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urban nature

Issue 126 **Winter** 2023 *Time of Makuru and Djilba in the Noongar calendar.*

Keep Carnaby's Flying – Ngoolarks Forever

Photo – Rick Dawson.

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

Bushland News *is a quarterly newsletter of Urban Nature, a Department of Biodiversity, Conservation and Attractions Parks and Wildlife Service program to support community involvement in bushland conservation.*

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Next issue

Spring *Bushland News*

Spring *Bushland News* contributions should be sent to Urban Nature by **14 August 2023**. *Bushland News* seeks original contributions. If your submission has been or may be published elsewhere please let us know. Compiled and edited by Julia Cullity.

Keep Carnaby's Flying – Ngoolarks Forever

By Bec Donaldson

Keep Carnaby's Flying – Ngoolarks Forever is a Lotterywest funded partnership between universities, environmental non-government organisations (NGOs), Aboriginal groups and local governments, to undertake community-led activities for black cockatoo conservation across the Perth-Peel region. Launched in May, the project is science-informed and community-powered to help halt declines of our threatened black cockatoos.

What is the project doing?

We are working with the community to keep Carnaby's flying across Perth. We know that black cockatoos are heading towards extinction, largely because too much of their habitat has been cleared. To halt their declines, we need to halt the net loss of native vegetation.

Male Ngoolark (Carnaby's cockatoo). Photo – Rick Dawson

Some of the Keep Carnaby's Flying – Ngoolarks Forever project members and supporters at the May project launch at Zanthorrea native nursery, holding native plants that are key black cockatoo foraging species. Photo– Murdoch University.

Carnaby's cockatoos, aka Ngoolarks (a Noongar name), are perhaps the most iconic, well-loved wildlife in the urban landscape, and growing numbers of people want to protect them. This project grew out of that concern.

Our project is putting more food in the ground. We are planting key Carnaby's cockatoo food plants, such as banksia, hakea, jarrah and marri, in selected local government areas where we know flocks are roosting and need food. We are also installing Cockitrough water drinking stations near some roosts, to protect against heat stress from insufficient water or disease from contaminated water. We are working with Aboriginal Elders to incorporate cultural knowledge appropriately, holding outreach activities in selected schools, and developing area-specific black cockatoo conservation action plans for selected councils. We will also soon be offering additional resources for schools, councils and the public on our website. Together we hope to raise awareness about the habitat crisis facing black cockatoos and provide opportunities for the community to help.

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Ngoolarks (Carnaby's cockatoos) urgently need more food. Much black cockatoo foraging habitat around Perth has already been lost, and more is being cleared every week. This is driving their declines towards extinction. Perhaps the number one thing people can do is to help put more food in the ground for the birds. Photo – Karen Riley.

What about Baudin's cockatoo and the forest red-tailed black cockatoo?

Our project's flagship species is Carnaby's cockatoo because this project is focused on the Perth-Peel region, a key region for Carnaby's cockatoo during the non-breeding season. However, our revegetation and community engagement activities also aim to help WA's other black cockatoos, Baudin's cockatoo and the forest red-tailed black cockatoo. Effective action is time-critical for Baudin's cockatoos, which have recently become critically endangered, the last step before extinction.

Who is involved?

This project is a broad collaboration. Wildlife vets and scientists from the Black Cockatoo Conservation Management Project at Murdoch University, who have been studying the health and ecology of black cockatoos for 15 years, are partnering with the university's Ngangk Yira Institute for Change and Harry Butler Institute and key environmental NGOs that are experts in restoring native habitat or caring for black cockatoos. These community organisations include Birdlife Australia, Perth NRM, SERCUL, Winjan Aboriginal Corporation, Peel Harvey Catchment Council, Landcare SJ, Urban Bushland Council and Kaarakin Black Cockatoo Conservation Centre. We are also collaborating with the Department of Biodiversity, Conservation and Attractions (DBCA), and the Town of Victoria Park.

Our project's environmental NGOs are working with four councils per year on revegetation activities to give black cockatoos more food, with opportunities for friends groups and the public to join planting days. In 2023, the councils involved are City of Melville, City of Cockburn, City of Wanneroo and Shire of Serpentine Jarrahdale.

Another partner, Curtin University's TrEnD laboratory, is using environmental DNA techniques to investigate the biology of forage and identify plant species that black cockatoos from particular local government areas are feeding on, by isolating trace amounts of DNA from their scats. The researchers have been collecting uncontaminated Carnaby's poo in this year's local government areas and will be looking for volunteers to help with collection in other areas across Perth later in 2023 or 2024. Collection techniques must be followed carefully, email Birdlife's Merryn Prior to assist with this study.

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How can people take part?

Everyone can help by joining council-run planting days, joining or starting a friends of bushland group to restore or rewild remnant patches of bushland that are precious for black cockatoos, or creating Carnaby's cafés by filling your gardens and schools with flowering banksias, hakeas and other favourite foods. Our partner Winjan Bindjareb Boodja Ranger Program and other Aboriginal ranger programs support First Nations participation in habitat restoration. Citizen-science opportunities include getting involved in our partner Birdlife Australia's annual Great Cocky Count every March/April or year-round with CockyWatch. Our Keep Carnaby's Flying website has more ideas, including volunteering with revegetation and wildlife NGOs.

Our hope for the future

We are funded by Lotterywest. Our project aligns with Lotterywest's priorities of protected sustainable ecosystems, inclusive thriving community and active healthy people by supporting revegetation and the associated community-government collaborations that are vital for black cockatoo survival.

Our hope is for Perth to be a city of green urban forest canopies which keep its wildlife (and human!) residents cool as WA's climate becomes hotter, with bushland corridors, parks, schools and gardens brimming with native flora, where black cockatoos can continue to entertain and entrance us as they nibble banksia cones or wheel and call overhead.

Create a Carnaby's Cockatoo-friendly garden!

Zanthorrea Nursery is helping black cockatoos by participating in the Keep Carnaby's Flying - Ngoolarks Forever project.

Ask our staff about native plants that will provide food for our endangered Ngoolarks (Carnaby's Cockatoos) in your garden.

Further information about what to plant and how to help save this threatened species can be found at **keepcarnabysflying.org.au.**

Keep Carnaby's Flying project launch was held at Zanthorrea Nursery who are participating in this project along with APACE WA, Australian Native Nursery and Muchea Tree Farm. We are providing these nurseries with large signs to help people identify which plants are the best healthy food sources for black cockatoos. Photo – Murdoch University.

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Hello and goodbye to Nia Murray *By Julia Cullity*

Meet Nia Murray who is completing her biology degree from Edith Cowen University by interning with the Urban Nature program for first semester this year. Nia has been involved in all aspects of this issue of Bushland News including production, editing, proofing and writing the Project snapshot feature on eDNA. Along with her assistance at the Hearts Healing the Land conference, we hope it will give positive exposure to science communication.

Nia has also assisted with restoration efforts on Penguin Island including helping set up a seed treatment and germination trial for wild grape (*Nitraria billardierei*), and monitoring and collating visitor activity on the island. She also spent a week fauna trapping at Wandoo National Park with pre-dawn starts and nothing in the traps until the last day!

Nia will be leaving us as this newsletter is distributed. We wish her all the best in her new career.

Nia Murray joined the Urban Nature program as a conservation intern to complete her biology degree. Here Nia is planting fruits of wild grape at Penguin Island in a grid which will later be covered by a mesh cage. This trial is comparing different seed treatments to see which will result in germination. Photo – Grazyna Paczkowska.

Hearts Healing the Land/Koort-al Boodja Koyingkeriny

Hearts Healing the Land brought together land care practitioners, traditional owners, scientists and volunteers to learn from each other and celebrate the achievements community and land managers can make when caring for flora, fauna and country (boodja).

The conference is held every two years, with funding from the Rehabilitating Roe 8 project and Urban Nature was pleased to be part of the organising committee along with friends and colleagues from SERCUL, Perth NRM and the Australian Association of Environmental Educators. It was a packed program and, on the day, Nia and I were involved in timekeeping. Our wonderful presenters were excellently prepared and the whole day ran smoothly.

A unifying theme was the speakers' connection to country. We heard Noongar Traditional Owners' continuing cultural, spiritual and economic connection to country. We also heard about some more recent but strongly held connections to natural areas by community groups protecting and managing bushland, even down to doing a little bit more in our gardens and streetscapes for local plants and animals. In our interactive session we workshopped ways to support community involvement in conservation.

Most, but not all, of the presenters at Hearts Healing the Land posed for a group photo. Johanna Riddell Urban Bushland Council (from left), Julie Ginbey Swan Estuary Reserves Action Group, Heidi Hardisty Friends of Lake Claremont, Jane Chambers NatureLink Perth, Adam Peck Rehabilitating Roe 8, Rachel Standish Murdoch University, Shae Holden and Otto Animals Australia, Ali Babbington Murdoch University, Sally Marsh Cockburn Community Wildlife Corridor, Eddy Van Etten Edith Cowan University, Hannah Gulliver Perth NRM, Iriaka Isaacs Climate Justice Union, Kate Goodman Friends of the Ngoolyak, Heidi Mippy Noogar Land Enterprise Group, and Cristina Ramalho The University of Western Australia. Photo – City of Cockburn.

