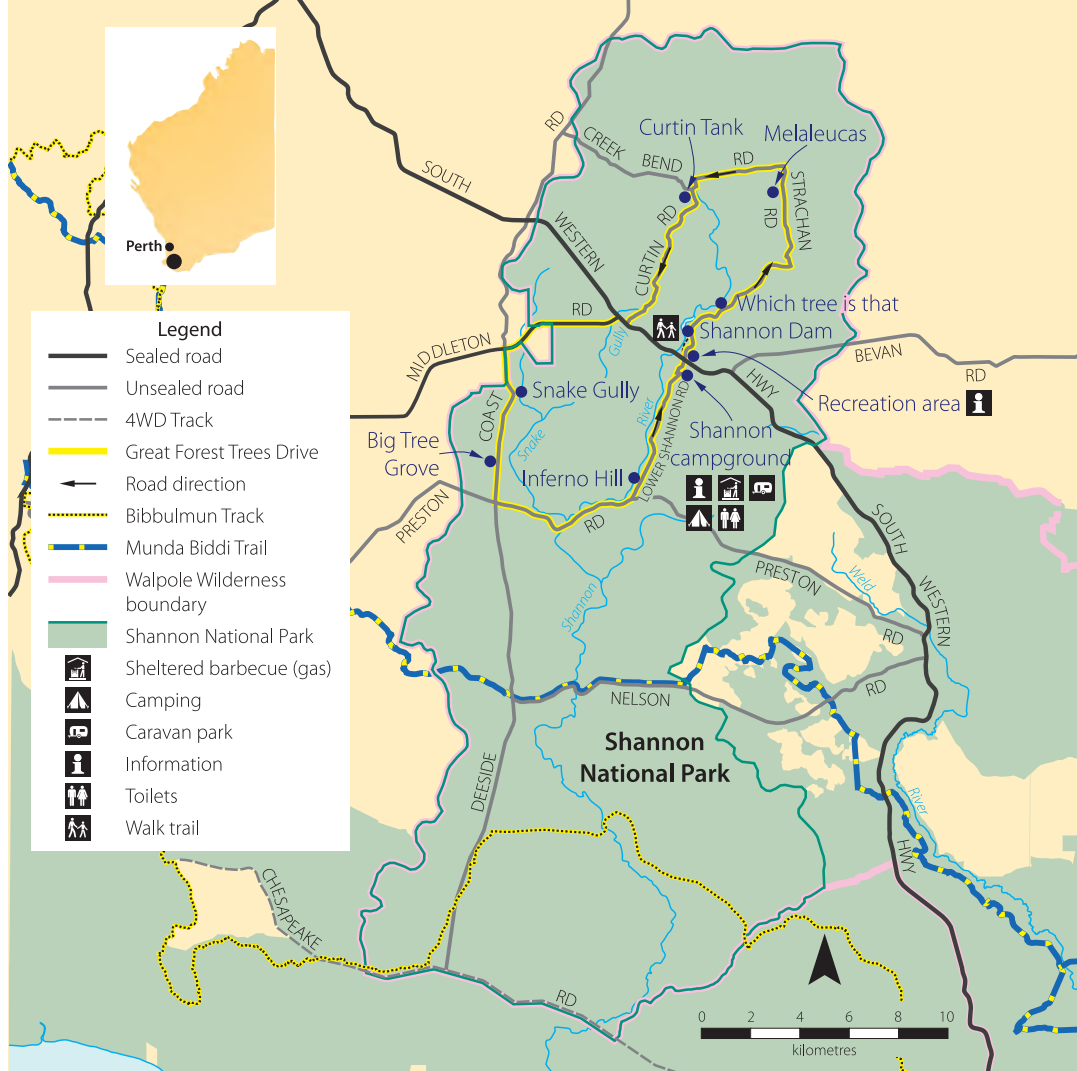
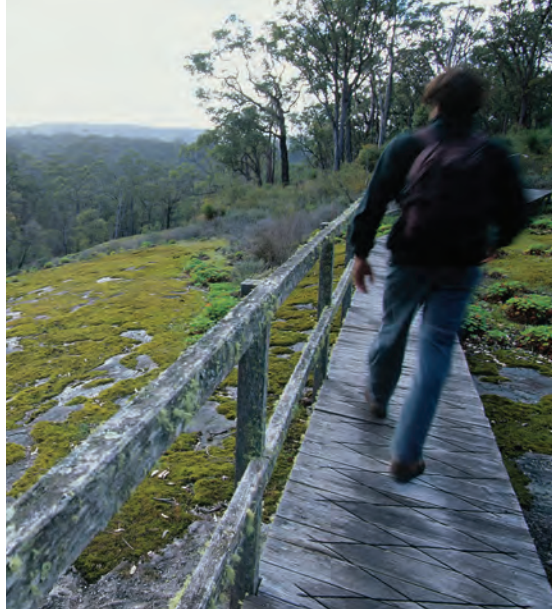
Discover more about
Shannon National
Park

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business. Most of the Shannon workforce was transferred to the Pemberton Mill and the houses and buildings were sold and transported away. A 'Return to Shannon' reunion was held in 2017 for those who were connected to the area. Interpretation throughout the park, including as part of the Great Forest Trees Drive, gives visitors insight into what life was like in the area in yesteryear.

By the end of the 1980s, a 55,598-hectare area was gazetted as Shannon National Park to protect its stunning natural values and important ecosystems. Since then, it has become a popular destination for people who are lured by its magnificent beauty and the opportunity to see some of WA's most



stately karri trees, which can grow to more than 90 metres tall, as well as its beautiful stands of jarrah, marri, bullich, paperbark and blackbutt. Last year, the park attracted approximately 45,000 visits.

WIDE APPEAL

Shannon National Park has something for everyone. Visitors can try to spot some of the local birds, bushwalk on one of the park's three tracks or take in the views of the Shannon basin from high above the forest on Mokare's Rock along the Rocks Walk Trail. You can also venture to Inferno Hill. Here, the impact of the 2015 Northcliffe fire, which was started by a lightning strike in Shannon National Park and burnt through more than 95,000 hectares of the park and surrounding area, is still very obvious. Parks and Wildlife Service staff have also been working with local groups to develop facilities to accommodate horseriding, which should be available later this year. But perhaps the most popular activity is the Great Forest Trees Drive, a 50-kilometre, self-guided

drive that meanders through spectacular old-growth karri, jarrah and marri forest and past sedgeland, heath and granite outcrops. It also takes in the regrowth forests established following past timber harvesting in the area. There are a number of places to stop along the way to learn more about the area.

Recent upgrades to Shannon Campground cater to those who want to stay a while, including those with mobility issues, and use the national park as a base from which to explore nearby D'Entrecasteaux National Park, Windy Harbour and the spectacular Walpole Wilderness. Shannon Campground offers 68 campsites, which provide for tents, campervans, caravans and even large five-wheeler vehicles. The sites have been designed to provide holiday-makers with room to move and the campground makes use of the former town's roads. Gas barbecues, communal fire rings, hot showers and new toilets make the stay a little more comfortable and football goals will keep the kids amused.



Do it yourself

Where is it? Shannon National Park is 55 kilometres south-east from Manjimup, half way between Manjimup and Walpole on the South Western Highway.

What to do: Canoe and kayak, bushwalk, bird watch, explore the area on the Great Forest Trees Drive, camp, swim, fish.

Facilities: Information, campground, toilets and showers, barbecues.

For more information: Contact Parks and Wildlife Service on (08) 9776 1207 or visit parks.dbca.wa.gov.au





Strategic science
planning the future

by Margaret Byrne,
Stephen van Leeuwen
and Kimberly Onton

'Scientific excellence informing biodiversity conservation' encapsulates the Department of Biodiversity, Conservation and Attractions' (DBCA's) vision for ensuring the best outcomes are delivered for the nature of WA and the community, where science and knowledge underpin the conservation of our unique plants, animals, communities and ecosystems, and the management of the State's lands and waters. A new strategic plan will guide DBCA to realise this vision.

Western Australia is a large State with unique biological diversity, including two internationally recognised terrestrial and marine biodiversity hotspots, 12 internationally significant wetlands and eight of the 15 national biodiversity hotspots. WA has one of the highest rates of discovery of new species in the world. Integrated scientific and management expertise is essential in order to provide the depth of knowledge required to effectively manage these complex and diverse environmental systems.

The creation of the Department of Biodiversity, Conservation and Attractions (DBCA) provided a focus for consolidation of the science being undertaken by the statutory authorities (Botanic Gardens and Parks Authority, Rottneest Island Authority and Zoological Parks Authority) and the former agency (Department of Parks and Wildlife) to protect and conserve WA's plants, animals, communities and ecosystems, and better streamline scientific activities through shared expertise and approaches. Since 1 July 2017, much work has been carried out to determine the most effective ways to consolidate the department's science and conservation functions. A key part of this process has been to develop a new *Science Strategic Plan 2018–21* to provide a framework for the department's scientific programs across WA, including in national and marine parks, Kings Park and Botanic Garden, Perth Zoo, Rottneest Island and the WA Herbarium.

A WHOLE NEW WORLD

The creation of DBCA and consolidation of conservation science presents many opportunities to build on existing collaborations between staff. In the past, many projects have been carried out through partnerships between the four organisations, including native animal captive-breeding and translocation projects involving Perth Zoo and Parks and Wildlife; seed banking and fire ecology projects involving Parks and Wildlife and Kings Park; quokka conservation and marine monitoring with Rottneest Island and Parks and Wildlife; and restoration work



Hear more about DBCA's Science and Conservation program

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



Previous page

Main Western swamp tortoises are one species that have benefited from the historic collaboration of the former agencies that have merged to make the Department of Biodiversity, Conservation and Attractions. **Insets** DBCA staff work on a range of projects, across a variety of disciplines, throughout the State.

Above Yawuru rangers sampling at Crab Creek. Photos – DBCA

between Kings Park and Rottneest Island. While the scientific focus of each of the four agencies was varied, the principles that guided them were the same. The amalgamation, and the associated united approach to conservation science, will foster scientific excellence to support effective conservation of our plants, animals and ecosystems, and management of our lands and waters.

WORKING TOGETHER

Development of an integrated strategic plan was a recommendation from an independent review commissioned in the early months of the new department in 2017. This strategy is aligned with the department's overall *Strategic Directions 2018–21* and articulates how science will contribute to delivering DBCA's strategic priorities and statutory responsibilities, the key priorities of the State Government, and the needs of the community.

The process to develop the *Science Strategic Plan 2018–21* was collaborative

and comprehensive, with more than 120 DBCA staff from across operations, management, policy and science involved in three workshops. Participants contributed their knowledge and expertise to identify the areas in which knowledge and scientific evidence were required to achieve the desired outcomes for biodiversity conservation and natural resource management. Clear themes were evident across the workshops and these were readily mapped against five of the six strategic intent statements from the department's Strategic Directions: biodiversity and conservation; fire management; natural and cultural values; our community and partners; and our people. The goals identified for these themes and the approach to achieve them will guide targeted science activities and inform evidence-based decision-making to support the conservation and land management operations of the department.



DBCA conducts science over a range of areas, including:

Animal science	Seeking to understand the factors and processes critical for the conservation of WA's fauna.
Biological survey	Biological surveys to gain greater knowledge about the biodiversity of WA.
Biodiversity information	Coordination and accessibility of biodiversity knowledge for conservation of plants, animals and ecological communities and evidence-based decision-making.
Fire science	Research into fire behaviour and the impacts of bushfires and planned burning in WA.
Forest monitoring	Monitoring the health and productivity of forests, parks and other reserves in WA.
Island conservation	Understanding islands as conservation areas and caring for Rottnest's unique and diverse island environment.
Restoration	Research into native plant biology for ecological restoration.
Marine	Research and monitoring to guide management of Western Australia's marine wildlife, parks and reserves.
Animal breeding	Contributing to the conservation of threatened species through applied scientific research.
Plant science	Flora conservation and taxonomic research to protect the future viability of plant species in WA.
WA Herbarium	Maintenance of the State's plant specimen collection and taxonomic research to inform conservation.
Wetlands, rivers and estuaries	Research and management to conserve WA's wetland, estuarine and riverine ecosystems.
Ecoinformatics	Ecoinformatics, or ecological informatics, is the science of information in ecology and environmental science.
Remote sensing and spatial analysis	Integrating remote sensing and spatial analysis to provide information for scientific investigations and meet conservation knowledge gaps.

The development of this strategic plan provided a clear and transparent means of prioritising science across the department and will foster confidence among partners, stakeholders and the community that DBCA is delivering targeted best-practice science for biodiversity conservation.

A coordinated science and research capacity that is integrated with policy and management functions, is one of DBCA's strengths. This approach enables end-user, risk-based priority setting and ensures research is relevant to WA and directly linked to Government needs. It also allows for rapid incorporation of up-to-date knowledge to support DBCA's immediate policy and operational requirements through effective and efficient technology transfer and research up-take; the ability to undertake vital strategic long-term science essential for Government decision-making; and the availability of science-based

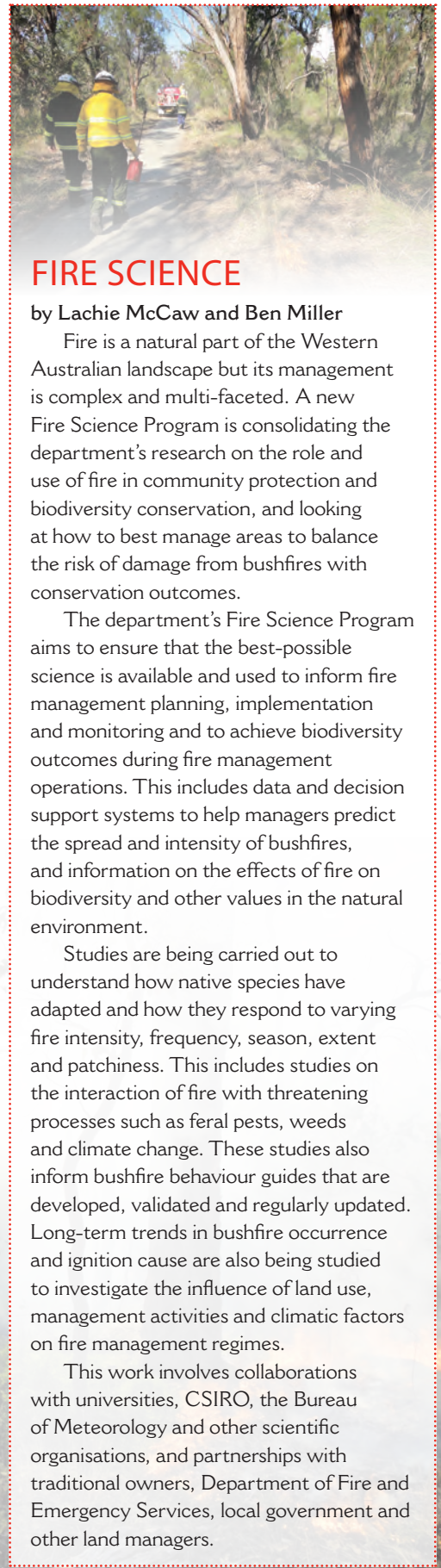
knowledge and information to provide accurate and timely scientific, technical and policy advice to Government.

