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Our environment, our future

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NEWSLETTER OF THE LAND FOR WILDLIFE SCHEME

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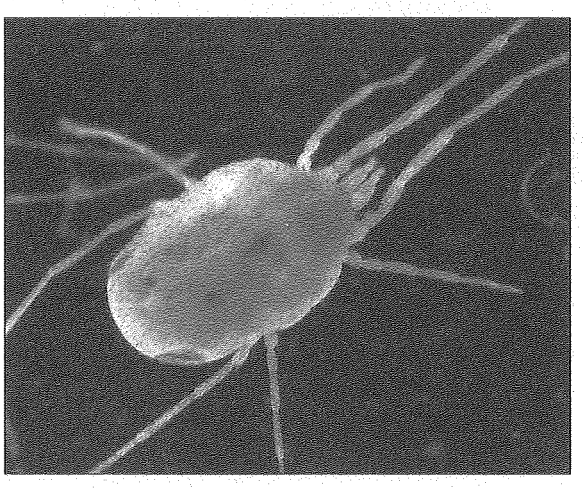
SOIL MITES

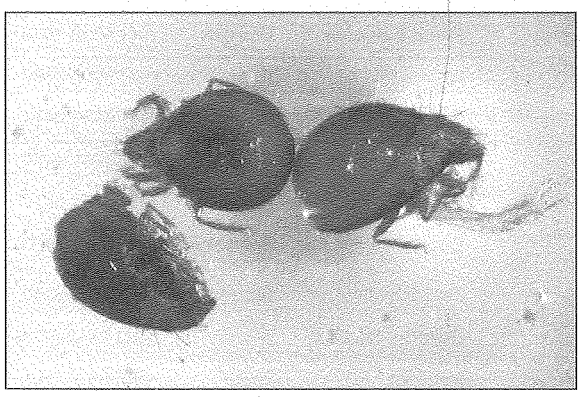
Adrianne Kinnear

What kinds of animals live in the soil?

Most of us, if asked this question, have no trouble identifying one or two soil animals – earthworms, ants or termites are common examples. In fact, our soil and the 'tablecloth' of leaf litter covering it, contains some of the most abundant and diverse animal communities in our terrestrial ecosystems! Even many biologists are unaware of this biodiversity and for this reason the soil has been referred to as the 'last biological frontier'. Below-ground and out of sight, complete communities of herbivores, predators and scavengers interact with the fungi and bacteria to process the world's organic matter, recycle essential nutrients and keep ecosystems functioning. In between the macro-earthworms and the micro-bacteria is a huge array of animals we rarely hear about or even more rarely see. Commonly grouped together as the mesofauna ('middle-sized'), these animals measure between 2 and 10 mm in size. Within the mesofauna, the free-living mites make up between 50–95% of the animals, and are the most diverse soil animals, both in morphology and ecology. A small core of rich, moist forest soil the diameter of your fist may contain 50 – 100 species!



A large, ground-running predator.



A collection of beetle mites, which are grazers.

The mites are tiny 8-legged relatives of spiders and scorpions and can occur in very large numbers in soil, ranging from several thousands per square meter in the arid soils such as in the Eastern Goldfields, to many tens of thousands in the tropical soils of northern Australia. Not only are they very numerous, but they display an amazing variety of feeding habits – fast-running predators, ambush predators, slow-moving fungal and baterial (microbial) grazers, piercing plant feeders and litter chewers. All these feeding types are represented in the soil and litter mite fauna. Their morphology is even more diverse with armoured beetle mites that become unpalatable balls of chitin to a fossiking predator, large litter mites covered with fringes of long red setae, tiny pink-coloured mites that can 'flash' their erect feathered setae, fierce ambush predators with strong pincer-spiked arms for mouthparts and perhaps most odd of all, mites with tiny skyscrapers of jewel-like columnar crystals covering their bodies and legs (we think this might be a possible adaption to arid climates).

For many decades, even in countries where the mite fauna was well-known, it was considered to contribute very little, if at all, to the decomposition of organic matter and the recycling of nutrients back to plant roots. There were

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Greetings all!

EDITORIAL

The lead article of this issue of *Western Wildlife* features soil mites, part of the soil invertebrate community that enables healthy soil processes. It is important to remember, whether we are a farmer, gardener, reserve manager, or just a person who wants an ecologically sustainable future, that soil is the foundation for most terrestrial ecosystems, and that without healthy soil we are unlikely to have healthy woodlands, gardens or crops. Healthy soil contains a vast multitude of tiny creatures that most of us know little about, but whose destruction impoverishes the entire community. All rehabilitation schemes should treat soil health as an important first step towards sustainability.

Other articles discuss the pressures experienced by rare species and communities. The difficulties of managing a climate-dependant plant such as reedia, or a disturbance opportunist like the Wongan cactus, show just how hard it will be to conserve our natural heritage for the future. Perhaps off-site cultivation, as described in the article about the Banksia Farm, is a possible way to go? The numbat story offers great hope!

There are a number of staff movements to report. In Albany, Dorothy Redreau has joined *LFW* for a year, while Sylvia Leighton is on maternity leave. Dorothy will already be well known to many *LFWers* as she was, for many years, the mainstay of Greening Australia. Since moving to Denmark, she has been involved with numerous projects on the South Coast. She is a revegetation expert, and author of *Southern Plants for your Garden*. We are delighted that Dorothy has joined the team, and hope she enjoys her time with us.

Robyn Polini, who has been working as *LFW* Administration Officer for the past year, has left to take up a position in the Risk Management Section in DEC. She is a cheerful and efficient person, a great colleague, and we wish her all the best in her new job. Please welcome Irene Vo, the new Administration Officer.

Their contact details are below, perhaps you would like to ring and say hello!

Penny Hussey.

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ECONOMIC VALUE OF BIODIVERSITY

BUSSELTON SHIRE BIODIVERSITY INCENTIVE STRATEGY

Cherie Kemp and John McKinney

Are there any Land for Wildlifers in Busselton Shire who would like a rate rebate for their bushland? Do you fit the criteria?

The Biodiversity Incentive Strategy for private land in the Busselton Shire was written and implemented in April 2002. It has two forms of incentives – a) subdivision incentive and b) rate rebate incentive for private landholders who have high quality biodiversity values on their property and who would like to preserve those high values.

The strategy essentially acknowledges that protection of conservation values on private land is often associated with a financial burden on the landowner. Landowners who choose to set aside wetlands or bushland on their property for conservation purposes usually forego potential income that may have been generated from using the land for agricultural production.

The strategy provides landowners with two rate rebate options:

- receiving a 50% rate rebate proportional to the area of bushland/wetland protected that is covered by a voluntary conservation covenant; $250 minimum rebate and $1500 maximum rebate; or
- receiving a proportional 35% rate rebate for bushland where a fixed term (10 year) management agreement in association with a *LFW* membership has been agreed; $150 minimum rebate and $1000 maximum rebate.

In addition to the rate rebates, grants may be available for fencing or rehabilitation works.

Initially, the Shire carried out surveys of the poorly represented vegetation types, then they picked the largest and better quality lots of these poorly represented vegetation types and offered these small number of properties the options listed above. There are 12 poorly represented vegetation types within the Busselton Shire.

Example of good quality rate rebate LFW property: Yelverton (Yw) poorly represented vegetation.

The minimum criteria for lots to receive a rate rebate are:

- minimum of 5ha bushland in 'fair' or better condition; or
- rehabilitation projects of 2ha or more or being at least 200m wide that have a strategic function ie formation of a corridor or buffer to a core habitat area (consisting of local native species and local provenance);
- bushland or wetlands of any size containing Declared Rare Flora, or a Threatened Ecological Community as identified by DEC (was CALM); and
- lots containing a Conservation Category wetland.

Requirements of the landholder (35% rebate option):

- joining *LFW*; a management plan will be written for the property;
- signing a 10-year management agreement (legal agreement) with Council, based on the *LFW* management plan;
- the management agreement must include protection of bushland in addition to specifying any active management;
- the management agreement must include permission for an annual inspection of the property by *LFW* or Council officers for the purposes of monitoring.

(Note – when the property is sold, the *LFW* registration, management plan and management agreement do not automatically continue, it is up to the new owners as to whether they would like to continue with these programs and receive the rate rebate.)

The Busselton Shire Environmental Officers have found since the initial uptake of these incentives that there are many more areas of good quality bushland and wetlands that could qualify and would like to further extend their offer of a rate rebate to other *LFWers* in the Busselton Shire.

So, if you are in the Busselton Shire and have more than 5ha of bushland or wetland on your property and would be keen to preserve it with a management agreement with the Shire, contact your local *LFWO* on 9752 5533.

