bushland news

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Issue 128 **Summer** 2023-24 *Time of Birak and Bunuru in the Noongar calendar.*

We are worth saving – feral cat strategy for Western Australia gets underway

Photo – David Thomson.

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

Bushland News *is a quarterly newsletter of the Urban Nature program to support community involvement in bushland conservation.*

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This publication is available in alternative formats on request. Current and archived issues of *Bushland News* are available at www.dbca.wa.gov.au/bushlandnews

Next issue

Autumn *Bushland News*

Autumn *Bushland News* contributions should be sent to Urban Nature by **9 February 2024**. *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.

We are worth saving
– feral cat strategy for Western Australia gets underway

By Helen Zillmann

In response to the ongoing decimation of native fauna by invasive feral cats, in July the Western Australian Government announced the launch of the State-wide strategy to crackdown on feral cats.

Feral cats have a devastating impact on native wildlife, particularly small to medium sized mammals, and are considered the most destructive single species in Australia. They have been implicated in at least 27 of the 47 mammal species extinctions and directly threaten the survival of multiple mammal, bird, reptile and frog species. In Western Australia, more than 70 species are vulnerable to predation by feral cats. It is estimated that a single feral cat roaming the bush can kill more than 700 small animals every year.

The Western Australian Feral Cat Strategy is the first of its kind to be implemented by a State or Territory Government in Australia.

Front Cover: *Feral cats have been implicated in at least 27 of Australia's mammal extinctions and are currently threatening more than 70 fauna species in Western Australia. The Western Australian Feral Cat Strategy five year plan (2023–2028) is the first of its kind to be implemented by a State or Territory Government in Australia and will help ensure the survival of our unique fauna, such as the endangered numbat pictured in Dryandra National Park. Photo – David Thomson.*

The five-year plan (2023 – 2028) will encourage the use of new technology, to help combat the feral cat population.

The strategy will provide a framework to guide a four-year $7.6 million Government investment and ensure that there is a consistent and coordinated approach to feral cat management. The strategy is also designed to assist stakeholders, which include, traditional owners, State and local governments, non-government conservation and community-based organisations, and private and leasehold landholders on actions that will contribute to the effective and adaptive management of feral cats.

As part of the strategy, the Western Australian government has completed the call for applications for the first round of Feral Cat Management (FCM) Grants in November. The grants recognise three objectives:

- Increase effective feral cat management to improve conservation outcomes for native species, through a tenure-blind approach.
- Continual improvement of methods and technologies for feral cat management through research and development.
- Broaden social acceptability and awareness of feral cat management methods.

2023 saw the collaboration of DBCA and external agencies who came together at Giralia Station in Exmouth. The workshop allowed staff to learn techniques used in the management of feral cats, get hands on experience with Felixers™, and share their knowledge. Photo – Corrin Everitt.

FCM Grants prioritise the direct involvement of local community groups in all stages of project design, planning and implementation to help foster efficient and effective partnerships between government, industry, and community. A total of $2 million will be made available over four years of grant funding with $500,000 made available in round one.

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DBCA learning how to operate Felixers™ at the 2023 feral cat workshop held at Giralia Station in Exmouth. This innovative technology uses laser and camera sensors to detect the shape and gait of a (cardboard) cat and then shoots a gel (non-toxic in this case) which the cat ingests after they lick themselves. Photo – Corrin Everitt.Photo – DBCA.

A new technology that the strategy will support is the use of Felixer™ grooming traps . Felixers™ use lasers and cameras to detect the shape and gait of a cat and then shoot a toxic 1080 gel which kills the cat after they lick themselves.

The Department of Biodiversity, Conservation and Attractions (DBCA), in collaboration with South West NRM and Blackwood Basin Group recently completed an unpublished study spanning three years (2020 – 2023) in the Upper Warren and Lake Muir area of the Southern Jarrah Forest to test the safety and efficacy of Felixers™. This area supports many threatened or conservation priority species including at least 10 mammals and three birds for which predation by feral cats is recognised as a key threat. The outcome of the trial concluded that the use of Felixers™ did not present any risk to non-target species, was effective in targeting feral cats, and as part of an integrated feral cat management program has the potential to significantly improve conservation of affected threatened species in the Southern Jarrah Forest.

DBCA in collaboration with other organisations, currently has 16 Felixers™ deployed within Western Australia – six are located in the Southern Jarrah Forest, eight in the South Coast to assist in the protection of the western ground parrot and Gilbert's potoroo, and the remaining two are located in the Pilbara region assisting in the protection of the endangered northern quoll.

Progress of the Feral Cat Management Strategy will be assessed annually, which will include input from those involved in feral cat management through the Western Australian Feral Cat Working Group and reports on goals and achievements will be available on DBCA's website.

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Feral cat with chuditch taken from a remote sensor field camera. The chuditch or western quoll is considered vulnerable under the Biodiversity Conservation Act 2016 *and, although a predator itself, it falls into the critical weight range of 35–5,500g within the size range of cats' prey. Photo – DBCA.*

Comments sought on draft federal threat abatement plan for predation by feral cats

Threat abatement plans establish a national framework to guide and coordinate Australia's response to key threats, like feral cats, that impact on Australia's biodiversity. The plans identify research, management and other actions stakeholders across Australia can take to ensure the long-term survival of native species and ecological communities. Cat predation is one of 22 Key Threatening Processes listed under the *Environment Protection and Biodiversity Conservation Act 1999*. This draft plan will supersede the existing 2015 plan. Submit your feedback by **11 December 2023**.

Urban Nature update *By Julia Cullity*

Urban Nature has been out and about in the bushland during the past few months of spring. A particular focus has been looking at the threats and management actions needed for some of the threatened ecological communities (TECs) that occur in the DBCA's Swan Region many of which are endemic to our region. This winter had a very short wet season which caught us out a little as flowering started very early. We were out at the Perth to Gingin ironstone TEC in mid to late August and if you didn't know the species and soils you wouldn't have picked it for a seasonal wetland. Climate change is very evident this year. We had field trips to southern occurrences of the Herb rich saline shrubland in clay pans TEC to the west of the Peel Harvey Estuary. Although natural salinity is characteristic of the community, increasing salinity is an ongoing concern. The recent nomination and federal listing of Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion prompted us to revisit Shire View Hill containing this community and survey for new occurrences of this TEC. We identified two new patches of this community in Mosman Park and believe there might be more suitable habitat in the limestone ridge to the west of Kwinana. I'd encourage Kwinana locals prepared to scramble up some steep slopes to have a stickybeak and report back if they identify more or let us know at Urban Nature if it doesn't occur there. It was also a pleasure to visit an excellent condition occurrence of *Banksia attenuata* woodlands over species rich dense shrublands at Hawkevale Nature Reserve. The flowering was abundant and it's great to hear that there is a new group, the Friends of Hawkevale Bushland, has formed for this very special patch of bushland in High Wycombe.

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The profusion of flowering at Hawkevale Nature Reserve was striking this year and demonstrates the resilience of this excellent condition bushland's response to a hot summer bushfire two years earlier. Photo – Julia Cullity.

Will Fowler spraying our trial plots at Watkins Road Nature Reserve. Will is joining the Urban Nature team from March – July 2024. Photo – Grazyna Paczkowska.