The day ended with a well-rounded discussion of the amazing achievements in restoring and understanding of the values of the Roe 8 corridor. This was followed the next day by a tour of the corridor. Soon we hope the corridor will have a new name that looks to the future and not the destructive past.

We will be sure to include a link to the presentations and workshop results in a future issue once they get uploaded. It was a great day. I learnt a lot and had some great conversations with inspirational people.

Emma Stevens preparing to collect a water sample in the Canning River as part of her masters research. Photo – University of Western Australia.

New emerging biodiversity monitoring techniques – exploring eDNA

By Nia Murray

What is eDNA?

Environmental research within Australia is reaching new heights, with the use of exciting and emerging non-invasive molecular techniques harnessing eDNA (environmental DNA). Organisms leave traces of DNA throughout their environment and this DNA or 'eDNA' is helping scientists discover the organisms that inhabit an environment with one single sample of water, soil, and other matter. The growing use of eDNA is assisting in discoveries of invasive species, endangered species survival and overall biodiversity monitoring, possibly creating an inexpensive complementary technique to many time-consuming traditional study procedures. A DNA sample from an ecosystem can also show scientists the presence of pathogens and invasive species aiding the management and restoration of these ecosystems.

For conservation, depending on the objective, eDNA metabarcoding or single species surveys can be used. Metabarcoding eDNA can identify multiple species from a single environmental sample, allowing for the identification of detectable biodiversity within an area. This can be used as a general survey tool to find species from different taxonomic groups which otherwise would require multiple different survey techniques, knowledge, and skills. Single species surveys include identifying and extracting only the DNA of one single species, assisting in the detection of specific threatened or invasive species. This can also assist in tracking populations for post release survival of a translocated/reintroduced species.

Although eDNA can provide valuable information on biodiversity, it is not able to provide information about an organism's age, condition, or breeding status, which may clarify the population biology of a target species. Knowledge of these still requires the use of traditional methods. Ultraviolet radiation, temperature, and weathering can degrade an eDNA sample, possibly causing limitations to collecting samples.

In the lab

It is most important to avoid contamination when collecting eDNA samples, otherwise the DNA found will not reflect the eDNA in the surveyed area. This requires, at the very least, gloves, pre-sterilised equipment, and completing any traditional testing methods after eDNA sampling.

There are several laboratories in Australia that conduct eDNA testing, including the DBCA Sid James Conservation Genetics Laboratory, the TrEnD Lab at Curtin University, the commercial lab eDNA Frontiers, enviroDNA in Melbourne, ecoDNA in Canberra and the Australian Genome Research Facility. These labs can receive a DNA sample from any environment, the DNA is extracted through a series of steps to remove organic material and retain the target DNA. For single species detection these labs analyse eDNA samples by running it through a qPCR machine to give a presence/absence result, similar to how advanced and sensitive Covid-19 tests are completed. When metabarcoding, the PCR machine replicates the DNA material extracted from the sample, creating more copies for a DNA sequencing machine to read. To then identify the organisms, DNA readings are searched in databases known as reference sequencing databases which include records of past collected and sequenced DNA. Unfortunately, the organism can only be identified if their sequence has been entered into a database. These databases are still being added to and include GenBank and BOLD. Many labs have their own databases dedicated to their study areas.

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What research has taken place and what has been discovered?

Canning River invasive fish detection

Western Australian freshwater ecosystems are commonly under threat by invasive fish species, disturbing their rich biodiversity. Invasive fish have been introduced throughout the Canning River by various processes, one being the public releasing pet aquarium fish. To combat this issue, barriers were placed throughout the river over the years in the hope of stopping the spread of the invasive fish.

A study involving DBCA and The University of Western Australia has been designed to investigate how effective these barrier modifications were in managing invasive fish movement three years after installation, and to obtain a general biodiversity survey of the river.

*The pearl cichlid (*Geophagus brasiliensis*) is an invasive species of the Canning River that is aggressive to native fish populations and degrade our waterways due to their sediment sifting feeding behaviour. It is an attractive aquarium species but Don't dump that fish. Photo – Paige Wilson.*

This study has looked at both traditional fyke netting (a traditional type of cylindrical fish trap that is easy for a fish to enter but difficult for them to leave) that is left overnight, and the new method of sampling eDNA. Samples were collected over a two-week period from the Canning River using two different eDNA methods. One where the water is collected and the DNA is actively filtered out using a pump, and a second method where the filters were placed in the river and DNA was allowed to accumulate onto the filter.

After the eDNA samples are collected, the traditional fyke nets can be used to compare the different methods, whilst providing fish population density, which eDNA cannot do. It is hoped that this data and future studies will assist in giving insights into what fish are currently utilising the river, how they move within and between the barriers, and which invasive species are present.

This highlights the importance of the Don't Dump That Fish campaign of public education about the negative effects of releasing unwanted pets into drains and waterbodies with their potential as invasive species.

Monitoring translocated wallabies

Monitoring marsupials using traditional capture methods can prove a challenge. Trapping is invasive and difficult as many marsupials don't enter traps readily, while photo-monitoring methods aren't always effective as most marsupials have no identifiable features. New work by DBCA analysing scats (faecal matter) for DNA from bilbies, and banded hare-wallabies (amongst others) has provided a breakthrough in monitoring these elusive, trap shy species. This is allowing researchers to monitor the effectiveness of management including the translocation of threatened species.

Analysing eDNA from the scats of the threatened banded-hare wallaby has provided a non-invasive monitoring technique which has been used to study translocated animals. Scientists can generate a unique genetic fingerprint for individual animals and identify their home range, gender, and genetic diversity. Early results from the translocation to Dirk Hartog Island are very promising and have shown the population increasing and interbreeding within two to three years. Photo– Richard Manning.

The banded hare-wallaby has become extinct in the wild on Australia's mainland and efforts are underway to recover the species by undertaking conservation translocations to islands and fenced areas where they are safe from feral predators such as cats and foxes. As a pilot release in August/September 2017, 12 rufus and 12 banded hare-wallabies were translocated from Bernier and Dorre islands to Dirk Hartog Island, followed by a full-scale translocation of 90 banded and 50 rufus hare-wallabies in October 2018. Banded hare-wallaby translocations also occurred in 2017–2018 from Faure Island to Mt Gibson Wildlife Sanctuary. DBCA staff on Dirk Hartog Island are undertaking a rigorous monitoring program following the release of the translocated species to ensure they are settling in and establishing new territories.

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As banded hare-wallabies are not easy to capture, a new method using genetic analysis of hare-wallaby scats is helping DBCA staff to identify and count individuals in their new environment. Originally achieved using genetic markers known as microsatellites, DBCA are now using a new marker type known as SNPs, which has enabled a higher throughput method of genetic analysis. SNP – or single nucleotide polymorphism – refers to a change in a single nucleotide in the genome sequence of an individual. Sampling multiple SNPs in an animal's genome enables researchers to generate a unique genetic fingerprint for each individual, which then serves as a method of non-invasive ID tagging.

From the DNA obtained from each scat, scientists are then able to identify and count the number of individuals in the sampling area and each animal's home range based on the distribution of their scats. Analyses indicated an increase in the number of banded hare-wallabies in the survey area between 2019 and 2020, indicating the hare-wallabies are establishing well. Not only can they tell individuals from their scats, they can also determine the animal's gender and estimate the genetic diversity in the population.

Genetic diversity is important, as it helps a population to better adapt in their new environment. Results from genetic diversity tests found that individuals from separate source populations were interbreeding, which is a good sign for population growth and genetic adaptation. All this information was gathered, non-invasively, using scat eDNA.

eDNA in WA's pollen

Animal and insect pollinating species are on a decline from environmental stressors and visual surveys to monitor pollinating activity are time consuming giving limited data for scientists to work with. The use of eDNA in partnership with visual surveys can detect these important pollinating events in greater detail and provide insight into understudied flora and fauna species interactions. Joshua Newton and colleagues at Curtin University conducted a study comparing eDNA metabarcoding with visual surveys in the Helena and Aurora Range of WA. They were able to detect interactions between flowers from seven species with diverse floral morphologies with birds, mammals and insects, and discover the changing ecology of pollinating species in WA.

The differences between techniques were striking, eDNA identified 59 pollinating taxa, where visual surveys identified only 16. Interestingly, the visual and eDNA survey results did not significantly correlate. The eDNA results left many bee visits undetected, such as the introduced European honeybee which were visually detected on 13 plants, yet honeybee DNA was detected on only four. Visual surveys also detected native bee species, which were left undetected during DNA surveys. It is possible that environmental factors have caused DNA degradation. The use of eDNA metabarcoding did assist with detection of nocturnal species. During visual surveys, no nocturnal taxa were recorded visiting the flowers, however the eDNA surveys detected species of moth, and nocturnal mammal species including the western pygmy possum.

