Western Wildlife
LAND FOR WILDLIFE NEWSLETTER
Department of Biodiversity, Conservation and Attractions
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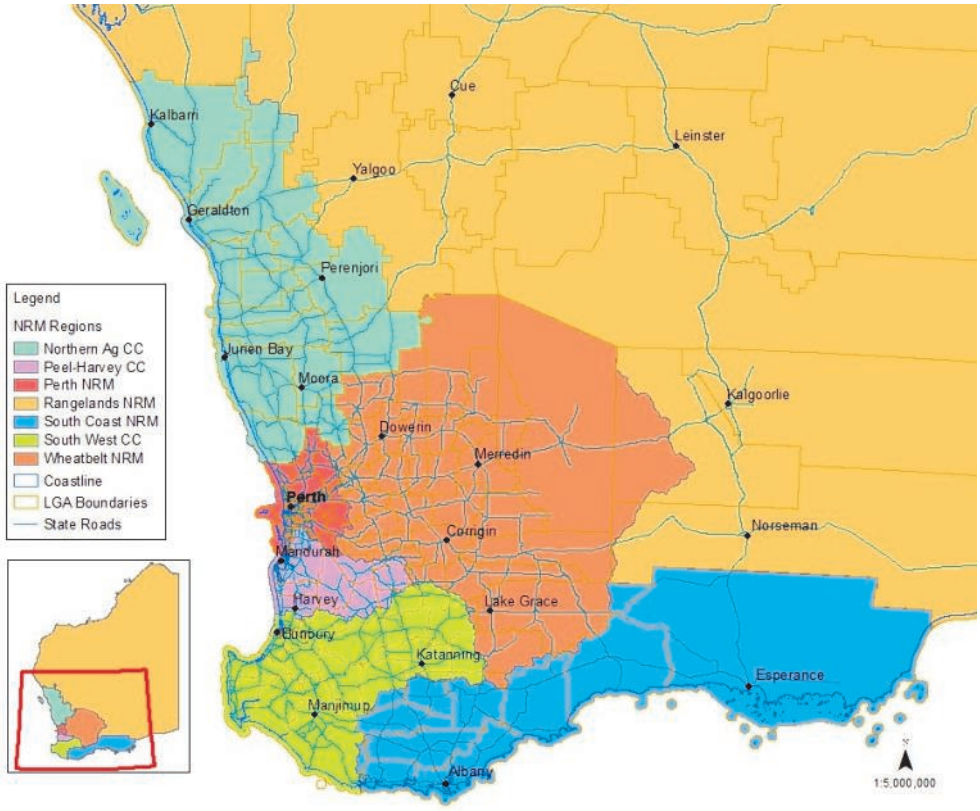
LAND FOR WILDLIFE & NATURAL RESOURCE MANAGEMENT WA PARTNERSHIP

Gillian Stack

As many readers would be aware, in May 2016 the then Department of Parks and Wildlife entered a Partnership Agreement with Natural Resource Management Western Australia to work together to provide biodiversity conservation support to *Land for Wildlife* members.

First question — what is natural resource management? Usually shortened to NRM, it is about managing nature-based resources, such as water, soil, plants and animals, to ensure quality of life for both present and future generations. It looks at the sustainable use of these environmental resources and their long-term profitable management, as well as maintaining strength and resilience in the communities using those resources. Conservation of natural ecosystems is a goal of NRM.

Many threats to biodiversity conservation occur on a landscape scale, including habitat clearing, rising salinity, weeds and feral animals. NRM groups address these by acting on a landscape-scale as well as site-based works. Depending on local issues and priorities, they may coordinate feral predator control across an area to maximise effectiveness, or prioritise high conservation value areas for fencing, weed control or revegetation projects.



Regional NRM group boundaries, framed to show detail of smaller regions. The full extent of Rangelands NRM region is shown in inset and on page 9.

There are seven regional NRM groups in Western Australia:

Northern Agricultural Catchments Council;

Peel-Harvey Catchment Council;

Perth Natural Resource Management;

Rangelands Natural Resource Management;

South Coast Natural Resource Management;

South West Catchments Council; and

Wheatbelt Natural Resource Management.

An introduction to each of these NRM groups and the ways we're all working together is a feature of this issue of *Western Wildlife*.

All groups are a source of advice on local land management issues, and will have opportunities defined by each group's focus and capacity. Each will be happy to hear directly from members as need arises. *If you are near a border and would like to know which region your property lies within, please contact the Editor (details on the back cover).*

EDITORIAL

As conservation-minded managers of natural areas, Natural Resource Management (NRM) is something that *Land for Wildlife* (*LFW*) members do, whether they call it that or not! This issue of *Western Wildlife* introduces the Regional NRM groups that are partners with the Department on the *LFW* program, and how they can support *Land for Wildlife* members. Over the last year, I have been working with their biodiversity staff to develop ways we can deliver support to members. You may wish to subscribe to your NRM group's e-newsletter for other NRM news from your region, and to ensure you are aware of any opportunities in your area. The link is generally on their website's home page.

Some of you will be aware that the Department of Parks and Wildlife has changed name and structure, and is now part of the Department of Biodiversity, Conservation and Attractions (DBCA), along with Perth Zoo, Botanic Garden and Parks Authority (Kings Park) and Rottnest Island Authority.

This is the first issue of *Western Wildlife* to be extended to people with DBCA-registered Conservation Covenants on their property. Some of those people are also *LFW* members and familiar with what we do; others may not be. If this is your first *Western Wildlife,* welcome, and I trust you will enjoy reading it. For those readers not familiar with them, an introduction to Conservation Covenants is given on page 24.

As I look back over the last year, I am struck by the sheer diversity of people I have spoken to who are all working in different ways towards conservation of our unique species and environments. This vast network can give much-needed support and encouragement in times that are both challenging and exciting.

A number of *LFW* members I have spoken to in recent months have expressed interest in having contact with other members in their area, and perhaps getting together periodically over a cup of coffee or glass of wine to discuss *LFW* highlights and challenges; what they've tried and how it went. LFW doesn't give out member contact details without permission, so if you would like to share your contact details with neighbouring members and be a part of a like-minded network, please let me know! My contact details are on the back cover.

Long-time members from the South Coast Sylvia Leighton and Peter McKenzie share their experience of farming after a bluegum plantation has been harvested, including revegetation to connect pockets of remnant vegetation. As many bluegum plantations are reaching maturity, plans for the land post-harvest is likely to be on the minds of a number of members.

This issue sees several scientists generously share their specialist knowledge. I am also grateful to specialist raptor rehabilitator Michael Calvin for sharing his experience trialling new technologies to teach an orphaned falcon to hunt for herself in the wild – a complex, physically demanding task.

As always, I welcome contributions from *LFW*ers about your successes and trials, and hope that other members facing similar conditions or challenges can learn from them or suggest a solution, as well as celebrating success.

My best wishes to you all,

Gillian Stack

Land for Wildlife Coordinator

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Habitat planting of native grasses at Aroona, alongside Warren River. Also planted that day were flooded gum, WA peppermint, Warren River cedar and reeds. *Photo: Sharyn Cody*

NORTHERN AGRICULTURAL CATCHMENTS COUNCIL

Jessica Stingemore

Land for Wildlife is well underway in the NACC NRM region under an exciting collaboration between Department of Biodiversity, Conservation and Attractions (DBCA) and NACC, via a broad partnership arrangement with NRM WA. The collaboration means that existing *LFW* members in the region continue to have local support in the program, while providing new opportunities for other landholders wanting to join the scheme.

NACC's region – the Northern Agricultural Region (NAR) – extends over 7.5 million hectares of WA, encompassing a variety of valuable environmental and agricultural landscapes. The NAR runs from Gingin in the south to Kalbarri in the north, and east to Mullewa, Perenjori and Kalannie along the Local Government Area (LGA) boundaries. It contains three of Australia's 15 biodiversity hotspots, and lies within the internationally recognised Southwest Australia Biodiversity Hotspot.

NACC's vision is to build healthy, diverse, vibrant and productive land, water and seascapes in which local communities and individuals care about environmental stewardship and take real action to protect and manage the amazing natural assets of the region.

Within the NAR, high levels of biodiversity contribute to the long-term health of the agricultural sector through provision of essential ecosystem services. It is also valuable for health and wellbeing and contributes to tourism and the beauty of the region. Losing biodiversity threatens the health of the environment, economic productivity for farmers, and local communities.

In 2016, NACC staff were visited by conservation champions Fiona Falconer and Gillian Stack who helped them gain a better understanding of the *Land for Wildlife* process, and how NACC could incorporate this into current projects.