We have also begun a project to try to identify a new selective herbicide for watsonia weed control because the highly effective herbicide dalapon (2,2-DPA) is no longer commercially available. Last year we set up a very simple trial and sprayed six different herbicides at differing dose rates to see how effective they were in controlling watsonia in a very degraded patch of almost 100 percent weed cover. Two herbicides looked promising, and our next question is to investigate if these chemicals will cause off-target damage to native bushland. We have selected a study site at Watkins Road Nature Reserve where good to excellent condition bushland is being invaded by watsonia and are trialling those two candidates with various dose rates. The work is in its infancy and it might take a few years to determine whether we have succeeded or not in finding an alternative control method.

This will be my last issue for a while as I will be taking a long break and so will be passing on the production of Bushland News for the next six months to Alex Hutchinson and Will Fowler. Please be kind to them by continuing to keep great stories about your experiences of bushland conservation flowing in.

Monitoring our trial plots at Watkins Road Nature Reserve. Watsonia is one of only a few weeds that is invading this otherwise intact bushland. It will be interesting to see if we can identify a new selective herbicide for watsonia control with minimal or no off-target damage to native species. Photo – Julia Cullity.

Tetragonia decumbens *(above) a common weed of our coastline has long, climbing or scrambling stems with fleshy, succulent leaves that are often glistening with surface water-storage cells. The oval leaves are narrower at the base, generally 2-4cm long and have leaf margins that curl back toward the midrib. It produces 3–5 flowers from the same growing point in the leaf axils and a leathery, dry four-winged fruit. The local native* Tetragonia implexicoma *(right) has shorter, more linear and less fleshy leaves. The flowers are solitary, and it has a succulent berry-like fruit. Around Perth it is only known from the islands. Photos – Julia Cullity and Kate Brown.*

Sea spinach (*Tetragonia decumbens*) *By Kate Sputore*

For anyone working in coastal ecosystem restoration sea spinach or *Tetragonia decumbens* is a familiar and exasperating sight. A native plant to the coastal areas of the Cape region of South Africa, this species was likely to have been accidentally introduced to Western Australia from ballast water of sailing ships moored at Fremantle and Albany. It has quickly become an aggressive and significant weed of the metropolitan coastal region and beyond, causing persistent management challenges.

Tetragonia decumbens is a herb of the Aizoaceae family, characterized by long, climbing or scrambling stems with fleshy, succulent leaves that are often glistening with surface water-storage cells. The leaves are generally 2-4cm long and have leaf margins that curl back toward the midrib.

The plant will produce small inconspicuous yellow flowers all year round and is open pollinated by a wide variety of insects. A small, dry, leathery, four-winged fruit 1.5–2 cm long, can be wind-dispersed and can survive long periods of time immersed in seawater, adding to the tenacious nature of this species. Extremely long, thread-like roots have been pulled from dune systems, reaching up to eight metres from the parent plant. The native *Tetragonia implexicoma* is known from the islands off Perth but occurs along the WA coast from Shark Bay to Esperance. Distinguishing characters are the smaller, thinner, linear and less fleshy leaves than its weedy relative, single flowers, a succulent fruit and a climbing rather than spreading habit.

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A relative of the popular bushfood of the east coast Warrigal greens (*Tetragonia tetragonoides*), sea spinach, while edible, has not become a popular food source due to its incredible saltiness and tough older leaves. Various sources indicate that the fresh young shoots of *T. decumbens* can be eaten fresh, but boiling to reduce salt content and oxalic acid is a more palatable approach. Unfortunately, it would seem that touting this plant as a 'native spinach' will not be the solution to eliminating it from coastal dunes.

Controlling the spread of *Tetragonia decumbens* poses a significant challenge due to its adaptability and prolific seed production. Traditional management methods include mechanical or hand removal, and herbicide (glyphosate) application. These methods can be effective, but do not come without additional concern.

With the ability to form large, rounded mounds that act as frontal dunes, and the capacity to climb over fences, walls, and other plants, *T. decumbens* does an excellent job of preventing erosion in mobile dune environments, which means consequences must be carefully considered before undertaking any kind of removal. In many cases across the Perth region, this species is the sole vegetation type present on a frontal dune, forming a monoculture – its ability to outcompete native dune colonisers, especially *Spinifex* species – mean it must be tolerated until a replacement erosion control measure or dune cover can be installed.

Coastcare groups across Perth have approached this problem in various ways. In areas of rocky limestone coast (parts of Cottesloe, Bay Beaches between Trigg and Sorrento) or in dune swales, removal and eradication is possible. *Tetragonia decumbens* plants are taken out prior to winter, empty space filled with native ground covers and dune pioneers during planting season, with the rocky substrate or protective primary dune providing protection from sand loss. Ongoing maintenance is crucial with this approach, as there is likely to be viable seed and thriving root systems present within sites for many years. In areas of more dynamic, sandy dune systems (Floreat, North Hillarys, Mullaloo beach area) the cover of sea spinach can be holding vast sections of mobile foredune in place and to remove it will potentially result in dune blowouts or the collapse of dunes across access pathways. Careful handweeding in sections may over time reduce the biomass, but regrowth can be fast and can mean efforts are wasted.

In dynamic, sandy dune systems the cover of sea spinach can be holding vast sections of mobile foredune in place and to remove it can result in dune blowouts or the collapse of dunes across access pathways. Staged removal and erosion control will be necessary. Careful handweeding in sections may over time reduce the biomass, but regrowth can be fast and can mean efforts are wasted. Applying herbicide to large sections of sea spinach and then covering with erosion control material (jute matting) may work in some cases – leaving the organic biomass in situ but preventing its survival. Here at Leighton Beach, you can see the erosion control structures installed below the shelter where weed control and revegetation works are taking place. Photo – Julia Cullity.

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Applying herbicide to large sections of sea spinach and then covering with erosion control material (jute matting) may work in some cases – leaving the organic biomass in situ but preventing its survival. Again, remaining seedbank and the expansive nature of the root system will require careful monitoring and maintenance.

Removing any large mass of *T. decumbens* is time-consuming and challenging. The vine-like branches of the plant can make headway into dense native vegetation, requiring real dedication to ensure all plant sections and auxiliary roots are removed. When the plant forms a solid mass over a large area, we have had success in almost rolling it up like a mat – lifting large sections away from the sand and chasing roots as far as possible. Underneath, the brown fruits will be evident in the sand – a reminder of this plant's persistent survival mechanisms.

Coastcare groups have had success in eliminating or at least reducing the presence of sea spinach, to the point where native vegetation communities are resilient and resistant to further invasion. When undertaking coastal ecosystem restoration, it is crucial to work with funding bodies to ensure that managing these weeds is given the time and resources required to have lasting positive biodiversity outcomes.

In areas of rocky limestone coast or in dune swales, removal and eradication of sea spinach is possible. Control takes place prior to winter and areas are then planted with native ground covers and dune pioneers with the rocky substrate or protective primary dune providing protection from sand loss. Ongoing maintenance is crucial with this approach, as there is likely to be viable seed and thriving root systems present within sites for many years. Photo – Julia Cullity

Extremely long, thread-like sea spinach roots have been pulled from dune systems, reaching up to eight metres from the parent plant. In this dune at South Beach, the plants are struggling to keep the foredune from eroding. Photo – Julia Cullity.

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The dilemma of twenty-eight parrots damaging grass trees

By Shapelle McNee

Recent observations about twenty-eight parrot feeding damage to grass trees in the Boyup Brook area has sparked interest back into research I was involved with twenty years ago.

