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Western Wildlife

LAND FOR WILDLIFE

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GNAMMAS AND THEIR AQUATIC LIFE

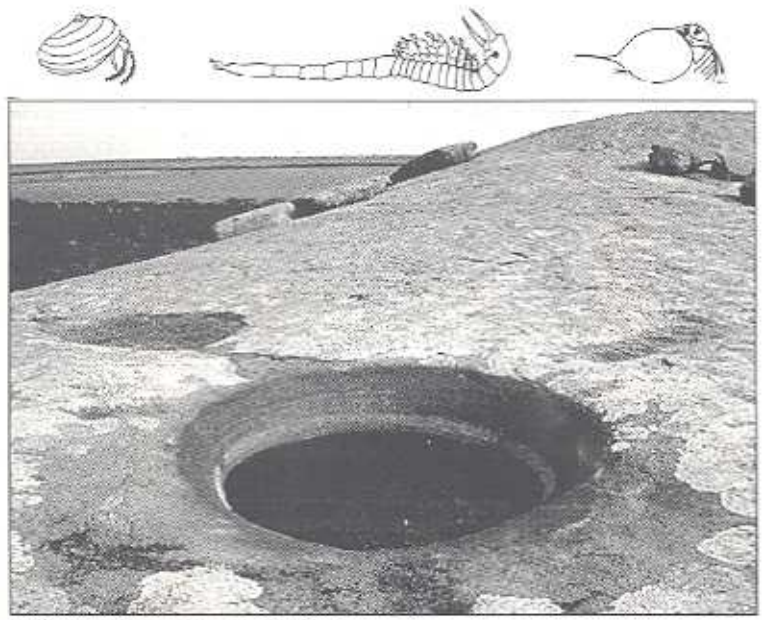
by Ian Bayly

"GNAMMA" (or "namma") is a very distinctively Australian word, derived from the Western Desert group of Aboriginal languages, which refers to a rock-hole or more especially a rock-hole capable of holding water. In written form, the word first appeared in a list of Aboriginal words published in a pamphlet written by George Moore, a Western Australian lawyer, in 1842. The word was used commonly in a number of travelogues written at the end of the nineteenth century. For example, David Carnegie in his well known book, "Spinifex and Sand" (1898), has a whole chapter devoted to "namma-holes" and "soaks". Although widely used, the term "gnamma-hole" is incorrect; the word "gnamma" by itself means "a rock-hole", so why say "a rock-hole -hole"?!

Gnammas are formed very slowly over long periods through the enlargement by chemical weathering of what initially may be only a cup-size depression. All that is necessary for this process is water and carbonic acid which is formed when carbon dioxide dissolves in the water. However, humic acids derived from lichens and mosses may have an additive effect. One ancient Roman scholar formulated the following paradox: "What is harder than rock, or softer than water? Yet soft water hollows out hard rock." The ability of slightly acidic water to slowly dissolve a wide variety of solid materials resolves this paradox. Accordingly, "solution pit", an alternative for "gnamma", used by some overseas geologists, is a very appropriate and enlightening term.

Gnammas are found commonly, but not exclusively, on granite outcrops. They may be found on the top of most of the hundreds of domed granite hills that occur in the southern regions of Western Australia where the slope is less than 20 degrees. There are several different kinds of gnammas but the most common variety is the flat-floored pan.

Pans are usually irregular in outline, have a small depth to surface area and are formed where the granite has horizontal planes of weakness. A less common type of gnamma is the hemispherically-shaped pit (see pic). Pits are typically circular or ovoid in plan, have a large depth to surface area ratio, and develop in granite that is quite solid and lacks planes of weakness. Types of gnamma other than the pan and pit are also recognised.



A pit-gnamma. Photo Ian Bayly

Flooded gnammas in Western Australia provide habitat for a limited number of plants and a wide variety of invertebrate animals. In 1990, I sampled 36 flooded gnammas distributed between 17 different granite outcrops in Western Australia and recorded almost 90 species of invertebrate. Many of these animals are less than 2 mm long and are observable with the naked eye only with some difficulty - a hand-lens helps. A bright red

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EDITORIAL

Greetings everyone!

This winter edition of Western Wildlife contains a number of articles with a 'wet' theme. Good rains will have filled the gnammas, creeks and wetlands, and provided abundant feeding grounds for water birds and aquatic animals. Frogs will be having a great season! Unfortunately, so will pests and diseases, and land managers need to take care to encourage the good fungi and discourage the bad.

Wetland management is a very specialised skill, and one article raises concern about fire actually burning peatland soil. Drains, those artificial creeklines, need management too if they are to function efficiently, and Emma discusses how some ecological functioning can be brought back to them.

But when we planned this issue, we never dreamt that some people could be having too much of a good thing ..... our deepest sympathy to everyone in northern areas who have watched their land go under water twice in eight weeks ..... and the second time with the crop in place ..... You have our good wishes for the best possible remainder of the year. If there is anything we can help with, please get in touch.

On a more pleasant note, several *Land for Wildlifers* have reported interesting events on their properties - it seems that there is still some fascinating wildlife around, even relatively close to the city. Remember, we may be able to identify things from a clear photo.