Wubin farmer Keith Carter took the honour of being the first farmer in the NACC region to sign-up two of his properties under the new *LFW* partnership. One property has a block of about 120ha of native vegetation, and the other supports 75ha of remnant bushland. Both properties provide habitat for numerous native fauna, including threatened species such as the western spiny-tailed skink (*Egernia stokesii* subsp. *badia*) and malleefowl (*Leiopa ocellata*)

As part of NACC's biodiversity incentive program, field staff are undertaking field visits to assess local properties for their eligibility for the *LFW* scheme.

NACC staff Roger, Lizzie, Heather and Marieke on site with local *LFW* champion Fiona Falconer and Gillian. *Photo: Jessica Stingemore*

NACC is also planning on hosting several field events with a focus on how to create healthy ecosystems on private property and move towards sustainable land management. In addition, NACC staff are offering professional advice on how to integrate wildlife habitat and management with other uses on private land – to the benefit of the landholder and wildlife – and how to manage remnant bushland and wildlife. By working together, NACC and local land managers can protect the wonderful wildlife of the region for future generations.

For more information about *LFW* in the NACC NRM region, please contact NACC Biodiversity Coordinator Jessica Stingemore on 9938 0106 or jessica.stingemore@nacc.com.au.

Jessica Stingemore, NACC's Biodiversity Coordinator. *Photo: NACC*

LFW & NRM PARTNERSHIP

PEEL-HARVEY CATCHMENT COUNCIL

Jordon Garbellini

The Peel-Harvey Catchment is nestled between the Perth and South-West regions and includes over 170,000 hectares of native vegetation on private land. The 1.2 million hectare Catchment includes the Hotham-Williams catchments and extends east to Cuballing, south to Harvey and Williams, and north to Byford and Wandering.

The PHCC's motto is 'People working together for a healthy environment' and this is how we work with groups and volunteers, including landowners who care for bushland and their local environment.

Support from the City of Mandurah and Shire of Waroona is enabling the PHCC to work with existing and new *Land for Wildlife* members within the Lake Clifton Catchment. Landholders who would like to be involved will be assisted with site assessments and personalised plans to integrate nature conservation into their property management, with flow on benefits to Lake Clifton. The ultimate aim is to restore habitat in the lake's catchment and improve the lake's water quality and ecosystem functions.

Jordon will be available to offer advice such as:

- how to integrate wildlife habitat with other uses of private land;
- how to manage remnant bushland and wildlife;
- the ecological role and requirements of native plants and animals;
- how to include habitat features in revegetation and landcare projects; and
- information about other assistance and incentives that are available.

Landowners with *LFW* site assessments will be invited to enter into voluntary management agreements and subsequently have access to land conservation grants (subject to future funding). Workshops and field days to support landowners will be advertised on the PHCC website and social media.

In the future, the PHCC looks forward to working with all landowners across the whole catchment, including the 155 landowners already involved in the *LFW* program, to support them in their management of bushland, forests, rivers and wetlands. Landowners outside the Lake Clifton catchment can currently access support through:

- community landcare centres at Mundijong, Waroona, Mandurah and Boddington;
- workshops and training, including topics such as fire recovery, weed control and wildlife management;

PHCC Natural Assets staff (L-R) Jesse Rowley, Jordon Garbellini and Jo Garvey. *Photo: PHCC*

- grants and funding opportunities; and
- special projects working directly with landholders on threatened species habitat.

These opportunities and services are provided by the PHCC working with others, including community groups such as Landcare SJ, the Harvey River Restoration Taskforce and the local communities of the Hotham-Williams Catchments.

If you are a landowner in the Peel-Harvey Catchment, and would like more information, call Jordon on (08) 6369 8800 or email Jordon.Garbellini@peel-harvey.org.au.

Check out our website for grant opportunities available to landowners www.peel-harvey.org.au/ or our Facebook page www.facebook.com/PeelHarveyCatchmentCouncil.

Lake Clifton supports the largest known reef of thrombolites in the southern hemisphere. These living non-marine microbialites rely on a healthy ecosystem for their existence. Thrombolites are a window to the deep past as they are very similar to the earliest forms of life on earth, responsible for initiating the oxygen-rich atmosphere that later lifeforms rely on. For more information see *Western Wildlife* 14/2 and 10/3. *Photo: PHCC*

PERTH NATURAL RESOURCE MANAGEMENT

Luke McMillan

Perth NRM is pleased to be supporting the *LFW* program. This partnership has provided a strong focus for private land conservation in the Perth Region and adds a valuable layer to our *Living Landscapes*, *Living Perth* and *Food Futures* programs.

Living Landscapes is focussed on supporting the health and resilience of Perth's native plants, animals and ecosystems for the community to value and enjoy. It aims to protect our natural landscapes by restoring ecological connectivity and managing environmental threats. A significant amount of this work is delivered by the community through grants and by undertaking weeding, planting, rubbish removal and seed collection among other things.

Food Futures works with orchardists, viticulturists, farmers, horse owners and other land managers in peri-urban Perth to protect natural resources on properties by sharing information about soils, nutrition, irrigation, phenology and crop performance through on-farm trials and demonstrations, as well as targeted training and field days.

The conservation or revegetation of bushland on private property can play an important role in landscape-scale connectivity and protection of important native plants and animals. For Perth NRM, *LFW* will provide the key mechanism for supporting those landholders who want to contribute to preserving our environment.

A Carnaby's cockatoo extracting seeds from a banksia cone. This highly mobile and critically endangered species requires extensive areas of habitat in the Perth region to feed and breed in. *Photo: Gary Tate*

Luke McMillan, Perth NRM's Environment Program Manager. *Photo: Shay Crouch*

The Perth region has 424 registered *LFW* sites. Perth NRM has staff with local knowledge and expertise to provide advice to members in regard to conservation or land management issues. This may include information about plants and animals, management of weeds or other pests, how to go about a revegetation project, or access to other resources.

If you know someone who is considering registering property with *LFW,* Perth NRM can provide details about the process, an assessment of the site and information about other forms of assistance and incentives that may be available.

Perth NRM will keep you informed about local workshops or field days that may be relevant to habitat management, and will be actively seeking new ways to support *LFW* members, either financially or through direct assistance.

Look for the *LFW* logo on the Perth NRM website and newsletters, which will link to a range of program information and resources,. You can also keep an eye out for the *LFW* banner at our events, where you can hear more about emerging opportunities for *LFW* members in the Perth Region.

Contact Perth NRM's Environment Program Manager, Luke McMillan on (08) 9374 3333 or enquiries@perthnrm.com to discuss *Land for Wildlife* in the Perth Region.

SOUTH COAST NATURAL RESOURCE MANAGEMENT

Meredith Spencer

South Coast Natural Resource Management is delighted to be working with the *Land for Wildlife* program in the South Coast region.

The South Coast NRM region extends over 8.6 million hectares, from Walpole in the west, to beyond Cape Arid in the east, and within it is an extremely rich biodiversity, much of which is recognised as being internationally significant. Protecting and enhancing wildlife habitat on privately owned land is key to conserving these values across the region.

Working with local Catchment groups over many years, South Coast NRM assists the local community to protect and enhance biodiversity through funding of practical on-ground works. These include revegetation, fencing to reduce grazing pressures on bush, weed and feral animal control.

One major risk to biodiversity in the region is phytophthora dieback, a plant disease that threatens many of the iconic plant communities of the South Coast. With the development of a dieback management framework, South Coast NRM can offer advice to reduce the spread of this devastating plant disease.

Over the past few years South Coast NRM has also implemented new and innovative methods to monitor the effects of management on wildlife. This has included use of remote cameras and drones to monitor plants and animals.

South Coast NRM is excited to be a part of the new partnership. Biodiversity Program Leader Karl Hansom notes, "This agreement will lead to benefits for private landholders and South Coast biodiversity. It will help to protect those species and communities that occur outside the formal conservation reserve system".

This woodland has been revegetated to provide habitat for a range of flora, fauna and fungi. *Photo: Meredith Spencer*

"We're looking forward to working with existing *Land for Wildlife* members and meeting new people interested in taking up the program. By working together and sharing knowledge and resources, we can make a great difference to the protection and conservation of wildlife habitat in our region."

South Coast NRM can connect landholders with publications and research resources, current grant opportunities, and local field days and events linked to increasing knowledge and appreciation of our natural world.

To keep up with the latest in natural resource management on the South Coast, check out the website at www.southcoastnrm.com.au and subscribe to our newsletter.

For more information about *Land for Wildlife* in the South Coast NRM region, please contact Karl Hansom, Biodiversity Program Leader on 9845 8537 or email karlh@southcoastnrm.com.au.