DBCA's internal research capacity is extended and leveraged through attracting external investment to address State priorities, and through strategic collaborations and partnerships with external research agencies and end-users where this provides access to relevant expertise.

Above Yuna spider orchid.
Photo – Andrew Brown/DBCA

Top right DBCA is using science to help balance risks posed by bushfires with conservation outcomes.

Background Fire is a natural part of WA's landscape.
Photos – Ben Miller/DBCA



FIRE SCIENCE

by Lachie McCaw and Ben Miller

Fire is a natural part of the Western Australian landscape but its management is complex and multi-faceted. A new Fire Science Program is consolidating the department's research on the role and use of fire in community protection and biodiversity conservation, and looking at how to best manage areas to balance the risk of damage from bushfires with conservation outcomes.

The department's Fire Science Program aims to ensure that the best-possible science is available and used to inform fire management planning, implementation and monitoring and to achieve biodiversity outcomes during fire management operations. This includes data and decision support systems to help managers predict the spread and intensity of bushfires, and information on the effects of fire on biodiversity and other values in the natural environment.

Studies are being carried out to understand how native species have adapted and how they respond to varying fire intensity, frequency, season, extent and patchiness. This includes studies on the interaction of fire with threatening processes such as feral pests, weeds and climate change. These studies also inform bushfire behaviour guides that are developed, validated and regularly updated. Long-term trends in bushfire occurrence and ignition cause are also being studied to investigate the influence of land use, management activities and climatic factors on fire management regimes.

This work involves collaborations with universities, CSIRO, the Bureau of Meteorology and other scientific organisations, and partnerships with traditional owners, Department of Fire and Emergency Services, local government and other land managers.

ANIMAL BREEDING

by Peter Mawson

For some animal species, augmentation of wild populations is necessary to improve their conservation status and reduce the risk of extinction. Breeding of native species is undertaken in facilities at Perth Zoo for numbats, western swamp tortoises, dibblers, and orange-bellied and white-bellied frogs for release into protected areas. More than 4000 animals bred or reared at Perth Zoo have been released to bolster wild populations in the Swan, Midwest, South West and South Coast regions of WA, while some animals have been translocated to areas of New South Wales. Animals are released into sites where fox and/or feral cat control has been carried out through the department's *Western Shield* fauna conservation program, or to fenced sanctuaries operated by conservation partners. Perth Zoo is also undertaking studies to understand the biology and husbandry requirements of western ground parrots to inform potential breeding of this critically endangered bird.

Breeding of native species leverages the expertise of staff across the department, from zoologists with animal husbandry skills to the fauna monitoring conducted by science and regional staff. It also occurs in partnership with other non-government organisations such as the Australian Wildlife Conservancy, in conjunction with the relevant native species recovery teams.

DBCA staff also work with local friends groups, such as those for the western swamp tortoise, numbat and western ground parrot, recognising the important role the community can play in conserving wildlife. In addition, the work is supported by university researchers and students who contribute to the breeding programs and translocations by conducting baseline research and undertaking projects to measure the survival and dispersal of animals released to the wild.

RESTORATION SCIENCE

by Jason Stevens and Colin Yates

Restoration science provides the knowledge to underpin cost-effective and scalable practices across all terrestrial and marine vegetation types and disturbed systems. The approaches developed can be applied to single species plant translocations and whole plant community restoration projects. This science involves integration of the disciplines of taxonomy, genetics, seed science, biotechnology, ecology, ecophysiology and pollination biology. DBCA scientists also collaborate with other researchers who provide engineering and soil science solutions.

Restoration science is informing restoration work at Kings Park and Bold Park and across other DBCA-managed lands and waters, as well as providing guidance to a range of stakeholders, including mining companies. The research demonstrates that by systematically understanding the biology of various plant systems we can provide restoration solutions for plant species and complex biodiverse community programs, such as banksia woodlands and banded iron formation threatened ecological communities.



DIRK HARTOG ISLAND FAUNA RECONSTRUCTION

by Keith Morris

Dirk Hartog Island National Park is WA's largest island and the focus of a program to restore it to its condition prior to European arrival, when a number of native animals roamed free. The first stage of the project has been focussed on removal of sheep and feral goats, and eradication of feral cats, which is essential before reintroduction of native animals. Removal of sheep and goats, and weed control, is also enabling recovery of the vegetation.

DBCA scientists and Midwest regional staff have assessed the suitability of the island habitat for the species to be reintroduced, and have determined the best populations from which to source these animals, based on genetic diversity, abundance, logistics and population sustainability criteria. They have also developed protocols and guidelines for reintroduction of animals to the island, which can be applied elsewhere.

Rufous hare-wallabies and banded hare wallabies are the first animals to be translocated to the island and monitoring of the animals is showing good results, with the presence of pouch young indicating they are breeding. Establishment of these new populations will improve the conservation status of these species, and provide an opportunity to gain a better understanding of the interactions of rare mammal species with each other and their habitat.

This project is being carried out with assistance from Dirk Hartog Island Eco-Lodge operators Kieran and Tory Wardle, the Shire of Shark Bay, the Malgana people, the local community and visitors, and researchers from Murdoch University, The University of Western Australia, and the National Environmental Science Program's Threatened Species Recovery Hub.

This page: 1) Perth Zoo vets caring for captive-bred frogs. Photo – Perth Zoo 2) Numbats are the subject of collaborative conservation. Photo – Doug Coughran/DBCA 3) Restoration science is being used to protect and conserve WA's flora. Photos – Peter Nicholas/DBCA 4) Restoration science can be applied to disturbed ecosystems. 5) Monitoring work at Dirk Hartog Island National Park. Photos – DBCA



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KIMBERLEY CORAL MONITORING

by Alan Kendrick

The health of the world's coral reefs has been a recent focus in marine science because of increasing incidences of coral bleaching caused by elevated sea temperatures. DBCA undertakes coral monitoring in marine parks and reserves, including the recently created Kimberley reserves, as part of the department's State-wide Marine Monitoring Program that measures long-term trends in the condition of ecological values in relation to pressures that include climate change. Research has focussed on establishing coral monitoring sites across the huge area of the Kimberley reserves by identifying reef habitats and photographing the corals with a drop camera. Thousands of images are being analysed and archived by our marine scientists to determine measurements of coral cover and coral community composition that can be compared over time.

This monitoring is a collaboration between DBCA science and regional staff and traditional owner joint managers, who participate in the monitoring and management of this key ecological asset which holds great cultural value and interest. The collaborative implementation of the department's Marine Monitoring Program provides managers and traditional owners with opportunities to develop and share practical science skills that inform management.



FOREST MONITORING

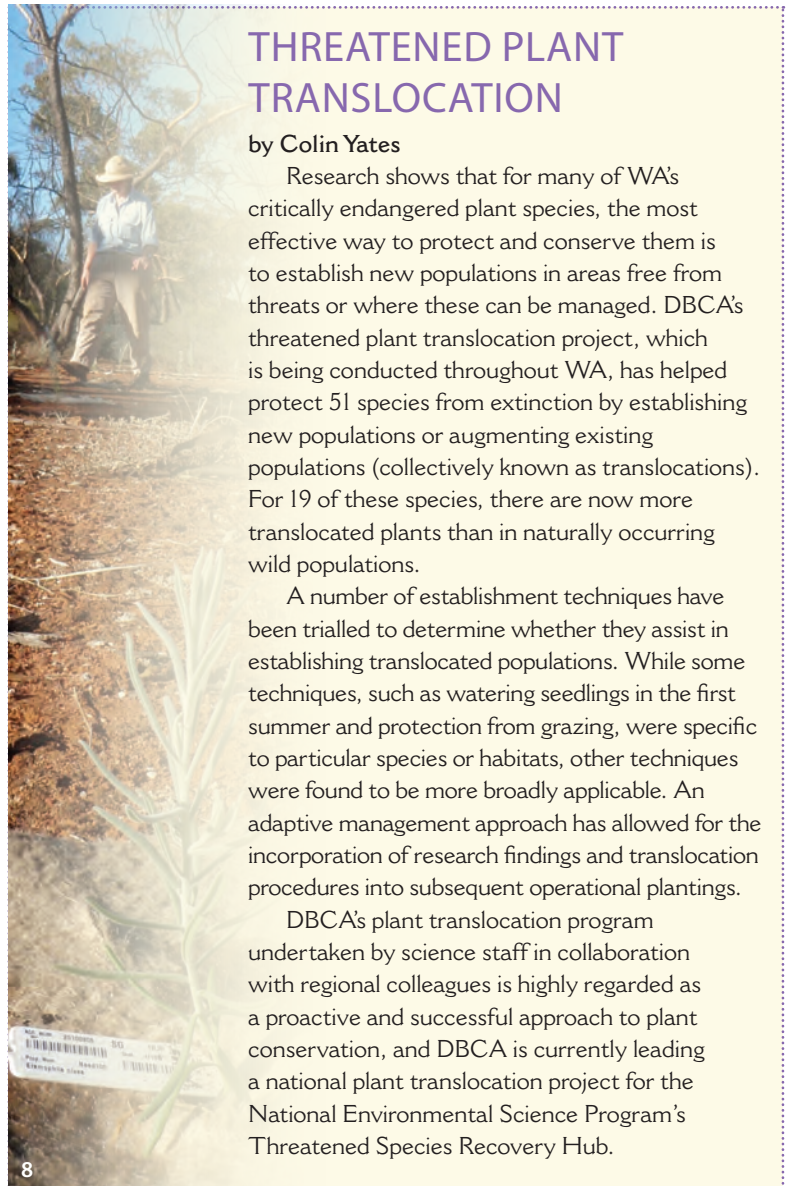
by Lachie McCaw

FORESTCHECK is a monitoring project that indicates changes and trends in biodiversity associated with forest activities. Observations have been collected at 67 permanent monitoring grids

established across the Swan, South West and Warren regions. Since 2002, information has been gathered on 3900 species that occur in the jarrah forest, including fungi, plants, invertebrates, birds, mammals, reptiles and frogs. Many were new to science and are yet to be named. Other observations recorded for each grid include forest structure, regeneration stocking, litter fuel loads and the amount and condition of coarse woody debris. It has been observed that most species groups are resilient to the impacts of timber harvesting, with monitoring 10 years after harvesting showing few changes in species richness between disturbed and reference sites.

This data informs forest management policies and practices and has contributed to periodic revision of operational guidance documents for forest activities. Information gathered from monitoring has been used to validate predictive models for forest growth and species distribution and provides a framework for studying the response of jarrah forest ecosystems to timber harvesting, prescribed burning, bushfires and extreme weather events.

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 This page: 6) Drop cameras were used to survey coral.
 7) FORESTCHECK's Bruce Ward and Peta Byrne at Plavins.
 8) Establishing new populations of plants is an effective way to conserve threatened species. Photos – DBCA



THREATENED PLANT TRANSLOCATION

by Colin Yates

Research shows that for many of WA's critically endangered plant species, the most effective way to protect and conserve them is to establish new populations in areas free from threats or where these can be managed. DBCA's threatened plant translocation project, which is being conducted throughout WA, has helped protect 51 species from extinction by establishing new populations or augmenting existing populations (collectively known as translocations). For 19 of these species, there are now more translocated plants than in naturally occurring wild populations.

A number of establishment techniques have been trialled to determine whether they assist in establishing translocated populations. While some techniques, such as watering seedlings in the first summer and protection from grazing, were specific to particular species or habitats, other techniques were found to be more broadly applicable. An adaptive management approach has allowed for the incorporation of research findings and translocation procedures into subsequent operational plantings.

DBCA's plant translocation program undertaken by science staff in collaboration with regional colleagues is highly regarded as a proactive and successful approach to plant conservation, and DBCA is currently leading a national plant translocation project for the National Environmental Science Program's Threatened Species Recovery Hub.

SEED BANKING, TISSUE CULTURE AND CRYOSTORAGE

by Jason Stevens and Colin Yates

Ex-situ conservation involving seed banking, tissue culture and cryostorage are important components of plant conservation, with particular focus on the South West and mining-intensive regions such as the Pilbara and Midwest. This program provides an insurance policy for Western Australian plants, by securing collections of seeds in safe and secure facilities. By keeping the seeds at purpose-built facilities in a suspended state at low temperature and humidity, they can be maintained for hundreds of years. Living collections of tissue culture material of critically endangered species are also maintained for species whose seed cannot be stored or does not readily germinate. Cryostorage of material at low temperature is also undertaken, particularly for orchids and their fungal symbionts as this has proven to be the most effective means of maintaining these species out of the wild.

Research on seed storage behaviour and longevity provides a framework for managing and curating large and diverse seed collections. Research into seed germination methods has resolved optimal conditions for seed germination of hundreds of Western Australian species. Seed collections, living collections and tissue obtained from cryostorage are working collections as they are used to generate germplasm for establishing plants through translocation and for research programs.

DBCA's seed collections have been supported by the Australian Seed Bank Partnership, and research projects have been undertaken in partnership with mining industry sponsors, WA universities, and other botanic garden and State Government agencies, including the Royal Botanic Gardens Sydney (Australian Plant Bank) and the Australian National Botanic Garden.



This page: 1) Mulla mulla. 2) The Western Australian Seed Centre collects and stores seed. 3) Ex-situ conservation is necessary to protect WA's vulnerable species. Photo – DBCA 4) The WA Herbarium partners with tertiary institutions. Photo – John Huisman/DBCA 5) DBCA scientists collecting peat samples to determine its age and microbial communities. Photo – DBCA 6) Wetlands support WA's waterbirds. Photo – Marie Lochman

Opposite page: 7) Western school prawn. Photo – David Morgan 8) Prawn Watch is a citizen science program. Photo – Stewart Allen 9) Fire scars detected as part of the Remote Sensing and Spatial Analysis. Photos – DBCA

WETLAND CONSERVATION

by Adrian Pinder

WA's unique and diverse wetlands are rich in ecological and cultural values and form an integral part of the natural environment of the State. The department carries out monitoring and research of wetlands at the Pilbara's Fortescue Valley and in the Wheatbelt, South West and Warren regions. The data collected will indicate changes over time and investigate responses of wetland animals and plants to threatening processes.

One such research project aims to understand the hydrogeological processes sustaining the Walyarta organic mound springs in the Great Sandy Desert and Eighty Mile Beach Ramsar wetland. Knowledge from this project will result in an improved ability to model the potential impacts of groundwater resource development in the West Canning Basin on the Walyarta and similar springs. Investigations have shown the important connection between groundwater and the surface springs with groundwater from depths up to 200 metres below ground level supporting the springs. DBCA scientists have hydrochemically fingerprinted the aquifers in order to assess and model the discharge rate of the springs.

Large scale hydrological investigations such as this rely on collaborations with research partners such as CSIRO and the Australian Nuclear Science and Technology Organisation, and requires engagement of industry and government as end-users of the research.