The difference in visual and eDNA survey results perhaps implies that the use of both survey methods is most effective for accurate results on pollinator species and flower interactions. Using eDNA can provide otherwise undetectable information on pollination ecology and assist in future conservation efforts.

Visual and eDNA survey results did not significantly correlate. Survey data from the eDNA identified 59 pollinating taxa, where visual surveys identified only 16 with few overlapping results. This suggests both methods are complimentary. Graph – Joshua Newton et al.

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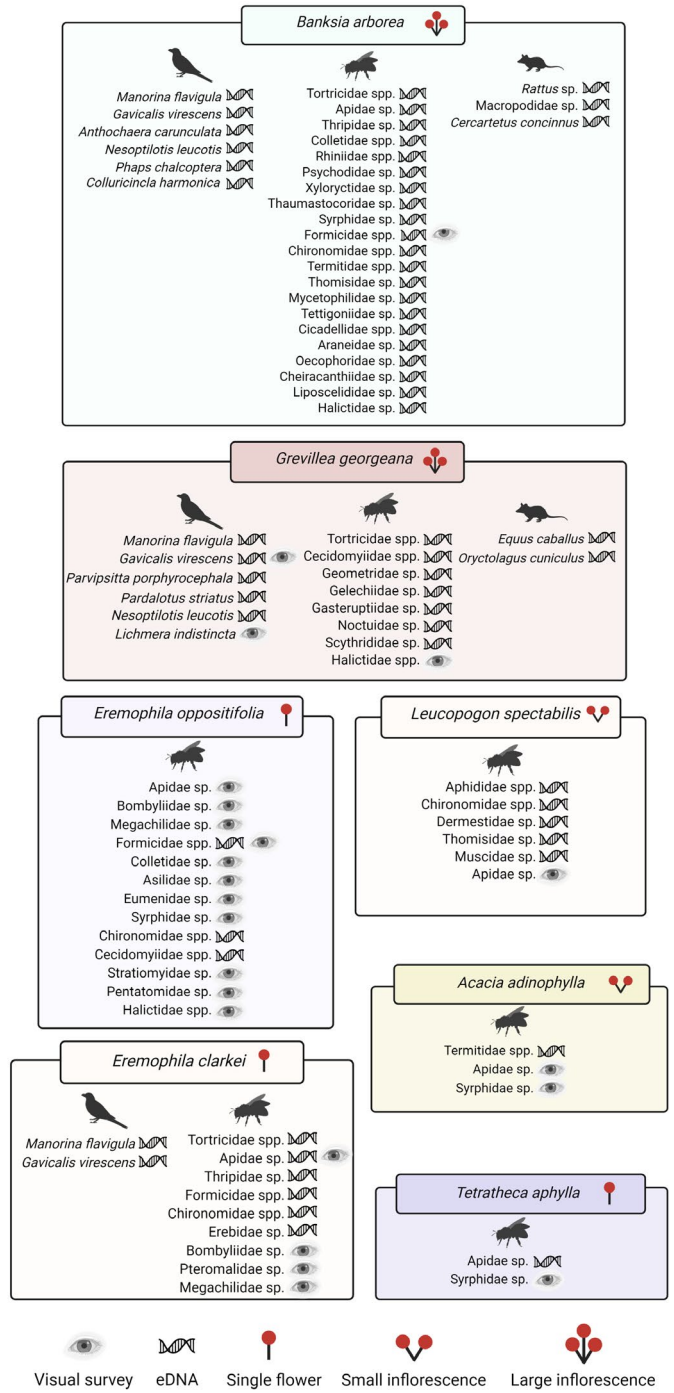


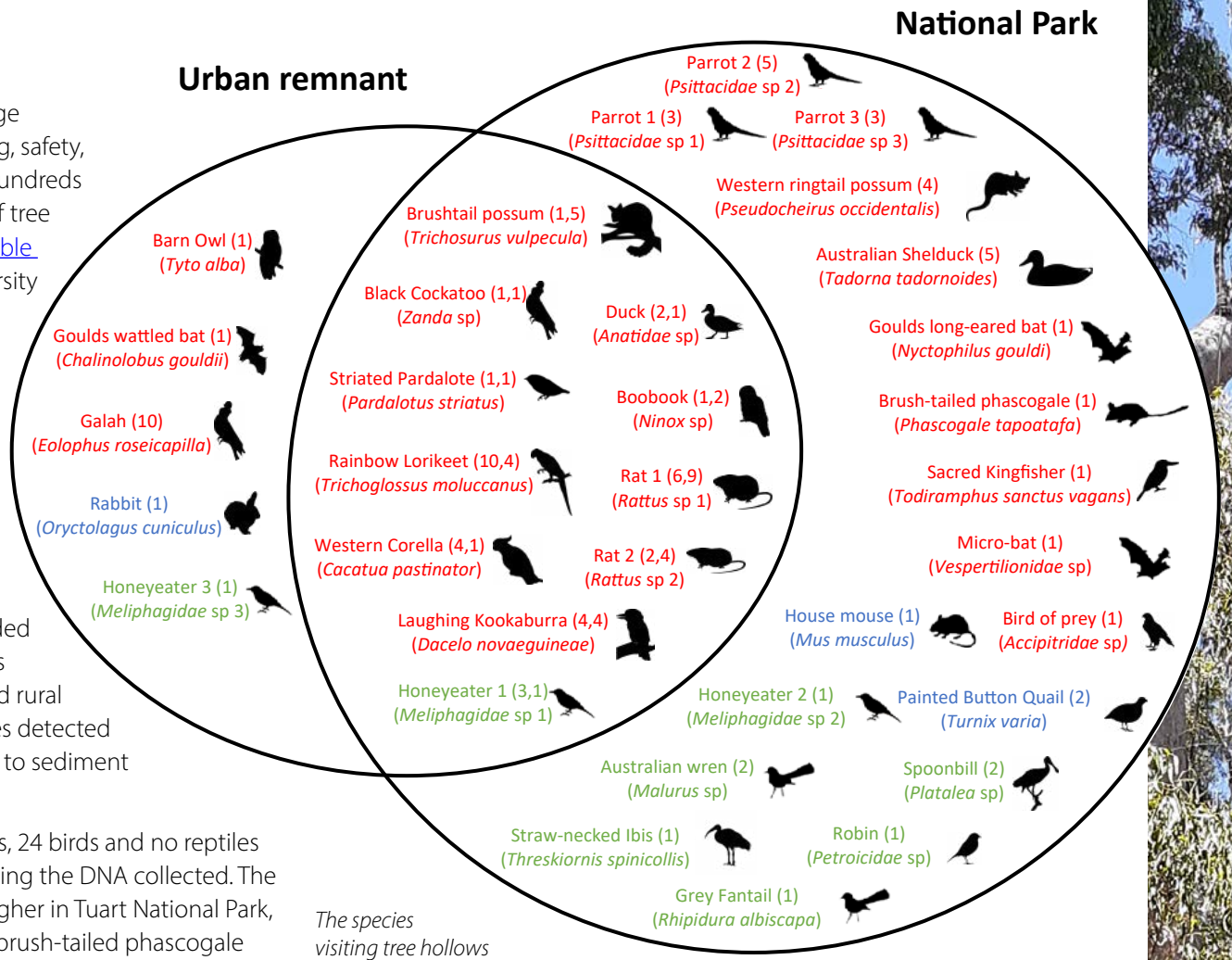
Who is in our tree hollows?

Tree hollows provide vital habitat for a range of species, acting as a resource for breeding, safety, and sleeping. With tree hollows needing hundreds of years to form in old trees, and the rate of tree clearing, the number of tree hollows available are in decline. Scientists from Curtin University used Kings Park, Bold Park, and the Tuart National Park as study sites to assess species interactions with tree hollows, while also comparing the efficacy of two sampling methods, extracting DNA from collected sediment samples versus using roller swab samples.

Using the non-invasive method of collecting eDNA, 138 samples were taken from 93 tree hollows. These samples included 93 roller samples and 45 sediment samples around urban Kings Park and Bold Park, and rural Tuart National Park. The roller swab samples detected a greater species richness of 19, compared to sediment samples which detected 13 species.

Thirty-four vertebrate species, 10 mammals, 24 birds and no reptiles or amphibians were detected after calibrating the DNA collected. The number of species detected overall was higher in Tuart National Park, including detection of the cryptic species brush-tailed phascogale (*Phascogale tapoatafa*). The two sites shared 11 common species with the invasive rainbow lorikeet (*Trichoglossus moluccanus*) being the most common hollow user. The graph shows the species found and provides a comparison between the urban Kings Park and Bold Park and the rural Tuart National Park sites.

The use of eDNA provides accurate insight into the species visiting tree hollows and valuable information on the impacts of invasive species such as the rainbow lorikeet to assist bushland managers.