Karl Hansom is SCNRM's Biodiversity Program Leader. *Photo: South Coast NRM*

Left: Wallaby gates facilitate wildlife movement through fencelines. *Photo: Basil Schur, Green Skills Denmark.*

SOUTH WEST CATCHMENTS COUNCIL

Emily Hugues-dit-Ciles

South West Catchments Council (SWCC) has been a long-term supporter of the *Land for Wildlife* program, helping many members across the South West region manage their bushland and promote wildlife biodiversity through projects, grant funding and providing information and technical expertise.

As the NRM Region for the South West, SWCC works with the community to improve terrestrial and aquatic biodiversity, protect coastal environments, increase environmental knowledge and skills, and help farmers improve sustainable farming practices.

Improving wildlife habitat on private land can play a major role in sustainable agriculture by providing shade and shelter, helping control wind/water erosion and pests, managing salinity and creating ecological linkages.

Valerie Hopkins is a Busselton *LFW*er who has been working with SWCC for the past two years to fence and revegetate 20 hectares of remnant bushland and cleared paddocks to improve their habitat value.

Valerie's property contains rich habitat for many common and threatened fauna species including the brush-tailed phascogale (wambenger), western ringtail possum, quenda (bandicoot), water rat (rakali), as well as white-tailed and red-tailed black cockatoos. She recognises the incredible importance of providing corridors to link flora and fauna between areas of bushland to prevent gradual genetic extinction in plants and animals.

SWCC is working with regional partners, catchment groups and Landcare centres to establish a support network for *LFW* members across the South West region that provides a mix of regional capacity with local knowledge and support.

SWCC CEO Damien Postma says "We have enjoyed helping *LFW* members over the years access our Groundworks grants and other on-ground support through the Australian Government's National Landcare Programme. Now as formal partners with *Land for Wildlife*, SWCC is looking forward to increasing that support by sharing information and holding local events that benefit the *LFW* community."

He encourages existing and prospective *LFW* members to get in touch if they require assistance with:

- *LFW* property assessments;
- professional advice on potential conservation actions and rehabilitation works on their properties;
- access to funding for conservation projects on their properties;
- capacity-building opportunities such as field days, seminars and other training to increase knowledge and skills in conservation; and
- supporting networks of like-minded people as well as information exchange through regular newsletters and publications.

LFW members in the South West can call SWCC direct on (08) 9724 2400 for more information and assistance.

Dr Emily Hugues-dit-Ciles, SWCC's Environment Program Manager. *Photo: SWCC*

Ms Valerie Hopkins in her *LFW* bushland in the Busselton area. *Photo: SWCC*

LFW & NRM PARTNERSHIP

WHEATBELT NATURAL RESOURCE MANAGEMENT

Rowan Hegglun

Covering close to 8.5 million hectares of the Western Australian Wheatbelt and close to 3.5 million hectares of the Great Western Woodlands, Wheatbelt NRM is home to a large range of rare and special species and ecological communities. Over two-thirds of the region falls within the internationally recognised Southwest Australia biodiversity hotspot. Undertaking conservation activities in this region is vital for protecting the precious remnant vegetation that supports our valuable wildlife.

Having worked with over 300 individual landholders on wildlife and remnant vegetation protection and enhancement projects over the past four years, the Wheatbelt NRM Healthy Environments team look forward to increasing support for these projects by signing interested landholders up to the *Land for Wildlife* program.

Wheatbelt NRM also look forward to having conversations with landholders in the region who are already members of *Land for Wildlife* to offer support through our Community Feral Control program. The Community Feral Control program supports landholders to manage invasive species on their properties. We encourage landholders to talk to their neighbours and try to line up their control activities at the same time to increase effectiveness and the chances of having a landscape scale impact on feral species.

This fence now protects 150ha of remnant salmon gum woodland from impacts of feral animals, and 125ha from grazing by stock. *Photo: Wheatbelt NRM*

Vegetation near Wyalkatchem, with the foreground in flower post-fire. *Photo: Avril Baxter*

Biodiversity projects currently funded through the Wheatbelt NRM Healthy Environments team include:

- fencing to protect remnant vegetation;
- revegetation;
- environmental weed control; and
- feral animal control.

These activities not only help to provide and improve habitat for native plants and animals, they also ensure our landscape is providing a range of important ecosystem services to benefit farm productivity. These services include erosion control, salinity management, increased diversity of pollinators, healthier suites of soil microorganisms, and shelter and security for crops and stock.

For more information about *Land for Wildlife* in the Wheatbelt NRM region please contact Leigh Whisson on 08 9670 3136 or by email on lwhisson@wheatbeltnrm.org.au.

Leigh Whisson, Wheatbelt NRM's Regional Landcare Facilitator. *Photo: Wheatbelt NRM*

RANGELANDS NATURAL RESOURCE MANAGEMENT

John Silver

Rangelands NRM works with land managers based on their interests and abilities, and are exploring options to enable interested land managers to become involved in a tailored and locally relevant *Land for Wildlife* program.

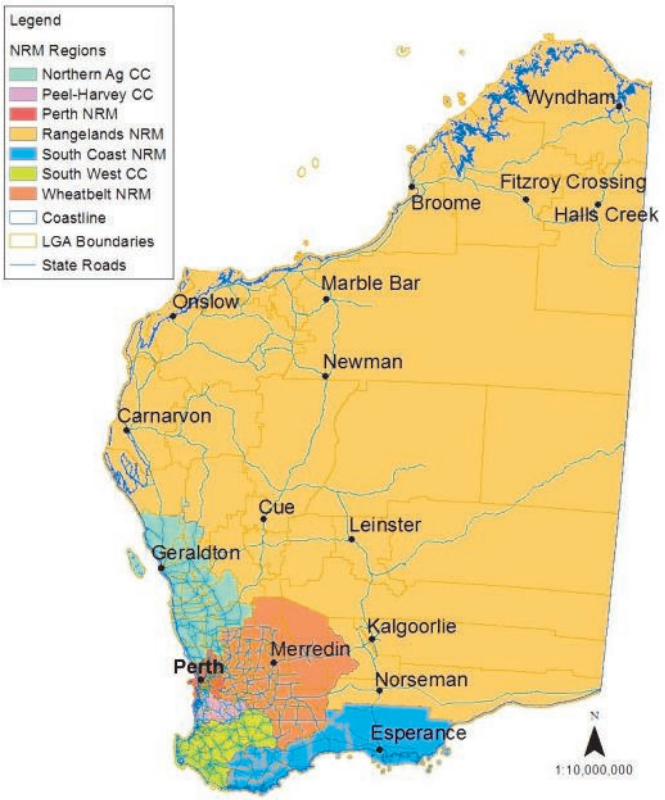
Rangelands NRM consolidates existing information and processes, then presents site-specific practical actions and potential projects back to land managers for consideration and adoption.

This provides the opportunity for landholders to better integrate conservation values into a productive pastoral system. The paradigm shift, for example, may not see natural water systems (rivers and wetlands) as watering points for stock, but a conservation area managed specifically for wildlife. Inevitably this will result in the need for additional/ strategic watering points, fencing and other stock control methods such as self herding for example. (More information on self herding can be found at www.selfherding.com/rangelands-self-herding.html)

Many of the rangelands' natural jewels are often degraded, over-utilised and not inherently valued for conservation purposes. Even the recognition of these assets may be viewed as a threat; a potential impediment to production and diversification. A proactive approach will create the opportunity for land managers to focus on key indicator species or a targeted threatened species relevant to them, based on their values, specific environments, threats and personal priorities.

Land for Wildlife has the potential to assist with educating the broader community and the industry about integrated land management. The program can assist commercial interests such as 'green' credentialing and creation of offset areas for the pastoral estate, which is primarily managed for production values. Threatened species, conservation, production and profits needn't be mutually exclusive; there can be a compromise which creates a win-win situation of holistic landscape management.

One of the challenges in these areas managed for wildlife habitat will be allowing for and assisting natural ecological succession to take place. The change in species structure of an ecological community over time has similarities with regenerative farming systems which mimic nature, but here the objective is habitat enhancement, as opposed to the management of pasture recovery. Quite often the agricultural system can be locked into early succession (colonising species) through disturbance such as clearing, grazing or fire.



Regional NRM groups of Western Australia, including the full extent of the Rangelands NRM region.

I suspect our journey will commence with land managers starting on their "L" plates, where we will all be learning from those already championing the practice. Once we have been through some trial and error, some will advance to "Ps" where we can continue to monitor and review progress towards having confidence in a meaningful, rangelands-tailored, *Land for Wildlife* brand that is suitable for the conservation tool box.