WESTERN AUSTRALIAN HERBARIUM

by John Huisman

WA has one of the most unique and diverse floras in the world, including vascular plants, algae, fungi, lichens, mosses and slime moulds. The Western Australian Herbarium houses more than 790,000 specimens from all regions of WA, and provides a comprehensive and scientifically defensible record of the State's flora taxonomy, which is crucial to effective conservation. These data are made widely available through 'FloraBase' – a publicly accessible database – and also feeds into the department's biodiversity portal 'NatureMap', which provides information on WA's natural assets. The work of the WA Herbarium is supported by a group of enthusiastic volunteers and through engagement with numerous stakeholders, including industry, other government agencies, and the general public.

Herbarium botanists carry out taxonomic research, often using DNA sequencing, to ensure that all species are recognised and described. Information captured in the WA Herbarium collection enables conservation prioritisation of species and communities, and informs management plans, biodiversity assessments and environmental impact assessments. The WA Herbarium works closely with the Threatened Flora Seed Centre as another biodiversity collection, and is a source of preliminary information and repository for voucher specimens from biological surveys.



RESTOCKING WESTERN SCHOOL PRAWN

by Kerry Trayler

The western school prawn (*Metapenaeus dalli*) was once the focus of an important commercial and recreational fishery in the Swan Canning Riverpark, before stocks declined. Restocking was identified as a way to increase the population of western school prawn and a collaborative project between DBCA, Murdoch University and the Australian Centre for Applied Aquaculture Research was established, with funding through RecfishWest, Department of Primary Industries and Regional Development and the Fisheries Research and Development Corporation.

Research was undertaken to refine understandings of the biology and ecology of the prawns, including environmental triggers for breeding, sediment preferences and predation. Optimal approaches to restocking were identified and 4.5 million prawns were released into the Riverpark between 2013 and 2016. The research also provided advice for sustainable management of this recreationally important species and monitoring is continuing to understand inter-annual dynamics of the prawn population.

A citizen-science project, *Prawn Watch* (run through DBCA's *River Guardians* program), was undertaken in conjunction with the restocking, and provided opportunities for community engagement and improved stewardship of the fishery and the Riverpark.



REMOTE SENSING AND SPATIAL ANALYSIS

by Jane Chapman and Neil Burrows

Remote sensing technologies provide a range of derived products that can be highly informative for conservation and land management. One such product is a high-resolution fire history mapping that covers approximately 46.5 million hectares of WA and includes the Millstream Chichester, Karijini and Karlamilyi national parks, most of the Martu Native Title Determination and a large portion of Birriburu Indigenous Protected Area. Remote sensing using Landsat satellite imagery and object-based image analysis is used to produce a highly accurate fire history suitable for detecting small Aboriginal hunting fires and patchy, cool season prescribed burns.

Accurate fire history and associated statistic reports are important for planning and evaluating prescribed burns to mitigate the damaging effects of large bushfires, and for predicting the occurrence of important fauna habitat, such as the threatened black-flanked rock wallaby. Findings have shown that the scale of wildfires is reduced in areas where traditional, mosaic/patch-burning is taking place. The information from this project is used by the department's Pilbara and Goldfields regions, Kanyirrinpa Jukurrpa and Bush Heritage Australia.

Margaret Byrne is DBCA's Executive Director of Biodiversity and Conservation Science. She can be contacted by email (margaret.byrne@dbca.wa.gov.au).

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Collecting seeds and capturing culture



For 600 generations, the Spinifex people have maintained and fostered their spiritual and cultural connection to their traditional lands in the heart of the Great Victoria Desert. For many Spinifex women this has meant passing their rich bio-cultural knowledge of plants and seeds down through generations. Now, thanks to the creation of the *Aboriginal Ranger Program*, the Spinifex women will be supported to combine their traditional knowledge with modern plant biology to ensure this knowledge is protected, and to provide positive opportunities for all those involved.

by Mitzi Vance





Deep in the heart of Western Australia's spinifex country, within the arid, remote, rugged and beautiful Great Victoria Desert, is the traditional land of the Spinifex people. This group of hunter-gatherers only returned to their land in 1984, following years of displacement and relocation caused by the Maralinga Atomic Testing in the 1950s. A group of Spinifex people are regarded as the last known Indigenous people to emerge from the desert in Australia, when a family of seven emerged in 1986.

Today, in their community of Tjuntjuntjara, some 700 kilometres east of Kalgoorlie, and in one of the most remote communities in the State, they continue to live a largely traditional hunter-gatherer lifestyle. They have vowed to “never leave their traditional country, as their cultural responsibility and obligation is to look after their land, heritage and culture”, as did their forebearers.

In 1997, the Spinifex people received worldwide attention for their poignant traditional paintings, which depicted Spinifex country and captured the area's stories and history. This helped support a native title claim for the area, and eventually culminated in a major exhibition of their work in London in 2005, which helped raise the profile of Australia's Indigenous artists.

In 2000, the Spinifex people received recognition of their native title land – the first determination of native title in WA and the second in Australia following the proclamation of the Native Title Act. Following the granting of native title rights, the Spinifex people established the Pila Nguru Aboriginal Corporation to govern their native title rights.

AN ANCIENT LAND

Extending west for 200 kilometres from the South Australia border and north-south some 280 kilometres from the top of the Nullarbor Plain, Pila Nguru country encompasses 5.5 million hectares of arid desert, which houses about 370 species of native plants, including mulga, western myall, sandalwood and



Opposite page

Inset top Debbie Hansen travelled to Perth to visit the WA Herbarium.

Photo – Andrew Crawford/DBCA

Main The Spinifex people have maintained a connection to their land for 600 generations.

*Photo – Marie Lochman/Lochman
Transparencies*

sheoaks, as well as varieties of sennas, emu bushes, and spinifex.

These plants and the seeds they produce are important for the Spinifex peoples' way of life. In Tjuntjuntjara there is a small group of Spinifex women who are dedicated to ensuring cultural knowledge is passed from generation to generation and who live by the premise that if you care for Country then it will care for you, particularly around plants and seeds, which are traditionally the responsibility of women.

This life-long commitment is now being supported by the State Government's new \$20 million five-year *Aboriginal Ranger Program*, which will see Spinifex women trained as rangers. As well as helping to continue this important cultural and conservation practice, this program will also create pathways for young women and children, generating social and economic benefits for their community.

For the Spinifex women, funding provided through the program will help



Hear more about the Spinifex women's visit

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





“By understanding modern techniques in plant conservation, the Spinifex women rangers can combine contemporary practices with traditional knowledge to collect and grow seeds that will help them develop business opportunities and eco-tourism ventures such as bush-tucker tours.”

Above Marie Brown (second from left), Debbie Hansen (third from left), Rochelle Franks (third from right), Samantha Doudle (second from right) and Nancy Donegan (right) spent time with DBCA’s Andrew Crawford (left) and Anne Cochran (centre).
Photo – Ryonen Butcher/DBCA

support meaningful work and training opportunities, in balance with their family responsibilities. This is important considering their very remote location. It will also, for the first time, bring together traditional bio-cultural knowledge and modern plant biology and ecology principles to provide meaningful and positive outcomes.

MINYMA UNINYPA

As part of the *Aboriginal Ranger Program*, the Pila Nguru Aboriginal Corporation received funding of \$770,000 for ‘Minyma Uninypa’ – the three-year project that will employ and train Spinifex women rangers in collecting and growing seeds to help support their community.

Since being announced as a recipient of round one funding earlier this year, Pila Nguru has established the Minyma Uninypa Women Ranger team. Led by Spinifex women ranger coordinator Samantha Doudle, four of the team – Marie Brown, Nancy Donegan, Debbie Hansen and Rochelle Franks – have already visited DBCA’s Threatened

Flora Seed Centre in Perth for a week of training. Herbarium botanist Ryonen Butcher gave the rangers insight into plant identification, before Andrew Crawford spent the remainder of the week training the women about seed, including how to clean and quantify collections, how to test their quality, how to store them to ensure their longevity, and how to germinate them.

By understanding modern techniques in plant conservation, the Spinifex women rangers can combine contemporary practices with traditional knowledge to collect and grow seeds that will help them develop business opportunities and eco-tourism ventures such as bush tucker tours.

Learning how to store and propagate seeds builds on their traditional knowledge about when to collect seeds, which Nancy Donegan says is based around the seasons: “the calls of different birds, the sun and the stars”.

The training will also help the women participate in the preparation and planning of Anglo Gold Ashtanti’s Tropicana Gold Mine rehabilitation program and potentially take on fee-for-service activities while also progressing their qualifications towards a three-year Certificate II in Conservation and Land Management.

PARTNERSHIPS

Anglo Gold Ashtanti, Great Victoria Desert Biodiversity Trust, Red Dirt Seeds

and the Australian Government are significant supporters of the project and have contributed \$191,000 in funding and in-kind contributions worth \$278,000. Anglo Gold Ashtanti has provided a transportable laboratory building for the Spinifex women to use and the Australian Government is connecting the electrical and plumbing services, while the Great Victoria Desert Biodiversity Trust is providing \$16,000 for laboratory and seed collecting equipment. DBCA, in addition to the one-week training program in Perth, will support a visit by Andrew to Tjuntjuntjara each year to assist with further training and review the seed collection and storage program.

FOLLOWING FOOTSTEPS

The Minyma Uninypa Team will join the award-winning Spinifex Land Management team, based in Tjuntjuntjara, which uses adaptive management to plan and achieve land management outcomes over the 94,000-square-kilometre area they manage on behalf of the Spinifex, Pilki and Mamungari traditional owners.

The processes and outcomes from Minyma Uninypa will be shared widely with other Indigenous land management groups, including the Indigenous Desert Alliance, 10 Deserts project and the Great Victoria Desert Adaptive Management Partnership.



Above Sandalwood is one species found in the Great Victoria Desert.
Photo – Jiri Lochman

Above right The Aboriginal Training Program is providing career pathways for Aboriginal people.

Below right Nancy Donegan weighing seed with Samantha Doudle.
Photos – Andrew Crawford/DBCA

Aboriginal Ranger Program

The State Government's *Aboriginal Ranger Program* aims to protect the environment and leverage the social and economic benefits that employment provides in regional and remote areas. It will provide a pathway for Aboriginal people to develop careers in land and sea management and create long-term opportunities in Aboriginal communities.

The \$20 million five-year program is working to increase employment and training of Aboriginal people in land and sea management, including conservation, cultural, tourism and education activities across a range of tenures. This investment supports new and established ranger groups across WA to manage Country in partnership with public and private sectors.

Significant progress has been made in implementing the program since it began in September 2017. The Spinifex women project was one of 13 recipients provided with funding under round one of the program, which totalled \$8.5 million. The range of applications received from across the State, including the Kimberley, Midwest and South West regions strongly reflects the aspirations of Aboriginal people to establish new ranger programs to manage their Country.

The first round will see 85 new jobs created, of which more than half will be for female rangers.

Aboriginal people are being employed to carry out work such as biodiversity monitoring and research, management of tourism and cultural sites, weeds and feral animal control, prescribed burning, bushfire suppression and environmental protection works.

Consultation with Aboriginal groups was carried out to ensure Aboriginal knowledge and aspirations informed the program's design and delivery.

The ranger program is empowering Aboriginal people and providing real jobs and training that will assist in building stronger communities and a better economy for the future.



TJUNTJUNTJARA'S FUTURE

Through meeting and talking with the women during their training in Perth, it was not hard to see the enthusiasm, positivity and excitement that this new opportunity will bring to their community.

Nancy said that empowering women to take a role in the ranger program was important to the young girls of the community; it will teach them where to find seeds and to understand when they are ripe according to the seasons. More importantly, it will provide an opportunity for elders to teach young people, because, as Nancy says, it's "easier to teach young people and learn while their elders are around".

With a population of about 150 people, which can grow to 500 during cultural business occasions, Tjuntjuntjara has a small community school of about 30 children. A popular and important part of the school is its *Learning on Country*

program, where students go bush to experience and understand their culture and how to care for it under the guidance of rangers.

According to the Spinifex women, being a ranger is seen as the ultimate 'dream job' by many children. And now, thanks to the Seed Women project, young girls will have a career path, which, as ranger leader Samantha Doudle says, "is really special in an area as remote as this with its lack of employment opportunities".

Essentially, this is what the *Aboriginal Ranger Program* is all about – building stronger, more resilient communities by creating more jobs and leadership roles for people on Country that achieve wide-reaching benefits. Added to this is successful cross-cultural engagement, traditional knowledge transfer and capacity building and business

development opportunities. But what is really special about the Minyma Uninyapa is that it recognises and celebrates the vital role that Aboriginal women play in caring for Country in remote areas, and empowers them to continue and expand their work to benefit generations to come.




Mitzi Vance was a DBCA projects coordinator. For more information about the *Aboriginal Ranger Program*, visit www.dpaw.wa.gov.au/parks/aboriginal-involvement/504-aboriginal-ranger-program

REMOTE REFUGES:

Pilbara inshore islands

Threatened species paradise





The remote inshore islands of the Pilbara coast provide a haven for a number of threatened and protected species. Until recently, little was known about these precious ecosystems, but a comprehensive survey into their natural values and the pressures they face will help guide future management to ensure they are protected.

BY CAROLYN WILLIAMS AND FELICITY KELLY



Located off the Pilbara coast extending from Exmouth Gulf to just north of Cape Preston, lies a chain of 93 small island nature reserves. Many of these remote inshore islands are less than 20 hectares in size and make up a total area of 8506 hectares. Together, they have a span of 244 kilometres of coastline, comprising sandy beaches, rocky shores, and mangrove forests.

These inshore islands are fragile habitats, moulded by summer cyclones, but they are relatively free from disturbance and other pressures associated with the mainland, including introduced predators such as the fox. Although remote, they are surrounded by industrial development. They have high conservation values as they play an important role in the life cycle of many threatened and protected species, and support marine turtles, shorebirds, seabirds and the last remaining populations of some mammal species that are no longer found on the mainland.

MORE TO DISCOVER

Between 2013 and 2018, DBCA's Pilbara Region islands reserve officers, funded by offsets associated with Chevron's Wheatstone Gas Project, conducted an intensive island nature reserve program to better understand the values and threats. Biological values of three islands – Thevenard, Airlie and Varanus – are well known from environmental studies that have been carried out by industry bodies. But, to date, few of the remaining islands have been studied in detail (see 'East of the Gulf', *LANDSCOPE*, Summer 1992–93), if at all.

So, a series of extended field trips to 52 of the islands was carried out. These visits helped to gain a better understanding of the importance of these islands and how they are being impacted by recreation and other human pressures. Information collected through aerial monitoring, remote camera surveys, acoustic recordings, turtle tagging and track counts, fauna trapping and opportunistic observations, flora and social surveys has



Previous page
Main Ruddy turnstones are present on most islands all year.