The species visiting tree hollows in urban remnants and a national park, shows a higher number of species found in Tuart National Park compared to the urban remnant bushland at Kings Park and Bold Park. Red indicates a known hollow user, green is a non-hollow using bird and blue is a possible prey species. The number of detections is recorded in brackets with the invasive rainbow lorikeet being the most common hollow user. Graph– Joshua P. Newton et al.

A non-invasive sampling method involved tree climbing to collect roller swabs and sediment samples. Here Simon Cherriman from iNSIGHT Ornithology is high up in a tuart tree collecting eDNA. Photo – Joshua Newton.

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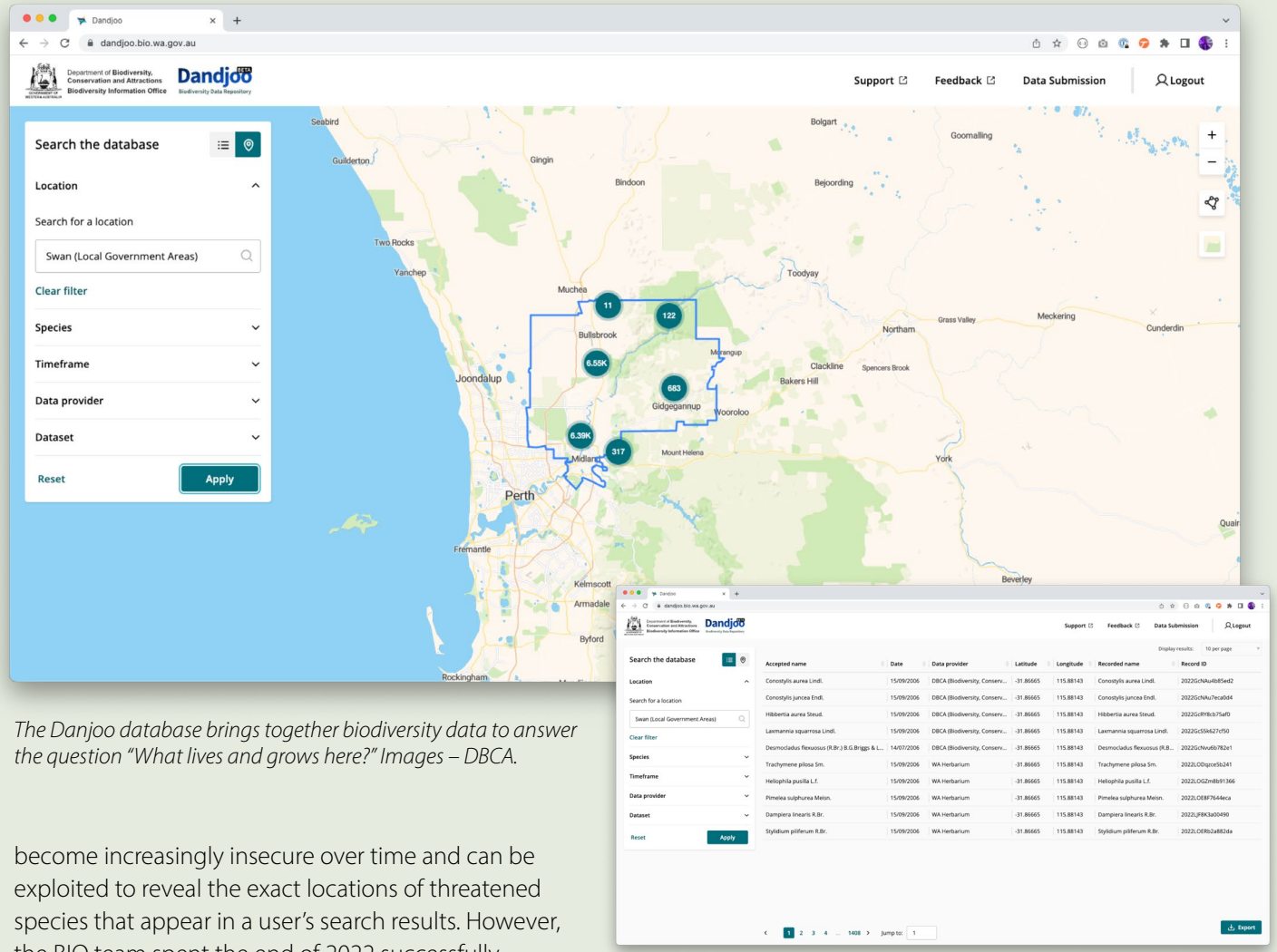
Dandjoo: bringing our biodiversity data together

By Helen Ensikat

The Biodiversity Information Office, or BIO, was established in late 2020 as part of a broader government plan to streamline environmental decision-making and regulation in Western Australia. BIO's work on improving the quality and availability of the State's biodiversity data supports more informed, more efficient decisions within government. However, agencies and regulators are far from the only groups that will benefit – local governments, businesses, researchers, educators, and community groups also ask the question 'what lives and grows here?' as part of their work.

In mid-2022, BIO launched Dandjoo – a digital platform that handles all stages of biodiversity data management, from submission, through to curation and display. Dandjoo's name translates to 'together' in the Noongar language, a reference to both the bringing together of data from various sectors, and its origin as a collaboration between various State and Federal agencies. For data users, this release of Dandjoo offers a light map interface, and core search and data export functions. As detailed in the Dandjoo User Guide, users can currently search for species occurrences by date, scientific name, location, or data provider, and can apply a variety of map overlays to put the data in context.

In early 2023 the BIO team began work on the next phase of Dandjoo's development, which will deliver a substantial upgrade and performance enhancements for users. One of the most welcome additions will be the introduction of species reports that incorporate conservation-listed species – a popular feature of DBCA's retired NatureMap platform. The previous technology used to provide this feature in older systems has become increasingly insecure over time and can be exploited to reveal the exact locations of threatened species that appear in a user's search results. However, the BIO team spent the end of 2022 successfully developing and testing a new, more secure approach that will allow this important data to be shared safely via Dandjoo by the middle of 2023.



The Danjoo database brings together biodiversity data to answer the question "What lives and grows here?" Images – DBCA.

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BIO is also looking forward to introducing a variety of new and improved search tools in Dandjoo in the coming year including the ability to search by common name, as well enhanced handling of data produced by scientific surveys. When this work is complete, users will be able to drill down into survey datasets, exploring and displaying more detailed information about specific survey sites as well as data on the species found there.

For those who collect biodiversity data in their day-to-day work, Dandjoo allows them to share it with others, providing self service tools that take the hard work out of formatting and standardising their records. Dandjoo also includes an extensive set of built-in curation tools. Every record loaded into the platform undergoes a series of quality checks that species names, conservation codes, locations, and dates are valid. Records from some of Western Australia's most significant biodiversity data collections are among the millions being ingested into Dandjoo for curation, delivering in a State-wide uplift of data quality. Over 1.5 million records have already been curated and loaded, and this number will continue to grow.

Beyond 2023, BIO is developing a long-term roadmap for Dandjoo's future, from delivering user-requested features to incorporating new data sources. Visit bio.wa.gov.au to follow the progress of this work.

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1983–2023 Celebrating 40 years of landcare in Western Australia

2023 marks 40 years since the beginnings of the modern landcare movement in Western Australia and the WA Landcare Network is establishing the WA Landcarers' Hall of Fame, a repository of portraits, biographies, and timelines of this rich history to provide inspiration and education for generations to come.

Appointment to the WA Landcarers' Hall of Fame will include presentation with special certificates at community-based 40-year anniversary celebrations around the State, duly recognising a lifetime of dedication through action, leadership, research, advocacy, policy, publication, and persistent hard work.

Landcare owes a great deal to traditional custodianship, and to those early landcare adopters who stepped up and stayed there, breaking the utilitarian approach to land that dated back to when Europeans first arrived, and giving energy and passion to the beginnings of the broader movement we have today. No enduring movement is born overnight, and a lot had been happening prior to 1983 in response to the degradation occurring in the environment. This 40-year birthday marks when WA entered the era of formalised landcare and pays tribute to all the actions that occurred around that time. By 1988, 60 percent of farmers and 90 percent of pastoralists were directly involved in community landcare. Simultaneously nature focused groups such as the Ongerup Conservation Organisation, environment centres and friends of groups evolved.

Photo – Kevin Sparrow

First Nations peoples have always carried out cultural responsibilities managing and caring for the health of Country, with this becoming increasingly recognised by the landcare movement from the mid-1990s.

Keep an eye out for the 40-year anniversary of landcare's WA season of celebrations, starting in August. Landcare groups will be invited to host celebrations with their local landcare communities, and the newly formed Parliamentary Friends of Landcare will be engaged in enabling landcarers to celebrate with local politicians, building relationships and support for their work.

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Modern taxonomic study describes South West freshwater mussels new to science *By Michael Klunzinger*

Carter's freshwater mussel (*Westralunio carteri*) is no longer the only freshwater mussel species living in the South West of Western Australia. In 2021–2022 genetic evidence published by Klunzinger *et al.* and Benson *et al.* showed that the mussel, in fact, has evolved into three genetically distinct lineages. Late last year a study by Dr Michael Klunzinger (Australian Rivers Institute, Griffith University) and co-authors Drs Justin Benson & Barbara Stewart (University of Western Australia), Dr Alexandra Zieritz (University of Nottingham (UK)) and Dr Lisa Kirkendale and Corey Whisson (Western Australian Museum) formally described the three genetically distinct lineages as separate species and subspecies in *Nature Scientific Reports*.