For more information contact Mary-Anne (Mez) Clunies-Ross on 0413 857 048 or maryannec@rangelandswa.com.au..

Mez Clunies-Ross, Rangelands NRM's Project Manager. ***Photo: Rangelands NRM***

CONSERVING OUR REMARKABLE TRIGGERPLANTS

Juliet Wege

The triggerplant genus *Stylidium* is rather extraordinary. Famed for its incredible pollination system in which a touch-sensitive column or 'trigger' transfers pollen to and from insects, this large and charismatic genus also packs a punch in the beauty stakes. Triggerplant flowers come in a dazzling assortment of colours, shapes and sizes, are variously arranged and orientated, and are often adorned with hairs and small, intricate appendages. Furthermore, their growth forms are often highly ornamental and are remarkably diverse, encompassing rosetted or stoloniferous (running) perennials, dwarf shrubs, climbers, stilt plants, cushion plants, geophytes (which die back over summer to grow again next year), and tiny annual herbs.

But for all this wonderful variation, triggerplants have a dark side — a well-founded reputation as being taxonomically problematic and difficult to identify; however, this is gradually beginning to change. Over the past 20 years, a range of scientists have made extraordinary advances in the discovery, collection and description of new species, resulting in a much better understanding of triggerplant diversity in Australia. The genus is now known to comprise at least 300 species, most of which are endemic to Australia, with Western

A bee fly pollinates the threatened species *Stylidium applanatum*. Photo: Juliet Wege

Triggerplants know how to pack a punch – a native bee carrying a greenish pollen load gets thumped again by *Stylidium squamosotuberosum*. Photo: Juliet Wege

Australia's remarkable south-west region home to the greatest diversity. In this region, triggerplants grow in most habitats, and it is common for several different species to grow and flower together. Unfortunately, the south-west region is also where many triggerplants are either poorly known or under severe threat in the wild.

Underpinning conservation efforts in the south-west and beyond is a broad-ranging research program being conducted at the Western Australian Herbarium at the Department of Biodiversity, Conservation and Attractions (DBCA). This program not only includes the documentation of new species, but also the revision of known species and resolution of nitty-gritty nomenclatural issues, the sorting and classification of herbarium specimens, rare flora survey and conservation assessments, the study of evolutionary relationships and, perhaps unsurprisingly, a little pollination research.

Ingenious pollination

Triggerplant flowers are highly specialised. The male and female organs of the flower are fused together into a column that is usually bent at the throat of the flower so that it rests against the labellum (the tiny, modified fifth petal). At the tip of the column are the reproductive structures — male anthers and the female stigma, the latter usually developing after the pollen is released from the anthers. When a visiting insect probes for nectar, the column rapidly rotates so the tip hits the insect, either dusting it with pollen or, if the stigma has developed, retrieving pollen that the insect may already be carrying.

Triggerplant pollination has been clocked at 15–30 milliseconds, making it one of the fastest plant movements known. The rapid firing motion is followed by a much slower resetting, which returns the column to its original position so that it can be retriggered (within minutes in hot conditions). The rapid movement and slow resetting are brought about by changes in the distribution of potassium and chloride ions in the column bend, and associated changes in the shape of specialised motor cells.

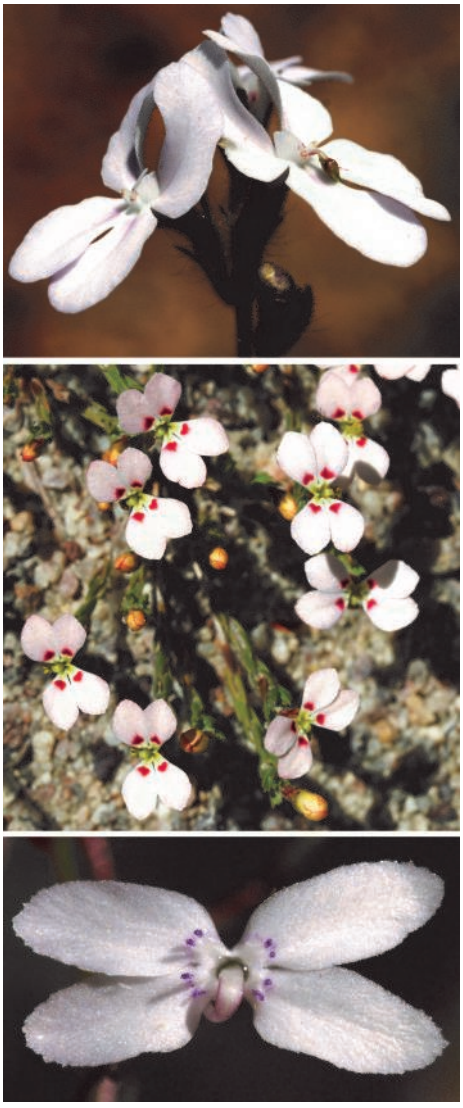
Ongoing research at sites across the South West region is revealing that a wide variety of nectar-gathering insects pollinate triggerplants, including an especially large range of large and small bee-flies and solitary native bees. All are undeterred by the unique form of punishment dished out to them; they seem to be long-resigned to their role as pollen couriers, repeatedly visiting different flowers in search of sweet nectar, and thus the triggerplant succeeds in moving pollen from one plant to the next.

Watching for pollinators takes a degree of patience (particularly in tick-prone habitats), but on a sunny morning it usually doesn't take long to observe some trigger action, particularly at sites where there are lots of plants in flower. Insects will happily move between flowers and, after a short while, a large and often colourful pollen load will become visible to the naked eye. In fact, if there is more than one *Stylidium* species growing in the vicinity, the insects are likely to move between them, and more than one pollen splodge may become visible. This is the really ingenious thing about triggerplant pollination: different species of *Stylidium* can place pollen in different places on different kinds of pollinators and can retrieve pollen from the correct spot on each. The direction of column movement (whether ventral, lateral or dorsal), and the length and shape of the column help to dictate the precise part of the insect's head, thorax or abdomen that will be hit. The same insect might visit three different triggerplants, only to be hit on the side of the thorax, the top of the head and the tip of the abdomen — they simply don't stand a chance!

A collection at the core of conservation efforts

The *Stylidium* collection at the Western Australia Herbarium, which consists of more than 12,250 preserved specimens, is at the centre of the *Stylidium* research program and associated conservation efforts. Sorting and accurately cataloguing this collection, which has more than tripled in size in the past 40 years, has been vital to understanding what species occur in Western Australia, where they grow and how rare they are. This baseline information is essential for conservation management, especially in view of the significant numbers of triggerplants that are known to be rare, threatened or otherwise of conservation concern.

There are 99 *Stylidium* taxa listed on the *Threatened and Priority Flora list for Western Australia*, more than half of which have been discovered and named in the last 20 years. Most need further survey to better document their distribution and abundance, as well as any threats to their survival. Triggerplants can be challenging to survey; they are often difficult to find when sterile, usually have narrow flowering windows, and different species can be easily confused with one another. Not only do you need to be in the right place at the right time, but you need to know exactly what you're looking for—a sound taxonomic framework is crucial.



Species discovered at the Western Australian Herbarium: *Stylidium diplotrichum* (top), *S. perula* (centre), *S. perplexum* (bottom). *Photos: Juliet Wege*

To produce this framework, each specimen at the Western Australian Herbarium is being assessed and validated. This process had led to the correction of many mis-identifications and a suite of new species discoveries including: *Stylidium diplotrichum*, a rare and stunning large-flowered species from the Lesueur sandplains; *S. perula*, a sprawling, stoloniferous species with a distribution centred on the Avon Wheatbelt; and *S. perplexum*, a lignotuberous shrub from near Dardanup. In

A new population of the conservation-listed species *Stylidium tylosum* was discovered by chance last year. *Photo: Juliet Wege*

each case, the taxonomic status of these species was confirmed by relocating and examining them in the wild. This is a plant group that demands field work, not only to obtain key data and resolve taxonomic issues, but to inform conservation.

Spring surveys

Every spring, I integrate field-based taxonomic research with surveys of poorly known triggerplants. This might involve a targeted search of a particular area to look for new populations of rare species, gathering information on pollinators or population numbers, or assessing habitat preferences or quality. Sometimes it simply means following my instincts and stopping the car to search a site I'm passing because my triggerplant radar has begun to quiver. Just last year those instincts turned up a new population of *Stylidium tylosum*, a pretty but little-known species from the southern Avon Wheatbelt.