Photo – Bill Belson/Lochman Transparencies

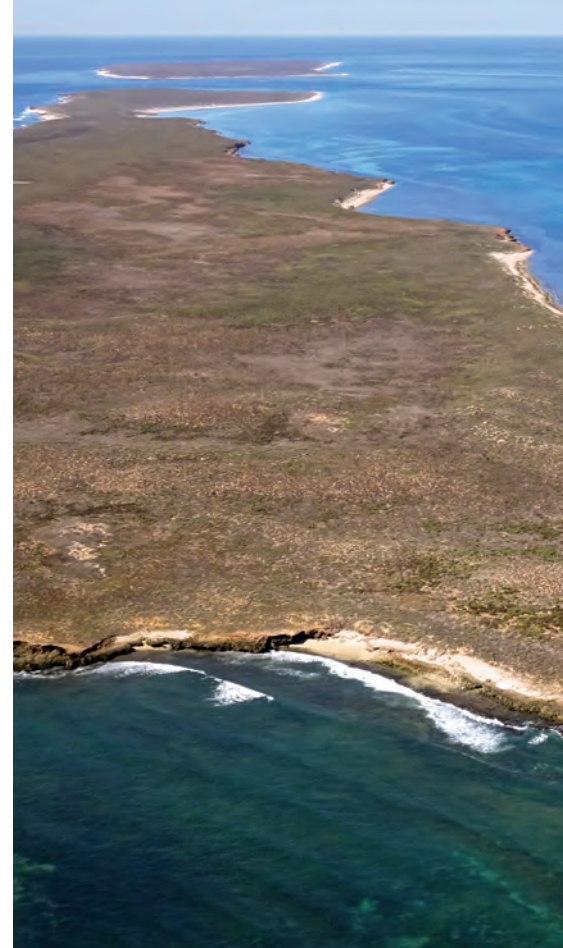
Inset top Middle Mary Anne Island.

Inset centre Mangrove communities, Potter Island.

Inset below Loggerhead turtle.

Above DBCA's Scott Whiting and Steve Breedveld measuring a green turtle on South Muiron Island.

Right Muiron Islands Marine Management Area.
Photos – DBCA



“These inshore islands are fragile habitats, moulded by summer cyclones ...”

informed the development of the draft *Pilbara Inshore Islands Nature Reserve Management Plan*. Once finalised, this plan will set out a strategy to best manage these islands in the future. A key collaboration with the Gorgon Barrow Island Net Conservation Benefit Project *Island Decision Support System* led by DBCA research scientist Cheryl Lohr resulted in hundreds of records added to the Pilbara Islands Species Database.

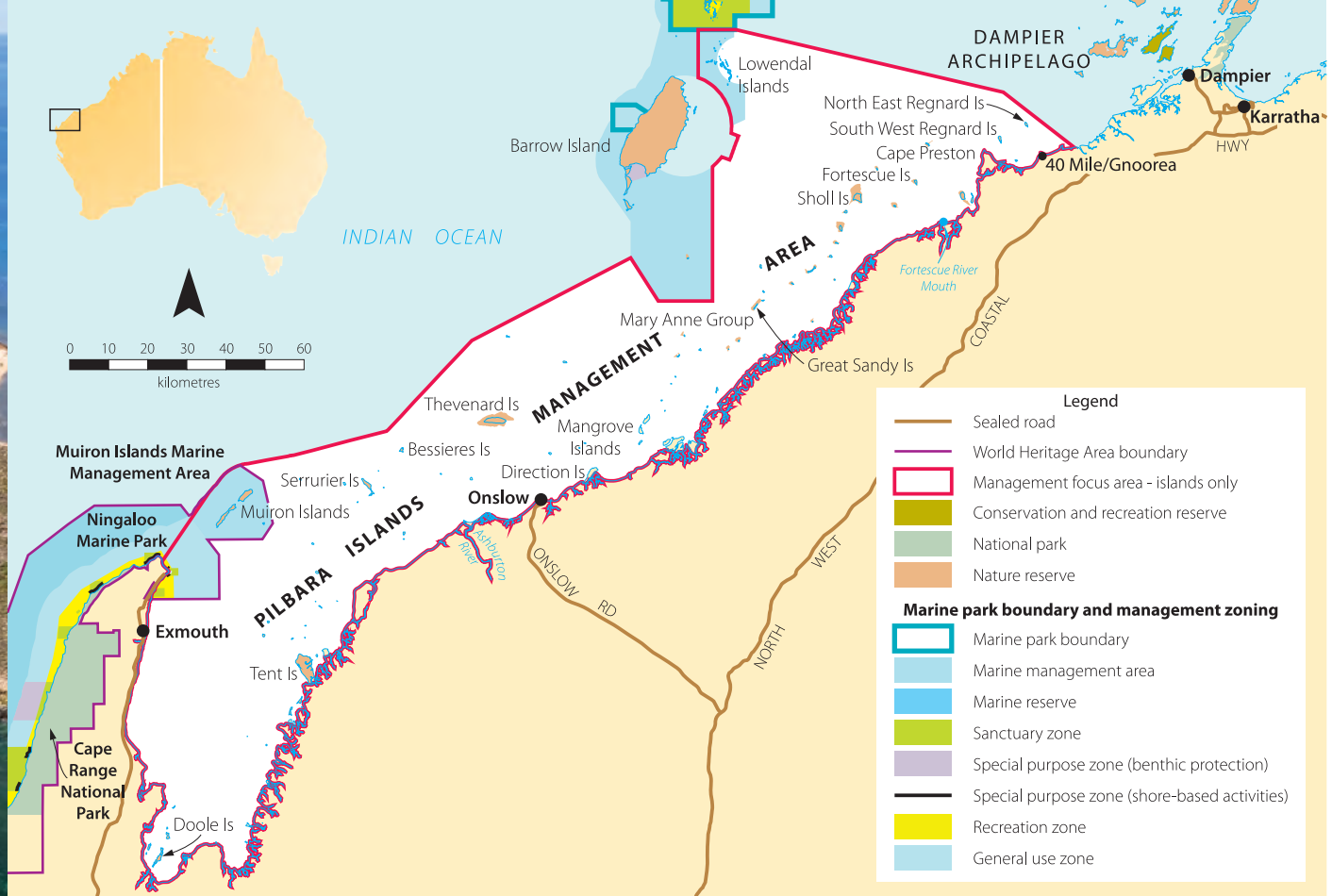
The field work was facilitated through a number of internal collaborations, involving staff from the WA Herbarium and from DBCA's marine and terrestrial Biodiversity and Conservation Science programs. It also relied on a range of external partnerships, including with geologists from Curtin University who studied the island profiles and how they were formed, and archaeologists from The University of Western Australia and the WA Museum who guided the process of documenting the cultural history of both Aboriginal and post-European settlement

of the islands. Traditional owners also made a significant contribution to the study, with members of the Yaburara and Coastal Mardudhunera Aboriginal Corporation joining northern islands field trips, and representatives of Gnulli joining southern islands field trips. This provided the opportunity for two-way knowledge sharing.

Volunteers also played an invaluable role, with 10 volunteers contributing 581 hours, providing specialist knowledge through mapping migratory shorebird high tide roosts and identifying preferred nesting islands for seabirds, including a colony of 6000 roseate terns on Stewart Island. Pilbara flora expert Vicki Long provided guidance in identifying vegetation associations and producing maps for high priority islands.

DISCOVERING NATURAL VALUES

Many of the islands provide nesting habitat for marine turtles and have been



Right DBCA volunteer Laurinda Timmins on Doole Island.
 Photo – DBCA

Far right The critically endangered eastern curlew prefers the solitude of islands close to the mainland.
 Photo – Nigel Jackett



identified as habitat critical to the survival of four species of marine turtle. Islands of significance include coastal islands from Locker Island to Cape Preston for flatback turtles (*Natator depressus*), Serrurier and Thevenard islands for green turtles (*Chelonia mydas*), Sholl Island and the Lowendal Islands for hawksbill turtles (*Eretmochelys imbricata*) and the Muiron Islands for loggerhead turtles (*Caretta caretta*).

The team recorded 64,000 birds including 24 species of migratory shorebird, seven species of resident shorebird and 13 species of seabird that use the islands for resting, feeding and nesting. The critically endangered eastern curlew (*Numenius madagascariensis*) along with the grey-tailed tattler (*Tringa brevipes*),

ruddy turnstone (*Arenaria interpres*), pied oystercatcher (*Haematopus longirostris*), sooty oystercatcher (*Haematopus fuliginosus*), bridled tern (*Onychoprion anaethetus*), crested tern (*Thalasseus bergii*) and roseate tern (*Sterna dougallii*) have been observed in internationally significant numbers on the Pilbara inshore islands, which has led to the recognition of three key biodiversity areas being identified – Exmouth Gulf Mangroves, Sunday Island and the Lowendal Islands. The islands are included in the Hamersley-Pilbara National Biodiversity Hotspot and specifically mentioned as “refuges for vulnerable

species that are rare or extinct on the mainland”.

About one million wedge-tailed shearwaters (*Ardenna pacifica*) occupy the Pilbara islands for most of the year with significant breeding colonies on seven islands and minor colonies on 12 others.

Fauna surveys have observed 17 terrestrial mammal species present on the islands, including two species that have disappeared on the adjacent Pilbara mainland habitat: the western chestnut mouse (*Pseudomys nanus*) and the pale field rat (*Rattus tunneyi*).



Vegetation surveys have found 252 species of flora from 54 families present on the islands. These include five Priority flora (the Priority 2 *Tephrosia* sp. *North West Cape*, and the Priority 3 *Corchorus congener*, *Gymnanthera cunninghamii*, *Lepidium biplicatum* and *Carpobrotus* sp. *Thevenard Island* and one Priority Ecological Community *Coastal dune native tussock grassland dominated by Whiteochloa airoides*.

IT TAKES A VILLAGE

Aerial surveys, on-ground observations, comments, books and social surveys have shown that while the islands are valued for social and recreation purposes, the level of use is very low. Fishing and diving around the islands, camping, day visits, picnics and nature walks are among the activities people enjoy while going ashore. However, light pollution; some recreation activities, including camping; boat landings on small islands; and marine debris, can cause disturbance to the nesting, resting and feeding behaviours of shorebirds, seabirds and marine turtles. The impacts of recreational visitors seem most severe on islands that are less than 100 hectares in size.

Parks and Wildlife Service Exmouth District staff have been working with residents and visitors from Exmouth, Onslow, Karratha and further abroad to raise awareness of threatened species and

the importance of these island habitats. They are also working to promote positive behaviour that will minimise impacts on threatened species and safeguard sensitive habitats. A number of measures are in place to promote these messages, including the installation of interpretative signage at major boat launching facilities, the development of publications, a curriculum-based *Threatened and protected species of Western Australia's marine and coastal habitats* education manual and other activities for schools, shorebird and turtle workshops and community festivals. Protection of these precious islands will require support from the entire community and the involvement of key stakeholders. But the future of these islands already looks brighter, thanks to a greater understanding of their importance.



Above left Western chestnut mouse.
Photo – Jiri Lochman

Top Aboriginal artefacts have been recorded on many islands.

Above *Tephrosia* sp, Tent Island.

Below A fairy tern nest at Sholl Island.
Photos – DBCA

Carolyn Williams is a Pilbara Islands reserves officer employed under Wheatstone offset Project D.

Felicity Kelly was a Threatened Species Habitat project officer employed under Wheatstone offset Project 66e.

Chevron Australia Pty Ltd funded a number of offset projects and further information can be obtained from DBCA science coordinator Kelly Waples (08) 9219 9796.

For more information on the Pilbara Inshore Islands visit parks.dpaw.wa.gov.au/park/pilbara-inshore-islands

The authors wish to thank DBCA staff and volunteers for their assistance with the projects.

New discoveries are often a combination of serendipity and expertise. Such was the case when research on ants led to the discovery of a population of the critically endangered arid bronze azure butterfly (*Ogyris subterrestris petrina*).

Prior to this discovery, the butterfly was only known from a single population of perhaps several hundred individuals in a small nature reserve in the north-eastern Wheatbelt, near Mukinbudin (see 'The ant, the butterfly, the leafhopper and the bulldozer', *LANDSCOPE*, Autumn 2010), which was found by chance in 2006. Historically, the butterfly had a wider distribution – it was originally collected near Kalgoorlie in the 1980s but disappeared from this site by 1993. Before the butterfly was found at Mukinbudin, it was believed that it may have become extinct. Several searches of remnant vegetation in the Mukinbudin area had been undertaken since 2006, but all failed to find any additional populations of the butterfly.

A knowledge of the ecology of the arid bronze azure was critical in this new discovery. The butterfly's caterpillars have an obligate association with a specific ant (the inland form of the bearded sugar ant (*Camponotus terebrans*)). The caterpillars enter the ants' nest from eggs laid near the entrance, where they are fed by (or are predators of) the ants – a very unusual food source among butterflies. Although many butterfly species are quite conspicuous, this is not the case with the arid bronze azure, as it is relatively small, is subdued in colour and has a wingspan of about 36 millimetres. So an alternative method to search for new populations of the butterfly, as opposed to blindly searching for flying adults, is to target colonies of the caterpillars' host ant.

As part of a research project investigating the changes in composition, structure and function of gimlet (*Eucalyptus salubris*) woodlands with time since fire (see 'Woodland recovery after fire', *LANDSCOPE*, Autumn 2015), ecologist Carl Gosper led a team of scientists from DBCA and CSIRO Land and Water to sample ant communities at more than 50 sites along

the western margin of the Great Western Woodlands. Among the 37,273 individuals and 232 ant taxa recorded, were 701 bearded sugar ants, collected from 12 sites. These records caught the attention of the department's statistician and butterfly expert Matt Williams. Using the precise locality information collected for each ant colony, he and colleagues Andy Williams and Rebecca Coppen, together with volunteer Hayden Cannon, were able to target their searches for the butterflies, which are usually only found in a limited area around the ant colony.

The first attempt at surveying seven potential sites, near Marvel Loch at the eastern edge of the Wheatbelt, was unsuccessful. One site in particular had habitat very similar to that of the Mukinbudin population, and the host ant was confirmed to be present in abundance, but no adult butterflies were detected. Undeterred, the team searched a site further to the north, and were thrilled to find flying butterflies. A second arid bronze azure population had been found! The full extent of this site has not yet been determined, but it appears to be a much smaller colony than the previously known sites near Kalgoorlie and Mukinbudin. Fewer than 10 butterflies were recorded over an extent of about one kilometre.

As with many aspects of scientific research and ecology, our discovery raises as many questions as answers. Is the 'new' population of recent origin, founded from the pre-existing Mukinbudin one? Or has this population existed undetected for an extended period? Do other populations exist in nearby uncleared vegetation in the Great Western Woodlands? What features of the habitat render it suitable for the butterfly and its host ant? And is such habitat widespread or restricted in distribution? Both of the extant butterfly populations are found in woodland dominated by gimlet. Although gimlet is a widespread tree species across much of the Wheatbelt and Goldfields, suggesting



Using ants to find a butterfly

Above Arid bronze azure butterfly.
Photo – Andy Williams/DBCA

potentially broad habitat availability, both populations are found in gimlet woodland that is regenerating after disturbance, indicating a preference for vegetation of a specific structure of higher density, smaller trees. DBCA scientists will continue with ongoing searches, monitoring and research to address these gaps in knowledge.