Balga grass trees (*Xanthorrhoea preissii*) are a prominent understorey species in jarrah, marri and wandoo forest and woodlands. Since the late 1980s to the current day, local people have noticed that the grass trees are not doing so well. Extensive damage to grass trees has been observed from the feeding activity of Australian ringnecks, from Moora to Frankland. Ron Johnstone of the WA Museum recounts that the earliest known records of crowns grazed on by parrots was in 1955. We do not know if this behaviour existed prior to clearing and the growing of cultivated grain.

In the 1990s farmers in the Boyup Brook, Kojonup and West Arthur Shires started fencing off their bush remnants and noticed that Australian ringnecks, locally known as twenty-eight parrots (*Platycercus zonarius semitorquatus*), were chewing on grasstree fronds to such an extent that whole crowns were chewed back, looking like giant dinner plates of cut back fronds. Over time, these grazed grass trees died. The loss of whole populations of grass tree in remnant vegetation was observed as early as 1990–1993. In these same areas, Australian ringnecks have also been observed chewing on the cambium (inner bark) of blue gum (*Eucalyptus globulus*) trees in plantations as well as on the native marri (*Corymbia calophylla*) and flooded gum (*Eucalyptus rudis*), affecting their growth and causing dieback of branches.

Twenty-eight parrots chew on grass tree fronds to such an extent that whole crowns look like giant dinner plates of cut back fronds. In Boyup Brook locals have noticed that during wet weather the chaff decomposes and the decay eventually can kill the grass tree, often within two years of the first attack. Photo – Adrian Price.

The Kojonup, Boyup Brook and West Arthur LCDCs initiated projects and employed me to look at the damage being done by twenty-eight parrots to grass trees, and the foraging behaviour of twenty-eight parrots in the summer months using radio telemetry (1999– 2001). There was also a trapping/shooting trial conducted over a 23-month period (May 1997 to March 1999) to determine if this had an effect on parrot abundance and damage activities. At the same time research was being done on the damage to Blue Gum plantations.

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Twenty-eight parrots are adapting their feeding habits and adding new food sources to their diet in response to changes in their habitat. We do not know if feeding on grass trees existed prior to clearing and the growing of cultivated grain. The challenge is how to turn this around. Photo – Georgina Steytler (Birdlife WA).

Damage to grass trees crowns by twenty-eight parrots is highest from January to April. This is the hottest and driest time of year. The intensity and extent of the damage can vary, being lowest in wet summers and highest in dry summers and can vary dramatically from one remnant to another. For those sites with moderate to high levels of damage, 23% to 69% of the monitored grasstrees died from 1996–1998.

It appears that not all twenty-eight parrots feed on grass tree fronds, and of those that do, not every day. One parrot I tracked fed on grass tree fronds every fourth day in January 2000. Of 22 twenty-eight parrots radio tracked, three of eight birds fed on grass tree fronds in November 1998 (dry month), one of seven in January 2000 (wet summer), and three of seven in January and March 2001 (very dry summer).

We know that twenty-eight parrots and grass trees have coexisted in this area for a very long time. Although grass trees are able to grow their crown fronds back, from the centre, moving out in a spiral, they eventually succumb after years of sustained heavy grazing. What effect has clearing, agriculture and the timber industry had on the twenty-eight parrot?

Clearing began about 130 years ago, though was probably most intensive during the 1950–60s. In the area from West Arthur to Kojonup, farming practices involved sheep grazing and the growing of oats, barley and wheat crops. By the mid-late 1980s, a new crop, canola was grown, which is now a major crop. Feedlots for cattle have also been established as have vineyards. Changes in the timber industry occurred when wood chipping of jarrah and karri was introduced in the 1960s, followed by wood chipping of marri from 1976–2001.

In response to these changes in their habitat, the twenty-eight parrot has increased in abundance and added new food sources to its diet. Prior to clearing and farming, the twenty-eight parrot would have fed predominantly on seeds of native tree and shrub species, supplemented with native flowers, leaves, grubs and quite possibly bark (cambium) as well. The twenty-eight parrot in this area between the forest and wheatbelt, now feeds on significant quantities of cultivated grain.

Maybe cultivated grain does not provide all the nutrients they need. Certainly aviculturists will tell you that Australian parrots need green seed to breed and be healthy. For example, green sources of food (leaves, cambium) can be high in Vitamin A and calcium while grains can be low in these.

While studying the foraging behaviour of twenty-eight parrots, it was apparent that given a choice, they would eat green or germinating seeds rather than dry grain. Sources of green seed during summer, among pasture and harvested crops, are dependent on heavy rainfall events such as occurred in 2000 (99mm of rain in January and 42mm in March). This contrasted with the very dry summer of 2001 (4.2mm rain). However, it is not simply the food that has changed, their numbers have swelled in response to year-round access to grain, noticeably during the 1980s.

Our native eucalypt trees, grass trees and likely the twenty-eight parrots themselves, are in trouble. This area, with a relatively high rainfall, is productive for sheep, crops, and parrots, though maybe at the cost of our remnant native vegetation. The challenge is how to turn this around.

More information

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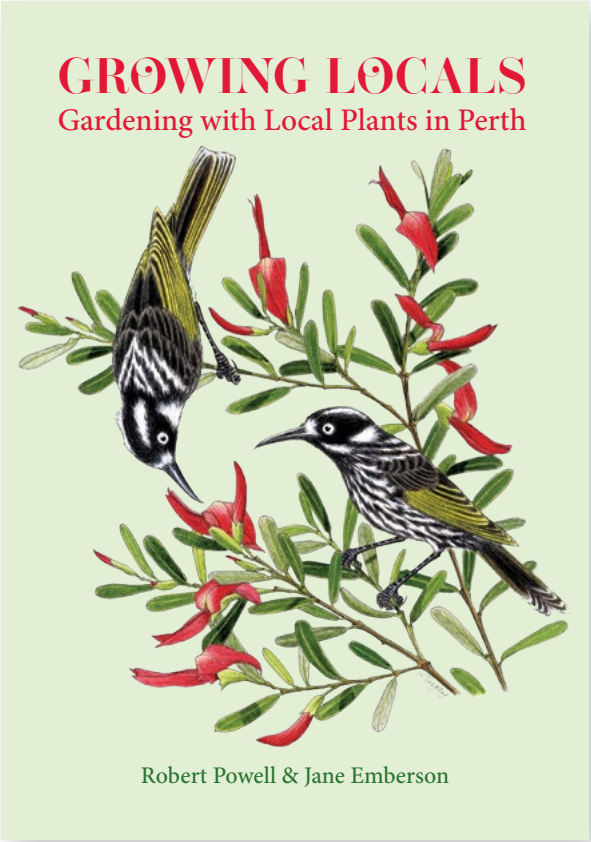
Please send us your regional report (400 words) and one or two photos by Friday 9 February 2024. Text may be edited in response to volume of submitted reports.



Twenty-seven years after first publication, Growing Locals *has been reprinted in a revised edition. A fabulous resource for gardeners and bushland managers who want to know what grows where and how to go about it.*

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A new edition of an old favourite for Perth's gardens

By Robert Powell and Jane Emberson

What wild plants grew on your block of land when it was still bushland? Those species were your local plants, and they are the focus of our book *Growing Locals: Gardening with Local Plants in Perth*. Long out of print, it will shortly reappear in a new edition. It presents a basic method of gardening (based on our own experience), and, above all, a principle: that, if we value the natural ecology of our locality and want it to survive, we should bring it home to our own piece of land.