Targeted surveys for the triggerplants most at risk are often done in collaboration with DBCA Conservation officers and volunteers, who have fantastic regional knowledge. Such a collaboration recently led to the conservation status of two taxa from the Avon Wheatbelt (*Stylidium applanatum* and *S. coroniforme* subsp. *amblyphyllum*) being upgraded to Threatened. Two more species will be targeted this year: *S. hygrophilum*, from east of Margaret River, and *S. asymmetricum*, from the Wandoo National Park.

Stylidium hygrophilum is one of a select number of leafless triggerplants: it is a geophyte, having a rhizomatous stem that lies undetected in the soil until late spring, at which time its attractive apricot-pink flowers come into bloom. There are less than 250 individuals known in the wild, a sobering statistic that spurred a seed-banking quest in 2014 during a private trip to Margaret River. I was able to convince my long-suffering partner to help me bag plants with developing fruit so that seed could subsequently be collected by a DBCA Conservation Officer and sent to Western Australia's Threatened Flora Seed Centre. This teamwork resulted in around 2,500 seeds being banked.

The second species to be targeted for surveys this year is *S. asymmetricum*, an ephemeral herb named for its unusual, asymmetric corolla lobes. This tiny triggerplant is currently known from just three sites and is being threatened by feral pig diggings and inappropriate off-road vehicle use. A team of people will be out and about this year, taking advantage of the good seasonal conditions to survey the known populations and search for more.

What the future brings

Stylidium remains in a state of taxonomic flux as our natural history collections continue to be sorted and classified, new species formally described, and the scientific names researched and validated. A taxonomic account of the genus is being prepared and will include web-delivered fact sheets and an interactive key, both of which will be full of photographs and information that will revolutionise identification and facilitate conservation efforts across the country. So watch this space. No, better still, go and watch some triggerplants. You'll be amazed at what you see.

Juliet Wege is a Senior Research Scientist at the Western Australian Herbarium.

The hunt is on for more populations of the tiny triggerplant *Stylidium asymmetricum*. *Photo: Juliet Wege*

CARPET PYTHONS

David Pearson

Can you imagine losing 50 percent of your body weight in the process of bringing your babies into the world? In most animals, a loss of that amount of body weight would result in death, but for female carpet pythons (*Morelia spilota*) this is their lot. To produce the next generation, they must gorge themselves, starve themselves, lay perfume trails and then spend two months coiled around their eggs to maintain an even temperature.

Mark-recapture and radio-tracking studies of carpet pythons in Dryandra Woodland, Garden Island near Rockingham and other islands has revealed some remarkable insights into the life history of carpet pythons. And it begins with sex. In some carpet python populations in eastern Australia, males indulge in slow motion coiled fights with the winner getting the prize of mating with the waiting female. Not so amongst south-western 'carpets'. Males are much more relaxed and they queue to take their turn with a receptive female, basking on a nearby bush and then moving in to excite the female with seductive tickling using their small pelvic spurs - the only external trace of their ancestors' hind limbs (internally they still have a pelvic girdle). Since adult males are reproductively active every year and females only every 3-4 years, there are lots of interested males for each female.

This carpet python has eaten a tammar wallaby, and is now working on laying down some fat deposits. ***Photo: David Pearson***

Bearing the next generation

For an adult female to be ready to breed, she must have eaten enough prey to lay down extensive fat bodies that will be used to develop the eggs and sustain her during their incubation. When the breeding season commences, she cannot afford to endanger her ova with the risk of injury through grabbing and constricting prey. Instead, she commences a long fast. In late spring when she is finally ready to breed she will move through the bush leaving a pheromone trail, essentially a perfume lure, so that courting males can locate her. Males follow that trail to find her - if she is busy with another male, they may wait or move onto another female. The advantage of the multiple matings for the female is that her progeny will have several fathers and so are genetically more diverse, which increases likely survival and success of at least some of her young.

Once mating is complete, the female will retreat to a quiet place to develop the fertilized ova into eggs. She will typically choose a warm protected site such as inside a log or a rock crevice warmed by afternoon sunshine to lay her eggs. Once the white ping pong ball-sized eggs are deposited, the female coils around them and maintains them at a regular temperature of around 28-30°C. If their temperature drops too low, she may uncoil and bask briefly outside the den or generate heat by small movements (shivering) with her muscles. It takes two months to incubate the eggs and by the time they hatch, she is skinny and weak. As the eggs begin to hatch, the female slips away, her work complete and the hatchling pythons, about half a metre long and weighing about 25g, are on their own.

Breaking her fast

For the mother python, this is a dangerous time. She has lost substantial muscle strength and needs to find and subdue prey quickly as winter is coming and it will soon be too cold for her to digest a meal. If unsuccessful in finding prey, she may die. Some females do manage to survive over the winter, perhaps going without a meal for 12 months!

The growth of the young pythons also depends on finding enough suitable prey. Pythons don't have cutting teeth or limbs to hold food and so are obliged to swallow their food whole. So little carpet pythons eat lizards, geckoes and mice, while larger ones consume birds and large rodents, eventually moving onto larger mammalian prey including possums, bandicoots, rabbits and small wallabies.

Expensive tastes

Their love of such sized prey does mean they can be unpopular with my colleagues that work on such species as numbats, woylies and potoroos, because periodically pythons swallow their study animals complete with their radio-collars! This may become a problem where the level of predation is high enough to limit a population's recovery.

Carpet pythons at Waychinicup National Park have developed a taste for Gilbert's potoroos, a critically endangered species, requiring intervention to reduce their consumption. Pythons are relocated to other nearby habitat when discovered and other ways of locating and capturing them are currently being investigated using some of the information collected during the studies of their life history

Aside from the odd misdemeanour, they are eager consumers of some pest species such as rats and rabbits. While their collective hunger is not sufficient to control such species (after all, rabbits breed like rabbits, and pythons have a much slower and more considered approach to reproduction!), they may delay outbreaks and reduce localised populations of these pests. Many people in country areas have wild carpet pythons living in the roof spaces of houses and sheds and they are an effective deterrent for rats and possums.

Carpet pythons are tolerant of 1080 poison and are unaffected by rabbit calici virus and myxomatosis so they remain in the landscape to 'mop up' rabbits after control operations have been undertaken. Carpet pythons have managed to cope with changes to their diet through the loss of some native species with the arrival of introduced species, but clearing of habitat has seen them disappear over large areas of the Wheatbelt and Swan Coastal Plain.

Carpet python habitat

Pythons need hollow logs and rock crevices for shelter, and in cooler areas, they also require suitably sized hollow limbs in trees. During autumn, pythons will ascend trees and hide in hollow limbs. It is warmer there than in shaded logs on the ground and they will emerge on warm days to bask in the sun on a branch close to their hollow. Young pythons in particular need thick shrubs to ambush their prey of lizards and birds.

To keep carpet pythons in the landscape, it is important to preserve areas of native bush which contain their prey and to retain hollow logs on the ground and hollow limbs in trees for shelter. Maintaining a diverse range of vertebrate prey in the landscape allows pythons to grow (it may take 10 years or more for a female to reach maturity), reproduce and recruit a new generation of pythons to the population. And please take care when driving in late spring! This is when male pythons set out on quests in search of females for mating. The lure of their perfume means the males are not mindful of the dangers of roads and many are killed crossing between patches of bushland.

Dr David Pearson is a Principal Research Scientist at the Woodvale Wildlife Research Centre.

Ed: Once described by John Gould as the constant companion of the quokka, there are now approximately 70 Gilbert's potoroos on the planet. Recovery efforts raised numbers from 30 to around 130, but two dry summers and a catastrophic bush fire at Two Peoples Bay drastically reduced those numbers. The Recovery Team is currently assessing a new site for an additional insurance population.

A rarely-seen Gilbert's potoroo (*Potorous gilbertii*). *Photo: courtesy of Gilbert's Potoroo Action Group - Dick Walker*

NOTABLES

There are fortunately a great many people that work hard to learn more about and protect WA's natural environment. I'm sure all *LFW* members join me in whole-heartedly congratulating these giants in the field—and *LFW*ers—on receiving significant recognition for their expertise, long-term commitment and sheer hard work! Thank you all for your inspiring achievements.

MRS ALISON DOLEY AM

Alison Doley of Coorow was made a Member of the Order of Australia (AM) on Australia Day this year. The award recognised her exceptional and sustained contribution to conservation and the environment through revegetation and catchment recovery initiatives.