Even though there is still much to learn about the arid bronze azure, the discovery of a second population means that the future of the butterfly may be slightly less precarious. Both of the extant populations are vulnerable to a single catastrophic event, such as a bushfire or a sudden collapse of the ant colony, as occurred to the Kalgoorlie site in the early 1990s. However, catastrophic events are less likely to concurrently affect two distant populations. This discovery has shown how information collected for one purpose can be informative for other conservation projects. It also opens the possibility of using known ant colonies, such as the site near Marvel Loch, as target translocation sites to establish new arid bronze azure populations.

*New future for
biodiversity conservation*

by Gordon Wyre and Sophie Moller





*The new Biodiversity Conservation Act 2016
and its associated regulations mark a significant
milestone for the future of biodiversity
conservation in Western Australia.*

Any search online for the term ‘biodiversity conservation’ will quickly locate information about how biodiversity is essential for the biological life support systems that we all depend on. Natural biological services or ‘ecosystem services’ provide oxygen to breathe, clean water to drink, fertile soil and productive oceans for food, and many other resources. In short, if we fail to conserve biodiversity, we will fail to have the full suite of natural biological resources we need to survive. There are also ethical reasons for conserving biodiversity, for recognising the rich tapestry of life on the planet and for living sustainably. And human health studies demonstrate that we also benefit as individuals from appreciating first hand, the sights, sounds, and smells of the natural world around us. We all have a role in ensuring the long-term conservation of Australia’s biodiversity.

A BIODIVERSITY WORTH CONSERVING

Western Australia has world-renowned biodiversity in terms of both variety of species and their uniqueness. We have more than 12,000 flowering plant species (more than 60 per cent are endemic), about 200 species of mammals, around 850 bird species, 550 reptile and 80 amphibian species, more than 2000 fish species, and invertebrates number in the hundreds of thousands.

The State is so diverse on a global scale that it qualifies (without the rest of Australia) as one of the world’s megadiverse countries (more than 5000 endemic flowering plant species and diverse marine ecosystems). Indeed, if WA was a country, it would be in the top 10 largest countries on Earth, as well as being one of the most megadiverse.

WA also has eight of the 15 nationally recognised terrestrial Australian biodiversity hotspots as well as world-renowned marine biodiversity. South-west WA is one of the world’s biodiversity hotspots with about 3000 endemic flowering plant species (as well as a significant number of animal species), of which many are under threat. This is



Previous page

Main Spotted-thighed frog.

Photo – David Bettini

Inset Ningaloo Marine Park.

Photo – Clay Bryce/Lochman Transparencies

Above Leschenaultia, like this one pictured at Drummond Reserve, was first protected in WA in 1912.

Photo – Sallyanne Cousans

Right Western ringtail possums are classed as critically endangered.

Photo – David Bettini



largely due to the reduction and dramatic altering of about 30 per cent of the State’s original native vegetation.

A LEGAL FOUNDATION

Biodiversity conservation legislation provides the legal foundation for conserving biodiversity, and for protecting the natural processes it provides. Modern biodiversity conservation legislation promotes, encourages and facilitates conservation efforts by individuals, community groups and corporations, because the biodiversity conservation outcomes needed cannot be achieved by governments alone.

The *Wildlife Conservation Act 1950* (Wildlife Act) was archaic and failed to provide a sound baseline level of protection for biodiversity. It was

penalty and regulatory based, with limited provisions for the protection of species, did not recognise ecological communities or habitats, had inadequate deterrent penalties and had no capacity for promoting conservation, consulting with the community or stakeholders, or facilitating or recognising conservation efforts. These failings are largely attributable to the age of the Wildlife Act – 68 years – and the fact that it was heavily based on legislation going back more than 100 years, with an initial focus of protecting the King’s game from poaching (see ‘The path of biodiversity legislation’ on page 34).

The need for new biodiversity conservation legislation has been recognised for many years, starting with the proposal to replace the Wildlife Act

“The State is so diverse on a global scale that it qualifies (without the rest of Australia) as one of the world’s megadiverse countries ...”



Left The spectacular glossy ibis is protected under an international agreement.
Photo – Marc Russo

Above Australian green skinhead is one of WA’s many fungi species.
Photo – Richard Robinson/DBCA

with a revised and expanded *Wildlife Conservation Bill 1992*. A series of proposals for new legislation followed but, due to various reasons, were not brought to fruition.

A NEW AGE

In developing the new Act, particular attention has been given to recognising modern and widely accepted conservation concepts. There is a new focus on biodiversity conservation outcomes, including providing tools to various sectors of the community to undertake and become involved in conservation, knowing that their efforts will be recognised and protected. A fundamental change is that decision-making is now more inclusive, particularly for landholders and managers, while also directly encouraging and

protecting private conservation initiatives.

The new legislation includes the following initiatives:

- improved protection for threatened species, including conservation of their habitats;
- measures to conserve threatened ecological communities and critical habitats;
- cooperative provisions to recognise, promote and provide protection for private conservation efforts, including biodiversity conservation agreements and conservation covenants;
- public nomination provisions for listings of threatened species, communities and threatening processes;
- greatly increased deterrent penalties for people and corporations impacting on threatened species and communities

(up to \$500,000 for a person and \$2.5 million for a corporation);

- greatly increased deterrent penalties for unlawful sandalwood trading, increasing these from \$200 under the Sandalwood Act to \$200,000 for individuals and \$1 million for corporations, with additional penalties per tonne of unlawfully obtained sandalwood;
- an ability to require offenders to repair impacts to species and ecological communities in addition to penalties for damage done;
- control over impacts of environmental pests where these are not addressed under other legislation;
- biodiversity management programs, to cover the arrangements for sustainable harvesting, damage mitigation and other conservation management issues;



- reducing duplication by recognising approvals for impacts on biodiversity under other legislation, including the *Environmental Protection Act 1986*; and
- providing the basis for State biodiversity management arrangements to be recognised and exempted from secondary approval under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 1 provides a summary of the major differences between the Biodiversity Conservation Act and the principal Act it is replacing, the Wildlife Act. This comparison demonstrates how archaic the Wildlife Conservation Act is. With hindsight it is remarkable that more of the State's biodiversity has not been lost over the past 68 years. Thanks must go to the many dedicated people across the community who have worked tirelessly for biodiversity conservation.

This new legal framework recognises that landholders and managers are often best placed to appreciate the biodiversity values of their land and that they know how to best to help conserve these. New measures involving, for the first time, statutory processes for consultation with landholders and managers include:

- advice on significant threatened species' and threatened ecological communities' habitat locations;
- the preparation of threatened species and community recovery plans;
- the preparation of biodiversity management programs;
- consideration of critical habitat declarations; and
- development of environmental pest notices.

One fortunate consequence of the long delay in bringing the Biodiversity Conservation Act to fruition is that it includes developments in contemporary legislation that have been made over the past 25 years nationally and in other states. Significantly, the important biodiversity conservation provisions of the EPBC Act have been taken into account and are replicated at a scale appropriate to a State jurisdiction. This provides opportunities for the Commonwealth to recognise State decision-making and management under the Biodiversity Conservation Act and to accredit these arrangements under Part 4 of the EPBC Act. Where State biodiversity management is accredited duplicate Commonwealth approvals will not be required.

Above left The penalties for taking fauna such as bobtails have been increased under the new legislation.

Above Western wattlebirds are commonly seen throughout southern WA.
Photos – David Bettini

Another significant development for the Biodiversity Conservation Act is that it will also eventually fully replace the *Sandalwood Act 1929*, which is even older than the Wildlife Act. The May 2014 report of the Legislative Council's Standing Committee on Environment and Public Affairs on its *Inquiry into the Sandalwood Industry in Western Australia* found it to be severely lacking in its ability to protect wild sandalwood.

Importantly, the Biodiversity Conservation Act has been prepared to support matters that have been operating effectively and simply without legislation. An example is the process for listing threatened species and communities. The Act makes a significant change with the requirement (for the first time) that the Minister must have regard to expert scientific advice when making listing



Top Australia has about 108,000 animals without back bones, including the jewel beetle (*Temognatha brucki*).
 Photo – Jiri Lochman

Above Short-eared rock wallabies are one of WA’s mammal species.
 Photo – David Bettini

decisions. The Act enables the Minister to continue using the non-statutory Threatened Species Scientific Committee, which has been proven to work very well for more than 20 years, rather than also requiring a statutory committee to provide this advice. This avoids the additional costs and bureaucracy that establishing and maintaining a formal statutory committee would entail.

Table 1: Key differences between the *Biodiversity Conservation Act 2016* and *Wildlife Conservation Act 1950*

Biodiversity conservation matter	Biodiversity Conservation Act	Wildlife Conservation Act
Listing of threatened species in categories of Vulnerable, Endangered and Critically Endangered with public nominations	Yes	No
Listing of threatened ecological communities with public nominations	Yes	No
Listing of threatening processes with public nominations	Yes	No
Minister must consider scientific advice before listings	Yes	No
Listing of critical habitat with landholder consultation required	Yes	No
Preparation of recovery plans to guide recovery of threatened species and communities, with community consultation	Yes	No
Preparation of biodiversity management programs for sustainable use and conservation of non-threatened species	Yes	No
Preparation of voluntary Biodiversity Conservation Agreements to assist and guide cooperative programs for biodiversity conservation on private and leasehold lands	Yes	No
Preparation of Biodiversity Conservation Covenants on private lands to secure long-term protection for private landholder biodiversity conservation efforts	Yes	No
Ability to regulate biodiversity impacts of environmental pests	Yes	No
Ability to adopt codes of practice and to regulate nature-based tourism potentially impacting on biodiversity	Yes	No
Significant deterrent penalties covering unlawful taking of biodiversity, up to \$500,000 for a person taking critically endangered species	Yes	No (Maximum \$10,000)
Ability to require reparation of biodiversity habitat damage	Yes	No
Act applies in full to State Government agencies for flora, fauna and threatened ecological communities	Yes	No (only for flora)
Publicly available Ministerial Guidelines to provide explanations and standards for decision-making under the Act	Yes	No

The path of biodiversity legislation

Game Act 1892

"An Act to provide for the Preservation of Imported Birds and Animals and of Native Game."

Provided for the Governor to proclaim closed seasons, during which native game and exotic game animals and birds could not be lawfully taken. Native game included ducks and other bird species, such as black swans and malleefowl, as well as kangaroos, tamar wallabies and seals.

Game Act 1912

"An Act to consolidate and amend the Laws relating to Imported and Native Game."

In addition to closed seasons, this Act provided for the Governor to proclaim "acclimatisation areas" where introduced species were to be protected under the control of the Acclimatisation Committee of Western Australia. This Act also provided for the Governor to identify native game species that were wholly protected from hunting.



Native Flora Protection Act 1912

"An Act to protect the Native Flora of Western Australia."

Protected eight genera of native plants growing on Crown land from being picked without authorisation. These included acacias, kangaroo paws, boronias, Christmas bush and Leschenaultia.

Game Act Amendment Act 1913

Amended the Game Act by adding various provisions for regulating commercial harvesting of species and imposing royalties on skins (e.g. kangaroos).

Native Flora Protection Act 1935–1938

"An Act to provide for the protection of the Native Flora of Western Australia."

This Act replaced the 1912 Flora Act and added protection from taking native flowers from private property where the owner had not given permission, while also expanding the range of native flora species protected.

Fauna Protection Act 1950

"An Act to provide for the Conservation and Protection of Fauna."

This provided a fundamental change in the legislative approach from protecting

fauna for hunting to also protecting fauna as part of the State's heritage.

The Act covered only native vertebrate fauna and did not protect invertebrates, or species listed as vermin under the *Vermin Act 1918*. It provided for reservation of lands as fauna sanctuaries.

Wildlife Conservation Act 1950 (to 1980)

"An Act to provide for the Conservation and Protection of Wildlife."

A series of amendments were made to the Fauna Protection Act. The most significant of these occurred between 1967 and 1980 to change the name of the Act to the Wildlife Conservation Act and incorporate flora protection, while repealing the *Native Flora Protection Act 1935–1938*. The flora conservation provisions introduced the concept of 'declared rare' flora and provided for controls over the conservation of declared rare flora on both private and public lands in addition to controls over the harvesting of wild flora from public lands.



WHAT HAPPENS NEXT?

The Biodiversity Conservation Act will replace the Wildlife and Sandalwood Acts in their entirety. As part of this, detailed biodiversity conservation regulations are being prepared. These regulations will replace the Wildlife Conservation Regulations that cover matters such as the licences that are required to take, keep, study and buy and sell protected native animal and plant species. They will also replace the Sandalwood Regulations. The new

regulations will include a new system to regulate and track wild sandalwood harvests from harvest through to processing. This is necessary to ensure that only lawfully obtained sandalwood is traded.

On 3 December 2016 a number of the new provisions in the Biodiversity Conservation Act became operational. These include 'biodiversity conservation covenants' and 'biodiversity conservation agreements' which provide enhanced protection for private biodiversity

conservation efforts. It is intended that the remaining provisions of the Act and the Biodiversity Conservation Regulations will be in place by the end of 2018. Relevant stakeholders and interest groups will be consulted during the development of the Biodiversity Conservation Regulations.

These first steps represent significant progress in a long-overdue process. However, with these first steps underway, the health and sanctity of WA's precious environment looks set to be protected well into the future.

Above Honey possums are endemic to the south-west of WA.

Photo – Sallyanne Cousans

Above right Kangaroo paw was first afforded protection against unlawful taking in 1912.

Photo – David Bettini

Right Pied herons are found in the far north of WA.

Photo – Marc Russo



Gordon Wyre was the former Department of Parks and Wildlife's Director of Legislative and Policy Reform and was instrumental in bringing the Biodiversity Conservation Act to fruition.

Sophie Moller is a DBCA principal policy officer.

For more information on the Biodiversity Conservation Act visit www.dpaw.wa.gov.au/plants-and-animals/468-biodiversity-conservation-act-2016. Feedback on the ministerial guidelines can be submitted by email (biodiversity@dbca.wa.gov.au) until 30 September 2018.

A report summarising the feedback received and how it has been addressed will be published by the department at the end of 2018.



MENACING OR MISUNDERSTOOD?

Understanding swooping magpies

Each spring magpies lay their eggs in nests that they may vigorously defend. This can make a stroll around the neighbourhood or a trip to the park a fraught undertaking, reminiscent of an Alfred Hitchcock movie. But are magpies random assailants? Or is there more to their behaviour? And what can we do to avoid their aggression?