Welcome to Anne Rick, the new *Land for Wildlife* Officer based at Newdegate, we hope you will enjoy working with us.

Penny Hussey

Kent - Lake Grace - Kulin - Kondinin

Land for Wildlife now has a Field Officer working specifically in these Shires. Anne Rick (neé Coates) is a botanist and one half of a family farm partnership – well qualified to help with both vegetation management and revegetation.
She can be contacted at the Newdegate Telecentre, phone 9871 1792.
Why not give her a ring to say Hi!?

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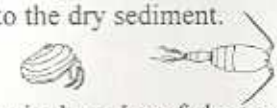
copepod (a micro-crustacean about 1.5 mm long) is one of the most common animals in these rock pools.

However, there is no difficulty in observing some of these animals. Among the crustaceans, the delicate, whitish fairy shrimps reach lengths of up to 15 mm, and the darker clam shrimps (primitive crustaceans with a bivalve jacket or carapace resembling a small mussel) may be 10-20 mm long. It is not uncommon to see copulating pairs of clam shrimps swimming around in a gnamma. Among the insects, diving beetles, back-swimmers and water-boatmen are all readily observable. Most of these insects are predators feeding on crustaceans.

On the vertebrate side of things, the tadpoles of some frogs may occur in gnammas, but the main breeding sites of frogs such as *Crinia pseudinsignifera* and *Pseudophryne guentheri* are the run-off waters below the main region of gnammas.

Where are all the animals when the gnamma is dry? Most of them, the "stayers", are still there but in the form of microscopic resting eggs. These minute eggs are capable of withstanding desiccation and high temperatures during the dry summer period. With the arrival of winter rains, development of these resting eggs proceeds rapidly and the adult form of the animal may be attained in as little time as 2 weeks. All of the crustaceans - the fairy shrimps, the clam shrimps, the copepods and the ostracods (a second group of crustaceans, smaller than clam shrimps, with a bivalve jacket) - are stayers, tolerating the dry period in the form of microscopic resting eggs embedded in the sediment or dust at the bottom of the gnamma. A second group on invertebrates (insects) are the "flyers". These avoid the dry period altogether by flying to permanent waters before the rock-pools dry up. Another group of insects (the midges), although capable of flight in the adult form, survive the dry period in the form of dormant larvae buried in the dry bottom sediments. Some of these larvae may become active immediately after the addition of water to the dry sediment.



A limited number of plants grow on the sediments accumulated at the bottom of gnammas. First are the quillworts, *Isoetes*, which are small sized descendants of the larger, ancient clubmosses. Several species of *Isoetes* occur in Western Australia including six endemics. A second common plant is the mud-mat, *Glossostigma*, which is readily recognised by its spoon-shaped leaves. This small flowering plant may occur in gnammas alone or interspersed with *Isoetes*. Six species (including three endemics) of *Glossostigma* have been recorded from Australian gnammas. Several species of *Myriophyllum* (water milfoil) occur in Australian gnammas and two or three species endemic to Western Australia have extremely limited distributions. One Western Australian species of *Myriophyllum* is known from only three gnammas!

Ian Bayly is a freshwater biologist, an Honorary Research Associate with Monash University, Melbourne and a Victorian Land for Wildlifer.

FAUNA

SOUTHWESTERN FROGS – FROM ANCIENT PAST TO UNCERTAIN FUTURE

by Ken Aplin

A most unfrog-like frog

THE early colonists at the Swan River Colony sent a great many interesting biological specimens back to England for study. But few were quite as peculiar as what came to be known as *Myobatrachus gouldii*, the turtle frog. This short-limbed, fat-bodied frog has dry, rubbery skin and a rounded head with a permanent, enigmatic smile. Only a century later did scientists uncover the mystery behind the smile – rather than laying its eggs in water for tadpoles to hatch, the eggs are placed in a breeding chamber deep below ground where they hatch after several months, as fully formed little turtle froglets. All in all, a most unfrog-like frog!

A frog fauna all of its own

The turtle frog may be the most peculiar of the southwestern frogs, but is certainly not the only one of scientific or conservation interest – far from it! As a matter of fact, every single southwestern frog species is endemic to this region – meaning that they occur nowhere else in Australia.

Several southwestern frogs have close relatives in Eastern Australia, for example the vociferous motorbike frog, *Litoria moorei*, which is a close relative of the threatened green and gold bell frog, *Litoria aurea*, recently made famous by its occurrence at the Homebush Sydney Olympic site. These species probably separated from a common stock across southern Australia only as recently as 1-2 million years ago.

Other southwestern frogs, including the turtle frog and its relative the sandhill frog, *Arenophryne rotunda*, are without close relatives in other parts of Australia. The ancestor of these species was most likely cut off from the rest of Australia by the first phase of drying out of inland Australia, perhaps as much as 10-15 million years ago.

The enigmatic smile of the turtle frog. (Sincere apologies to Leonardo!)