She has been a member of *Land for Wildlife* since 1997, and the bush on her property protects several threatened plant and bird species within a large area of salmon gum and gimlet woodland and wetland areas. Amongst other things, Alison put up some of the first artificial nestboxes to supplement breeding hollows for critically endangered Carnaby's cockatoos, now known to be very successful, and revegetated 165ha of her property Koobabbie with local provenance native species. (*Photo courtesy of NACC)*

MS PENNY HUSSEY AM

Penny Hussey of Helena Valley was made a Member of the Order of Australia (AM) on the Queen's Birthday this year in recognition of her significant service to conservation and land management practices in Western Australia through a range of government and volunteer roles.

She was the coordinator of *Land for Wildlife* in WA from its beginning in 1997 until her retirement in 2015, and contributed immeasurably to many members' environmental knowledge and their property management. She has held key roles with the WA Conservation Council, WA National Parks and Reserves Association, WA Naturalists' Club and Helena River Catchment Group, and been active in many other environmental groups. She has also co-authored authoritative books *Managing your Bushland* and *Western Weeds*. (*Photo: LFW*)

MR ROBERT BOASE — WA LANDCARER OF THE YEAR

Rob Boase from Dowerin was named WA's Individual Landcarer of the Year in September this year. The award recognised him as being one of the leading experts in the Wheatbelt on its unique flora, and his long-term commitment to protecting the remnant vegetation on his property through landcare activities and a conservation covenant. He and his wife Beth have revegetated areas of their property Arinya with over 78,000 plants grown in their own nursery, Arinya Plants.

They have been members of *Land for Wildlife* since 1998, and the bush on their property contains a very unusual threatened ecological community (*seen in picture on right, sourced from 2017 WA Landcare Awards Finalists booklet*) as well as ten rare and endangered flora species. Arinya also supports some wonderful Banksia woodland, all too commonly cleared in the wheatbelt.

Continued on page 23

FARM REDESIGN AFTER BLUEGUM PLANTATIONS

Andrew Callister and Sylvia Leighton

Returning a farm from tree plantation to grazing is a challenge now faced by many landholders in southern WA. Conversion of *Eucalyptus globulus* (blue gum) plantation back to agriculture is currently being undertaken across thousands of hectares where tree growth has proven to be non-commercial. However, south coast WA *LFW* members Sylvia Leighton and Peter McKenzie are embracing this land-use change as an opportunity to redesign their commercial agricultural 1240ha property with greater environmental sustainability. Landscape restoration company Shelterwood Forests has partnered with the farmers to establish 45ha of wildlife corridors and shelterbelts with the assistance of a grant from the Federal Government's 20 Million Trees Programme.

Sylvia's parents moved onto the property in Wellstead District fifty years ago when the land was released for agricultural production. They cleared the mallee scrub with dense proteaceous understorey and Kwongan heath and had a commercial sheep grazing operation for thirty years. In the early 1990s a plantation company offered to lease the Leighton property for blue gums. The Leightons signed up nearly all of their cleared agricultural land for two ten-year rotations. Now Sylvia has returned to live on the land that her parents first cleared and this time it's 800 ha of plantation trees that are to be removed.

***LFW* members Peter McKenzie and Sylvia Leighton.**

Rows of blue gum stumps mark where the blue gums recently stood. In areas where the blue gum harvesting occurred last year the coppice regrowth has been sprayed and reduced to naked, dry sticks. Remnant bush fragments are scattered across the property, and Sylvia and Peter aspire to buffer plant around each remnant. They would also like to link most of the remnants to provide corridors for wildlife and fenced-off physical shelterbelts for the stock.

The original fence-lines were all removed for plantation establishment. This provided the opportunity to redesign the property in sympathy with soil type and landscape features. The biodiversity value of native vegetation in this locality is immense. Only 23km from the UNESCO Fitzgerald Biosphere Reserve, there are an estimated 1850 species of plants native to this region, approximately 75% of which are endemic. The floral diversity is particularly rich at the Leighton farm because it is situated at the boundary of two major ecotones. The low eucalypt forest dominated by marri and mallee forms of jarrah reach its eastern extent, converging on the diverse range of southern wheatbelt eucalypts adapted to lower rainfall and drier summer conditions on their western extent.

Quenda are found on the property, as are honey possums, echidnas, pygmy possums, brush-tailed possums and grey-bellied dunnarts. The target long-term challenge is to bring back the western brush wallaby, which was frequently observed in the bush on the farm when Sylvia was a child 40 years ago. The mallee and heath scrub also supports many bird species including Carnaby's cockatoos and red-tailed forest cockatoos. The freshwater creek on the property has a healthy population of long-necked turtles.

In July 2016, Peter and Sylvia worked closely with Shelterwood Forests and designed 23ha of direct-seeded wildlife corridors to connect fragments of remnant vegetation. Sixteen kilograms of local-provenance seed was sown, representing 46 species present on the property. Priority was given to representative species that are ecological cornerstones of the vegetation communities and to species that are known to establish well by direct-seeding.

A single line of seed was sown between each row of stumps, with the larger seeds at a greater depth than the smaller ones.

Andrew Callister hand planting seedlings between bluegum stumps. *Photo Sylvia Leighton.*

Seeding was impeded by blue gum harvest debris and ironstone boulders near the stumps that had been raised by deep-ripping at plantation establishment. It was a challenge to adapt seeding and planting techniques to these rough conditions. A further 2000 local-provenance seedlings were hand planted, including a Priority 4 species found on the property - *Eucalyptus kalgenensis*. Four hundred cuttings of *Adenanthos cuneatus* were planted as pioneer species into highly erosive deep sand sites. A further 22ha of shelterbelt trees (sugar gums) were hand-planted for strategic shelter.

Long term monitoring will be carried out to measure the success of the direct-seeded wildlife corridors. Fauna surveying will be carried out to monitor fauna movement into the revegetated areas and hopefully one day a western brush wallaby will return to live in the bush on this *Land for Wildlife* farming property.

Andrew Callister is the Director of Shelterwood Forests, and Sylvia Leighton is a farmer, Land for Wildlife member and biodiversity champion.

This project is supported by Shelterwood Forests, through funding from the Australian Government's National Landcare Programme.

Direct-seeding. ***Photo Sylvia Leighton***

Reconnecting remnant vegetation. ***Photo Sylvia Leighton***

SPOTTED PARDALOTE

*LFW*ers Eddy and Donna Wajon did well to spot and capture this picture of a spotted pardalote digging its nest tunnel on their property Chingarrup. This particular subspecies (*Pardalotus punctatus* subsp. *xanthopyge*) is also called yellow-rumped pardalote, and often occurs in semi-arid mallee woodlands. These small birds (around 10cm long) dig tunnels up to 1.5m long leading to a nest chamber which they line with strips of bark. They generally feed on psyllid insects and their sugary exudate in eucalypt canopies.

Spotted pardalote tunnelling. ***Photo Eddy Wajon***

RAINBOW BEE-EATERS

Rainbow bee-eaters (*Merops ornatus*) are also underground nesters, excavating a tunnel to a nest chamber. These charismatic migrants have been reported breeding on several members' properties. They are spectacular to watch as they catch flying insects on the wing, usually rubbing them against a perch before swallowing them or delivering to hungry chicks. This helps to remove the stings and venom glands from bees and wasps.

Rainbow bee-eater. ***Photo Ben Clark***

HALLOWED LANDSCAPES AND DEEP TIME NATURAL WONDERS

Kingsley Dixon

When you walk in any of our southwest bushland and forest areas you probably appreciate the interesting plants, set in our unique landscapes and how important these natural values are. But just how irreplaceable are they?

What I hope to share with you is just a snapshot of what truly makes our southwest from Shark Bay to the Bight and beyond into our vast and stunning deserts places of such immense global value.

So we are strolling through Kings Park bushland. Not that this is a particularly unique piece of banksia woodland, but it is representative of much that we have lost on the Swan Coastal Plain and its setting makes it a very special place. But what of the plants I am seeing? Every plant (other than the ever-pervasive invasive weeds) is only found in the southwest. An easy statement to make but each and every native plant is found here and nowhere else on the planet. In comparison, if I walked through the bluebell woodlands attached to the Royal Botanic Gardens in Kew not a single species is unique to that woodland, nor to the UK. I would have to go a very great distance into southern Europe and the Iberian Peninsula before endemic species appear. Yet even within our banksia woodlands, from north to south and west to east, we keep encountering locally endemic species.

But what is more exciting from my perspective are not the rarities (though each and every one is exceptional in their own way) but the common species. The banksia trees are a conspicuous element. We now know from the pollen and fossil record that the antecedents of the very species we see today, such as firewood banksia (*Banksia menziesii*) and candlestick banksia (*B. attenuata*) have been in WA for at least 50 million years. Not that the Swan Coastal Plain is that old but if you could walk back then you would probably be able to identify a banksia!