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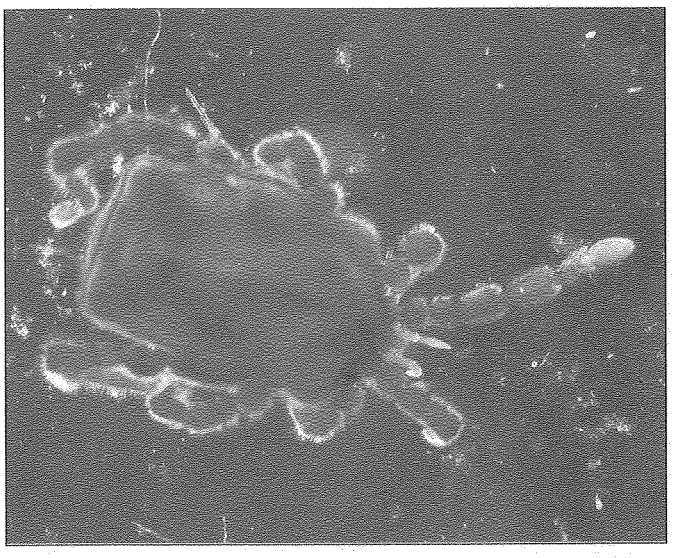
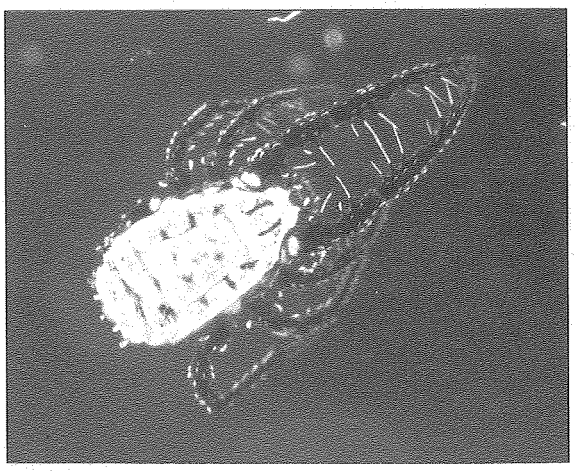
FAUNA

Soil mites



Another oddly-shaped ground-running predator

two main reasons for this. Firstly, the mites do not possess the chemical factories (the enzymes such as cellulases and lignases) that enable the bacteria and fungi to break down the leaf litter into its component raw nutrients so they can be reused. So how could they play any significant role in decomposition? Secondly, compared with the bacteria and fungi, the soil mites contribute very little to the actual weight of organisms in the soil. There is so much more bacteria and fungi that they far outweigh the larger fauna. So the larger fauna were considered unimportant. But these ideas were turned on their head in the latter half of last century when experiments demonstrated that, if mites and the other mesofauna (including the springtails) were excluded from samples of decomposing leaves, the leaves were much slower to decompose. In dryer climates, this slowing down of decomposition without the mite fauna can be as much as 30 – 40%.



A rather spectacular ambush predator

So, if this tiny fauna cannot actually decompose the plant litter, what does it do?

We now know that the mites contribute to the breakdown of plant remains in indirect, but very important ways:

• As they graze on the colonies of bacteria and fungi covering the surfaces of the dead leaves, they fragment this leaf litter and repackage it into tiny, spherical fecal pellets mixed with the gut mucus and other digestive secretions. These pellets aid soil structure and are ideal food sources for the bacteria and fungi which colonise them. In fact, the presence of these fecal pellets is thought to activate inactive ('sleeping') microbial species, an interaction known as the 'sleeping beauty effect'! All of this accelerates the decay of the dead plant matter and is the most important way in which the soil mites influence decomposition rates.

A very tiny fungivorous mite

• The feeding effects of some mites can indirectly affect the composition and abundance of the bacterial and fungal communities. For example, by feeding on roundworm communities that feed on the bacteria, predatory mites can cause increases in bacteria which, in turn can affect nitrogen cycling in the soil.

• The mites act as miniature transport vehicles, travelling along the air channels between the large soil pores carrying fungal spores and bacterial cells on their bodies, and moving them through the litter layers and the soil profiles.

Long-term studies of different soil practices have demonstrated that over time, if the soil faunal diversity is reduced, important soil properties are affected detrimentally. These include soil structure, organic matter content and nitrogen storage and cycling. There is little doubt now that maintaining and enhancing the soil biodiversity generally is an important aspect of soil conservation.

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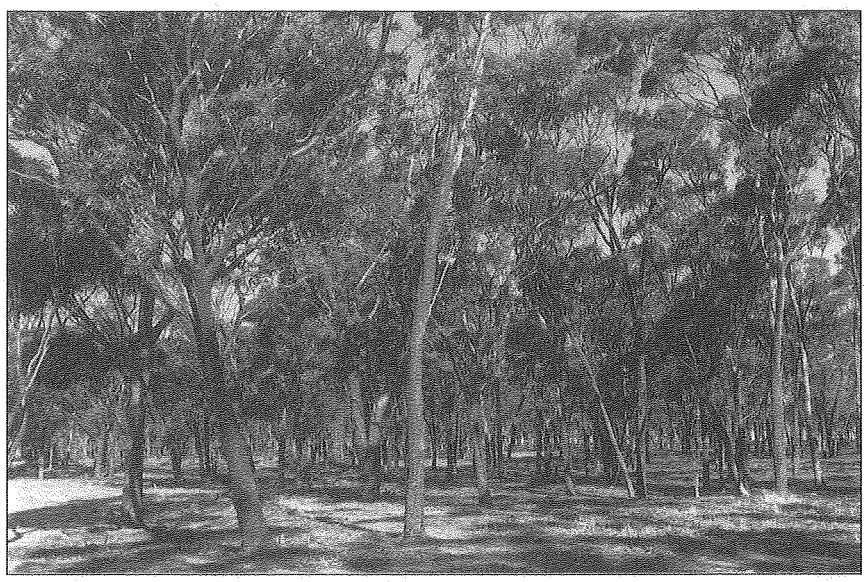
FAUNA

Soil mites

How can we best maintain and enhance soil mite diversity?

The soil mites are dependant on a soil structure which maintains their living spaces - the air-filled macropores, and a diverse array of energy and microbial sources dependant on organic inputs. Land use strategies that rebuild and restore soil structure and increase organic matter will accelerate the restoration of diverse soil communities with positive feedback on soil profiles, decay rates and nutrient retention. Where revegetation or rehabilitation of vegetated refuges are planned, a focus on litter management (something not often considered) can influence the development of local mite diversity. The development of an appropriate mixed-species litter cover (with natural barriers, if necessary, to prevent its removal by wind and water) is one of the most important management outcomes for restoring the above ground mesofaunal diversity and abundance, which in turn feeds the soil biodiversity. Litter islands which develop in vegetated landscapes, and the soil beneath them, are important hotspots of mite diversity, soil development and nutrient return. Just like we manage the larger landscape, so the micro-landscape of litter deserves our attention. From a mite's point of view, it is just a matter of scale!



Woodlands that have been grazed for many years (like this salmon gum/gimlet example at Perenjori) often have a very poor litter layer. This is due to the disturbance and trampling by stock, combined with wind and water erosion. Building up the litter layer will increase soil health, and so the health of the entire remnant.

Adrianne Kinnear is an Associate Professor in the School of Natural Sciences, Edith Cowan University. Her interests are in the soil and litter mite communities of WA and terrestrial invertebrates in general. She can be contacted at: a.kinnear@ecu.edu.au

WHO ATE THESE HONKEY NUTS?

Bush Detective

Marri, *Corymbia (Eucalyptus) calophylla*, is a vitally important food tree for many different species of native fauna. The flowers are especially valuable as a food source through autumn, as are the fruits (honkey nuts) and the seeds they contain.

The softish outside flesh of these immature nuts has been chewed away in neat little bites, while the interior, with unripe seeds, has not been touched - rather like someone eating around an apple core. Western Wildlife has illustrated the characteristic signs of feeding on honkey nuts by twenty-eight parrots, red-capped parrots and Baudin's black cockatoos (WW 1/1) as well as by long-billed corellas and red-tailed black cockatoos in WW 1/4.

Given that this is none of the above - who ate these nuts?

They have been eaten by a brush-tailed possum. Thank you to Trish Gardner for this puzzle.

FLORA

REEDIA - A VERY EXTRAORDINARY SEDGE

Cate Tauss

Reedia spathacea is a rare and endangered sedge (Cyperaceae family) that only occurs in the high rainfall zone of Western Australia's globally renowned 'biodiversity hot spot'; the South West Floristic Region. It inhabits two distinct types of habitat in two biogeographical regions of the South West; the sedgy peat slopes of near-coastal areas of the Warren Region between Walpole and Point D'Entrecasteaux and the perennial tributaries of the lower Blackwood River, in the Jarrah Forest Region, south east of Margaret River. Both of these habitats and the biota they support are recognised as Priority Ecological Communities (PECs)*.

The genus *Reedia* has only one species, *R. spathacea*. It was first described by the famous colonial botanist, Ferdinand von Mueller in 1857. Apart from this basic taxonomic description, very little was known of the biology and ecology of this idiosyncratic plant until quite recently. The interest in *Reedia* was rekindled in 1996 by the threats to its survival posed by the Boronia Ridge urban development proposal at Walpole and the generally accelerating pace of the degradation of our natural environment throughout the South West.

In appearance, *Reedia* is strikingly different to other sedges in our region. The fascinating adaptations of this plant equip it well to thrive in its oxygen-deficient, permanently waterlogged and nutrient-limited habitats. *Reedia* forms large leafy shoots with tall flowering scapes to nearly 3m in height. Its long strap-like leaves resemble those of large bromeliads as they are bordered by sharp prickles and the broad sheath at the base of each leaf collects rainwater in a 'phytotelm' (literally a wetland in a plant). Hidden below the leafy canopy of each shoot is a caudex (anatomically most similar to the trunk of grasstrees like *Xanthorrhoea*) that forms the central axis of the plant and produces numerous stilt roots near its apex. The stilt roots anchor the caudex into the mass of slowly decaying organic matter that makes up the ground layer in a *Reedia* habitat. This ground layer includes the dead remains of *Reedia* shoots from previous seasons and the roots of the native rush tanglefoot (*Empodisma gracillimum*), a major component of *Reedia* wetlands that is the ecological equivalent of *Sphagnum* moss in northern hemisphere peat bogs. When the stilt roots reach the ground they branch into horizontal cable roots (with specialised structures called pneumatophores that peep up just above the waterlogged ground surface and aerate the roots) and vertical roots that proceed down deeper into the ground to source the plant's water and mineral needs.