Carter's freshwater mussel, Westralunio carteri, is listed as vulnerable on the IUCN Red List, the WA Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. It was listed as threatened as a result of significant range contraction from salinity and drying climate.

W. carteri is found along the west coast in freshwaters draining to the Indian Ocean from Gingin Brook, north of Perth, to Margaret River on the southern end of its range. The 'new' species *Westralunio inbisi* is genetically distinct from *W. carteri* and has shells which are, on average, smaller and less elongated than *W. carteri*. The name of the recently described species is derived from the Noongar word 'inbi' which translates to "freshwater mussel" and naming the 'new' species was overseen by the WA Museum Aboriginal Advisory Committee, facilitated by Curator of Molluscs Dr Lisa Kirkendale. Two subspecies were also described in the study with *Westralunio inbisi inbisi* from southerly flowing rivers from Waychinicup River to the Margaret and Blackwood river drainages along the south coast. *Westralunio inbisi meridiemus* was described from the Margaret and Blackwood rivers. The name *meridiemus* derives from Latin 'meridiem' meaning 'southwest', in reference to its restricted distribution.

Work is now underway to formally assess the conservation status of the newly described species of freshwater mussel. Given the ongoing issues with salinity and continuing declines in rainfall and increasing temperatures in the regions where the newly described species lives, it is likely that the species is under threat. Stay tuned as more research becomes available.

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*Newly described freshwater mussels (*Westralunio inbisi*) from the south coast of south-western Australia. The shells are, on average, smaller and less elongated than* W. carteri. *If you live in the South West and need to tell your mussels apart, take a dive into the new taxonomic description. Photo – Dr Justin A. Benson.*

Please send us your regional report (400 words) and one or two photos by Monday 14 August 2022. Text may be edited in response to volume of submitted reports.

Building community capacity to care for urban bushland *By Johanna Riddell*

Most friends groups name their two biggest challenges as the recruitment of new volunteers, especially younger volunteers, and succession planning for leadership roles.

The Urban Bushland Council WA Inc (UBC) has welcomed the opportunity to work with some of our member groups to understand the challenges around volunteering, to identify practical solutions and to pass those ideas onto others.

The Building community capacity to care for urban bushland project started with a deep dive into current national and international volunteering trends and found that most Australians are time poor and therefore are less likely to volunteer than the previous generation. When Australians do volunteer, they prefer short-term or one-off volunteering experiences called episodic volunteering. Think about all those folk that come along to your group once or twice a year for tree planting events.

Our project uncovered other factors that impact on friends groups' ability to recruit new volunteers including

- Is the friends group welcoming, flexible, open to new ideas and engaging?
- Does the friends group illustrate their impact to the community?
- Does the friends group actively value their volunteers?

Some of these behaviours may seem a little obvious, but as Cassie Howell from Intrepid Landcare said "If you think you are being welcoming then be five times more welcoming than that". This sentiment was repeated in other project interviews.

The project worked closely with five friends groups. All the groups expressed that one of the major benefits of being a part of the project was the opportunity to reflect with fresh eyes on their group, its activities, its visibility in the community, its attitudes, its relationships within and outside the group and their group culture.

The project found that modern friends groups generally need to operate more professionally akin to a small business or social enterprise. They need to prioritise equally their planning for bushcare and for volunteer recruitment. This creates extra workload for volunteer group leaders when they are already burdened with a full to-do list.

To support transition to new ways of working the project provided tailored assistance, and in partnership with participating groups, hosted over 16 different community engagement events assisting with the promotion, posters, outreach, organising guides, speakers, kids' activities, bushfood tasting and even forest bathing walks and more.

Bump events were very successful. These are a series of smaller events, held over a few weeks, where people can bump into each other naturally. This helps lessen the barriers for people to engage, celebrates existing volunteers, and invigorates local interest in the group.

Contact us to attend the launch of our Volunteer Recruitment and Retention Plan with all our final results from 6pm on Thursday 15 June at City West Lotteries House.

Many thanks to our participating volunteers and our funding body the State Natural Resource Management Program. Please don't hesitate to get in touch to learn more.

GOVERNMENT OF WESTERN AUSTRALIA

natural resource management program

Bump events, a series of smaller events held over a few weeks, can be very successful as people can bump into each other naturally and start to engage with the group and each other. The gladi grab and bushfood tasting at Wireless Hill is a great example of reaching out to new members of the community and then using social media for further promotion. Facebook – Margaret Matthews.

Contact

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Attendees of Waves of Wisdom in Bunbury. Photo – Coastswap

Riding the waves of wisdom *By Julie Hill*

On 24 April coastal and marine stewards from around Western Australia gathered together to hear about some of WA's thriving coastal and marine conservation projects. The event, Waves of Wisdom, was held at the same time in Bunbury, Perth and Geraldton and streamed State-wide online, allowing people to tune in from anywhere.

Attendees heard about a range of successful WA programs including:

- The innovative hands-on marine and conservation education with primary and secondary students in Margaret River, delivered by Educational Marine Areas Australia.
- The results of rehabilitation and maintenance work in Cottesloe, conducted by Cottesloe Coastcare Association and Syrinx Environmental.
- The latest conservation efforts for the Australian Fairy Tern in the midwest and Abrolhos regions, from the WA Fairy Tern Conservation Network.

This hybrid event was a pilot for WA's Coastal and Marine Community Network and associated partners: Perth NRM, Coastswap and Northern Agricultural Catchment Council. It was funded by CoastWest and State NRM Grants and supported by Batavia Coast Maritime Institute CRT and Dolphin Discovery Centre. All involved look forward to riding this wave further and expanding the reach across WA with further hybrid events, so coastal and marine stewards can share their wisdom.

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Coast care group advocated for changes to the City of Joondalup's Weed Management Plan 2023–2033

By Mike Norman

The Joondalup Community Coast Care Forum Inc. is the umbrella group for three coastcare groups undertaking coastal restoration work within the City of Joondalup. The groups have been involved in extensive weed control for more than 20 years.

Earlier this year the opportunity arose for public comment on the City of Joondalup's 10 year Weed Management Plan. Our Deputation to Council is shown in a PowerPoint set. We were pleased to see about two thirds of our recommendations were debated and adopted by Council.

Our recommendations adopted for the plan were:

- A listing of all herbicides.
- A trial to discontinue pre-emergent herbicide Sierraron 4G.
- Increase community grants to undertake more manual weeding.
- Increase the concentration of herbicide marker dye for at least 24-hour visibility.
- Training friends group members to wipe certain weed species with herbicide.
- Prescribing golden crownbeard (*Verbesina encelioides*) as a pest plant within the City's local law.
- The City engaging with neighbouring local governments to prescribe golden crownbeard as a pest plant within their boundaries.

We will continue to advocate for the reduction of weed seed bank in the soil by control of weeds prior to seedset and removal of seedheads, increased use of manual and mechanical weed control and the minimised use of herbicides. One strategy we recommend is that weed management contracts should include slashing/mowing in addition to herbicide application. When weeds have set seed, the contractor moves to slashing, reducing overall herbicide use.

*A proposal has been put to Council to identify golden crownbeard (*Verbesina encelioides*) as a pest plant within the City of Joondalup, requiring landowners to control this species. Photo – Mike Norman.*

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Friends of the Ngoolyak seed collection project – Nuytsia floribunda By Kate Goodman

Last December the City of Melville launched Friends of the Ngoolyak seed collection project to collect native seed for propagation and planting back in the reserve they were collected from.

When the project began, several WA Christmas trees (*Nuytsia floribunda*) in the Piney Lakes Reserve were blooming. The team considered if it would it be culturally appropriate to the Whadjuk Traditional Owners and feasible to collect the seed, germinate and plant seedlings. With permission granted, we collected seed along with other target species, including kangaroo paw (*Anigozanthos manglesii*). WA Christmas tree seed viability rapidly declines, so the seed was processed and planted on the same day as harvest. The seeds have three papery wings, two of the wings were placed flat on the soil surface, the third wing standing up. A total of 300 seeds were planted.

WA Christmas tree is both a photosynthetic and hemiparasitic plant, as it attaches itself to the roots of other plants and sucks their sap. Kangaroo paw harvested and germinated onsite was chosen as the host plant. The kangaroo paw seedlings were pricked out and co-planted with each WA Christmas tree seed.

Two months later the germination count was 183. The seedlings are being cared for in the temporary nursery at Piney Lakes for planting in a revegetation site this year.

On 3 March 2023, armed with long handled loppers and collection buckets, the team successfully harvested of approximately 75 grams of seed from the WA Christmas tree. Photo – Johnny Prefumo.