But if we shift our gaze to the ground level then things get even more exciting. What looks like an indistinct grassy looking species known as *Anarthria prolifera* is in its very own endemic family—the Anarthriaceae.

Looking around, the common drumstick plant (*Dasypogon bromeliifolius* — also called pineapple bush) is anything but common in terms of its global significance. Again 'mostly endemic' with just one species that 'leaked' over to Victoria, this whole family is truly momentous in harking back 120 million years - just 15 million years after the first flowering plant is thought to have appeared. Other members of the family that will be familiar to you include the tinsel lily (*Calectasia* species) and the extraordinary kingia (*Kingia australis*). Surviving, indeed thriving, on our landscapes for this period of time is an amazing thing to contemplate.

To put it into context, Europe is the centre of origin for so many crops and plants important to humans - from grapes to garden peas and many of the major cereals - yet it has not a single endemic plant family. In comparison, southwest WA has seven endemic plant families. Few other places on earth of similar size have such extraordinary richness.

Why is this so? The great age, immense periods of geological stability, impoverished soils (bad for

Anarthria laevis* - common and widespread, but in an ancient plant family with just eleven existing species. All eleven are restricted to the southwest botanical region. *Photo: Kingsley Dixon

The drumstick flowerheads of pineapple bush attract myriad species of insects, including a wide range of native bees, case moths, butterflies and ants. *Photo: Mark Brundrett*

Kingia is a remarkably adapted species to our southwest forests, swamps and heathlands. For example, it sends aerial roots down the trunk underneath the leaf bases, which can absorb moisture, organic material and oxygen from the trunk as well as the soil, and help reinforce the slender stem. *Photos: Kingsley Dixon*

agriculture, but good for plant diversification … think coral reefs!) and lack of major glaciation events since the dawn of the flowering plants (135 million years ago) have driven diversification in the absence of landscape-scale extinctions. But a key driver of the evolutionary engine has been at least 10 million years (and probably a lot more) of genetic isolation.

Seed, pollen and plants arriving from elsewhere is—in the main—non-existent. The South West is the 'end of the road', protected to the east and north by vast continental-scale deserts and to the west by the Indian Ocean. But this may also explain why we have a disproportionate number of endemic plant families. Species were clearly not able to successfully export propagules to other parts of the continent or other continents. Think of *Kingia*, *Calectasia* and *Dasypogon* species - common and widespread throughout the southwest yet never once did these plants (as far as we know) ever make the long haul flight to other regions of the world. Why over their 120 million year tenure these genera and many others in the South West never succeeded with even one off-shore settlement remains, as Darwin would have put it, an abominable mystery.

So the next time you stroll in our bushland and forest, remember you walk in a hallowed landscape that is an evolutionary marvel of unparalleled diversity, and beauty that is truly one of a kind. Touch that tinsel lily or hug a kingia and you are stepping back in time with venerable members of our great flora.

Kingsley Dixon is a Professor and Director, ARC Centre for Mine Restoration, Department of Environment and Agriculture, Curtin University.

Left: A resin bee (*Megachile erythropyga*) foraging on a pineapple bush flower. The bee's orange 'fringe' is distinctive. *Photo: Jean and Fred Hort*

Right: The flowers of blue tinsel lily (*Calectasia narragara*) have a delightful sheen. The stamens start yellow and age to red. *Photo: Jean and Fred Hort*

LOFTY AMBITIONS

Michael Calvin

This article is an introduction to the work of the Raptor Rehabilitation Association of Western Australia Inc (RRAWA), and the use and refinement of free exercise techniques by skilled and experienced members for the meaningful rehabilitation of raptors that may benefit from them.

At the outset, it's important to be clear that the vast majority of raptors that come into care throughout WA are unsuitable for a course of free exercise flying prior to final release back to the wild. Most, unfortunately, sustain injuries or other debilitations which are simply not consistent with release regardless of veterinary treatment and expert care. There is another sizeable proportion of birds taken into care that can be successfully rehabilitated and given the best chance through 'conventional' aviary-based rehabilitation methods.

For example, an adult brown goshawk that suffered a car or window strike which resulted in mild concussion but has recovered within a few days, (provided that it doesn't meet with any further damage in care, such as broken flight and tail feathers which are vitally important), could be released as soon as it appears to have fully recovered and the rehabilitator may reasonably expect a very good outcome. These are the simplest and by far the most effective cases of rehabilitation - the injury or illness is limited to only a few days, and further physical or psychological damage to the bird whilst in care is kept to an absolute minimum.

At the other end of the spectrum would be a 5 or 6 week old orphaned peregrine falcon which, although it may have no physical injuries, may well become psychologically damaged if handled with anything but the most expert care by people who understand the complexities of how these birds develop throughout their 'critical development' stage, which in this case is from about 2 to 12 weeks of age. If appropriate psychological development does not occur throughout the critical development stage, this is perhaps as debilitating as physical injury as far as going back to the wild and contributing to the wild gene pool through successful breeding is concerned. Food association with humans is particularly critical and should be avoided at all costs. Appropriately screened off 'seclusion' aviaries which shield the developing youngster's view of approaching humans with food, and the use of food drawers or chutes to facilitate nothing more than the sudden appearance of food to the youngster, and perhaps mirrors within the aviary so the bird develops the appropriate body image (rather than a human for example) can be beneficial in most cases throughout these first few weeks. All these things should be a primary consideration for any raptor rehabilitator and very specialist knowledge should be sought.

Raptors can rarely rely only upon the instinct that they hatched with, and to simply release the bird when it gets to natural fledging age would in most cases amount to nothing more than a death sentence, no matter how nicely it flew off into the sunset. Even extensive exercise within a huge circular aviary (who of us can afford those?) cannot possibly prepare an orphaned peregrine falcon for release to the wild for it MUST develop the appropriate prey image and the skills to catch them.

RRAWA chairman Matt Lamb with a male peregrine falcon (*Falco peregrinus*). *Photo: RRAWA*

After reaching fledging age at about 42 days, wild young peregrines spend up to the next three months within the family cohort building flying fitness, dexterity, manoeuvrability and most critically, the ability to successfully and consistently hunt their natural quarry in their own environment. The learning to hunt part of their development is much more detailed and extensive than many would first imagine. Adult peregrines actively teach their young to hunt by showing them over and over how it's done. They capture fast flying birds such as parrots, pigeons and ducks as well as a myriad of other available species and they release them sometimes alive, high in the air for the young to catch. This cannot in any way be considered to be 'cruel' and is an entirely natural part of the life journey of each and every wild-born peregrine falcon.

Even then, once they go their own way at dispersal, as many as 50-60% will not see out their first winter and perhaps only 20% reach breeding age. Only half of

This female peregrine falcon models a backpack-mounted GPS transmitter, allowing her movements, speed and altitude to be tracked to inform future care and training. *Photo: RRAWA*

those go on to successfully breed and fledge their own young. That's right - perhaps as few as one in ten go on to successfully breed. It's tough out there!

An orphaned peregrine falcon is an example of when the specialist knowledge and skill of some members of RRAWA can pay dividends because arguably the surest way of giving it the best chance of wild survival is to free exercise fly it for extensive daily periods to build elite fitness levels, and then to allow the bird the opportunity to hunt by being released daily where it's natural quarry are abundant. This all takes specialist knowledge and resources, including suitable housing, equipment, food, availability of sophisticated GPS or radio-telemetry tracking equipment, time and of course access to suitable land. (Could this include your property? Please contact me if you're interested!)

As part of the training process, the bird being rehabilitated is encouraged to fly for its supper by use of a drone carrying a food prize. As the raptor builds strength, speed and endurance the drone is flown progressively higher and faster for the raptor to chase down for their food reward. (*Ed: For social media users, some footage of this process can be seen on the Facebook page called Aggie's Journey, maintained by a RRAWA member*).

The concept of an association of raptor rehabilitators with the required skills and means to train and free exercise fly suitable raptor candidates was developed in 2012. It was high on our priority list to share and disseminate information and knowledge, to provide assistance to one another as required, to contribute to education by engaging with the general public via school visits and attendance at agricultural shows, and to commit to supporting and/or carrying out our own scientific studies into release outcomes. Put simply, the aim was to 'raise the bar' with regard to all aspects of raptor rehabilitation but particularly those which include training and free exercise flying prior to release. More than that, we developed systems and protocols which include a Code of Ethics, Aims and Goals, a mentoring and apprentice training module for the less experienced, and a commitment to be transparent and accountable through our 'raptor reporting forms'. Each bird to be trained is selected upon strict criteria in order to ensure as far as is humanly possible that the particular bird can benefit from being free exercise flown more than from 'conventional' methods, and during the process the raptor is made clearly identifiable by means of an ID tag with contact information to assist rapid and safe recovery in the event of premature loss.