Your local plants evolved to thrive in the natural conditions of your locality, without fertilizer or extra water. They provide essential habitat for local wildlife, especially insects which we now know are suffering drastic declines in many parts of the world. Interactions between natural plants and insects enhance the individuality that makes nature's patterns so infinitely varied.

One chapter of our book discusses the factors that influence the development of individual plants and also the structure and condition of natural vegetation, for instance environmental factors like salt winds or the more widespread influences of climate change, fire and the tide of weeds creeping through many Perth bushlands. Besides impoverishing the bushlands themselves, such modern influences impoverish the general perception of how they should really look — the wealth of species, the sheer numbers of plants, the species composition, variation in response to small differences in situation, and the age structure of the plant communities. Gardens of truly local plants, even very small ones, can supplement reserves, as can the use of local plants in public parks or other green spaces.

The book includes a plant-list that aims to provide as complete a list as possible of the vascular plants native to the Perth Metropolitan Region, showing their distribution across the region. It has been thoroughly revised by Greg Keighery, Vanda Longman and Barbara Rye, to reflect the many changes since the previous edition. Of four common species shown in a silhouette drawing in the book, for instance, three have changed their genus, and one its species name too. The list's increase from about 1,500 to more than 1,800 species and subspecies reflects the advances in scientific knowledge of Perth's flora.

Besides line drawings by Susan Tingay, the new edition is illustrated with photographs of local-plant gardens, revegetation projects, and examples of different vegetation types. Josh Byrne, well known from the ABC's 'Gardening Australia', has provided a foreword. With support from the Wildflower Society of WA, the book is published and on sale by the WA Naturalists' Club.

A garden of local plants on the Bassendean sands, with pink myrtle and blueboy in flower; pricklybark and a young firewood banksia behind. Photo – Robert Powell.

Saving Kyloring competition *By Anne Bondin*

To raise awareness, and to encourage school children to find out more about the Western Ground Parrot, the Friends of the Western Ground Parrot together with BirdLife WA, the Oyster Harbour Catchment Group and the Albany & Surrounds Feral Cat Working Group sponsored an educational website Saving Kyloring Stories and invited students to create a story about Kyloring with the opportunity to enter a competition. Kyloring is the Noongar name for the Western Ground Parrot.

A judging panel, headed by renowned Australian children's book author Dianne Wolfer, has now selected the winners of the competition. The winners were announced on Threatened Species Day.

The winner of the competition in the Years 7–9 category is Lucy Phillips for her story *Call of the Kyloring*. Lucy, who loves birds as much as drawing, worked months on her story and succeeded in creating an amazing picture book about the Western Ground Parrot. The judges were so impressed with Lucy's entry that it was decided to get the story printed. Lucy is a student at the Our Lady of Mercy College in Australind.

The competition winner of the Years 4-6 category is Hazel Bee for her story *The Case of the Kyloring*. Hazel is a student at the Australian Christian College – Southlands in Albany. Each of the first prize winners received a cash prize of $250 as well as a copy of the Western Ground Parrot documentary *Secrets at Sunrise*.

Lucy Phillips from Our Lady of Mercies College was the winner of the Saving our Kyloring Stories competition for her story Call of the Kyloring. The judges were so impressed that they got her story printed in a limited print run.

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It takes a community to save a bushland *By Gabrielle Pither*

On 16 September 2023, the Friends of Jirdarup Bushland celebrated the launch of their book *Jirdarup Bushland and the Friends who care for it*, authored by local resident Dr Lesley van Schoubroeck.

According to Professor Kingsley Dixon from Curtin University "Jirdarup is the most pristine and highest quality banksia woodland remaining in inner Perth." Jirdarup is on our doorstep in East Victoria Park and includes Bush Forever site 48, within the Kensington Bushland Reserve. Noongar Elder, Emeritus Professor Simon Forrest, praised the acknowledgement of First Nations people in this publication.

The book features past and present members of the Friends group and DBCA staff alongside a galaxy of other scientists, local citizens and Council staff who contributed to the preservation of this remarkable area.

Cheryl Parker and daughter Alyce at the launch of Jirdarup Bushland and the Friends who care for it. Cheryl's enduring connection with the bushland dates back to high school, and her invaluable contributions, among many others, played a pivotal role in bringing this remarkable book to life. Photo – Derrin Kee.

Cheryl Parker, now a senior curator of the Western Australian Herbarium's vascular and marine plant collection, was captivated by the bushland when she was in high school. Upon graduating from UWA and commencing her first job at the Herbarium in 1980 she spent many lunchtimes with colleague Ray Cranfield collecting specimens. Dr Barbara Rye, who joined the Herbarium in 1981, was a member of the community management committee that resulted in the first Kensington Bushland Management Plan in 1993. The work of both these leading scientists and many others are celebrated as the rich history and treasures of Jirdarup Bushland Precinct come to life in this remarkable 84-page volume.

With a collection of maps and historical records, readers can witness the evolution of community and local authority sentiments towards preserving this cherished bushland. Young scientists can take heart that with good science and the community behind you, preservation and restoration of our banksia woodlands is possible.

How to Get Your Copy?

- Visit the Friends of Jirdarup Bushland website
- Ask your local library
- Email admin@friendsofjirdarupbushland.org.au

The publication of *Jirdarup Bushland and the Friends who care for it* has been made possible through generous donations of photographs and memories of contributors. Many thanks also to the Town of Victoria Park, with special thanks to Mayor Karen Vernon. The Jirdarup book launch was kindly supported by the WA Government's StateNRM program.

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Karak Cooby Bushcarers take flight *By Adam Peck*

A special piece of Coolbellup bush is in good hands following the formation of a new friends group. Karak Cooby Bushcarers (KCB) first met in June and celebrated with an official launch onsite on 22 October at what the community fondly refers to as the Malvolio Bushland, a popular area for the karak, or forest red-tailed black cockatoo, where they feed on marri trees.

The launch was attended by City of Cockburn Mayor Logan Howlett who planted a marri tree, Sealin Garlett Jnr. gave a Welcome to Country, and attendees celebrated with live music, children's activities, stalls and guided bushwalks.

Group convener Kim Dravnieks said "more than 50 people attended the launch. Even better, at the first weeding event after the launch, five new members helped out! I'm excited to see how the group evolves and what the future will bring. There are so many benefits to forming these groups, both for the natural environment and the wellbeing of city dwellers."

Malvolio Bushland was the site of the largest protest event during the 2017 clearing for stage 8 of the now defunct Roe 8 extension. This bushland tract has now been transformed by the community and the Rehabilitating Roe 8 partnership, with the support of the City of Cockburn. The KCB joins the Cockburn Community Wildlife Corridor group which has been caring for the western section of the highway corridor. KCB meet fortnightly for weeding, litter clean-ups and planting projects.

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At the launch of the Karak Cooby Bushcarers Mayor Logan Howlett said " he and his family had spent many years living near the Malvolio bushland and appreciated community and City efforts to rehabilitate the area since it was cleared." Photo – City of Cockburn.

Deloitte volunteers pitched in to assist with aquatic weeding at Yanchep National Park for their annual Impact Day resulting in a truck full of weeds. Photo – Deloitte Australia.

Deloitte volunteers lend a hand *By Sally Stable*

The WA Parks Foundation helped organise several community projects on nature themes for Deloitte Australia's annual Impact Day. Impact Day is a national initiative which celebrates Deloitte's year-round commitment to supporting the communities in which they live and work.