Contact

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Anne Bellman from Friends of Paganoni Swamp and John Tonkin College students recycling materials to build new fencing that will protect planted seedlings from kangaroo grazing. Photo – Leonie Stubbs.

Friends of Paganoni Swamp By Leonie Stubbs

Fencing exclosures to stop kangaroo grazing is a successful revegetation method at Paganoni Swamp. We began in 2016 with several DIY small exclosures constructed using chicken wire and star pickets in an extremely labour-intensive exercise. Later we were fortunate to have DBCA staff assist by building some larger exclosures into which we have successively planted over a couple of years. Since then, we have erected mobile exclosures using galvanised panels and star pickets that can be dismantled once our seedlings have grown and are not as inviting to the kangaroos. The benefit of these is that we can re-use the materials to setup new areas for restoration.

It was with much pleasure that our group was joined for three days by eight students from John Tonkin College as part of Peel Volunteer Resource Centre's Socialability Program. Much work was involved as students dismantled around eight exclosures removing star pickets which had been in situ since 2019–2020 and then erected two new exclosures with new galvanised fencing panels together with the reused materials. This winter we will plant some of our provenance seedlings into these exclosures with funding provided by the Federal Government's five-year Regional Landcare Partnership managed by Perth NRM.

The students learnt new skills and problem-solved, boosting confidence in tackling new tasks. Due to the physical nature of the work, our group could not have completed this work in such a timely manner without the students. So, it was a truly enjoyable and rewarding experience for all involved.

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Conservation grants a win for biodiversity

Edited reprint with thanks to Nature Conservation

There's been a big win for biodiversity in the Margaret River region with Nature Conservation delivering more than $60,000 in grants to 27 landholders for vital conservation work on their properties.

The conservation work in the past year includes controlling invasive weeds, fencing of remnant bushland, and revegetation to restore biodiversity on properties in key spots like wildlife corridors and river catchments. Now in its third year, grants for landholders are part of the For Nature Landowner Stewardship Program, designed to inspire, educate and assist locals to boost the conservation values of their garden, property and surrounding bushland. Landowners apply for grants on a cost-share basis, matching the grant money dollar for dollar with cash or their own labour. For Nature is supported by funding from State Natural Resources Management Program, the Water Corporation, and the Shire of Augusta Margaret River.

For Nature program officer Peta Lierich says the grant winners were carefully chosen to ensure the biggest and best environmental wins for waterways, wildlife corridors and healthy bushland. With 70 percent of land in the Margaret River region privately owned, she says local residents play a key role in protecting biodiversity.

Registering with For Nature is free and includes free equipment hire, workshops and resources, and cost-sharing arrangements to prepare biodiversity assessment and management plans.

Nikola Chaves and Brock Haydinger, received funding to fight woody weeds from high-quality bushland on their property which includes almost 60ha of remnant bush and is part of an important wildlife corridor. Photo – Peta Lierich.

Contact

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Soon after installation of the off-grid bird waterer a red wattlebird was photographed bathing. The four-metre-high structure is designed to keep birds off the ground where they are vulnerable to predation. Photo – Heather Thorning.

Cockburn environmental initiatives *By Michele Nugent*

A popular forage site for the threatened forest red-tailed cockatoo in Bibra Lake now has an off-grid bird waterer. It is the first to be fitted with a solar-powered submersible water pump connected to a 1,000L bulk water container, negating the need for access to scheme water in the sensitive bushland environment of the City of Cockburn. The four-metre-high bird waterer features four large water troughs at varying heights and angles, with timber rungs perfect for perching and beak-sharpening. It was designed and supplied by the Town of Victoria Park's Natural Areas Team and manufactured in Perth. Footage of birdlife using the structure within its first week had proven its early popularity among smaller bushland birds including magpies and bathing red wattlebirds. "There is no guarantee cockies or other birds will use it in the first year, as it may take time for them to get used to it and feel safe using it, but we know they like to forage in the area", Rehabilitating Roe 8 Project Manager Adam Peck said.

A new 199-lot carpark in Cockburn Central has incorporated habitat landscaping to create ecological linkage options for local wildlife. In a first for the City, the carpark beneath powerlines had incorporated landscaping specifically designed to act as a habitat, stop-off point or link for fauna. It features low growing endemic shrubs and ground covers interspersed with limestone boulders and hollow logs to act as shelter and habitat. A baseline fauna survey of the landscaped area is planned for October and further studies will be completed in future years to monitor its success.

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Celebrating 25 years of the Bush Rangers cadets program

By Emma Schoknecht

This year we celebrated 25 years of Bush Rangers at our annual conference in March held in Perth and Rockingham. Bush Rangers was initiated in June 1998 when the Environment and Youth ministers launched an environmental conservation program for high school aged youth through the cadets scheme facilitated by the Department of Communities wider Cadets Program.

Over the last 25 years, more than 31,000 school students have taken part in practical hands-on experiences contributing over 627,000 volunteer hours to conversation and community projects.

School teachers from around the State run 57 cadet units. These dedicated individuals give many hours to the program, most of it voluntary. With their assistance the program continues to deliver on its aim to empower young people to play an active role in the conservation of Western Australia's natural environment, through practical hands-on experiences and gain an understanding of the need for proper management to ensure Western Australia's natural biodiversity is conserved and protected for future generations.

Bush Rangers from around the State attended the conference. We celebrated alongside the River Ranger cadet unit leaders whose program launched years after Bush Rangers. River Rangers involves primary school students across Perth in activities to understand and help rivers, estuaries and waterways.

Long serving Bush Ranger unit leaders and instructors were awarded long service and achievement awards presented by Environment Minister Reece Whitby and Youth Minister Simone McGurk. The Rockingham SHS Education Support Bush Ranger Unit presented their Saving Seal Lions project to the cadet leaders alongside workshops from our marine scientists, marine rangers and Department of Communities representative.

We look forward to celebrating many more milestones with the Bush Rangers. Not only is Bush Rangers a great program to engage youth, it also promotes career pathways within our department and through our ranger and joint management projects.

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web https://www.dpaw.wa.gov.au/get-involved/nearer-to-nature/bush-rangers

Environment Minister Reece Whitby (left) with Rockingham SHS Education Support Centre Bush Rangers who presented on their Saving Sea Lions project. Photo – DBCA.

Saving seed to save species

By Andrew Crawford

Western Australia has a rich and diverse flora comprising over 12,500 native plant species, most of which occur in the southwest region of the State. Unfortunately, there are a range of threatening processes putting many of these species at risk of extinction; currently there are over 400 species listed as threatened in WA, in addition to over 3,000 priority species requiring further survey to ascertain their true conservation status. In the southwest region of Western Australia, the high number of endemic species combined with high levels of land clearing, has led to the region being listed as a Biodiversity Hotspot, one of 36 areas in the world identified as most needing urgent conservation action.

Whilst conservation of plant species in the wild is the primary focus of threatened species management, seed collection and storage are used as a complementary strategy to help prevent plant extinction. DBCA runs a conservation seed bank, the Western Australian Seed Centre (WASC), which has a vault located in the Keiran McNamara Conservation Science Centre in Kensington containing seed of the State's conservation significant plant species.

The purpose of this centre is to collect and store genetically diverse, and representative samples of plant species of conservation significance under conditions that will prolong the longevity of the seed, allowing them to be stored for decades or even hundreds of years. The first step in this process is to make high quality collections.

*Seed of the critically endangered Wongan cactus (*Daviesia euphorbioides*). It's not a cactus, it's from the pea family and is naturally restricted to a small area between Wongan Hills to south of Dowerin. Seed collection has enabled a new population to be established by translocation. Photo – Andrew Crawford.*

Seed quality is determined by a number of factors which include:

- confirmed identification of the target species (by lodging a specimen with the Western Australian Herbarium)
- the seed is mature at the time of collection
- the collection is genetically representative of the population from which it has been collected
- detailed collection information for example where and when the collection was made, a description of the location including the habitat, soil and associated species, the number of plants in the population and how many plants from which seeds were collected.

Continued next page ...

After collection, seeds are cleaned to a high level of purity, and are then quantified to determine how much seed has been collected. The seeds are then prepared for long-term storage. The two main factors that affect how long seeds will survive are the amount of moisture in the seed, and the temperature at which the seeds are stored. Reducing both factors increases the life expectancy of most seed. A special room running at 15 percent relative humidity is used to dry seed to a level suitable for long-term storage.

Germination testing takes place to determine seed quality before seed is placed in long-term storage. After any required pre-treatments, counted seeds are put in agar and placed into cabinets where temperature and photoperiod can be controlled, and the final germination count assessed. Photo – Andrew Crawford.

Long-term seed storage is in a vault at -20°C allowing seeds to be stored for decades or even hundreds of years. Photo – Andrew Crawford.

The seed are then sealed into foil bags so that the low moisture content is maintained. These bags are then stored in a vault at -20°C, freezing the seed for future use.