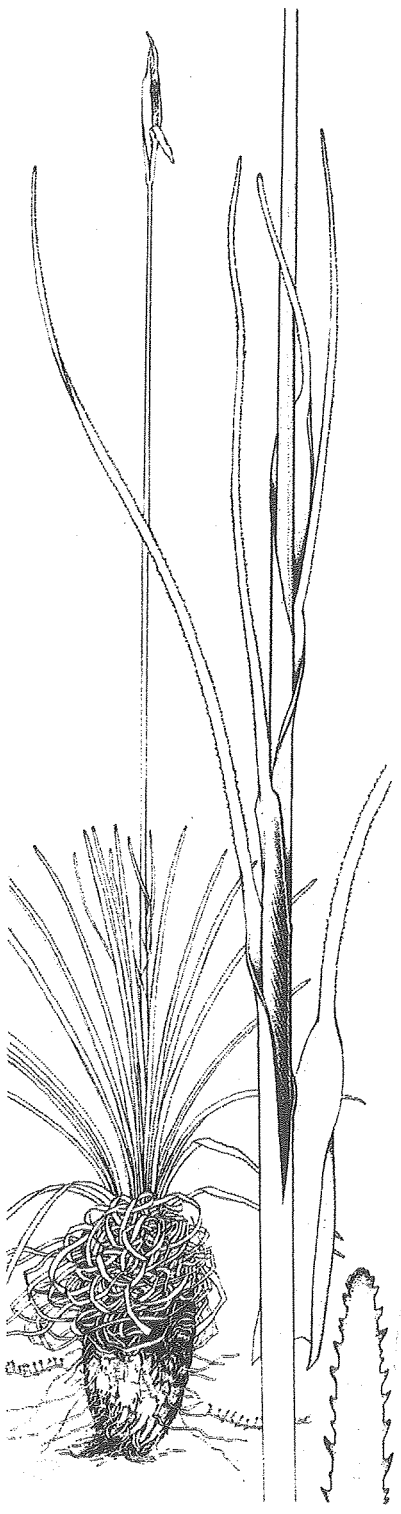


Illustration: M. Menadue

Reedia is a relict of a bygone geological era when the climate of most of Australia was much wetter than today and wetlands (not deserts) probably dominated the landscape. The nearest known relative of *Reedia* is *Gymnoschoenus* (best known as the Buttongrass of the soggy Tasmanian high moorlands). *Reedia* now only persists in a limited number of small wetland refugia that are very atypical of the general conditions in the South West. A number of its populations are known to have become extinct in the last 15 years due to human-mediated factors such as inappropriate fire regimes and the illegal introduction (and subsequent proliferation) of pigs in national parks and state forests.

Prior to the detailed study of *Reedia*, it was a common misconception that the plant possessed rhizomes or underground stems (like most hardy Australian sedges adapted to survive frequent fires by resprouting). In fact, *Reedia* does not possess

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Reedia

FLORA

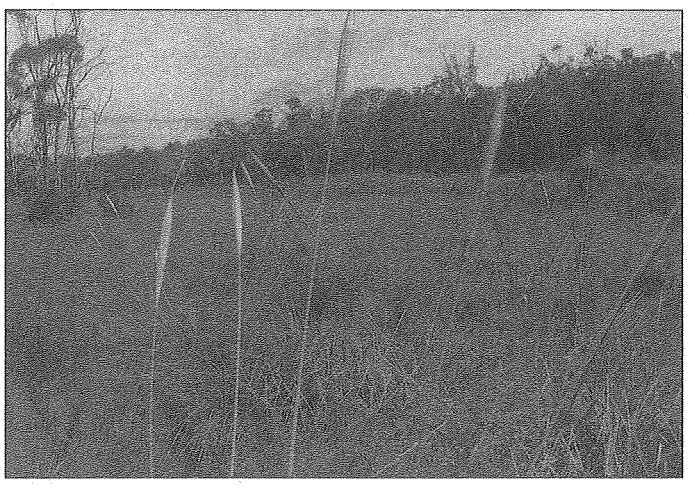
any below-ground storage organs or earth-protected regenerative buds and most of its biomass is stored above the ground. The apical shoots and root initiation zone of *Reedia* are in close proximity to large masses of flammable old leaves (which the plant presumably retains around the caudex to re-use scarce nutrients). Even cool fires have been observed to kill a proportion of the adult *Reedia* plants and most *Reedia* seedlings in the population affected. Flowering in *Reedia* populations is always slow to re-establish after cool fires as the plants take several years to muster the resources from their nutrient-limited environment to repair damages. Hot fires generally cause catastrophic losses with deep burns on the caudices that totally sever the root-to-watertable connection of the plant. When feral pigs graze on *Reedia*, they don't seem to mind chomping through the fierce prickles on the older leaves that surround the sweet, inner shoot. (The latter is rather like the texture and flavour of pandanus 'heart of palm', a northern Australian bush tucker.) The growth characteristics that make *Reedia* vulnerable to fire also mean that feral pig grazing is almost always fatal.

The most common method by which *Reedia* reproduces is by vegetative renewal of its aerial shoots. Despite the resources that *Reedia* invests in its massive flowering scape, the rate of fertile seed set is very low and the recruitment of seedlings is a rare event in undisturbed populations. Unlike most sedges that are wind pollinated, *Reedia* flowers emit a strong fragrance and attract numerous bees that are able to efficiently transport the large pollen grains. Copious pollen also accumulates within the shelter of the spathes around the inflorescence. Beetles and other insects congregate in the mini ecosystem within the spathes at this time. Red-tailed black cockatoos feed on the insect larvae that often colonize *Reedia* scapes.

The peat paluslopes (seasonally waterlogged slopes) of the Warren Region PEC are inhabited by assemblages rich in humid climate endemic flora and fauna species including the Priority Flora fern *Schizaea rupestris* and sundew *Drosera binata* and restricted fauna such as the burrowing crayfish *Engaewa walpolea* and the giant oiligochaete worm *Megascolex swarbrickii*. The perennial tributaries of the Blackwood PEC are inhabited by the rare frogs *Geocrinia vittelina* and *G. alba* and a suite of Priority Flora species.

The maintenance of hydrological processes is essential in sustaining the biodiversity values of both of the *Reedia* PECs.

The peat of the Warren PEC paluslopes forms a perched aquifer that overlies a shallow confined



Blackwood Reedia PEC (Photo: C. Tauss)

aquifer. The maintenance of these aquifers is a function of the humidity of the climate and the topographic and stratigraphic features of the upslope recharge area. The quantity and quality of the water delivered from the upslope recharge areas to the *Reedia* habitats downslope can be influenced by activities in the recharge area such as vegetation clearing, drainage, water diversion and pollution of run off in the course of urban development.

The perennial tributaries of the Blackwood River between Sue's Bridge and Alexandra Bridge that constitute the Blackwood PEC are maintained by localised artesian flow from the Leederville-Yarragadee aquifers of the Perth Basin. Unlike most streams that drain the Blackwood Plateau and the Jarrah Forest, these freshwater tributaries flow throughout the year and the narrow floodplains adjacent to their channels remain waterlogged in the dry months. Drawdown on the deep aquifers that sustain the PEC either by local use or for water supply to the Perth-Yarragadee scheme threatens the maintenance of this PEC. Inappropriate vegetation management and vegetation clearing in the catchments of these streams also threatens the quality of the water in the PEC.

A commitment to understanding the conservation values and the special management needs of vulnerable areas such as the *Reedia* PECs is required to plan a future for our most valuable natural assets.

** Recommended by the WA Threatened Ecological Communities Scientific Committee as a Threatened Ecological Community, but awaiting Ministerial endorsement.*

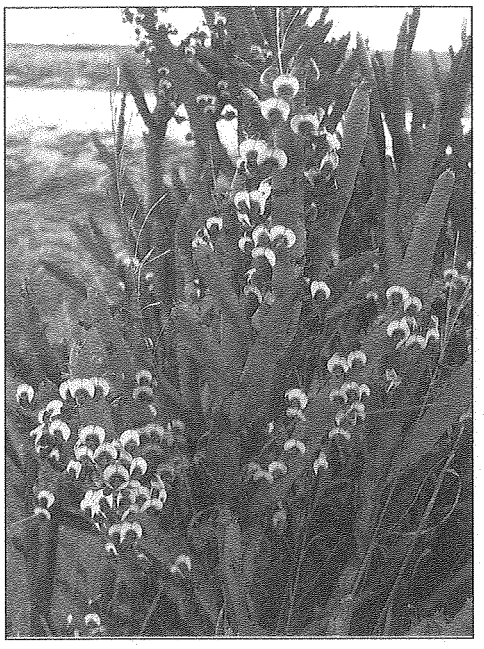
Cate Tauss currently works as a botanist in environmental assessment and is studying for a PhD in the School of Plant Biology at the University of WA. She is interested in almost anything to do with the native flora of WA. Her research currently includes flora taxonomy, the evolutionary history

FLORA

RECOVERY OF A SANDPLAIN STANDOUT!

Gillian Stack

Wongan cactus (*Daviesia euphorbioides*) is a striking species that gets its common name from the pithy cylindrical branches and greatly reduced spiny 'leaves'. Clusters of small red and orange pea flowers are produced in June-July. Like many daviesias, it is a disturbance opportunist, being relatively short-lived above ground, but having the ability to persist in the soil as hard-coated seed. It has been known to germinate after appropriate fire and grading of roadsides or similar mechanical disturbance. It is highly restricted, occurring in sandplain vegetation in the Wongan Hills and Dowerin-Goomalling areas. This vegetation type has been widely cleared for agriculture, and currently known populations occur mainly in small road and rail reserves.