One project assisted the Woodvale Waters Friends of Beenyup Channel with weed control at the Beenyup Channel, a natural waterway which connects Beenyup Swamp and Lake Joondalup in the Yellalonga Regional Park. Teams also helped out at the Kanyana Wildlife Rehabilitation Centre and at Yanchep National Park where they assisted with grounds maintenance and aquatic weeding.

Deloitte is one of our valued corporate partners and the WA Parks Foundation enjoyed the opportunity to identify a range of volunteering opportunities for the company's Impact Day. We also appreciated the opportunity to have WA Parks Foundation representatives attend a Strategy and Initiative Alignment workshop presented by Deloitte volunteers. If you'd like to get involved in volunteering, please get in touch with the WA Parks Foundation.

Contact

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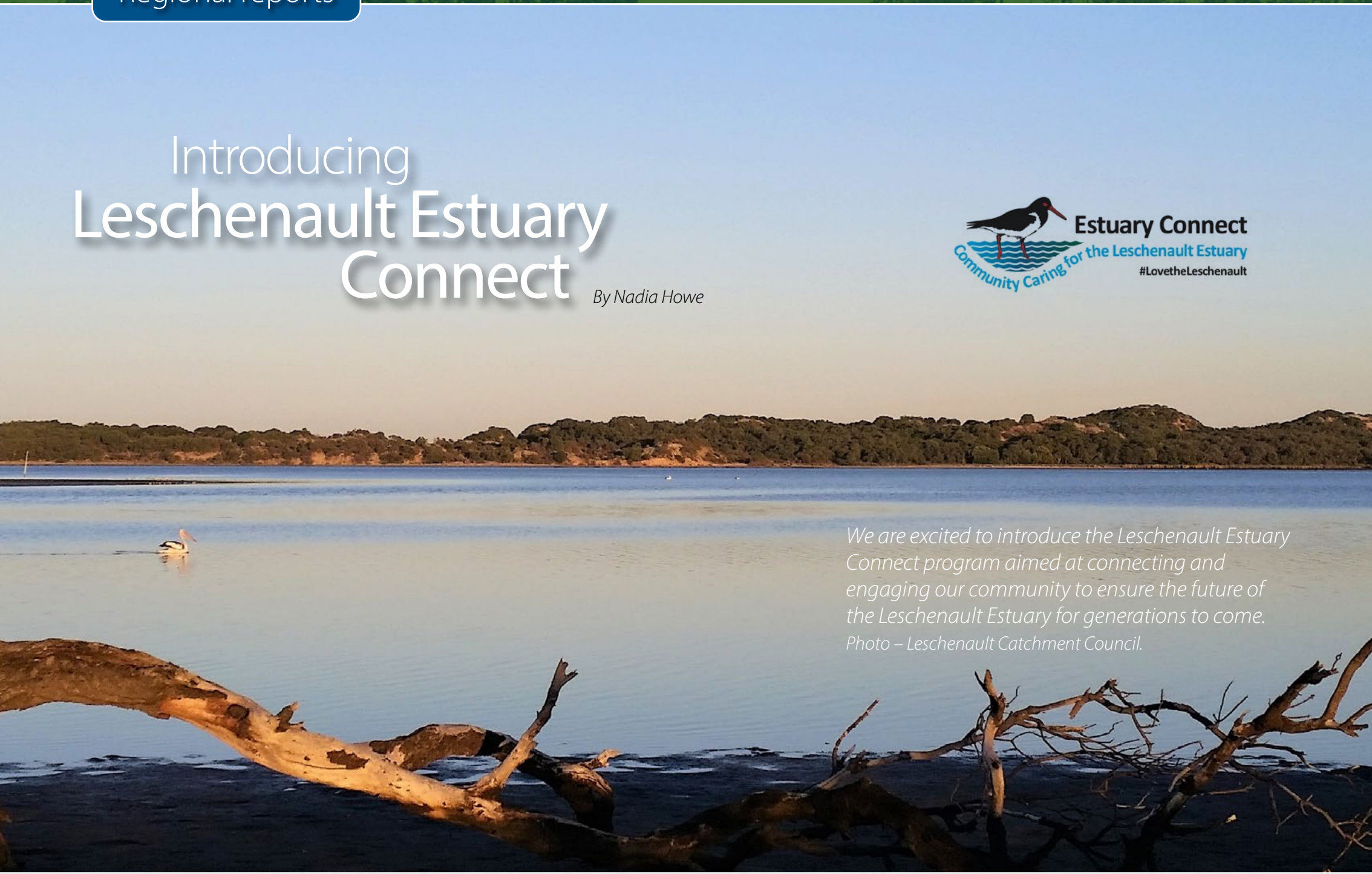
Introducing Leschenault Estuary Connect

By Nadia Howe

Estuary Connect
Community Caring for the Leschenault Estuary
#LovetheLeschenault



We are excited to introduce the Leschenault Estuary Connect program aimed at connecting and engaging our community to ensure the future of the Leschenault Estuary for generations to come.
Photo – Leschenault Catchment Council.

Introducing Leschenault Estuary Connect *By Nadia Howe*

The Leschenault Estuary is an ecological gem, a haven for wildlife and a treasured resource for the Greater Bunbury community, providing recreational opportunities and enriching our lives. However, the estuary faces challenges that demand our collective action to safeguard its future.

Understanding the Issues

The impact of various land uses in the surrounding catchment area on water quality, ecological health, and suitability for recreational activities have raised concerns about the health and well-being of the Leschenault Estuary. Despite significant efforts to address water quality issues, the lack of coordination among stakeholders and limited community engagement remain significant hurdles. The time has come for a strategic, collaborative initiative that unites all of us in protecting and enhancing this invaluable estuary.

Leschenault Catchment Council are excited to introduce the Leschenault Estuary Connect program aimed at connecting and engaging community by bringing together traditional owners, community members, key business partners, and both State and local government to raise awareness about the estuary's natural and cultural significance.

The program will encourage community engagement in restoration efforts, and promote collaboration to address water quality issues and protect biodiversity values. Lotterywest and Water Corporation, have provided three years funding with intention to continue the program after the initial three years.

Raising Awareness

The program will include forums, presentations, and workshops to educate the community about the estuary's natural and cultural values and show how simple everyday actions can contribute to its preservation. Including recording and communicating the cultural connections of local Aboriginal people to the estuary with an Aboriginal story/language book and video production.

Community Engagement

Volunteers will be invited to get involved in on-ground restoration projects, like planting and clean-up days around the estuary as well as to participate in citizen science programs in shorebird monitoring and seagrass restoration trials. Community contributions, no matter how big or small, make a real difference.

Collaborative Action

By uniting State and local government stakeholders with the community in a collaborative management group, we will communicate, share information, prioritise projects, and identify research opportunities to address water quality issues, protect the estuary's biodiversity, and better understand its health.

The Leschenault Estuary Connect program is a commitment to creating a better, more sustainable future for the estuary. Sign up to hear about upcoming opportunities to get involved and together we can protect and enhance the Leschenault Estuary for generations to come.