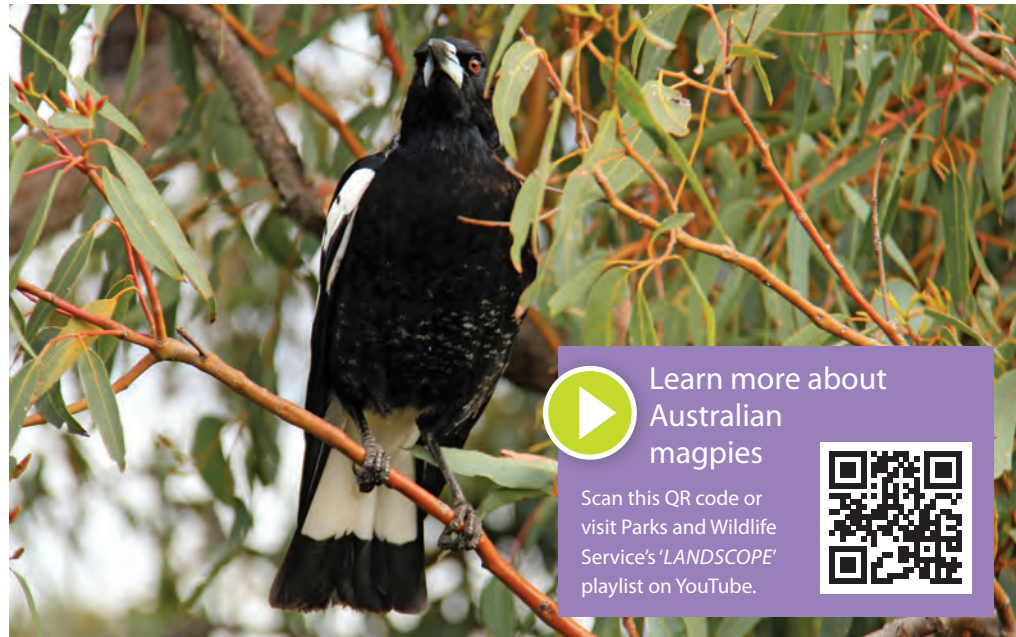
by Karen Smith, Allan Burbidge and Rhianna King
photos by Simon Cherriman

Australian springtime – it’s the glorious time of year when the shroud of winter clears and the days get longer and warmer. Winter coats are no longer needed for morning walks, the smell of blossom fills the air and plants hum with the sound of bees. But there’s another noise, synonymous with Australian springtime, that can instil fear in even the most valiant of us: the snapping beak and the whoosh of the wings of a swooping Australian magpie (*Gymnorhina tibicen*).

Most of us have at least one story of encountering a swooping magpie. Some have childhood memories of walking between classrooms wearing ice-cream containers on their heads for protection, while others have tales of needing to re-route their daily walk just to avoid being attacked. During spring, it’s not uncommon to see people donning bike helmets adorned with pipe-cleaners or cable-ties, or kids with big cut-out eyes stuck to the back of their hats. And you’d be hard-pressed to find an Aussie postie who doesn’t dread the period, particularly between the AFL Grand Final and Melbourne Cup, when their rounds can become particularly treacherous. For some, the impact of a magpie swoop, which can occasionally cause serious injury and bike accidents, can be catastrophic. But for most of us, it’s just an unpleasant, short-lived annual nuisance that comes with living amongst Australia’s iconic wildlife.

WHEN AND WHY

Magpies are a common sight across most urban areas of Australia throughout the year. Although they have become accustomed to sharing their living space with people, a very small percentage of these birds can become highly aggressive during their breeding season. In late winter or early spring, female magpies usually lay three to four eggs in nests that are generally built in tall eucalypt trees. After about 20 days, the eggs hatch and pink, blind, hairless chicks emerge. Then, in an act of protective parenting, a small percentage of adults begin vigorously defending their nestlings.



Learn more about Australian magpies

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



These birds rely largely on intimidating passersby by demonstrating a number of threatening behaviours, including a harsh alarm call, distance swoops (used as a type of ‘warning shot’) and, occasionally, swooping with intended contact. During this time, magpies are often seen as a collective menace. However, only about 10 per cent of magpies actually swoop, and, of those, 98 per cent are males. Being strongly family-oriented, these birds are not acting in aggression or anger but as defenders of their young. These birds will continue to defend their young, increasing in aggression as the chicks grow, until they fledge, six to eight weeks after they hatch – making the appearance of juvenile magpies on the ground, as they learn to fly, a welcome sight indeed.

SELECTIVE TARGETING

Magpies are not just random assailants, they are actually highly intelligent birds with long memories. Studies have shown that magpies can actually remember peoples’ faces and will not swoop humans who are in the area when they build their nests and whom they deem not to be a risk. Unfortunately, in public places and parks, many passersbys would be unrecognisable to a magpie and would therefore be considered a threat. Magpies are known to target people, who they perceive to be a threat, year after year. This phenomenon has

Previous page

Main Nestling magpies.

Above An adult female magpie watches walkers near her nest.

been experienced first-hand when one magpie only ever swooped Allan Burbidge, choosing to ignore everyone else, after he caught and banded its offspring.

PROTECT YOURSELF

So, what can you do to protect yourself against a swooping magpie? If you’re encountering one on your daily walk, then the most pragmatic approach is to change your route. Magpies will only defend their young within a small area (usually within a radius of 100 metres from the nest) so you may not need to adjust your course too much to avoid them. Curiously, they will attack cyclists over a larger area, perhaps because they are moving more quickly (and are therefore perceived to be a greater risk). And it will only be a six-to-eight-week period, usually between late August and November, before you can resume your normal habits.

Parks and Wildlife Service recommends people always wear a hat and sunglasses to protect their eyes. This is particularly encouraged for kids, who may turn to look at swooping magpies

Magpies

Magpies are medium-sized birds that are easily recognised by their black and white feathers. Adult males in Western Australia have an all-white back and adult females have a mottled black and white back while juveniles are like females but greyer, and have darker bills.

They are common and widespread throughout most of Australia, preferring to nest in tall eucalypts and requiring open areas for feeding on small insects and other animals that live in or just under the ground, such as worms, beetles, ants, spiders, frogs, lizards and even carrion. They have adapted well to agricultural and urban landscapes where suitable nesting trees occur.

Magpies have a complex social structure in which groups of up to about 12 birds, sometimes including more than one breeding pair, together with progeny from the previous two breeding seasons, will defend a permanent territory. Territory size depends on the quality of habitat and the number of birds in the group, but can be up to about 40 hectares.

The beautiful carolling of the magpie is commonly featured in the soundtrack of the Australian bush and can sometimes be heard on bright moonlit nights.



and risk sustaining damage to their eyes. Sheltering under an umbrella while passing through areas where magpies are known to swoop may also help. Magpies feel particularly threatened by fast-moving presences, so pedestrians are encouraged not to run through known magpie territories and cyclists should consider dismounting from their bikes.

Magpies should never be deliberately provoked or harassed. Throwing sticks or stones at swooping birds simply confirms to them that you are a danger to their young and will only increase their aggression and make them even more defensive. Instead, adopt a confident, but non-aggressive, stance and move on purposefully.

If you have the time, try making 'friends' with the magpie. If you are swooped, you could try slowly moving away a little, but allowing the male to study your face and general appearance so that he gets to know you.

Concerned members of the community can report particularly troublesome birds to Parks and Wildlife Service. In extreme circumstances, wildlife officers may visit the area to assess the situation and then, if a particular bird is found to be dangerous, a Dangerous Fauna Licence may be issued for a registered animal control agent to remove it. In Western Australia, magpies are

protected and actions such as unlawfully taking, harming or possessing magpies are offences under the *Wildlife Conservation Act 1950* and penalties of up to \$4000 can be imposed. From 1 January 2019 the new *Biodiversity Conservation Act 2016* will see the penalties for these offences increase significantly to a maximum penalty of \$50,000 (see also 'New future for biodiversity conservation' on page 28).

Magpies are not the only birds that may become a nuisance during spring – Parks and Wildlife Service receives many reports each year of menacing butcherbirds, wattlebirds and willy wagtails. But, be assured, this behaviour occurs for a very short period of the year. For most of the year, magpies and other swooping birds are friendly, sociable birds that live comfortably in our urban landscape. Magpies quickly ascertain if their environment is safe and will not threaten humans unless they feel vulnerable, and, even then,

.....
Above Newly fledgled magpies are often 'kidnapped' by humans who mistakenly think they are injured, which exacerbates swooping issues.

Above right A dominant male magpie.

Right Typical magpie nest in a marri tree.

only a small percentage will actually swoop. By learning to live with magpies, observing their behaviour and listening to their melodious calls, we can come to appreciate them for the charismatic, iconic birds that they are.



Karen Smith is a DBCA wildlife officer and can be contacted on (08) 9219 9843 or by email (karen.smith@dbca.wa.gov.au).

Allan Burbidge is a DBCA principal research scientist and can be contacted on (08) 9405 5109 or by email (allan.burbidge@dbca.wa.gov.au).

Rhianna King is a *LANDSCOPE* editor and can be contacted by email (rhianna.king@dbca.wa.gov.au).

The Wildcare Helpline provides advice to the public who find sick or injured native wildlife and can be contacted on (08) 9474 9055. Or download the Wildcare Helpline app from iTunes and Google Play.

STEPPING OFF: REWILDING AND BELONGING IN THE SOUTH-WEST



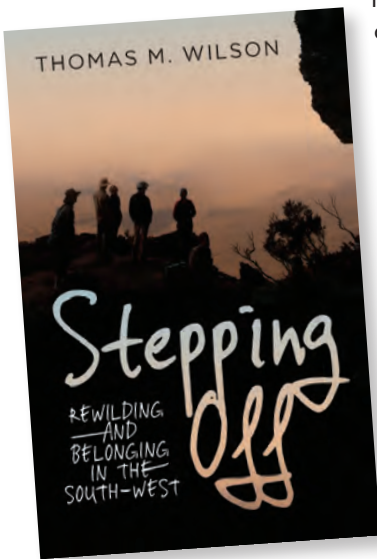
Stepping off by Thomas M. Wilson is the story of the special and unique south-west corner of WA. Wilson, who has a PhD in literature and the environment and has worked as an environmental journalist, delves into the history of the south-west in order to understand our current situation and make forecasts about where we're headed. It is Wilson's intention that by learning more about the geology, anthropology and cultural history of the place south-west Western Australians call home, we can deepen our connection with this land.

Wilson's observations are supported by wide-ranging research (indicated by the extensive reference list) and references to scientific studies and land management programs. His words are punctuated by literary references, poems, paintings, letters, journal excerpts and

notes from historians, early settlers and conservations. These, combined with his engaging and enjoyable writing style, make for a very entertaining read.

Stepping off helps the reader to gain a new-found appreciation for the south-west and provides a reminder that our existence is just a blip on the radar of this ancient and exceptional area. It also provides insight into the immense and in some cases irreparable damage we've caused to the landscape and the mammoth responsibility we have to halt and reverse our negative impacts.

Stepping off is available for \$29.99 from all good websites and from fremantlepress.com.au



CRF WILDFLOWERS



In late winter and early spring, Western Australia's Midwest is transformed with colour as thousands of species of wildflower bloom. One place that is particularly stunning is the 364-hectare Chapman River Regional Park, located in the heart of Geraldton.

A new app, designed and developed by Chapman River Friends and funded by the Northern Agricultural Catchments Council, showcases 112 of the area's 300 species of native plants. It is designed as a handy pocket guide and supports the *CRF Wildflowers* brochure, which can be picked up from tourism outlets in Geraldton.

The app enables users to search for species by type, flowering season, colour and name and provides information about the flowering habits and other identifying and interesting features. The photos are every bit as beautiful as you'd expect in an app celebrating wildflowers, and each species is depicted in a variety of states and settings, which helps even the lay person with identification.

CRF Wildflowers is available for free download from the Apple iTunes store or Google Play.



CYCLONE ALBY: MEMORIES OF THE 1978 WESTERN AUSTRALIAN STORM AND BUSHFIRE CRISIS

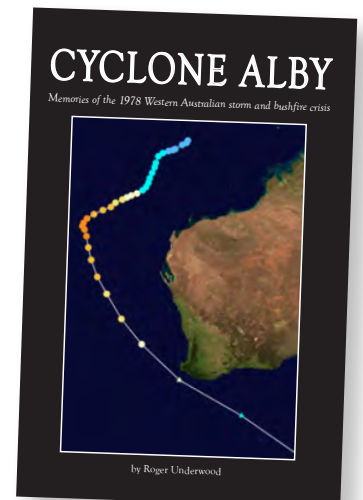


Forty years ago, Western Australia was rocked by windstorms and bushfires caused by *Cyclone Alby*. What started as a category 5 cyclone, became a bushfire disaster as fires burnt through the south-west fanned by northerly winds that reached 150 kilometres per hour. The storm and its aftermath claimed five lives, injured many others and caused significant damage to infrastructure, farms and timber plantations.

Author Roger Underwood sets the scene of the cyclone by describing the weather event and then details the social, agricultural and environmental landscape of WA in 1978. This is fascinating reading as it reminds us of all the advancements in technology, communications and systems that we take for granted in dealing with crises such as these today.

Then, the book presents a collection of accounts from the firefighters, nurses, foresters, teachers and others who were present for *Cyclone Alby*. These stories shed a human light on the event and the pages are filled with details of how the experience looked, felt and even smelt. There are descriptions of fear, surprise, devastation, heart-break, relief and appreciation. Collectively, these tales capture the endearing Australian spirit of mateship, courage and endurance that exists in our harsh and unforgiving, yet beloved landscape. Like many of Roger's books, *Cyclone Alby* provides an invaluable record of this significant event in Western Australian history that might otherwise have been lost.

Cyclone Alby is available for \$35 from The Bushfire Front Inc. Visit <http://volunteerfirefighters.org.au> for more information.



Highlighting heritage:

Riverpark trail celebrates Australia's Sikh history

A fascinating new interpretive trail on the Swan Canning Riverpark pays homage to a site used by the Australian Sikh community and shares stories not widely known about the extraordinary contributions Sikhs have made to Australia in the past two centuries.

by *Ben Ansell and Sophie Henderson*



Wandju Wandju Nidja
Whadjuk Boodja

ਸਤਿ ਸ੍ਰੀ ਅਕਾਲ

Welcome to Adanta Park

Welcome to the Australian Sikh Heritage Trail at Adanta Park,
a place of great significance in the history of Western Australia.

The site has long been associated with religious ceremonies of the Sikh
Community in Western Australia. It is the first location where ceremonial
saggy Sikh gurus in Western Australia. Ceremonial was only required
Sikh who Sikh campaigned for it from the late 1920s onwards.

In September 1987 the site was registered in the State
Register of Heritage Places and listed as the former
Sikh Cemetery, Cemetery of Sikh, Adanta Park is also
classified as a historic site by the National Trust (NS).

This trail marks the remarkable contributions of Sikhs
to Western Australia.



www.sikhheritage.com.au
www.adantapark.com.au



Adanta Park
Sikh Cemetery

Visitors have long been drawn to Adenia Park, Riverton, also known as Bicentennial Park, in Canning River Regional Park for walks, picnics and bike rides. It is also popular among birdwatchers, who venture there to enjoy the abundance of bird species that forage and nest in the vegetation that fringes the Canning River. It is also frequented by those on kayaks and canoes who explore the river. But, for Australian Sikhs, the area holds immense cultural heritage and historical value. And a new trail is providing visitors with a unique opportunity to learn about an important slice of Australian history that has not been widely told.