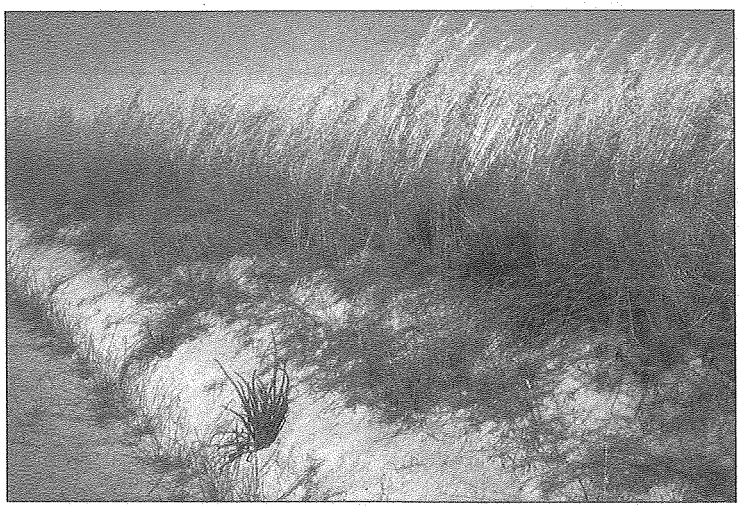
A plant in full flower. (Photo: J. Collins)

It is presumed that Wongan cactus is insect-pollinated (many small-flowered daviesias are pollinated by native bees), but pollination has not been observed in this species. Although daviesias typically produce many triangular seed pods after flowering, many of these abort before maturity. DEC's experienced Threatened Flora Seed collector Andrew Crawford has said although it is possible to get better results, it is not terribly surprising to find only 10 or 20% of the seed pods on a *Daviesia* sp. to contain 'good' seed. Wongan cactus does fit this pattern, producing relatively little seed each season, but the seed that is produced generally has very high rates of germination under the right conditions, and may endure in the soil for many years.

Wongan cactus is listed as Declared Rare Flora, and is currently ranked as Critically Endangered due to the low number of plants known and ongoing threats, including damage to existing plants through maintenance activities, competition from weeds, grazing of young plants and absence of disturbance.

A recovery plan was prepared for Wongan cactus in 2000, which aimed to abate identified threats and maintain or enhance wild populations to ensure the long-term preservation of the species in the wild. The plan will be considered a success if the number of individuals within populations and/or the number of populations have increased over the life of the plan. The plan gathered together available information on the species and recommended a range of recovery actions, including stimulating germination at populations containing dead plants, and undertaking a translocation.

Over the last few years, attempts have been made to stimulate germination of Wongan cactus from soil seed banks, inferred to exist where adult plants were previously known to occur.



A Wongan cactus plant living dangerously - on the backslope of a road in Dowerin Shire. (Photo: P. Hussey)

A management burn was done on a roadside in the Shire of Dowerin near some recently dead plants in 2005, and some good follow-up rains assisted germination of a number of new plants. These were fenced with rabbit netting, are surviving well, and may flower this year.

Following this success, a range of treatments was applied in 2006 at several selected sites to compare their effects. At all sites, the areas treated were fenced with rabbit netting to protect any seedlings from grazing or trampling. One site with one recently dead plant was burned, following the methodology of the successful fire last year. One adult Wongan cactus plant in poor condition was recorded some ten years earlier at another badly weed-affected

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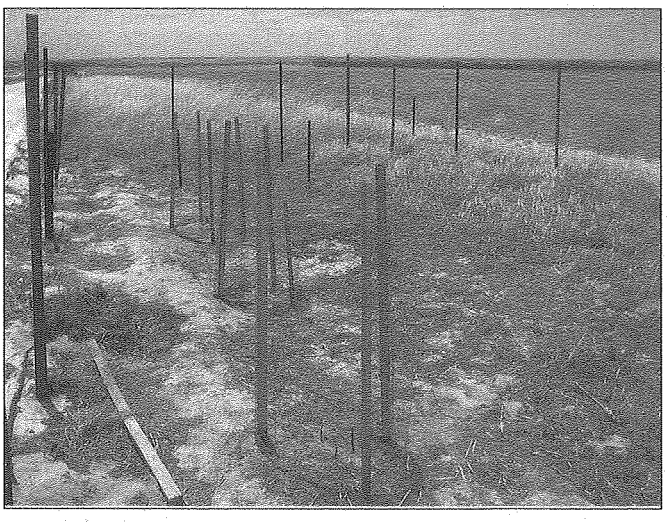
Wongan cactus

FLORA

Burning near dead plants on a roadside in 2005. Live plant in foreground. (Photo: G. Stack)

disturbed road verge site. An area of approximately 100m in this vicinity was mechanically disturbed with a small tractor-drawn rotary hoe. The area was divided into paired plots, of which half were also treated with smoke water. It was hoped that any other native vegetation seed still present may also be germinated, enhancing the flora values of the roadside. At a third site, ground around a recently dead plant was treated with smoke water only. Other small populations in the vicinity were able to act as control plots to see if germination came up in areas where no treatment was applied.



A treatment site, December 2005. (Photo: J. Collins)

Unfortunately, 2006 did not enjoy the same follow-up rains, and there has been no germination of Wongan cactus at any of these sites. On the bright side, weed germination has been sparse too, with follow-up weed control needed only at the very weedy mechanically disturbed site. Perhaps a wetter winter this year may encourage some germination of Wongan cactus in the second year after disturbance!

A translocation has also been undertaken, in an attempt to establish a population on conservation lands that may be more viable in the long-term than narrow road and rail verge populations. Approximately 70 Wongan cactus plants were cultivated at the Botanic Garden and Parks Authority nursery and planted into a suitable site in a nature reserve.

This site was chosen because it had similar soil and plants as the wild populations, was on conservation estate and was therefore secure for the future, and importantly, also because it was already disturbed. This part of the reserve had previously been cleared and used by a farmer for storing hay. A surprising choice for a conservation site? Not really, this translocated population will experience relatively frequent disturbance in the future to keep the population 'ticking over'. This frequency of disturbance would be very destructive to much of the existing vegetation in the reserve. With little remnant vegetation remaining in many wheatbelt shires, the cost of damaging the other flora and fauna of this nature reserve for the sake of this one species would be too high. The separation of this translocation site from high quality vegetation was an important consideration. Fortunately, despite its history, the site is not excessively weedy.

In the future, seed may be collected from plants stimulated through the disturbance trials to propagate additional plants for this translocation site, broadening the genetic diversity available. The long-term goal is for this site to be self-sustaining, with little management necessary other than occasional disturbance to provide germination opportunities.

Efforts are continuing to conserve this unique part of our floral heritage, with important contributions made by volunteers, Shire and DEC staff. If you believe you have this plant on your property, or would like further information on this species, please ring Joel Collins at DEC's Avon-Mortlock District on 9622 8940, or email him at joel.collins@dec.wa.gov.au.

Gillian Stack is a Flora Conservation Officer with DEC's Species and Communities Branch. She is most interested in protecting Western Australia's Rare Flora. She can be contacted on 9334 0344, or by email at gillian.stack@dec.wa.gov.au.

FAUNA

LIVING NEXT DOOR TO BOYAGIN

Avril Baxter and Tony Friend

In 2003, Chris and Sheina Murphy bought themselves a weekend retreat next to Boyagin Nature Reserve. They needed some time to get away from the city and observe nature. Initially they were rewarded by the sounds of birds in the morning and evening, but their greatest thrill came when they observed a numbat making use of their wood pile.

Numbats are unique to Australia and were originally found across the southern half of the continent from western NSW through to the south-west of WA. Unusual for an Australian mammal in that they are active during the day, they are naturally at risk from predation by carpet pythons and raptors, however burgeoning fox numbers nearly sent this species into extinction. By the mid-1980s less than 500 individuals remained at only two sites, Dryandra Woodland near Narrogin and Perup Forest near Tonebridge.

Numbats are specialised creatures that consume about 20,000 termites per day. They find these by sniffing the woodland floor and turning over small sticks and leaves looking for termite galleries near the surface. Once the shallow galleries are detected, their extremely long sticky worm-like tongue gobbles up the feast – moving faster than is visible to the human eye.

They are solitary creatures. Each animal has a home range of 25-50 ha, preferring to live in woodland with open areas for feeding and shrubs and hollow logs for cover. Given its total area of 28,000 hectares, Dryandra Woodland can support up to 500 animals. Dryandra was one of the sites where an experiment to measure the beneficial effect of fox control for threatened mammals was run. Scientists commenced monthly fox control using '1080' baits in part of Dryandra in 1982, and by 1985, numbat numbers in the baited area had risen dramatically, while numbers in an unbaited area had not changed.

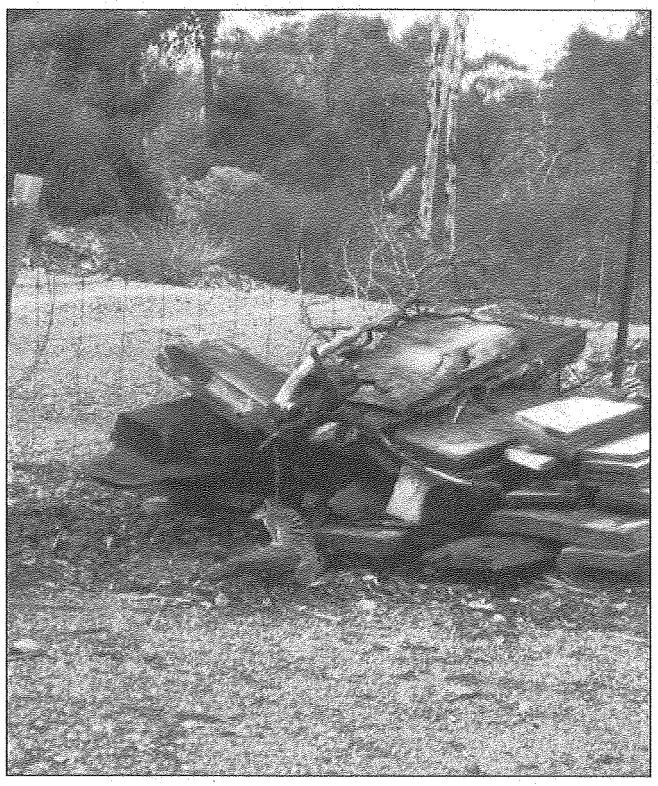


Photo: Sheina Murphy

Using individuals taken from this growing wild population, numbats were translocated to the eastern block of Boyagin Nature Reserve near Brookton, between 1985 and 1987. This area was chosen for the first numbat reintroduction as it was close to Dryandra and provided the same habitat. Seventeen numbats were moved in 1985, nine in 1986 and nine in 1987. Within six weeks of the first release, surviving animals had established their home ranges.