For these collections to be of use, it is critical that the viability of the seed (how many are alive) is known when the seed go into storage, and this needs to be monitored through time to ensure that the viability is being maintained. Germination tests are used for this purpose as they not only provide seed viability information, but also produce seedlings that can be used for other purposes such as species recovery, research, or education. Initial tests are conducted when collections go into storage with the aim of testing the viability at ten-year intervals thereafter.

Technical Officer Simone Dudley cleaning and counting seed of Acacia leptoneura. This critically endangered Wheatbelt species is known from only two localities, approximately 1km apart, with only a single plant at each locality. Photo – Andrew Crawford.

The WASC has been collecting and storing seed for conservation for over thirty years. During that time seed from 80 percent of the State's threatened plant species have been preserved, in addition to over 20 percent of the priority species. Not only have these species been conserved as seed, but many of the collections have been used for translocation, establishing new populations in the wild in sites where the threatening processes affecting the species can be effectively managed. Over fifty species have benefitted from these seed-based translocations.

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What Brickwood Reserve means to us *By Karl Titelius*

We cherish places like Brickwood Reserve in an urban context because they are a library of living information on creatures and other organisms and their inter-relationships, with answers to questions we have not yet thought to ask. All nature, including us, needs to keep that library alive and vibrant. Is humanity big enough to give some space and well-thought-out assistance to nature to thrive and value its gift of biodiversity? This could include genuine commitment by all and sundry to sustainable environmental stewardship as part of the core business of whatever we do, whether it's engineering in its many forms, planning our urban areas, or managing our cat movements.

My partner Ms Eileen Davis and I are privileged to be the custodians and Friends of Brickwood Reserve, starting nine years ago. Eileen brought her family up with the reserve as a valued neighbour where they would walk and appreciate the wildflowers, occasional kangaroos and even the tadpoles that would mature into the different species of frogs.

It was only years later when we found out that it included the one of the largest remnants of the marri and kingia woodlands on heavy soils in the Swan Coastal Plain threatened ecological community. Brickwood Reserve also contains two other threatened ecological communities, dense shrublands on clay flats and banksia woodlands of the Swan Coastal Plain. These threatened ecological communities are protected by State and Commonwealth biodiversity laws that sit alongside its Bush Forever protection status.

To us as lay volunteers we just knew that we had to register ourselves as Friends of Brickwood Reserve conveners. We do targeted weed management and call for assistance from the Shire of Serpentine Jarrahdale and SJ Landcare for larger-scale weed control via spray contractors and to upgrade fire access management. We also contribute to updates of management plans and other matters impacting on conservation of the reserve.

The key weeds we manage by non-chemical means includes Victorian teatree, scattered watsonia and Sydney golden and Flinders Range wattles. We found that, if these woody weeds were cut at close to ground level, no herbicide was needed. Watsonia is dug out. We have eradicated the teatree infestation by dint of regular annual check-ups and removal of the few isolated seedlings found at those times.

Weed control can be seen as a creative enterprise in which the careful, considered removal of weeds gives the local natives the space and time to get the appropriate environmental triggers and fill the space created by weed removal with abundance. Supplementary planting is only considered once nature shows us that there are species not coming back as part of the natural plant community succession process.

Continued next page ...

Eileen Davis standing beneath a giant kingia at Brickwood Reserve one of the best places to visit to experience the marri kingia woodland threatened ecological community. Kingia's are restricted to the southwest of WA. They are a slow growing plant with the trunk increasing in height by about 1.5cm a year. This massive plant is about 6m tall and would be at least 400 years old. Photo – Karl Titelius.

We are a small group that initially started with up to seven volunteers but over the years has dwindled to just the two of us. We have carried out wildflower walks that have been well attended and just recently the Shire organised a lantern making community event with a wonderful hands-on experience with WA Birds Of Prey, followed by a night walk through the reserve. The children especially marvelled at the spiders and little critters we came across and evidence of echidnas.

One of the greatest projects of recent years has been the role of SJ Landcare leadership, particularly former Executive Officer Francis Smit, in making the case for a State-funded, upgraded, and low visual impact fence to control vehicle access to Brickwood Reserve. That $130,000 fence has been completed and has dramatically reduced unauthorised vehicle access. It also had the side effect of marking the fenced space as something to be taken care of while still allowing free wildlife and pedestrian access.

Another key improvement of the reserve has been upgrading of the fire access infrastructure from graded tracks to limestone covered access tracks to reduce gullying issues and make the tracks safer for firefighters in emergencies.

What remains to be done is to celebrate and continue the restoration and protection of the wildflowers, animals, fungi and other organisms that work in concert to maintain Brickwood Reserve as our local library of living information. Part of the viability of Brickwood Reserve is its linkage to green spaces, creek lines and walking spaces. Brickwood reserve cannot survive as an island, it needs to be part of a network that is everyone's responsibility to protect as part of making Byford a great place to live.

Contact

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Karl in his happy place weeding watsonia by hand. Photo – Eileen Davis.

Marri kingia woodland is a seasonal wetland plant community found on the eastern side of the Swan Coastal Plain. Most of the wetland won't have open water as we see here but in winter the heavy clay soils will become inundated like a waterlogged sponge. Photo – Friends of Brickwood Reserve.

The Biodiversity Conference 2023

LISTEN TO COUNTRY

10 - 12 October 2023 // Perth Australia

You're warmly invited to join the second annual Biodiversity Conference 2023 10-12 October, The University Club of Western Australia. The overarching theme of this year's conference, Listen to Country, will share what's been learned about the biodiversity and ecology of our unique local ecosystems over millennia.

We aim to showcase innovative research and practice focused on delivering nature positive solutions for our region, featuring projects that have been co-developed with Indigenous knowledge and western science. Conference delegates will have the opportunity to explore five themes: listen to country, our biodiversity assets, innovation, learning from setbacks and towards 30 by 30.

This Conference will bring together researchers and practitioners from across Country, academia, government, industry, and community to share knowledge and inspire the change that's needed to conserve biological diversity for future generations to enjoy.

The conference is jointly supported and run by all five Western Australian Universities, DBCA, the WA Biodiversity Science Institute, and the WA Marine Science Institute. Registrations are now open.

Dieback Information Group Conference

Tickets are now on sale for the Dieback Working Group's annual DIG Conference 30–31 August, Perth. The DIG Conference represents a fantastic day of information and networking opportunities for a wide variety of people who are interested in *Phytophthora* dieback, its management, and its effects on our natural environment.

Phytophthora dieback, caused by the soilborne pathogen P*hytophthora cinnamomi*, is one of the most prominent issues that our threatened species face in Australia. Impacting over 40 percent of native plants in WA's southwest bioregion, this disease causes decline in our bushland flora as well as native fauna species which rely on that vegetation for shelter and food resources.

This year's DIG Conference theme is Biosecurity: It's Up To You. This theme is designed to communicate the shared nature of our environmental biosecurity system, particularly in WA where vast areas and relatively low population density means that we all need to be aware of potential new threats to our environment and how to report them.

In terms of established biosecurity threats like *Phytophthora* dieback, we all have the potential to spread it, which means that we all need to be aware of basic hygiene that we can employ when we are out in the bush to avoid moving the disease.

The DIG Conference is an inclusive day, with plenty of information shared that is relevant to people who work or volunteer with the environment or are just generally passionate about protecting our natural ecosystems from *Phytophthora* and other threats.

The Hamer Sprout Fund Sustainability Grants gives to smaller organisations and projects to get them off the ground. Supports innovation in environmental education, engagement in environmental action, advocacy for environmental sustainability, and collaboration between young people engaged in environmental leadership. Applications **close 30 September.**

Community Rivercare Program Funding to enable on ground works by community groups. Applications **open 1 June**.

Swan Canning Riverpark Urban Forest program supports public land managers to improve their urban forests in a $3 million investment in revegetation and improved management in the Swan Canning catchment. Approach your public land manager to partner in projects. **Open year-round**.

Peel Harvey Catchment Council's **Fencing and Revegetation of Foreshore Areas** funds **open year-round**.

NACC Growing Great Ground incentives up to $1,000/ha for establishment of ground cover and biodiverse native vegetation in the Northern Agricultural Region to address wind erosion on agricultural land. Expressions of interest are **open year-round**.

Local Biodiversity and Native Vegetation Management Grants $300,000 for activities that increase the capacity of Local Governments in the South West to consider biodiversity in their operations. Applications close 21 July.

Synergy Community Partnerships up to $50,000 for multi-year partnerships around four key themes: environment for the future, inclusivity and empowerment, committed to community, and energy leadership in the southwest of WA. Expressions of interest are **open year-round**.

Wettenhall Environmental Trust small environmental grants scheme funds research and education projects on fauna and flora conservation. Applications **open 1 July**.

Purves Environmental Fund up to $50,000 for projects addressing the focus areas of habitat destruction, capacity building of key NGOs and climate change adaption. Applications are **open year-round**.

Eucalypt Australia Grants up to $25,000 for charitable works on conservation, education or research on eucalypts in two streams, multi-year research grants and Dahl Fellowships. Applications **open 19 June, close 15 August**.