RICH HISTORY

The Australian Sikh Heritage Trail celebrates the remarkable story of Australian Sikhs over the past two centuries, and their contribution to Australia's heritage. Situated at Adenia Park, the exact site where Sikhs were cremated legally in Western Australia for the first time in the 1930s, the trail shares stories of how Sikhs shaped the present cultural and social landscape of Australia. From the mid-1800s, Sikhs from the Punjab region of India (the 'land of five rivers' – an area that spans eastern Pakistan and north-western India) made their way to WA – many of them as cameleers. Traditionally, horses and sometimes donkeys and bullocks were used by explorers and prospectors on expeditions into Australia's interior. However, because of Australia's harsh arid environment, horses often required regular water and large stocks of feed, making them a less than ideal mode of transport across the vast area of land they were required to travel. Horses were also easily exhausted by the tough and often sandy ground. So, it was thanks to camels and the cameleers (many of whom were from Punjab), and other cameleers from South Asia, who travelled to the centre of Australia, that the region was opened up to trade and transport between the Australian colonies. Sikhs living in Australia during the late 1800s and early



“... for Australian Sikhs, the area holds immense cultural value. And a new trail is providing visitors with a unique opportunity to learn about an important slice of Australian history which has not been widely told.”

Previous page

Main Adenia Park, Canning River Regional Park holds cultural significance to the Australian Sikh and Nyoongar communities.

Photo – Marie Lochman

Inset The Australian Sikh Heritage Trail celebrates 180 years of Sikh culture.

Above Interpretive panels share the history and culture of Sikh and Nyoongar people.
Photos – Bobby Sandhu/Be Still Studios

1900s also made a living as businessmen, hawkers, shopkeepers, farmers, wrestlers and soldiers.

Some early pioneer Sikhs who had previously been cameleers or hawkers became successful businessman and purchased stores, while others became security guards or purchased farms. According to the Australian Sikh Heritage Association, during the early period of the State's colonisation, almost every WA country town was visited by a Sikh

hawker several times a year. During the Great Depression, these towns could not have survived without the essentials that were being provided by these hawkers to country households – often on credit.

ANZAC LEGACY

The trail also pays respect to and acknowledges the contributions made by Sikh Anzacs. When war broke out in 1914, a number of Sikhs enlisted in the Australian Imperial Force. According to the Australian Sikh Heritage Association, at least 19 Sikhs enlisted in the Australia Imperial Force and the New Zealand Expeditionary Force (NZEF) and about 1.2 million people volunteered to fight for the British Indian Army in WWI – making them the largest volunteer army in the war. In World War I and World War II, 83,005 Sikhs were killed and 109,045 were wounded fighting for the Allied forces.

One of the stories illustrated in the signage at the Australian Sikh Heritage Trail is that of Manmohan Singh, who



Discover more about the Australian Sikh Heritage Trail

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

Above Australian Sikhs came from the Punjab region of India.
Photo – Bobby Sandhu/Be Still Studios

Left Cremations were first legally carried out at Adenia Park.
Source – *The Mirror* newspaper, 30 June 1934.
From the National Library of Australia.

joined the Indian Air Force Volunteer Reserve as a pilot officer at the outbreak of World War II in 1939. He was selected as the leader of an Indian Air Force batch of pilots sent to England for training and active duty. As the oldest of the group, he was affectionately known as 'Chacha ji' (Punjabi for uncle). Manmohan Singh was given command of a Sunderland flying boat with the RAF Coastal Command, hunting submarines during the battle for the Atlantic.

On the morning of 3 March 1942, a Japanese air attack destroyed 15 flying boats on the water in Broome Harbour, killing 88 people. Manmohan Singh was in

a Catalina at the time the attack occurred. He is thought to have survived the shelling and resulting explosion but, as he could not swim, he drowned in the ocean. Manmohan Singh died far away from his homeland fighting for the freedom of Britain and the world. Sikhs continue to serve proudly in the Australian Defence Force today.

THE SIGNIFICANCE OF ADENIA PARK

Adenia Park has long been associated with the religious ceremonies of the Sikh community, and was the location where cremations first legally took place in WA

after the Sikh community campaigned for cremation to be legalised. The funeral rites of the Sikh religion require cremation, however, in the Swan River Colony's first 100 years, cremation was not permitted by law. Cremations took place nonetheless and newspapers reported cremations in Claremont in 1897, Manjimup in 1901 and Kalgoorlie in 1910. Sikhs living in WA petitioned the State Government for decades to legalise the practice and the law was changed with the passing of the *Cremation Act 1929*.



Above Nihal Singh of Manjimup on his wagon with his dog.
Source – State Library of Western Australia



Above right Hawker Veer Singh from Wandering.
Photo – Courtesy of the Dowsett Family

In Sikhi, a religion that originated in the Punjab region, the funeral rites are called Unttim Sunskaar (final act). A wooden pyre is erected for the cremation while passages of Sikh Holy Scripture are recited. After the ceremony, the remaining ashes are scattered in nearby flowing water. The swamp sheoak (*Casuarina obesa*), which is also known as Kulli in Nyoongar, is commonly found around the Canning River Regional Park. According to stories, the local sheoak was used for wooden cremation pyres in the Sikh cremation ceremonies at Adenia Park.

Harjit Singh from the Australian Sikh Heritage Association spoke at the official opening of the Australian Sikh Heritage Trail and summed up the significance of the trail for the Sikh community, and the broader Australian community, as a celebration of multiculturalism.

“Close to 100 years ago, the WA Government honoured the ‘other’ when it was not required and was downright

unpopular to do so due to the prevailing White Australia Policy at that time,” he said.

“The WA Government acknowledged the religious needs of a minority and changed a law to make cremations legal.

“Today, the Australian Sikh Heritage Trail pays that gesture of goodwill forward by starting the trail by honouring those that came before us all – the Nyoongar people and the natural landscape of this beautiful land.

“It is hoped that visitors will embrace the messages shared on the trail and continue paying goodwill forward and commit to honour the ‘other’, in order to spread kindness and strengthen tolerance in our communities.”

WORKING TOGETHER

The Australian Sikh Heritage Trail project was achieved through a collaboration between DBCA, the City of Canning, the Australian Sikh Heritage Association, the Sikh Association of WA and Sikh Gurdwara Perth.

A Lotterywest grant secured by the City of Canning and the Australian

Sikh Heritage Association provided the initial impetus to kick-off early consultation with DBCA to help establish the framework for what became a three-year project. DBCA was keen to be involved in the project to celebrate the strong community connection that exists with the rivers, and, specifically, to acknowledge the strong link the Western Australian Sikh community has with Adenia Park.

A reference group worked together to develop design concepts, and research and uncover the remarkable story of Australian Sikhs, building on research carried out since 2010 by the Australian Sikh Heritage Association. Information was gathered through searching libraries, state records and tracking down information in private collections, as well as interviewing community members who could help piece together the story. Along the way friendships were made and stockpiles of individual stories and photographs were collected, indicating what a massive impact Sikhs have had on the Australian story.

“It is hoped that visitors will embrace the messages shared on the trail and continue paying goodwill forward and commit to honour ‘the other’ in order to spread kindness.”



WHAT'S IN A NODE?

The implementation of the Australian Sikh Heritage Trail has seen the development of four new interpretation facilities (or nodes) and a 250-metre-long concrete path with a number of interpretive elements. In designing the trail, DBCA worked closely with the City of Canning and the Australian Sikh Heritage Association to ensure the project connected to Australian Sikh cultural heritage values and was implemented in a culturally sensitive way. In addition, the project was designed for longevity so the infrastructure could be maintained in the long term.

The interpretation draws on striking images and storytelling across six key themes: cameleers, hawkers, entrepreneurs, Anzacs, wrestlers and cremations. Each of the nodes also incorporates a quote in Gurmukhi (Sikh script). There is also information relevant to Whadjuk Nyoongar culture, including an acknowledgment of Country, and information about the Riverpark's natural values. There are also plans to have stories from the Australian Sikh community recorded for visitors to listen to.

THE BIGGER PICTURE

The Australian Sikh Heritage Trail forms part of the broader Swan Canning Riverpark Trail network, connecting to other paths and interpretation facilities in the Riverpark – known as River Journeys, which enrich visitor experiences and

connection to the Riverpark's natural and cultural heritage.

The Swan Canning Riverpark Trail network has been in the making for a number of years, with extensive planning and liaison to develop a draft Riverpark Trail Masterplan and the Marli Riverpark Interpretation Plan, named after the Nyoongar word for 'black swan'. These documents have identified trail guides and key areas for interpretation along the Riverpark. An important part of developing the Marli Riverpark Interpretation Plan, was to establish a Nyoongar Advisory Panel to provide advice on how to integrate cultural heritage information and guide how messages about Whadjuk Nyoongar cultural heritage values of the rivers should be told.

The Riverpark Trail vision is to create a continuous recreation trail network through the Swan Canning Riverpark, from Fremantle to Guildford, on both the northern and southern shores of the Swan and Canning rivers. The network of trails will be designed to improve visitors' connectivity to the rivers and enhance their understanding and enjoyment of the Riverpark. The trail will include a range of recreation options, including short circuits and long distance walking and cycling opportunities, and improved access to the river edge. Along the Riverpark Trail, there will be interpretation nodes at key visitor locations to communicate the Riverpark's natural and cultural values. It is hoped that Adenia Park will attract visitors, particularly from India, interstate

and the wider community, and projects such as the Australian Sikh Heritage Trail will help connect visitors to parks, create a sense of shared ownership and improve the experiences of those who visit.

Above left The trail honours the Nyoongar and Sikh heritage of the area.
Photo – Marie Lochman

Above The trail caters to walkers and other users.
Photo – Bobby Sandhu/Be Still Studios

Below Canning River Regional Park provides a haven for waterbirds and other animals.
Photo – Marie Lochman



Sophie Henderson is a DBCA media relations officer. She can be contacted on (08) 9219 9918 or by email (sophie.henderson@dbca.wa.gov.au).

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For more information about the Australian Sikh Heritage Trail visit www.australiansikhheritage.com

Adventure out



Journeying through time and space at Geikie Gorge National Park

Geikie Gorge National Park (Danggu), located 25 minutes from Fitzroy Crossing, is recognised as one of the best places in the world to view limestone reefs or cliff systems. An event to launch the newly appointed tourist vessel, the *Ms Casey Ross* provided DBCA audio-visual production officer Shem Bisluk with the opportunity to experience this magnificent part of the world and hear about its fascinating history.

by Shem Bisluk



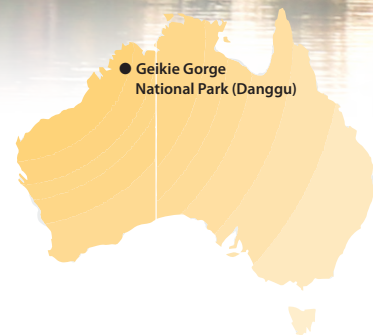
Warm light from the late afternoon sun projects itself onto the large, limestone rock formations, painting the landscape in rich tones. The still, calm water reflects both the sky and gorges above, and is disturbed only by the movement of the newly appointed tourist boat in which I'm travelling as part of its launch event. There's an overwhelming feeling of tranquillity here, and yet you can sense the history and culture of this sacred area, as though the ancient stories of the Danggu Dawanggarri people, the traditional owners of the area, are being whispered through the stillness.

Located in Geikie Gorge National Park (locally known as Danggu Geikie

Gorge National Park), the gorge has been carved by the Fitzroy River Crossing and boasts some of the most spectacular examples of limestone reef and cliff systems in the world. I was charged with documenting the launch of a new Parks and Wildlife Service vessel that guides visitors through the gorge – a daunting assignment, as no photos or footage I've ever seen do justice to this spectacular and awe-inspiring landscape.

MAIDEN VOYAGE

The new vessel – commissioned and operated by Parks and Wildlife Service – can accommodate 88 guests and two crew members. It leaves from a newly erected boat ramp in the national



Main The *Ms Casey Ross* guides visitors through the stunning Geikie Gorge National Park.

Photo – Jesse Murdoch/DBCA

Inset top and inset bottom Friends and relatives of Ms Ross gathered to celebrate the launch of the new vessel.

Photos – Shem Bisluk/DBCA



See more of Geikie Gorge National Park (Danggu)

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



park, which is a short drive from Fitzroy Crossing and is accessible by two and four-wheel drive vehicles. Built in Perth by Cordina Marine, this vessel replaces the department's longest serving vessel, *Miss Geikie 2*, which has been in operation since the early 1990s.

Like its predecessor, the vessel guides visitors down the Fitzroy River, providing guests with an opportunity to spot wildlife, such as wallabies, and birds such as sea eagles, broilgas and rare purple-crowned fairy-wrens, while being awed by the changing colours and forms of the gorge walls. One side of the river is fringed by sandbars with Melaleuca trees, where freshwater crocodiles can occasionally be spotted sunning themselves. On the other side, the multi-coloured rock formations soar towards the sky and frame the landscape beautifully. There's a honeycomb effect, created by sand being buried by both floods and river currents. And every now and again you see a cave-like structure nestled between the water's surface and the underneath of the rocks, which appears to go deep inside the water. The landscape is truly breathtaking and the vessel itself is impressive, and certainly provides a comfortable way to spend an hour. But, for me, what's really special about this whole experience is learning the history of the vessel's name.

WHAT'S IN A NAME?

The vessel has been named the *Ms Casey Ross*, after the matriarchal leader of the Danggu muway or clan when the national park was first created in 1967. At

the launch of the *Ms Casey Ross*, Ms Ross's daughter, Mary Aitken, together with other Bunuba people, gave a stirring welcome to country and shared her mother's story, which in turn became her own.

Mary held back tears as she spoke at the launch about how her mother believed that life was one big circle, and that her spirit lived on and she would never leave this special place. She said Ms Ross would be proud to see Aboriginal and non-Aboriginal people working together in partnership to maintain cultural values in all national parks and conservation reserves on Bunuba country and described how her mother was a strong custodian of her culture.

Later she gave those aboard the *Ms Casey Ross* a commentary of the landscape. She explained that the Danggu Dawangarri stories weren't intended for either men or women in particular, but rather, could be shared with children and future generations. She recalled how when the river flooded many years ago, her uncle built a raft and crossed the water, and was the only person to do so. She also described how Ms Ross had forged an enduring friendship with park senior ranger Ron Holland.

It was certainly humbling to be present for such an important event and to be given a special insight into the beauty and magic of this area. It's such a gift to visitors that, as traditional custodians of the land, the Danggu Dawangarri people want to share their story and their connection to the land which dates back to the Dreamtime.

Do it yourself

Where is it? Geikie Gorge National Park (Danggu) is 20 kilometres north-east of Fitzroy Crossing.

What to do: Canoeing and kayaking, gorge boat tour, bushwalking, fishing, Indigenous tours.

Facilities: Toilet, visitor centre, boat ramp. Geikie Gorge boat tours operate daily from 1 May to 16 October.

Cost: \$45 adult (16 years and over), \$32 concession, \$12 child (six to 15 years), \$100 family (two adults, two children). No fee for children five years and under.

Tours can be booked online. For information and bookings visit parks.dpaw.wa.gov.au/event/geikie-gorge-boat-tours

Above left The stunning geology of the gorge can be enjoyed from aboard the *Ms Casey Ross*.