Free exercise flying a raptor for rehabilitation and release provides many advantages. It builds the elite speed, altitude tolerance and endurance they will require if they are to survive. Peregrines, hobbies and goshawks are obvious examples that use dynamic aerial skills, fitness and dexterity during almost every chase and capture of their natural quarry. Peregrines have been recorded at speeds of up to 350kmh in their vertical dive or hunting 'stoop'! The methods allow us to gradually build this fitness without any boundaries, in a relatively stress-free way for the

Michael Calvin free exercise flying a peregrine falcon and watching its progress. *Photo: RRAWA*

raptor and to carefully monitor the fitness progression and any opportunistic attacks they may make on passing quarry. The practitioners get a much deeper understanding of the psyche and requirements of each individual raptor during the whole process.

There are some less obvious benefits too - occasionally the methods help us to identify those that are not suitable for release. An example is a male peregrine that I flew some years ago. His initial training and progression seemed to be normal but after a few weeks it became obvious that the progression wasn't continuing on the upward trajectory that would be expected. He seemed reluctant or incapable of sustaining powered flight up to a kite-suspended lure to heights of any more than about 100 metres, when 3-400 metres should be easily achievable in a short amount of time. Everything else seemed normal with the bird; all his vital signs indicated that there was nothing wrong. Still no further progress was gained so I took him to the vet who found old and previously undiagnosed damage to a shoulder joint and the prognosis was that he was unlikely to ever recover sufficiently. Conventional aviary-based rehabilitation methods could never have identified this underlying problem, potentially leading to release as 'fit', only to have succumbed to starvation through being unable to successfully hunt and feed himself.

Another less obvious advantage is that by flying in certain areas it quickly becomes clear whether it's the territory of resident birds of the same species, and therefore an unsuitable final release site. Release into these areas usually results in the raptor being smartly driven off....or worse! Then of course there is the social aspect of our group who are friendly, welcoming and ready at a moment's notice to do whatever it takes to help out in any particular case.

RRAWA is now going from strength to strength and building a history of rehabilitation and successful release, including one post-release study using radio-telemetry to check the release outcome for at least the short term, in the case of a female peregrine falcon. In the future we hope to progress to longer-term GPS tracking, subject to the issue of appropriate licencing from the Department of Biodiversity, Conservation and Attractions. As post-release tracking technology becomes more readily available and affordable, hopefully more rehabilitators will be able to learn about post-release survival and refine their methods.

For more information about the work of RRAWA or if you would like to join or support us, find us at www.rrawa.com and feel free to get in touch. If you have land that may be made available for any of our members to occasionally free exercise the birds we work with, or if your local primary school or country show is interested in us attending with a few of our display birds, you now know where to find us. Thanks for reading!

Michael Calvin is a falconer with many years of experience, and is a founding member of RRAWA. He may be contacted on 0434 495 620.

READY FOR DERMABRASION

This carpet python was photographed at Dryandra Woodland. Dark and dull colouration and the blue eye are signs of approaching sloughing. A scale covers the eye just as other scales cover the body. It begins to separate as a precursor of shedding the skin. The frequency of shedding depends on the growth rate of the python. As it increases in size, the limit of the elasticity of the skin is reached and sloughing is required. A python feeding frequently or a female with developing eggs will tend to shed more often than a 'regular' python.

Information from David Pearson of Woodvale Wildlife Research Centre.

Judging by size and wornness of scales, this is likely to be an adult male carpet python. Males are adult at about 1m and females about 2m. *Photo: Cathy Hurst*

MICROBATS OF THE SOUTH WEST: IN SEARCH OF TRAPPING SITES

Diana Prada, a Ph.D. student at Murdoch University, is researching microbats of the South West region. She is looking for sites where she may be able to trap the little creatures during her field season in February 2018. She plans to find sites all across the region.

Bat trapping involves setting up traps over water points such as small farm dams, creeks or open wells. Deciding whether a spot is good for trapping depends on multiple factors such as the presence/absence of vegetation near the dam, type of vegetation, sightings of bats in the area and accessibility.

Allowing Diana to trap in your property will be an opportunity to get to know your resident microbats and see them up close, as well as learn more about these fascinating mammals and the field of study.

If you are interested in assisting with this research, please contact Diana Prada on 32589004@student.murdoch.edu.au for further details.

A Gould's wattled bat (*Chalinolobus gouldii*) about to be released. P*hoto: Mikaylie Wilson*

NOTABLES

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PROF. JOHN PATE — WA SCIENCE HALL OF FAME 2017 INDUCTEE

Notable *LFW* member Professor John Pate was officially inducted into the WA Science Hall of Fame in November 2017. His research has contributed significantly to current understanding of Western Australian floral physiology and ecology, and particularly the features that give native plants resilience to climatic extremes including drought. He was head of the Botany Department at University of Western Australia for 12 years, and supervised many research students. His life's habit of observation can now be put to good use on his own property.

(Photo sourced from WA Science Hall of Fame 2017 Inductee profile).

MARRI TROUBLES

Marri canker is caused by the native fungal pathogen *Quambalaria coyrecup*. Although it is a longstanding component of the ecosystem, we are seeing symptoms expressed on more and more marri trees (*Corymbia calophylla*). These cankers progress in stages, and can eventually ringbark branches or whole trunks, killing that limb or tree. As a common dominant tree in south western forests and woodlands, ongoing decline of marri is likely to have a serious impact on those ecosystems. They are keystone providers of food and habitat for many common and endangered species.

Recent studies* within the Centre of Excellence for Climate Change, Woodland and Forest Health indicates that human disturbance (mainly clearing for agriculture, settlement or mining) and pathogenic *Phytophthora* species, influenced by climate, may have reduced the natural defences of marri trees, resulting in a higher probability of infection and disease.

A 13-year study of six sites found that canker incidence was significantly greater on trees present along roadsides and in paddocks than forest trees. Tree dimensions (height, diameter and crown rating) were not found to correlate to canker presence. It should be noted that although trees in intact forest were less affected, the effect was still there; a fact of considerable concern for the future of this species and those that depend on it.

** Contact the Editor for references to these papers.*

CONSERVATION COVENANTS

Lei Zhang

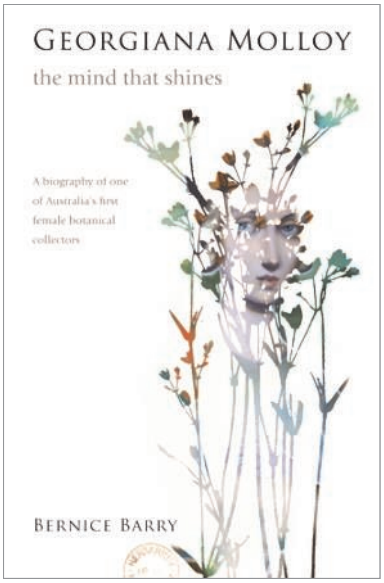
Western Australia has some of the most unique flora and fauna in the world and as members of *Land for Wildlife*, that's literally in your backyard!

As you would be aware, *Land for Wildlife* is a voluntary program that encourages landholders to maintain the wildlife and conservation values on their property, and members are free to withdraw at any time. This leaves future owners the right to manage the property as they wish, including clearing any vegetation.

A Conservation Covenant goes that one step further and gives legal protection to the natural values on a property in perpetuity. Some people find this particularly relevant when considering sale of their property and wish to prevent future owners from clearing their carefully tended (or arduously revegetated!) bushland. There is also funding available for management requirements such as internal fencing, feral animal control or weed control.

If you would like more information about the Nature Conservation Covenant Program, please feel free to contact me on (08) 9219 9518 or covenants@dbca.wa.gov.au.

Lei Zhang is Nature Conservation Covenant Program Coordinator at the Department of Biodiversity, Conservation and Attractions.



Bernice Barry is a *LFW*er from the Margaret River area who has written a book about the life of Georgiana Molloy, one of the great early Western Australian botanical collectors, and a key contributor to European knowledge of south west Australia's rich flora. *LFW*ers interested in the history of the South West might like to look it up!

Western Wildlife
LAND FOR WILDLIFE NEWSLETTER

Land for Wildlife

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Website: www.dbca.wa.gov.au/landforwildlife

A range of *LFW* publications are available for download from the website.

Facebook: www.facebook.com/LandForWildlife

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GOVERNMENT OF WESTERN AUSTRALIA

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