Estuary Connect
Community Caring for the Leschenault Estuary
#LovetheLeschenault

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Tackling landcare folklore and teaching kids science on the Myalup dunes *By Bruce Ivers*

"Mrs Bishop, what can we do to help Yarloop after the bushfires?" Cath Bishop was a Deputy Principal at Ardross Primary School (APS) and shortly after the start of the school year in 2016, a group of Year 6 boys approached her with that question. She referred the question to me, the school's Sustainability Co-ordinator, and that started a journey that continues today.

A phone call to the Peel-Harvey Catchment Council referred me to Samantha Pickering, the Environmental Officer at the Shire of Harvey (SoH) and a trial planting was organized for June 2016 where the 60 Year 6 APS students travelled to a former go-cart track near the corner of Honeymoon Rd and the Southwest Highway, Harvey and planted 1,800 Marri seedlings grown in the school nursery. The trial planting was judged a success and bigger plans were made for 2017 including a successful State NRM grant application.

In June of 2017, ten Perth schools, mostly from the Low Carbon Schools Pilot Program (now Climate Clever) including APS, travelled to Yarloop and planted 20,000 seedlings in fire ravaged reserves around Yarloop township. This too was a success and then we were seeking another big challenge for 2018 and beyond. Samantha Pickering recommended 40 ha of SoH land with 900m of beachfront immediately north of the Myalup township.

The job was to plant seedlings to stabilise the bare areas of the ocean front dunes.

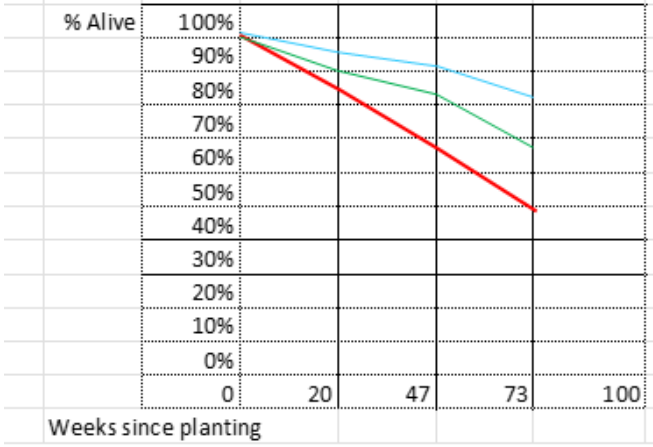
Trees Australia is the largest school-based tree planting program in Australia. With 20 years of experience revegetating Wheatbelt sites, I was acutely aware that coastal dunes at Myalup were a whole new field, but I wanted to apply my wheatbelt experience, especially planting at scale. That suits school groups with whom I work, because there is a large workforce for a short period. From the start in 2018, we conducted trial programs to test current practice and teach school students to do real world science. I wanted students to learn how to plant a trial, and through data analysis in the classroom, understand how to apply the results in the future.

The Myalup trial program is in its sixth year having been modified by increments each year as the new factors that might increase seedling survival rate are identified for example tree guards, species better suited to being colonisers, better plant nutrition using fertiliser tablets, and countering hydrophobic sands with soil wetters. We have four or five schools each year planting at Myalup. They have included APS, Forest Crescent PS, Thornlie PS, Samson PS, Lance Holt School, Fremantle PS, Subiaco PS, Baldivis Secondary College, Our Lady of Mercy College, Australind PS, Parkfield PS and Bunbury SHS.

2022 Myalup Trial Seedling Survival Rate to 73 Weeks of Age

Spinifex longifolius and Ficinia nodosa

Age	20 Wks	47 Wks	73 Wks	Av Ht 73 Wks (cm)
Nil	84%	68%	49%	13.8
Fertiliser at 49 Wks	90%	84%	69%	22.5
Fertiliser at Planting	95%	91%	82%	24.6



Graph one: *Seedling survival rates for the 2022 trial on weeks 20 (end of first spring), 47 (end of first autumn) and 73 (end of second spring) after planting with three fertiliser regimes. Seedling heights were also measured in week 73. Fertiliser has promoted both survival and increased height.*

Continued next page ...

Students from Ardross Primary School Year 6 River Rangers are planting the 2022 trial on the Myalup dunes on 23 June 2022. Photo – Bruce Ivers.

We found that four different types of tree guards have proved an expensive, time-consuming way to put off the inevitable death of underdeveloped seedlings, however, it was obvious that most species benefit from protection. Plants with the best survival rate were those growing right next to an established plant not part of the trial. Now we choose *Spinifex longifolius* (beach spinifex) and *Ficinia nodosa* (knotted club rush) as coloniser species because when mature, they should provide long lasting protection, unlike tree guards.

Once the coloniser species are established, greater biodiversity can be introduced to the bare, open, salt spray and wind harried dunes.

Last year Ardross Primary School and Trees Australia established a trial to test the impact on coloniser species survival rate of two types of tree guards and the presence or absence of a 10g Arbortab fertiliser tablet. Survival rates are displayed in Graph 1 for three dates at the ends of the first spring, first autumn and the second spring after planting.

At our second monitor, almost one year after planting, about a third of plants without fertiliser had died compared to one in 10 of the fertilised plants. This impact was so dramatic that we decided to plant fertiliser tablets next to Ficinia nodosa to check the response. This took place within the fortnight. So now we have three treatments, no fertiliser, fertiliser at planting and fertiliser almost a year after planting.

Continued next page ...

Just weeks ago, in week 73, we measured the height of the seedlings. Fertiliser has increased survival rates significantly. Half of the plants without fertiliser have died, two thirds of plants fertilised almost a year after planting have survived, and only a fifth of plants planted with fertiliser have died. The difference in height is distinct with the surviving unfertilised plants being at least a third shorter than either of the fertilised treatments.

Table one

2023 Myalup Trial. Seedling Survival Rate and Height, With and Without 10g ArborTab			
	Age 24 Weeks		
	Av Survival	Av Ht (cm)	
FO	99%	11.9	Ficinia nodosa no fertiliser
FF	74%	19.1	Ficinia nodosa 10g Arbor Tab at Planting
SO	80%	8.8	Spinifex longifolius no fertiliser
SF	68%	18.0	Spinifex longifolius 10g ArborTab at Planting

The 2022 trial in the second spring 73 weeks after first planting. There is a dramatic difference in the survival and vigour of plants with and without fertiliser. And note the distorted and collapsed cardboard guards at the back. The treatments are from left to right: Ficinia nodosa *fertilised almost a year after planting,* Spinifex longifolius *with no fertiliser,* F. nodosa *fertilised at planting,* S. longifolius *fertilised at planting,* F. nodosa *no fertiliser. Photo – Bruce Ivers.*

This year's trial was planted on very exposed bare sand to try and reproduce the 2022 response to fertiliser, see Table one. Our spring monitoring shows that the seedlings with fertiliser grew twice as high as those without, however the seedlings' survival rate was significantly lower. It will be very interesting to graph that over time.

The use of soil wetters to improve seedling survival will be incorporated in our trials next year.

Contact

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Wirambi Landcare *By Jason Bird*

Wirambi Landcare was formed in 2018 as a not-for-profit organisation with the main purpose and goals of assisting grass roots conservation groups in the conservation and preservation of our local ecosystems and species.

The organisation is comprised of mostly volunteers from various backgrounds and experience but all with a common interest of improving our local environment, protecting species and learning new skills. Over the past five years Wirambi Landcare has helped guide and train more than 40 Tafe and University students to gain entry in the conservation sector.

Along with assisting students, our organisation also aids friends groups in land restoration, community engagement, and flora and fauna surveys. At present we are supporting two newly formed groups, the Friends of Applecross Foreshore and Friends of Fred Johnson Park.