Monthly fox control was carried out at Boyagin Nature Reserve in the early years of this experimental translocation by DEC science staff from Woodvale. In 1989 DEC Narrogin District took over responsibility for fox control in both Dryandra and Boyagin and has maintained monthly baiting ever since. Monitoring by driven surveys and searches for diggings and scats was carried out annually by science staff.

By 1993 the numbat population in the east block of Boyagin had exceeded its carrying capacity and numbers crashed to a more sustainable level. However, part of this success story is that a few numbats made their way across one kilometre of open farmland and started to colonise the western block. By 1994 there was estimated to be at least 100 numbats within the reserve. Three numbats bred at Perth Zoo from Dryandra animals were released by DEC at Boyagin in 2005 to provide extra genetic diversity.

So what was the numbat doing in the Murphy's wood heap? Numbats give birth to usually four young in January. The mother does not have a pouch but carries the young on her teats until late July when they are deposited in one of her burrows.

The photograph above was taken on the 28th July. The animal was first observed late in the morning

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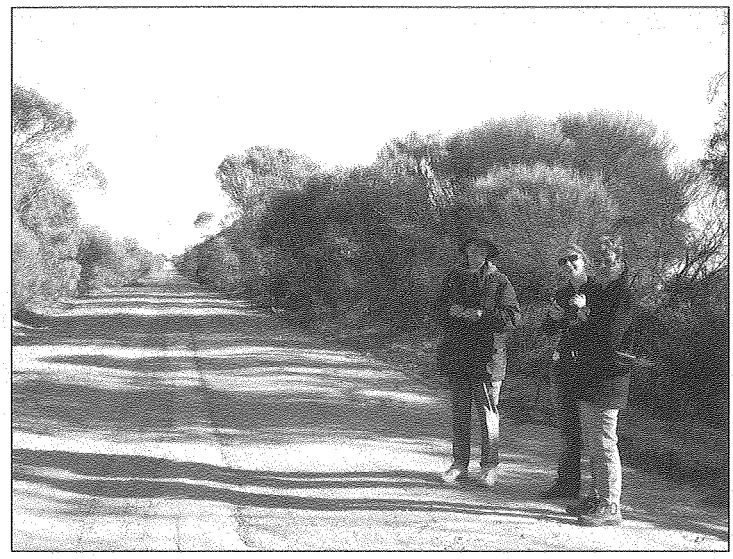
WUBIN BIRD WATCHING DAY

On 21 April, 24 keen people met at 7am on Stewart Road north of Wubin for a morning 'bird walk'.

With binoculars at the ready, the participants split into groups and proceeded to survey for the presence of birds along the railway reserve, road reserve and in a recently planted 'habitat linkage'. Despite the chill morning, there were some birds out and about, including the red-capped robin, raven, mudlark and willy wagtail.

After almost two hour's walk it was back to the Wubin Hall. Breakfast was a sausage sizzle and hot drinks provided by the Wubin Progress Association- most appreciated by cold and hungry bird watchers. This was followed by a morning of listening to talks about birds and nature conservation initiatives in the northern wheatbelt.



Marie Carter, Diane Aynsley and Pam Aynsley prepare to survey Stewart Road. (Photo: F. Falconer)

One of our special guests for the day, ornithologist Andrew Huggett provided a wealth of information about birds, including their role as indicators of health on farms and also his work in the Buntine-Marchagee Recovery Catchment on bringing back the bush birds. He said that the birds of the woodland, heath/shrub/ mallee, and freshwater and saline habitats of Buntine-Marchagee Catchment have been recognised for what they are - precious gems of a formerly more extensive and probably more diverse bushland bird community. That we still have these amazing little feathered friends is testament to their resilience and, now, the protection and progressive restoration of their habitat.

Our other special guest was Carl Danzi, Malleefowl Network Facilitator who provided interesting information on the malleefowl.

The day wound up with a walk through the Miamoon Reserve. We were thrilled to see an active malleefowl mound - quite amazing given how hard and dry the ground is right now!

The day was organised by NACC (Northern Agricultural Catchment Council), Buntine-Marchagee Natural Diversity Recovery Catchment, WWF and *LFW*. We would like to thank everyone who participated and helped before and on the day.

Fiona Falconer

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Living next door to Boyagin

and then in the afternoon with a piece of paperbark in its mouth extracted from the woodpile. It posed for the photograph before skipping across the firebreak into the reserve.

The numbat was probably lining a burrow chamber to provide a warm home where she could leave her young. In the jarrah forests this often consists of shredded bark and in the wandoo woodlands, grass and other soft insulating material. At Boyagin, paperbark and soft dryandra flowers have been found in numbat nests.

In early September, the young first emerge from the nest with their mother. They are weaned in late October, and by November and December leave home to find their own home range. Animals can move more than 15 km in search of a new place to live.

Other *Land for Wildlife* members have reported seeing numbats east of Dryandra along the Hotham River.

As part of the Numbat Recovery Plan animals have been released in other conservation areas in Western Australia, including Dragon Rocks, Tutanning, and Karroun Hill Nature Reserves, Batalling Forest, Hills Forest, Stirling Range National Park and Cocanarup Timber Reserve near Ravensthorpe. Through collaboration between DEC and the former Earth Sanctuaries Limited, two other populations have been set up in fenced sanctuaries in South Australia and New South Wales. As a result, the numbat's status has improved from Endangered in 1985 to Vulnerable today. Even so, there are less than 2000 animals in existence.

So if you see a numbat we'd love to hear from you. Please give Avril a call on 9881 9218 or email her at avril.baxter@dec.wa.gov.au

FLORA

ARE YOU LOST IN THE BUSH? - LET A BANKSIA HELP YOU OUT!

Kevin Collins

This is a story about a love affair with banksias!

Back in 1984, my wife Kathy and I purchased a small property near Mt Barker. It is 21 acres, with originally 11 being only partially cleared with no superphosphate history and it also contained one acre of precious remnant jarrah woodland. The property also had a range of soil types from deep acid white sand, to sand over laterite, ironstone rock over clay and some gravely peaty loam over deeper clay. A natural spring and small peaty area provided the site for an island pond feature.

In our revegetation we have managed to grow a complete arboretum of the 78 species and 24 sub-species of banksias (a world first), and the majority of the 140 taxa of dryandras. These are interspersed with a mixture of other showy natives.

We are thrilled at the success of our revegetation and the thriving eco-system we have created. Fifty-five species of birds have been recorded including emu-wrens and budgerigars (a long way south). Annually, heaps of white-tailed black cockatoos regularly feast on the banksia seeds – a real problem if you want to keep the seeds for growing on! Both pygmy and honey possums are seen occasionally as well as southern brown bandicoots, snakes, bungarras, and other reptiles. Fungi and lichens are also interesting and we enjoy the songs of four species of frogs. It truly is 'land for wildlife'!

Bags protect B. coccinea *fruits from cockatoo attack.*

As we got into our stride, we found there was a lot of public interest in our efforts, so we decided to try our hand at ecotourism. We first opened the place to visitors in 1991, and now we have over 1000 visitors per month during spring, including large bus groups. It's hard work though! You have to provide an attractive 'visitor experience', which in our case included not only a guided tour of the native plant areas, but an expansion of the plant nursery and the construction of an information centre including a fine-art gallery where local craftspersons can display and sell their work.

So what about the banksias?

We start from the known beginnings – we are very lucky that the WA Museum has given us a fossil of *B. archaeocarpa,* a 50-million year old species from the Kennedy Range. We then discuss the whole range of species in the banksia family, Proteaceae.

It is fascinating how banksias have evolved with wind and fire.

Many species that grow inland and extend to coastal provenances get progressively smaller to cope with wind. A good example is *B.grandis* which grows as a large or small tree in inland forested areas but only as a very low shrub at Windy Harbour and almost prostrate at Cape Leeuwin and Cape Howe. The lower coastal forms have evolved to survive the elements and the DNA has altered to the degree that they grow true to type from seed; subject to the transfer of pollen in the pollination process as pollinators can carry pollen great distances.

The plants have evolved to carry fire-resistant, insulating woody pods that can survive our hottest bushfires. The velvet layer beneath the outer flammable grey bracts is basically a fire-tolerant layer. Many species of banksia are killed by fire and rely on seed for regeneration. A few species re-shoot from lignotubers or epicormic buds beneath the thick bark. Dependant on the provenance, some species release seed when follicles open in summer, but only in areas of summer rainfall. Others, like *B. grandis*, open in summer and rely on autumn rains to loosen and activate the seed-holding device to release the winged seeds when the ground is sufficiently wet to ensure germination and survival. Species retaining the dead floral parts block the sun and use these flowers as fuel to burn hot enough to open the follicles. Other species such as *B. nutans* lose old flowers but don't open with sun as the flowers are within the dense foliage. The follicles of these types contain highly flammable oil which is the fuel in lieu of persistent flower parts. In summer rainfall areas, the follicles slowly open to release the seeds about eight hours after a burn and the seeds fall onto the cool ash bed. Dry inland species need fire to open, then await rain, which could be days or years away, then release the seeds. (Who says banksias don't have a brain? Look at *B.nutans* pods, certainly brain-like!)

When you look at a 'banksia flower' you can see that it is not an individual flower but an inflorescence (a head

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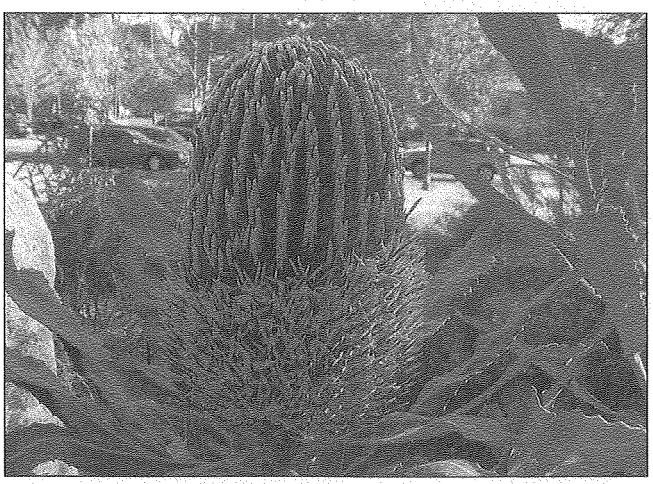
Banksias

FLORA

of hundreds of flowers, arranged in vertical rows in pairs having a perfect checker board pattern). The pollinated flowers produce follicles and non-pollinated ones appear as small dots in between. Rarely is greater than 10% pollination ever achieved due to the random visitation to flowers and the requirement to have two visitors in the correct timing sequence, with the appropriate pollen, to an individual flower to achieve pollination.