Mary Bremner Bequest Strategic Grants program of the Wildflower Society of WA for projects focused on WA flora. Applications are **open year-round**.

RSWA John Glover Research Support Grants for PhD students researching natural or physical sciences, anthropology or archaeology. Applications **close 14 July**.

The Cola-Cola Foundation gives back 1 percent of is operating income to enhance the sustainability of local communities worldwide. Empowering women, enhancing communities, protecting the environment and educating scholars are priority areas. Applications are open year-round.

IGA Community Chest raises funds to support local communities, charities and other worthwhile causes. Applications are open year-round.

The Indigenous Land and Sea Corporation's Our Country Our Future program funds land acquisition or management projects that deliver benefits to Indigenous Australians. This includes on-ground activities to maintain or improve the condition of Country (land, water, biodiversity, and cultural heritage). Applications **open on an ongoing basis**.

Lotterywest Grassroots Community-Led Grants are available for proposals big or small that work towards sustainable ecosystems including restoration, care for natural heritage, protection of endangered species, and reduction of the community's impact on the environment. Applications are **open year-round**.

Regional Economic Development Grants provides funding to businesses for projects that create economic growth in regional WA. Up to $250,000. Applications **close 30 June**.

Local government and place-based community grants These local governments provide small grants to their communities which may fund environmental groups' management and restoration projects. Eligibility varies. Albany Community Foundation **open year-round**, Alcoa Waroona Grants **open 1 June**, Armadale Habitat Links **open year-round** for rural residents, Augusta Margaret River **closes 30 June**, Belmont **closes 31 August**, Bunbury **closes 31 August**, Broome **open year round**, Derby/West Kimberley **closes 30 June**, Gosnells **open year-round**, Harvey Water **open year-round**, Serpentine Jarrahdale **open in July**, South Perth **open year-round**, Swan **open year-round for under $5,000**, Wanneroo **open year-round**, Waroona **closes 15 August**, Rockingham **closes 28 July**.

Recent Research

Braby MF, Williams MR, Douglas F, Beardsell C, Crosby DF (2021) Changes in a peri-urban butterfly assemblage over 80 years near Melbourne, Australia *Austral Entomology* 60, 27-51.

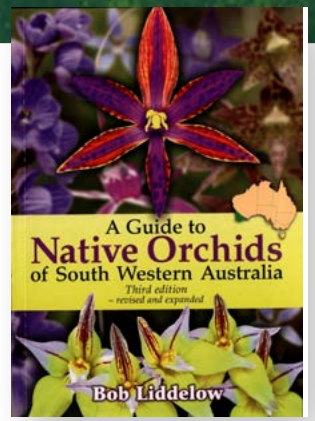
Beca G, Palmer B, Valentine LE, Erickson TE, Hobbs RJ (2021) Gut-passage time and viability of seeds consumed by Australian marsupials *Australian Mammalogy* 43, 363–367.

Bergstrom DM, Wienecke BC, van den Hoff J, Hughes L, Lindenmayer DB, Ainsworth TD, Baker, CM, Bland L, Bowman DMJS, Brooks ST, Canadell JG, Constable AJ, Dafforn KA, Depledge MH, Dickson CR, Duke NC, Helmstedt KJ, Holz A, Johnson CR, McGeoch MA, Melbourne-Thomas J, Morgain R, Nicholson E, Prober SM, Raymond B, Ritchie EG, Robinson SA, Ruthrof KX, Setterfield SA, Sgrò CM, Stark JS, Travers T, Trebilco R, Ward DFL, Wardle GM, Williams KJ, Zylstra PJ, Shaw JD (2021) Combating ecosystem collapse from the tropics to the Antarctic *Global Change Biology* 27, 1692–1703.

Plant Ecology Special Issue: Climate change and altered fire regimes: Impacts on plant populations, species and ecosystems.

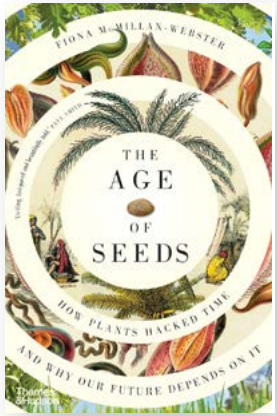
Dixon DJ, Callow JN, Duncan JMA, Setterfield SA, Pauli N (2022) Regional-scale fire severity mapping of Eucalyptus forests with the Landsat archive Remote Sensing of Environment 270.

Publications



A Guide to Native Orchids of South Western Australia (Third Edition) Liddelow, Bob. *R & R Publications*, 2022. $54. A representative collection of orchids in great detail, with specific sites for each orchid illustrated with mud maps.

Bee Detectives Ryan-Rendall, Vanessa. *CSIRO Publishing*, 2021. $24.99. A children's book on Australia's native bees. How our native bees live, what they like to eat and the important work they do to pollinate plants.



The Age of Seeds: How Plants Hacked Time and Why Our Future Depends on It McMillan-Webster, Fiona *Thames and Hudson*. $34.99. Seed longevity, the role they play in our everyday lives, and what that might mean for our future.

Addressing weed threats to biodiversity Webber, Bruce. *Western Australian Biodiversity Science Institute*, 2021. Reports on the program to address 28 priority knowledge gaps with new research and facilitate on-ground outcomes for biodiversity conservation.

What Birdo is that? A Field Guide of Bird-people Robin, Libby. *Melbourne University Press*, 2023. $40. This field guide to Australia's bird-people who form a conservation community that cares about the future of birds and their habitats. Provides a basis for understanding the complex relationship between people and birds in a land of extremes at the forefront of changing climate and habitats.

Reed Concise Guide: Butterflies of Australia Zborowski, Paul. *Reed New Holland*, 2022. $19. Covering nearly 200 species this pocket-sized guide with plastic cover contains 250 photographs illustrating key features for identification, habitat and range.

Apps

Smart Bird ID (Australia and NZ) Identify birds with your camera or your microphone! Just point to the bird and we'll ID it for you. Over 500 bird species from Australia and New Zealand are available, with plenty more from around the world. App Store or Google.

Biocontrol Hub allows Citizen Scientists to capture field observations of the spread of biocontrol agents in a consistent format, provides easy access to biocontrol information, and ensures biocontrol agent distribution data is readily available for analysis. This tool is hosted by the ALA and is available free from the App Store or Google Play.

Podcasts and audio

Clean State podcasts designed to build awareness of local opportunities to overcome the challenges of decarbonising WA. Clean State is a non-partisan, not-for-profit climate action initiative advocating for green jobs and a green economy for Western Australia.

Who's Gonna Save Us? is a co-production of the science team at ABC RN and triple j Hack. We're all looking for a way through the climate crisis. Who's going to get us there – and how will they do it? Meet the people who are trying to draw the map to a better future.

Let's Talk Coast podcasts from the Australian Coastal Society Ltd. Three episodes so far: Who owns the beach? Estuaries, blue carbon and climate change, and Community caring for coast.

Australian Frog Calls – Songs of Disappearance an album featuring 43 calls of our most threatened frogs. All proceeds go to the FrogID project and many of the recordings were those submitted by citizen scientists.

Websites and videos

Sustainability Handbook an online flipbook guiding you to improve sustainability in your everyday life and through volunteer opportunities with environmental NGOs.

Australia's Environment 2022 A report on Australia's environmental changes throughout 2022 including rainfall, temperatures, and biodiversity conditions, along with challenges being tackled.

Ningaloo Nyinggulu Tim Winton's documentary series immerses viewers in the natural world and First Peoples' cultural values of Nyinggulu and calls for its continued conservation.

The Secret Lives Of Our Urban Birds a two-part TV documentary series by ABC nature journalist Dr Ann Jones about the hidden lives of urban birds in Sydney and Brisbane.

Science Information Sheets Summaries of the latest research by DBCA. Recent publications include Fuel dynamics in Banksia woodlands and Walpole fine grain fire mosaic.

crawling frog

By Johnny Prefumo

Photo – Johnny Prefumo.

Aptly known as the crawling toadlet, *Pseudophyrne guentheri* doesn't opt to hop but does a ……type of walk. It is a unique frog unto itself and is a species that is missed out in many frog surveys throughout its distribution from Kalbarri to Esperance. The reason I think it is missed is a combination of things. Its call is quite low compared to other frogs, and the period between calls can be quite long, and they don't gather in large densities. They also call in May and June when the moaning frog rules the roost of frog chorus, so the usual chorus mapping techniques employed in surveys miss this guy out.

They hangout in seasonal wetlands beneath the ground cover of rocks, logs and leaf litter. During the breeding season, from the first rains in autumn to early winter, the male calls from shallow tunnels up to 10cm deep and the female deposits large separate eggs with a tough outer capsule. The species comes into its own as the male stays with the eggs suggesting that there is a paternal instinct. Then the tadpole starts to develop within the egg capsule until it reaches a certain stage. The eggs will hatch and tadpoles emerge once the tunnels are flooded with life-giving winter rains. The ability to stage larval development from egg to tadpole in sync with rainfall is so cool. This just another example of the fabulous uniqueness within this part of the world.