The volunteers at the Friends of Applecross Foreshore have already achieved great things since their formation in August this year. They are the first dedicated conservation group for the suburb and have already removed 190kgs of weeds from the foreshore whilst also conducting flora and invertebrate surveys. The information and data gathered will allow them to make better informed decisions for the reserve's restoration projects. With positives, there are negatives, such as the amount of rubbish being dumped, including building material and local residents wanting no trees along the foreshore, and the retention of the grass right up to the Swan River.

A core focus of Wirambi Landcare is the conservation of bats in Western Australia. Here the Friends of Booragoon and Blue Gum Lakes are setting up bat acoustic recorders at Blue Gum Lake. Photo – Jason Bird.

Continued next page ...

Since the beginning of our organisation, our core focus has been the conservation of bats in Western Australia. It has been our primary aim to deliver programs to grass roots groups about the importance of micro-bat species and why we should preserve them.

Our monitoring program began in 2019, primarily in the City of Melville, focusing on 17 reserves and consisting of 28 survey sites. To date, over 424,000 bat recordings have been made across 628 nights, totalling 8,237 hours. It might seem like a lot of recordings but on deeper analysis, only around 25,000 (6.1%) were positive bat recordings. Of those recordings, only four of nine species of microbats found on the Swan Coastal Plain were documented, the white-striped free-tailed bat, Gould's wattled bat, southern forest bat and lesser long-eared bat. This suggests that species diversity is less in urban areas that have lack of connectivity.

It is not just lack of connectivity between urban reserves that is impacting bats but also the lack of middle and lower storey flowering plants. These species of plants attract the micro-bats main food source, invertebrates. This observation led to us to developing our invertebrate and tree density monitoring program, to us understand how micro-bats fit in our ecosystems. The data we are collecting will help provide better species management recommendations to our various stakeholders.

Since 2019 Wirambi Landcare has coordinated the annual Ringtail Possum Tally for the Peel-Harvey area, joined by the Peel Harvey Catchment Council (PHCC) in 2023. This has been in collaboration with DBCA, GeoCatch, South West Catchments Council, Oyster Catchment Council, Nature Conservation Margaret River Region and Leschenault Catchment Council. The tally has been an important program to highlight the importance of this critically endangered species in the southwest. Since 2019, we have been gathering data and establishing population trends that suggest some negative interactions between residential development and ringtail activity. Field observations by community volunteers are helping us to understand possible causes of possum mortality, which can then be investigated further.

Next year we will be starting new monitoring programs involving trapdoor spiders, rakali and freshwater mussels. At present, we are drafting our new five-year strategy to identify fauna species that require monitoring and assistance. Please contact us if you or your group want to be involved, or you would like to learn more about our programs.

Contact

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Wirambi Landcare can assist community groups by engaging volunteers and corporate groups to attend environmental events. Here Trinity College staff and Wirambi Landcare volunteers are posing with the results after a morning weeding at Booragoon Lake. Photo – Jason Bird.

Jeff Joseph Reserve is part of the 850m of Swan River that the newly formed Friends of Applecross Foreshore are working to protect and restore. Wirambi Landcare is supporting this group by sharing techniques for land restoration, community engagement, and flora and fauna surveys. Photo – Jason Bird.

Improving conservation outcomes for seadragons with citizen science and machine learning tools

By Chrissy Tustison

Seadragons are iconic marine fishes that live only in Australia's southern waters, making them great ambassadors for temperate marine habitats. Their beautiful appendages and patterning make them compelling subjects for artists and photographers, which also makes them very well-camouflaged and difficult for people to spot in the wild. Including scientists!

Because of these challenges to data collection, we still have a lot to learn about seadragon populations across Australia's Great Southern Reef. Common and leafy seadragons, the two species that live in coastal waters, stay within small home ranges, and scientists are concerned about how warming ocean temperatures and other stressors may impact them. We don't have enough data at this point to determine whether they should be considered threatened, and if so to what extent.

Enter, SeadragonSearch! With the help of citizen scientists, we are now studying seadragons through photographs to answer conservation questions. Seadragons have unique patterning like fingerprints that can be identified in images. Photos of the same animals can be matched to one another using those patterns, creating time series for individual seadragons. With this data, we can investigate research questions about seadragon population sizes, lifespans, reproduction, and parasite loads. But how do we do this across such a large area like the Great Southern Reef?

Citizen scientists are helping us to collect the large-scale data that we need by sharing thousands of seadragon photos from across southern Australia. Then, applying machine learning tools helps us to complete the analyses for those data. Our machine learning pipeline assesses new images and provides a set of suggested matches in the database. Those matches are reviewed by our team, and the new animal is either matched to an existing time series or given a new individual ID to begin a new time series. The contributors of the photos receive email updates to let them know how their submissions are assigned and when an animal they've submitted has been re-sighted.

This project wouldn't be possible without the communities of citizen scientists who care about seadragons. We need data to quantify the level of threat to seadragons, and that's where citizen scientists really hold the power to influence the future for these animals. SeadragonSearch is now three years old, continuing to grow, and looking forward to inviting many more participants into our community! We plan to continue the project until at least 2030.

Do you have photos of seadragons? Here's how to get involved. Both current and older seadragon photos are valuable to our project! You just need to know the date and location for your photos. Then you can submit them to SeadragonSearch using our reporting form. Be sure to also read our Code of Conduct for interacting with seadragons. And get research updates and join seadragon conversations on our social media.

This lovely photo shows a weedy seadragon from Lucky Bay in Western Australia, but we don't need perfect photos for our research! Just clear views of the seadragon's patterning. This male seadragon has been sighted 21 times over a three-year time period, and he has also been photographed with eggs each breeding season since 2020. Photo – Michaël Roelens.

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Urban Rivers and Catchments Program $200 million for not-for-profit and government organisations to fund up to 5 year projects restoring the health of our urban waterways for native plants, animals, and local communities as part of the Australian Government's Nature Positive agenda. Stream 1 $150,000–$2 million, Stream 2 $2–10 million. Applications **close 13 February 2024**.

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.**

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**.

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

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.**

State NRM Community Stewardship Grants small grants $1,000–$50,000 for 18 month projects or large grants $50,001–$450,000 for up to 3 years. The next round is **likely to open in first quarter of 2024.**

Local Biodiversity and Native Vegetation Management Grants round 2 open to local governments in the South West who did not receive round 1 funding for projects on ecological assessments or the development of local planning policy on biodiversity. Applications **close 8 December**.

IGA Community Chest raises funds to support local communities, charities and other worthwhile causes. Approach your local store **year-round**.

Connecting to Country is for Aboriginal individuals and organisations to undertake on Country activities with intergenerational transfer of knowledge, culture and strengthening communities. Applications **close 01 February**.

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.**

Peel Harvey Fencing and Revegetation of Rural Drains and Waterways up to $4,500/km for fencing and $15,000/ha for revegetation via expressions of interest.