Aboriginal people used banksias in a variety of ways. They sucked nectar from individual flowers, made nectar drinks by immersion of flower heads into paperbark water containers, carried fire within non-pollinated spikes or large mature pods wrapped in paperbark and carried in kangaroo skin bags, used flower heads as hair brushes, chewed the sticky young buds and bracts of *B.attenuata* as gum and ate the tasty seeds (incidentally, lightly roasted *B.baxteri* seeds are the tastiest!). Some blooms can be picked when open and tapped onto your hand to release luscious nectar. Banksia honey was also sought by Aboriginal people and is still a treat today if you can find it.

And what about the title of this article? Yes, banksias in the bush can be used as a compass! Flowers in the inflorescence will open first on the warm sunny side, and be slowest to open on the cool south side, so you will see a sloping line on the inflorescence, where it peaks will be north. This compass effect is found on other species with inflorescences such as *Kunzea* and *Callistemon* and is very obvious on grasstrees. Pods that release seeds with the sun likewise open due north first.



On this B. menziesii, *north is on the right-hand side of the photo, south on the left.*

Pioneer settlers used banksia tree trunks as dart boards. Banksia timber or pods were used as firewood and non-pollinated spikes dipped into kerosene were useful candles. Research even unfolded a company set up in the Swan River Settlement utilising banksia velvet for stuffing pillows!

What of the future?

At Banksia Farm we have hosted several student projects, and we hope there will be more. There are still lots of fascinating interactions to study! Kathy and I have travelled the nation looking for our favourite plants in the wild, and are delighted to have been involved in discovering new species.

For those who like books, we are working with botanist Alex George on a new edition of *The Banksia Book* which should be out soon. As recipients of a Land and Water Australia fellowship, Kathy and I are also progressing with a project to produce a small booklet entitled *Regeneration with Banksias - developing the skills and extending the interest*, the story of our love and passion about establishing Banksia Farm.

Kathy and I extend a warm welcome to all *Land for Wildlifers*. For further information, including opening times etc, email: banksia@comswest.net.au

Did you know ...?

... that native animals can cause real problems in the use of pit traps during fauna surveys? (These traps consist of a bucket set into the soil with a fly-wire fence leading towards it. Animals such as frogs, small reptiles, scorpions, centipedes and other invertebrates fall in and cannot get out until the researcher records and then releases them.) But, in the Australian Wildlife Conservancy's Karakamia Sanctuary at Gidgiegannup, pits installed in the early days are not used much now, since native fauna numbers have built up. Why? Because quendas have learnt that the buckets contain fast food! They jump in, eat the trapped animals, and hop out again! Clever little fellows!

Trish Gardner, AWC

NEWS

DEEP DRAINAGE OPTIONS TO 'REDUCE UNCERTAINTY'

Tony Clack from the River Conservation Society, York, reports on the long-awaited Avon River Regional Drainage Evaluation report that was presented by officers from CSIRO at the Greenhills Hotel near York early in March.

The CSIRO report disclosed the outcomes of a modelling study that had been under way for two years and highlighted the recommended engineering options to address salinity issues in the Avon and other catchments.

Deep drainage in the wheatbelt, as a way to carry away saline and acidic groundwater from salt-affected agricultural land, has been a contentious environmental issue for a number of years. While it is acknowledged that in some landscapes, deep drainage can help in reclaiming salt-affected farmlands in the valleys of the Avon and other catchments, there has been an issue involving the disposal of such groundwater that could prove extremely harmful to downstream environments.

The WA Channel Management Group (WACMG), formed in 2003, to push for government-funded feasibility studies, have proposed a series of arterial drains, hundreds of kilometres long, snaking across the wheatbelt and delivering a hyper-saline and acidic load into the major rivers and wetlands of the region – the Yilgarn, the Lockhart and the Avon.

However the CSIRO report has found that while deep drainage might be an option for some farmers, down-stream disposal into the Avon River, and subsequently the Swan, is environmentally unacceptable.

The big environmental issue with saline groundwater is that while it is saline, it is also acidic, particularly the groundwater from the upper catchments such as the Yilgarn and Lockhart, where soils can be naturally acidic. There is also an issue with heavy metals and other contaminants. The water thus channelled would threaten the ecosystems of the Avon and Swan rivers.

The Avon River has been affected by increased salt loads for many years, but the salt levels have increased only at a very slow rate. The slowness of increase has allowed aquatic life living in the river and the permanent summer pools to adapt to a changing environment. A sudden change, such as a sharp rise in salt levels with the addition of acid water would wipe out all aquatic life within the river system. The ecology of the river would be seriously impaired, bird life which feeds on the aquatic species within the river would disappear, and the toxic stream would make its way into the Swan where it would have a similar effect.

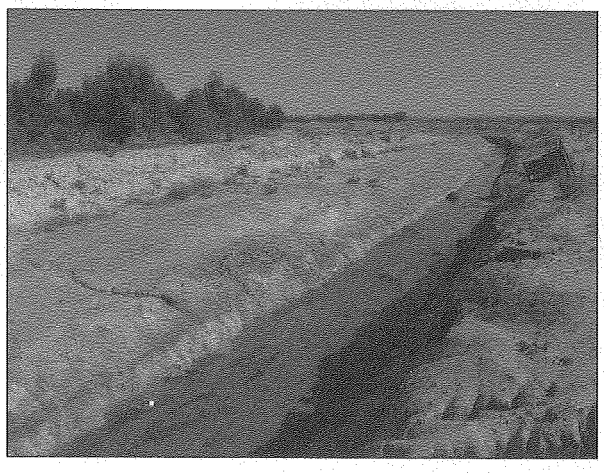
Suggestions by the WACMG that the highly saline groundwater would be 'watered down' by the addition of fresh water flows from the major tributaries of the wetter Avon region, ignores the fact that such flows would only occur during the wetter months of the year, whereas groundwater from deep drainage would be flowing continuously, both summer and winter.

As an alternative, the CSIRO report has suggested that, in the 108 catchments identified within the greater Avon basin, drainage might be an option if each catchment acted separately and where ground water could be collected in evaporative basins at the outfall of each catchment and either left to evaporate or utilised in some manner.

A separate report prepared by the Environmental Consultancy, GHD, relating to a proposal by the WACMG to cut a 35 km drain alongside the environmentally fragile Yenyening Lakes system, south-east of Beverley, was also presented at Greenhills. This report demonstrated conclusively that the deep drainage proposal was not environmentally viable and would adversely affect the biodiversity values of the Avon River.

All in all, the science is well and truly out and it shows that the downstream impacts of deep drainage would not be environmentally sustainable. What happens now in the long-running drainage debate will be up to the new Wheatbelt Drainage Council headed by former National Party leader, Hendy Cowan.

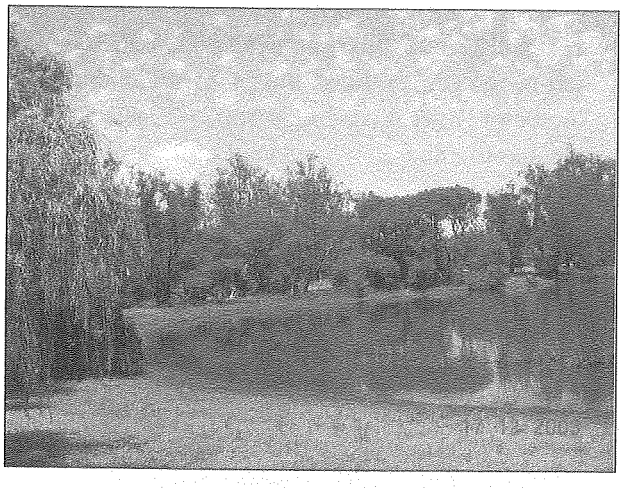
But as the Greenhills meeting ended, there were plenty of landholders who still thought that the preferred option would be the simplest and easiest way for them. That is, draining directly into the streams and waterways of the Avon basin and letting the water run directly to the Avon River, the Swan River and out to sea.



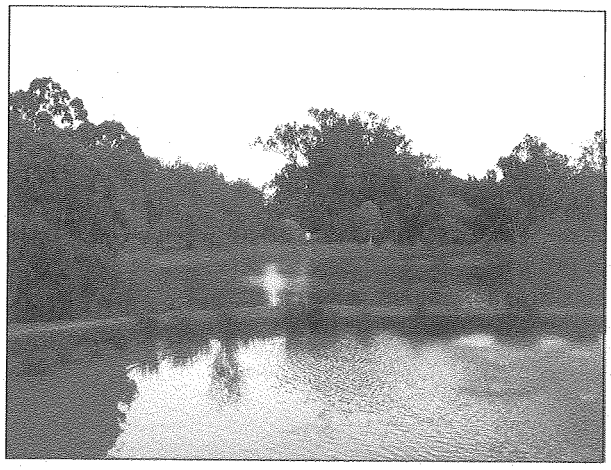
A section of the Narembeen Deep Drain taking saline/acidic groundwater across 30km of farmland, and which eventually diascharges into a bush reserve. (Photo: T. Clack)

HERON LAKE VINEYARD *LFW* CELEBRATION AFTERNOON

a LFW 10th Anniversary event



The lake in 2003. Note lack of lake edge plants.