Above DBCA Parks and Wildlife Service staff were on hand at the launch to provide visitors with information about the park.

Below The new vessel guides visitors down the Fitzroy river.

Photos – Shem Bisluk/DBCA



Shem Bisluk is a DBCA audio-visual production officer. He can be contacted on (08) 9724 6170 or by email (shem.bisluk@dbca.wa.gov.au).

Touched by nature



Doug Coughran: a man of stature

Well-known and respected marine mammal expert, Doug Coughran AM, the former Department of Parks and Wildlife's very own 'Wildlife Warrior', passed away earlier this year after a long and illustrious career. He leaves behind a legacy that includes whale rescue techniques that he was largely instrumental in developing, which are practised not just in Western Australia but around the world, as well as fond memories among those who knew him.

by Peter Dans, Carolyn Thomson-Dans and Cameron Craigie

On Monday 14 July 1980 a 28-year-old Douglas Keith Coughran presented for work as a trainee wildlife officer with the then Department of Fisheries and Wildlife. Within six months he was made permanent with his supervisor at the time referring to him as “a dedicated, efficient and studious wildlife officer – always reading informative and instructive books on flora and fauna to increase his already sound knowledge”. This was the beginning of a long and productive career, which culminated in him becoming renowned and respected around the world as an expert in marine mammal rescue and disentanglement. Throughout his career, he was a leader and an innovator who worked passionately and tirelessly on behalf of all wildlife.

FIRST MASS STRANDINGS

In the early days of the Department of Conservation and Land Management (CALM), Doug formed close friendships and professional collaborations with then Atlantis Marine Park veterinarian Dr Nick Gales (now the Director of the Australian Antarctic Division) and Greg Pobar, then CALM’s Marmion Marine Park manager. With others, like fellow wildlife officers Peter Lambert and Dave Mell, they worked side-by-side on two mass strandings of false killer whales at Augusta in 1986 and 1988 that captured the world’s attention.

Following these two events in almost identical locations only two years apart, Doug worked tirelessly to assemble and train volunteer organisations, develop emergency response plans to deal with marine mammal strandings and oil spills, and collect information and DNA samples for research being done by Nick and others.

Doug always placed a concerted emphasis on training and readiness. He and his colleagues worked to ensure there were trained professionals and an army of trained volunteers ready to spring into action at a moment’s notice, as well as specially developed equipment and stakeholders, such as professional fishers,



Previous page

Main Doug Coughran leaves a lasting impression on those who knew him, and a legacy in marine mammal conservation. *Illustration – Gooitzen van der Meer/DBCA*

Above Doug (centre) was involved in managing the response to mass whale strandings from the 1980s.

Right Pauline Goodreid, Doug and John Edwards after the successful disentanglement of a humpback calf off Albany. *Photos – DBCA*



ready to help out with boats and anything else required. Doug also understood the enormous value of good public relations and developed a close relationship with the news media, ensuring that communications plans were developed hand in hand with action plans. No details were ever left to chance.

In the early 1990s, Doug was instrumental in developing the management arrangements for the fledgling whale watching industry off Perth and, in doing so, spent many hours at sea in ‘his’ beloved wildlife protection patrol vessels *Pseudorca II* and then *Pseudorca III*, ensuring the industry and the management arrangements evolved sustainably with animal welfare at the fore.

DISENTANGLING LEVIATHANS

In the early to mid-1990s, as the humpback whale population really started to recover, the first reported

entanglements were experienced along the Western Australian coast. Doug led the charge and from 1992 CALM began to explore the techniques and tools required to safely attempt disentanglements. A highly trained specialist team was also formed and, during the late 1990s and early 2000s, Doug could be found sitting at the front end of the inflatable boat or directing people like John Edwards, Peter Lambert or Peter Dans from the mothership, whenever a whale was in trouble.

Through this period, Doug further developed his excellent working relationship with the media, and became the go-to departmental spokesperson for all incidents involving whales, dolphins, seals and sea-lions.

Doug was always looking for new information and better ways to do things, and he was always open to new ideas. His thirst for knowledge and new techniques saw him receive a prestigious Churchill



Fellowship in June 2004. The fellowship enabled him to travel to the east coast of the United States for eight weeks to study whale disentanglement techniques, tools, procedures and protocols and, importantly, see first-hand the collaborations between marine managers and the fishing industry designed to avoid and minimise entanglements.

In 2006, following a spate of mid-year entanglements, the then Environment Minister Mark McGowan (now Premier of Western Australia) called an urgent roundtable meeting with representatives from the fishing industry. Doug was critical in building working relationships with these stakeholders and developing changes to fishing techniques to help minimise entanglements. So effective were Doug's efforts in working with the fishing industry that in late 2006 he was awarded the Western Australian Fishing Industry Council's Environment Award.

“Throughout his career, he was a leader and an innovator who worked passionately and tirelessly on behalf of all wildlife.”

SAFETY AND COLLABORATIONS

Many would recall receiving emails from Doug that were signed off ‘stay safe’ and, during his years of overseeing whale disentanglements, he had an unwavering focus on the safety of the people involved. This was the impetus for him developing a nationally accredited course in large whale disentanglements, which saw him train and mentor departmental staff around the State as well as delivering the training to personnel in other Australian states and territories, and in New Zealand

Top left Then Environment Minister (now Premier) Mark McGowan (centre) met with Doug and the department's whale disentanglement team (Peter Lambert, Rick Dawson and John Edwards) after a spate of entanglements in 2006.

Top Doug travelled throughout WA training staff and volunteers in safe practices for marine mammal conservation.

Above left Doug carried out his work with a focus on safety and preparedness.
Photos – DBCA

Above Throughout his career, Doug was involved in the rescue of more than 70 whales.
Photo – Doug Coughran/DBCA

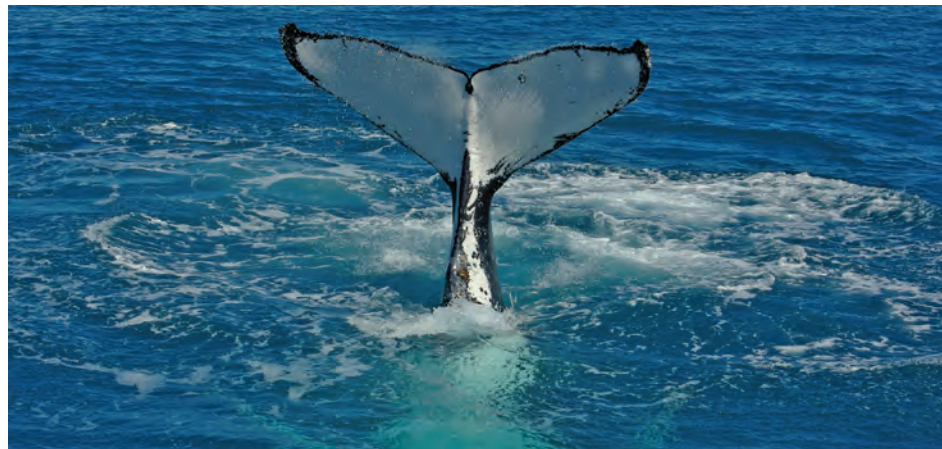


Above left Doug was also an esteemed photographer, whose work has often been published in *LANDSCOPE* and other departmental publications.
Photo – Doug Coughran

Above Doug was appointed a Member of the Order of Australia in the 2010 Queen's Birthday Honours List.
Photo – Peter Nicholas/DBCA

Left Doug was instrumental in developing guidelines for WA's whale watching industry.

Below Doug was also a keen birdwatcher.
Photos – Doug Coughran



and South Africa. Doug retained close connections with those he had trained and mentored, and maintained a global whale disentanglement network to share information and lessons learned from disentanglement efforts around the world.

During his 36 years as a wildlife officer, Doug developed successful operational and research partnerships with the department's scientists and regional staff (see 'Scientific serendipity', *LANDSCOPE*, Spring 2015). He collaborated with staff at other government agencies including Rottnest Island and Perth Zoo, as well as Murdoch University and other institutions nationally and internationally.

Doug co-authored 18 research papers and has been cited in 126 other papers in the field of marine mammals. In 2013 Doug presented a paper on the techniques he had pioneered for the humane euthanasia of large whales to the International Whaling Commission in London. His recommendations were

adopted unanimously. Doug was also a member of the International Whaling Commission's Expert Advisory Panel on entanglement response. During his career he rescued more than 70 whales.

Doug's achievements were formally recognised in the 2010 Queen's Birthday Honours List when he was appointed a Member of the Order of Australia for "service to conservation and the environment, particularly through the disentanglement of whales, as both a practitioner and educator".

ENDURING LEGACY

The Department of Biodiversity, Conservation and Attractions is currently having a new marine patrol vessel built. The vessel will be Perth based and will be tasked with responding to marine mammal incidents, managing the commercial whale watching industry, and carrying out marine park, river and island patrol duties. The vessel, which is due to be launched in October, will be named the *D. K. COUGHRAN* to recognise the

significant contribution Doug made to the protection and conservation of the State's marine animals and his tireless work in innovation and safety.

Peter Dans is DBCA's Deputy Director General. He can be contacted by email (peter.dans@dbca.wa.gov.au).

Carolyn Thomson-Dans was a senior project officer with DBCA and its predecessors.

Cameron Craigie is a DBCA regional wildlife officer. He can be contacted by email (cameron.craigie@dbca.wa.gov.au).





What's in a name?

A group of 20 to 25 Indo-Pacific bottlenose dolphins are a much-loved feature of the Swan Canning Riverpark. Each dolphin is given a name and can be identified by the unique markings on its dorsal fin, which it gets from interactions with other dolphins, from sharks or from becoming entangled.

The latest Riverpark dolphin to be named, is 'Click'. Click is almost two years old and is the calf of Tupac. Ruby Pyle from the *Nearer to Nature* Discovery Club suggested the winning name because Tupac uses various clicks and whistles to communicate with her calf.



You can learn more about the Swan Canning Riverpark dolphins by downloading a free copy of *FinBook*, a photographic guide of dorsal fin images designed to help the community monitor Perth's dolphin population. *FinBooks* are also available for the Mandurah dolphins and the snubfin dolphins of Roebuck Bay. These can be downloaded from www.riverguardians.com

Did you know?

The population of Swan Canning Riverpark dolphins includes several adult females with dependent calves, one or two groups of tightly-bonded adult males, and a number of sociable youngsters.



Above left Ruby Pyle was honoured with a certificate after suggesting the chosen name for the new calf. *Photo – DBCA*

Left Click with her mum Tupac. *Photo – Delphine Chabanne*

Dolphins in WA

Dolphins are fascinating and unique creatures. There are 14 dolphin species that inhabit Australian waters, many of which can be seen along Western Australia's coastline. **Here's how to identify some of our most common dolphin species:**



1

Common dolphin (*Delphinus delphis*)

Common dolphins have an hourglass pattern of light grey and tan or yellow on their sides and a dark stripe from flipper to lower jaw, with a long, black beak. This species has a prominent triangular dorsal fin, pointed flippers and a slender, streamlined body.



2

Common bottlenose dolphin (*Tursiops truncatus*) and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*)

Bottlenose dolphins have a short, rounded snout or 'beak' that resembles a bottle. These dolphins are sleek and streamlined, have a prominent dorsal fin, and can vary in size, shape and colour depending on where they are found. Indo-Pacific bottlenose dolphins develop black speckles on the belly as they get older, whereas common bottlenose dolphins do not.



3

Australian snubfin dolphin (*Orcaella heinsohnii*)

This dolphin is dark on top, a lighter shade of brown around the middle and the belly is white. It has a rounded forehead with no beak, unlike most other dolphin species in Australia. It has a small, rounded (snubbed) dorsal fin and inhabits waters of northern Australia.



4

Spinner dolphin (*Stenella longirostris*)

Spinner dolphins have a distinct tri-colour pattern, with a dark dorsal surface, light grey sides and a white underside. The head is slender, with a long narrow beak. Spinner dolphins occur in tropical and subtropical waters. Large groups are occasionally seen in Ningaloo Marine Park.



Red-winged parrot (*Aprosmictus erythropterus*)

The red-winged parrot – a medium-sized species – is found throughout northern Australia. It can usually be spotted foraging in tree canopies or in the outer branches where they feed on seeds, berries, flowers, insects and larvae. They are usually in pairs or small flocks but their calls are loud, so they are often conspicuous.

Illustration by Gooitzen van der Meer

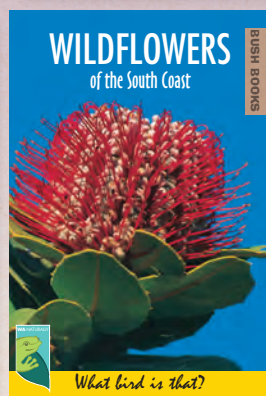
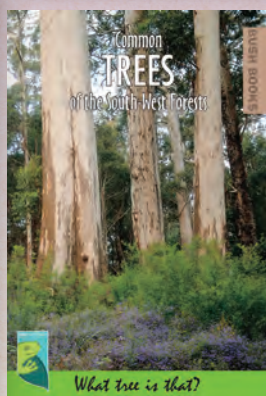
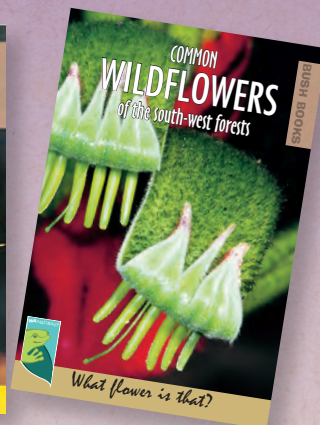
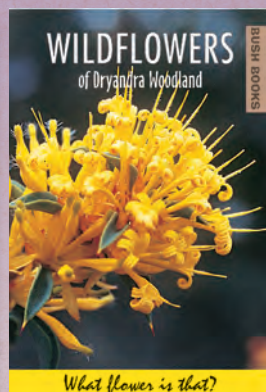
Reference photo by Jiri Lochman

BUSH BOOKS

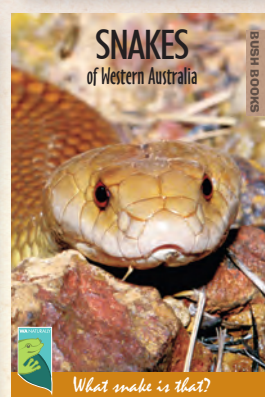
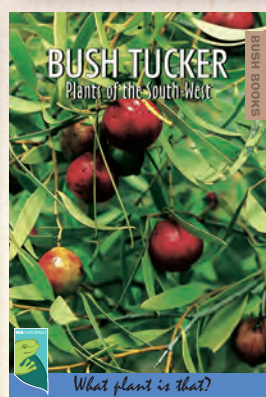
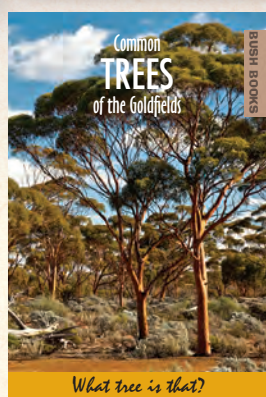
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