Rio Tinto Community Giving program invites local grass-roots organisations to apply for $500–$5,000 to support WA communities including those neighbouring Rio Tinto's operations and regional FIFO communities. Applications **one per calendar year.**

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. Armadale Habitat Links **open year-round for rural residents**, Bayswater **close 23 February**, Belmont **opens February**, Busselton **opens February**, Cockburn Sustainability **are open all year**, Derby/West Kimberley **round 1 closes 31 December and round 2 opens 01 January**, Geraldton **applications open 08 January**, Gosnells, Harvey Water **open year-round**, Joondalup **Applications open 05 February**, South Perth **open year-round**, Swan **open year-round**, Wanneroo **open year-round**, Alcoa Waroona **round 2 opens 01 December.**

Seedling Bank grants supporting community revegetation. Applications for 2024 **open December 2023.**

National Science Week Grants $2,000–$20,000 for the celebration of National Science Week, 10–18 August 2024. Applications **close 11 December 2023.**

Strengthening Rural Communities – Small and Vital up to $10,000 for initiatives that strengthen local people, places and climate solutions for populations <15,000. Applications **close 26 February.**

Recent Research

Novak P, Hoeksema S, Thompson S, Trayler K (2023) Per and polyfluoroalkyl substances (PFAS) contamination in a microtidal urban estuary: sources and sinks *Marine Pollution Bulletin* **193** (115215)

Roger E, Slayyer C, Kellie D (2023) Citizen scientists collect more nature data than ever, showing us where common and threatened species live *The Conversation*

Rycken SJE, Warren KS, Yeap L, Donaldson R, Mawson P, Dawson R et al. (2022) Forest specialist species in the urban landscape: do different levels of urbanization affect the movements of forest red-tailed black cockatoos (*Calyptorhynchus banksii naso*)? *Avian Conservation and Ecology* 17 (11)

Travouillon KJ, Cooper C, Bouzin JT, Umbrello LS, Lewis SW (2023) All-a-glow: spectral characteristics confirm widespread fluorescence for mammals *Royal Society Open Science* 10 (10)

Baker GB, Candy S, Robinson S, Friend JA, Holdsworth M, Jensz K, Page M, Algar D (2021) Effectiveness of dogs for detecting feral cat scats in wheatbelt reserves of Western Australia *Wildlife Research* 48, 690–700.

Burrows N, Stephens C, Wills A, Densmore V (2021) Fire mosaics in south-west Australian forest landscapes *International Journal of Wildland Fire* 30, 933–945.

Publications

Guidelines for embedded experiments in ecological restoration and management in Australia Broadhurst L, Prober SM, Boggs G, Bush D, Breed MF, Dickson F, Harrison PA, Jellinek S, Lynch AJJ, Rymer PD, Young RE, Commander LE (eds) *CSIRO Publishing*, 2023. Growth in the restoration sector is expected to increase over the next few decades as we rebuild our environments devastated by drought, bushfires, flood, fragmentation, and ongoing vegetation decline. These guidelines provide a framework for planning and implementing standardised experiments within restoration projects to help build a national research network. They cover the value of science partnerships and how to enable them, planning, designing, and monitoring embedded experiments, and how to collate and manage data from these experiments. The guidelines conclude with real-world case studies that put these concepts into practice.

Building biodiversity for thriving urban ecosystems. Menne S. *Western Australian Biodiversity Science Institute* 2023. Report of WABSI Urban Biodiversity Resilience Research Program which in consultation with many stakeholders outlines a prioritised research program to tackle Perth's most pressing biodiversity challenges.

The Great Southern Reef Venzo P, Francis P, James C. *CSIRO Publishing*, 2022. $24.99. For children 6–9 go beachcombing with Professor Seaweed and learn about the hidden treasures of the sea. Have you heard of the Great Southern Reef? The Great Southern Reef spans thousands of kilometres along the coast from northern New South Wales to Western Australia. It is home to giant kelp forests and fascinating animals such as rock lobsters, sea snails and sponges. Explore the sandy beaches and discover marine curiosities that are washed up along the coast after a big storm.

State of the World's Plants and Fungi 2023 200 scientists from more than 30 countries combined to report on the state of the world's plants and fungi and efforts to conserve diversity in the fifth report of the series. Australia has been identified as the country with the highest proportion (88%) of endemic plants. The report also identified 32 plant diversity darkspots, areas where are a large proportion of plants and fungi are unnamed and unmapped, with threats and conservation status unknown. Fourteen are within tropical Asia, nine within South America, six in temperate Asia, two in African and one in North America. Within Australia, Queensland and Western Australia had the greatest darkspot shortfall.

Looking After Country with Fire Steffensen V, Steffensen S. *Hardie Grant Explore*, 2022. $24.99. A picture book for 5 to 10-year-olds that demonstrates respect for Indigenous knowledge. Join Uncle Kuu as he takes us out on Country and explains cultural burning.

A Guide to Land Snails of Australia Stanisic J, Potter D, Stanisic L. *CSIRO Publishing*, 2022. $50.00 Australia's native land snails are an often-overlooked invertebrate group that forms a significant part of terrestrial biodiversity, with an estimated 2,500 species present in Australia today. This guide presents an overview of Australia's native and introduced land snail faunas, offering a greater understanding of their role in the natural environment. The book presents clear diagnostic features of live snails and their shells and is richly illustrated with a broad range of Australia's native snail, semi-slug and slug species.

Apps

With **On the Fly** app you will be able to accurately identify the family to which an Australian fly belongs. The app also includes information on each Australian fly family, including photographs, a brief morphological description, biology and distribution, and links to literature and web sites. Available for $14.99 from the App Store or on Google Play.

Key to Insect Orders This simple key aims to identify most common adult insects to the level of order. It has been designed for a range of users, including advanced secondary students, beginning undergraduates and others interested in entomology, and includes information about the structure and biology of insects as well as their identifying features. Available for $2.99 from the App Store or $1.99 on Google Play.

Websites and videos

Gardening Responsibly website promoting the supply of, and developing new low risk plants to maintain healthy, beautiful Australian gardens and landscapes. Researching the future invasive risk of ornamental plants and certifying low risk plants.

Fire and Air Forum: Biodiversity, Environmental Sustainability and Human Health recordings are now available.

Heartland Journeys Learn more about the natural wonders and cultural heritage of the Great Southern with Gondwana Link's online guide. Interactive map, self-drive journeys, biodiversity information, podcasts and multimedia stories from Noongar Elders, land-carers and environmentalists.

Insect Identification Tips details some very basic characteristics to categorise and report insects for the Wild Pollinator Count.

shanks for visiting

By Geoff Barrett

Photo – Georgina Steytler.

From the woody moorlands, bogs and marshes, in the Northern Hemisphere boreal forests, almost 30,000 greenshanks will fan around the coast and across inland Australia, where they can be found as individuals, or in small groups, searching the shallows for food. We are always on the lookout for those northern hemisphere wader birds, that have travelled the East Asia Flyway to spend their non-breeding, summer months around Perth. Wetlands that support good numbers of these international visitors, are recognised as Ramsar wetlands, and an extra effort is made to keep these sites hydrated and weed-free, with mudflats that produce the shrimps, snails, worms and small fish, that waders need to fatten up after their long flight.

Wetlands are where many of our land management mistakes end up, so, like many waders, common greenshanks (*Tringa nebularia*) are listed as vulnerable, but the main reason for their steady population decline, is disruption to the stopover sites, along the coast of the Yellow Sea, where greenshanks refuel during the flight south.

It is a pretty bird, with its white tummy, upturned beak and long, green legs, and being larger than most waders, greenshanks can be seen at a distance, even without binoculars. Standing erect as you approach, head bobbing with indecision, they will spring into the air with high pitched 'teu teu' calls, a flock of white rumps, disappearing over the water.