The lake in 2007. Note good establishment of reeds.

On the Saturday afternoon of 28th April, another *LFW* celebration field trip was held in the Busselton area.

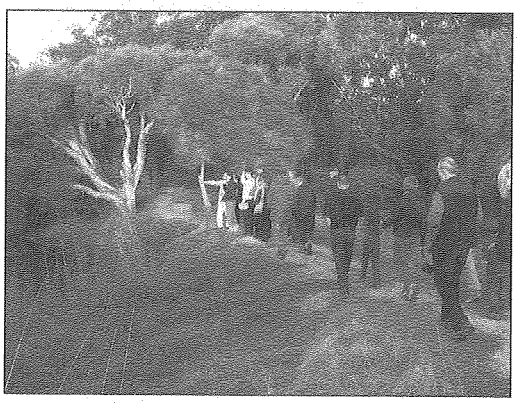
Rob Goodwin, owner of Heron Lake Vineyard, very kindly opened up his property to 20 people attending this field trip, with Heron Lake Vineyard providing the range of wines and cheeses and *LFW* providing some light snacks.

The original *LFW* visit to Heron Lake Vineyard was in 2003 where the lake was degraded and had very little natural vegetation cover around it. The property owners were successful in obtaining some Envirofunds to assist with their revegetation project, in combination with *LFW*, Geocatch and private consultants Iguana Consultants.

The project continued over three to four years and there were successes and failures, as with any project. The *LFWer*s were interested to hear how the plantings went, weed control and that a number of wetland birds had returned to the lake.

Twenty thousand seedlings were planted in the project, with many people assisting from Geocatch, *LFW* and TAFE students, plus the vineyard management staff.

Rob told everyone at the field day that he was a little disappointed in the outcome as he thought the project had not been as successful as it could have been, but that was due to a poor growing season for nurseries, lack of available plants and weeds encroaching upon the site which are very difficult to control – it has been a learning experience for sure.



Inspecting the success of the reeds and rushes around the lake edge. (All photos: C. Kemp)

Most people there were amazed with how well the project had gone. Yes, it is true that not all the species survived and that not all the habitat intended was in place, but the overall appearance of the site compared to the original photos was vastly different.

Many of the rushes and sedges had established surrounding the lake and small soak area, and were well grown. There are many small seedlings of the shrubs and trees surviving and growing along the banks of the lake, and many birds are using the habitat they provide – so all in all, a good outcome.

It was a wonderful afternoon as, just on dusk, everyone wandered around the lake watching the wetland birds with their glasses in hand, chatting about how this project enthused and refreshed them in their attempts at revegetation works on their own properties.

Cherie Kemp

Did you know ...?

... that sheep disperse Guildford grass seeds? Sheep grazing on an infested paddock ingest large numbers of seeds, and each day pass out more than 500 viable seeds in their droppings.

(For ref., contact the Editor)

IN BRIEF

JUST BECAUSE IT IS PRICKLY DOESN'T MEAN IT IS A WEED!

Last spring, this photo was sent in by Colleen Grugeon, who noticed the plant under banksias in the Scott River area. She assumed it was a weed and wanted to know how to get rid of it.

This is blue devils, *Eryngium pinnatifidum*, a member of the carrot family, Apiaceae. It occurs throughout the south-west on the coastal side of a line from Northampton to just east of Albany. It is an erect perennial growing, in good seasons, up to 30 cm high. The whole plant is slightly fleshy and grows from a narrow, carrot-like root. Both the leaves and the bracts surrounding the inflorescence are somewhat prickly and the entire thing smells of liquorice – a Mediterranean plant that is in the same family. It is believed that Nyoongar people did eat the soft base of the fleshy stem, but there are no definite records.

So, if you have this on your block, look after it and encourage it to spread. It is definitely not a weed!

MALLEE PRODUCT TRIAL A SUCCESS

Verve Energy has announced the successful completion of their work on the 'integrated wood processing' (IWP) demonstration plant at Narrogin. This was a test facility that was used to show whether the process would work on an operational scale. Verve Energy has concluded that the process is viable and have called for expressions of interest from prospective commercial partners, see:

www.verveenergy.com.au/mainContent/sustainableEnergy/futureProjects/iwp.html.

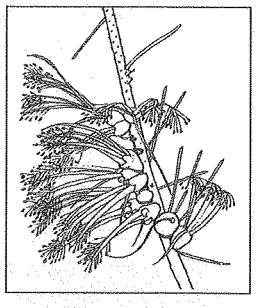
Verve Energy spent some $19 million and seven years on this development. They saw their process being best applied to biomass supplied from wheatbelt mallee crops. They showed that the IWP process could convert whole mallee biomass (i.e. chipped whole trees) to three products (activated carbon from the wood fraction, eucalyptus oil from the leaves and electricity from the residues). Their goal is now to find commercial partners. All of the IWP development work has been done on mallee and it is anticipated that the first commercial plants will be built in the wheatbelt and will utilise the considerable mallee resource that has been developed since 1994.

Large scale regional industries based on mallee could provide many benefits including a strong commercial driver behind salinity management, regional economic development, carbon sequestration and better environmental outcomes for the wheatbelt.

John Bartle

DIFFERENT FORMS OF ONE-SIDED BOTTLEBRUSH

The well-known one-sided bottlebrush, *Calothamnus quadrifidus*, is a common species widespread throughout the south-west. It is a dense shrub whose bright red flowers in spring are an important source of nectar for honeyeaters. It is also used extensively in revegetation, as it is simple to collect the seeds, germinates easily and grows well in all sorts of locations. But its also quite variable – plants from different locations can look quite distinct. Investigation by botanical researchers is now suggesting that it is not one species, but several. There'll be more names to learn!



In the meantime, this makes it even more important that you use locally collected seed for any revegetation project, so that plants from another area don't contaminate the local gene pool, especially if it is within honeyeater flight distance from a local population to which the birds could, perhaps, carry pollen. How far is that? Well, CSIRO's work at Kellerberrin showed that brown honeyeaters can travel 12.5km to a favourite feeding spot!

RESEARCH

THE SUSTAINING GONDWANA INITIATIVE

Jonathan Majer, Daniela Stehlik, Fiona Haslam McKenzie and Dong-Ke Zhang

A new research programme, focusing on WA's south coast, is just getting under way at Curtin University.

Curtin University is one of five new international Academic Partners of the US-based Alcoa Foundation. The university has been awarded a grant over five years under the Alcoa Foundation's Conservation and Sustainability Fellowship Program, with an additional contribution by Curtin. The aims of the program are to support and foster sustainability across the globe and to improve education in sustainability and conservation issues.

Albany wind farm - providing a viable energy option in some of the more remote parts of the State. Photo: J. Majer

Curtin's research program is focusing on sustainability and conservation in the south coast region of WA, between Walpole and Esperance. Titled 'Sustaining Gondwana: Harnessing local, place-based knowledge for sustainable outcomes', the project will ultimately document and enhance economic, environmental and social sustainability initiatives in the region.

A series of six postdoctoral fellows are being appointed, with two joining the initiative in the first year, two at the end of the first year and two who are yet to be appointed.

In the autumn of 2006, Dr Alan Marshall began the Ecomimicry Project which aims to draw inspiration from the unique ecology of the Great Southern region of WA to design technologies and practices based upon the local wildlife and the local landscape. He has already held a series of workshops across the region. The second inaugural fellow, Dr Amma Buckley, also commenced in March 2006 with a project focussing on the links between the social and the environmental in the Great Southern, concentrating on the Fitzgerald Biosphere Reserve and its surrounding communities.

The third fellow, Adam Dunn, was appointed in the spring of 2006, starting a project on modelling the fragmentation and biodiversity of the ecosystems of the Great Southern. He uses layers of landscape information to build predictive computer models of the significant environmental issues facing the region. Finally, Dr Robyn Mayes joined the program in mid-October 2006. The overarching aim of her research is to improve our understanding of the strengths and limitations of community identity. She is particularly working with the communities of the Shire of Ravensthorpe, at present undergoing considerable and rapid change with the advent of large-scale mining operations in the area.

The final two fellows will be appointed towards the end of this year. One of these will probably concentrate on energy issues in the south coast region and the other may assist senior researchers to draw together findings to provide an overview of conservation and sustainability issues in the region under investigation.

These studies, along with others not mentioned here, should provide a comprehensive picture of how the relatively underpopulated south coast region is developing and the threats to its natural and social environment. Importantly, it will provide recommendations for harmonising the inevitable development of this increasingly important area with conservation of the vast natural resources and features that exist there.

The four authors of this article are all professors at Curtin University and supervisors of the Sustaining Gondwana project. They can be contacted by email:

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Esperance - an interface between urbanisation, agriculture and the natural environment. Photo: J. Majer

FLORA - SURVEY

KEEP YOUR EYES PEELED FOR THE UNDERGROUND ORCHID

Marie Strelein

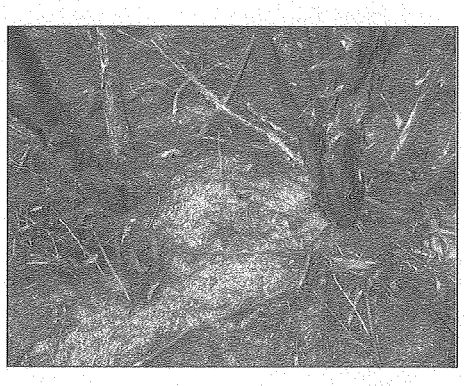
Do you remember hearing about the orchid that spends its entire life underground? It is one of the State's most interesting threatened species because of this underground lifecycle. The orchid also has a very particular three-way relationship with a specific fungus and the broom honey-myrtle. This article describes the habitat that the underground orchid, *Rhizanthella gardneri*, prefers to grow in. Perhaps you have suitable habitat on your property or know of an area nearby?

The underground orchid is currently known from near Corrigin-Babakin in the Central Wheatbelt and Munglinup-Oldfield River in the south-eastern wheatbelt. In the Corrigin - Babakin area the orchid grows with *Melaleuca scalena*. This is very similar in appearance to broombush, *M. uncinata*. In the Munglinup-Oldfield River area it grows with *M. uncinata* and *M. hamata*. In both areas emergent wattles and mallees are also typical of the associated vegetation.

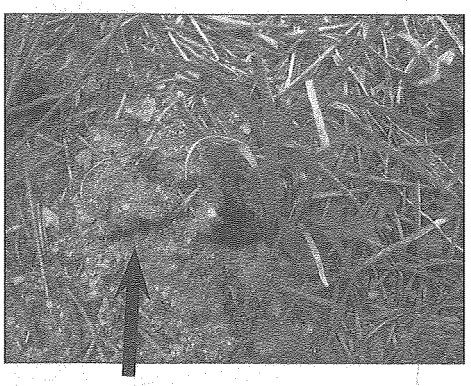
The soil where the underground orchid grows is also important. In both areas it is pale, sandy-clay or sandy-loam and you can actually see the coarse sand grains (quartz) at some of the sites. When the plant flowers in mid-May to early June, the bracts that enclose the flowers form a tulip-like head that pushes through this soil and creates a small opening at the surface. The opening is usually covered with a layer of leaf and bark litter. This is the spot where small fungal gnats enter and pollinate the flowers.

So, the best way to find the underground orchid is to look for melaleuca thickets on pale sandy-clay or sandy-loam soil. It is important that the area has some leaf and bark litter on the soil surface. Also look for large, dense melaleuca thickets as these promote a cool, moist soil surface. More open thickets may allow sunlight and heat to reach the soil surface around the base of melaleuca plants, causing it to dry out.

This is what to look for - typical broombush thicket habitat.



Below the broombush, litter has been gently swept aside and there is an Underground Orchid here - but it is not easy to see!



And there it is! The bracts have pushed up the soil, creating a small opening that allows tiny fungal gnats to enter and pollinate the plants.

Apart from all of these things the habitat must have the specific fungus that completes the three-way relationship between the melaleuca and the orchid. Without this special fungus the underground orchid will not be present.

As yet we can't look for this very specific fungus ourselves, but a research project is currently underway that is studying the relationship between the orchid and the fungus. Other major research initiatives are being developed to examine the underground orchid and find out more about its biology and ecology. As part of these research projects a soil test will be developed that will show whether the fungus is present at a site that has suitable habitat. If the fungus is present then the orchid could be present too!

With so many factors involved in where the underground orchid prefers to live it is no wonder this plant is tough to find! **Can you help by looking out for possible sites?** If you see a possible habitat, perhaps you could get on your hands and knees once or twice to have a look under that leaf litter?

If you would like more information or know of an area of bush near you that might be suitable for the orchid, please contact me. Even if you don't live near the known locations around Corrigin and Munglinup we would still like to hear from you. Because, as you might have noticed, these areas are not very close to each other, in fact there is more than 260 kilometres

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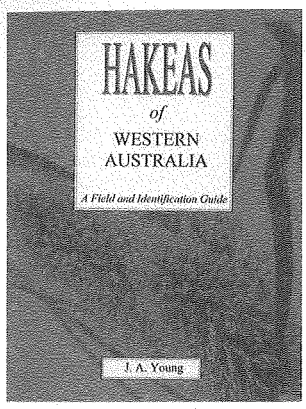
NEW BOOKS

Hakeas of Western Australia: a field and identification guide.

J.A. Young

Pub: J.A. Young

Cost:$20.00 + p&h (see flyer)



For the last 15 years, Jennifer Young has been searching out, drawing and propagating hakeas, as well as promoting them as superb plants to use in revegetation. She has already published regional identification books to the genus, but now she has collected all the WA hakeas into one book.

Apart from clear, uncluttered line drawings, most species are accompanied by a photo of the flower and also of the whole plant in its bushland setting. The latter is useful as it helps to recognise plants from a distance. Anyone interested in WA wildflowers will find this book very useful.

(Note: we may be able to arrange for copies to be available from the LFW office at DEC, Kensington, where you can buy a copy without the postage and handling charge – as long as you can collect it from our office. Email the Editor if you would like to take advantage of this offer.)

A new and expanding field book for the fungi of the Perth Region.

Bushlands in the Perth region have hundreds of species of fungi that contribute to the health of the bushlands. In the same way that animals and plants are considered, fungi need to be applied in the overall management for Perth's bushlands. Application of fungi has been impeded by the low availability of information about the fungi. This has been the impetus for a new book on Perth's fungi – the Perth Urban Bushland Fungi Field Book. The book has already provided an immediate and well-used dose of information since its inception in 2005, and has already expanded along its designated pathway to grow into a comprehensive guide over forthcoming years.

The Perth Urban Bushland Fungi Field Book is authored by DEC Mycologist Neale Bougher, and is seated upon an electronic self-managed format designed by fungi volunteer John Weaver. In an environment where many fungi are yet to be discovered and named, this book allows a guide to be available for use in the field now, and it has the flexibility to add more fungi as these are discovered and identified in the Perth region. Photographs of each species in the book are of local examples of fungi species in a local habitat. This is significant because fungi species can appear slightly different in different regions. The Perth Urban Bushland Fungi Field Book is available online, where the intricate details of the fungi illustrated can be best seen. The self-managed format allows users to download all or part of the book, and create their own physical copy conveniently-sized for using in the field. The flexible layout is designed so that additional species can be added as extra pages without having to print out the entire book over again. Updates to species also can be implemented with ease. Users are encouraged to supplement and expand the field book with their own notes and photographs. A downloadable template is provided for this purpose.

The best time to find fungi around Perth is through the autumn and winter months. Recently, a new updated and expanded edition of the Perth Urban Bushland Fungi Field Book has been posted online. So now's the time to make use of the field book, and also to join up with this year's free public events held by the Perth Urban Bushland Project. The field book and details of PUBF events can be accessed at www.fungiperth.org.au.

Neale Bougher

Reference: Bougher, NL. 2007. Perth Urban Bushland Fungi Field Book. Perth Urban Bushland Fungi, Perth Western Australia. (Online), from: www.fungiperth.org.au

Phytophthora Dieback Atlas

A Phytophthora Dieback Atlas has been produced, covering those areas of the south-west where Phytophthora could occur. The maps are at 1:250,000 scale and are not accurate to exact on-ground points. Nevertheless, they do show, in a general way, where the disease is known to be and so can assist with catchment and property management planning by highlighting actual or possible risk.

The Phytophthora Dieback Atlas can be found at:

http://www.naturebase.net/component/option,com_docman/task,cat_view/gid,429/Itemid,711/

Integrated Forestry on Farmland: Prospects for integrated forestry as a management tool for salt-source catchments.

Lisa Robbins and Nico Marcar.

Pub: 2007. CRC for Plant-based Management of Dryland Salinty, UWA, Perth.

Cost: free

Obtainable from the publisher, ph (08) 6488 2505

This report outlines the potential for further expansion of plantation-based forestry in six regions of Australia, all in the 450-750mm rainfall zone, in order to address the problem of dryland salinity. Its conclusions for the south-west of WA are that the prospects are good in the 600-750mm zone but less so in the 450-600mm zone, even though there is a greater opportunity in this zone to capture salinity benefits.

If you are already involved in tree cropping, or are considering it, this could be worth reading. It is brief but well illustrated and has an extensive reference list for further study if desired.

COMING EVENTS

Karakamia Sanctuary Twilight Walk

Chidlow

date and time to be rearranged

The evening at Karakamia was cancelled due to the weather, though a few hardy souls (including me - Ed.) did turn up. We had a fascinating walk, including watching a woylie eat a toadstool. The animal held it in one hand while it ate - rather like an icecream cone!

Zara is arranging a new date, so please keep in touch with her on: 9295 9112 or email: zara.kivell@dec.wa.gov.au

Cost: $5.00 per person(subsidised by AWC and LFW)

A Land for Wildlife 10th Anniversary event

Malleefowl Forum and First Western Australian Megapode Symposium

Sept 2007

This event brings together national research and management experience related to malleefowl and its relatives. It will be held at Katanning Leisure Centre on 7th to 9th September for presentations and discussions, and at the newly-opened Yongergnow Malleefowl Research Centre, Ongerup on 10th September to view malleefowl in the field.

To find out more, contact Stephen Davies on (08) 9572 1074 or by email: S.Davies@exchange.curtin.edu.au

11th International Mediterranean Ecosystems Conference

Sept 2007

This conference (referred to in short as MEDECOS XI) will be held in Perth from 2nd to 5th September 2007. This series of conferences is an important and well-established forum for the dissemination of research into the ecology of areas having a Mediterranean climate. As well as general ecology, papers will cover areas of global interest such as climate change, the conservation of threatened species and ecosystems and the effects of invasive species.

To find out more, visit the website at: www.medecosxi2007.com.au

State NRM Conference

March/April 2008

Planning has begun for the next WA Natural Resource Management Conference which will be held on 31st March to 1st April 2008 at Bridgetown and Boyup Brook, hosted by the Blackwood Basin Group. The theme is 'Regional NRM – Bridging the Barriers to Better NRM'.

To find out more, visit the website at: www.nrmconferencewa2008.com.au

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Underground orchid

between them. So apart from looking at similar habitat around Corrigin and Munglinup there may also be suitable habitat between these two areas near places like Kulin, Lake Grace or Pingrup for example.

You can contact me on (08) 98819200 or by email: marie.strelein@dec.wa.gov.au

Marie Strelein is Conservation Officer (Flora) at DEC Narrogin.

Scraping the soil away reveals that there are two plants, with pinkish bracts enclosing the flowers.

Funding acknowledgement: On-ground recovery actions for the underground orchid and some assistance to the current research projects in the Corrigin-Babakin area are delivered with investment from the Australian and Western Australian governments through the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust as part of the Avon Catchment Council's 'Back from the Edge' project.