A year-round cycle of breeding

The yearly cycle of frog activity in the southwest is determined largely by the pattern of rainfall. For many species, the year begins with the first heavy autumn rains. Around Perth, thousands of male moaning frogs, *Heleioporus eyrei*, can be seen at this time moving towards the seasonal wetlands, where they will toil to excavate breeding burrows in the still-dry soil. The males' incessant, mournful wail, issued from the mouth of the burrow, is evidently appealing enough to females of the species, as many will enter burrows to lay their egg mass. A month or so later, as the water level rises in response to increasingly regular rains, hundreds of thousands of moaning frog tadpoles are flushed into the swamps and streams to begin the next phase of their danger-stricken existence. Most will be eaten by water birds, turtles and other aquatic predators – very few survive to enter the next generation.

The colder months of winter trigger breeding activity in various other species including the tiny brown froglet, *Crinia pseudinsignifera*, and Glauert's or clicking froglet, *Crinia glauerti*, which occur in huge numbers wherever the ground becomes waterlogged. In the Darling Range, Lea's frog, *Geocrinia leai*, climbs low shrubs and reeds to lay its eggs suspended in jelly, from which tadpoles will later fall like raindrops into the stream below.

Late winter and spring bring a suite of new sounds to our busy southwestern wetlands. The explosive 'bonk' of individual male banjo frogs, *Limnodynastes dorsalis*, can be heard up to a km from the calling site – a very effective long-distance advertisement! In contrast, the harsh grating call of the male slender tree frog, *Litoria adelaidensis*, is usually lost to our ears, at least within the deafening screech that emerges from densely populated reed beds.

Last to begin their reproductive run around Perth are the motorbike frogs, which continue to call and lay their eggs right through the summer months. Many tadpoles of this species perish as shallow pools dry up completely – but with 3000 eggs per clutch, they can afford to lose a few!

Elsewhere in the southwest, late spring and early summer see the breeding of various forest frogs including the threatened white- and yellow-bellied frogs, *Geocrinia alba* and *G. vitellina*, and the recently-discovered sunset frog, *Spicospina flammocaerulea*. Unlike most of our other southwestern frogs, these forest dwellers are highly sedentary,

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probably living out their entire lives within a single swamp or along a single section of stream.

A multitude of threats – and an uncertain future

Frogs are declining worldwide and the southwest is no exception. Here, as in many other parts of the world, frogs face a multitude of threats including land clearance, environmental pollution and disease.

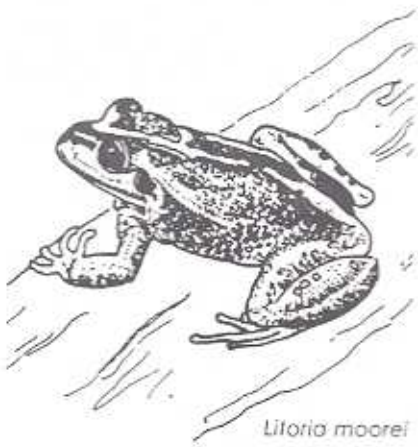
Land clearance has been the single largest cause of frog decline in southwest WA. Over the last 50 years, vast areas of natural vegetation have been cleared for agricultural, pastoral and suburban use. In the metropolitan area, this process continues today, with many of the smaller remnant bushlands and seasonal wetlands still falling prey to new housing or commercial developments. The fact that many local frogs spend a good part of each year foraging away from wetlands has not been widely appreciated.

Long-term residents around many of our larger metropolitan wetlands have noted a major reduction in the frog chorus today as compared with 20 or even 10 years ago. This decline in frog numbers in protected breeding sites is worrying, and may be due to increased domestic use of garden products such as herbicides, pesticides and soil-improvement products such as wetting agents. Laboratory tests on local frogs have shown that some of these products can be harmful to frogs and tadpoles, but the impact on wild populations remains unstudied.

Until recently, frogs living in our major conservation areas such as National Parks and Nature Reserves seemed to be protected against all of these 'human-made' problems. However, late in 1998 we learned of a new peril facing southwestern frogs – the arrival in WA of the deadly amphibian fungal disease.

The amphibian chytrid fungus was only recently identified as a significant cause of frog decline and extinction in both Australia and Central America. Evidence gathered so far suggests that it is an exotic disease, probably originating from a third country, and that it was first introduced into southeastern Queensland about 10-15 years ago. From there it appears to have spread both north and south, resulting in the decline and/or extinction of many species of frogs. Some species appear to be more susceptible to the disease than others, but it is likely that all species can catch and transmit the fungus. The fungus is probably passed by direct animal contact and by contact with infested water. The fungal spore is not resistant to drying and so cannot be dispersed by wind.

In WA, the fungus has so far been identified at various localities around Perth, and at widely scattered towns in the southern forests. As yet, we do not know whether these represent spot outbreaks or chance sampling points in a broadly distributed epidemic. Similarly, we do not yet know how many of our local species will be especially vulnerable to the disease. A great deal of research is yet needed to find answers to these and other vital questions.



Litoria moorei

What can we do to help?

Everyone can help protect and conserve frogs. The first step is to learn more about your local frogs – learn their names, learn to recognise their calls, and learn something about their feeding and breeding habits. The next step – and this often seems to grow naturally from a little knowledge – is to start thinking about ways in which we can make our own living environment more 'frog-friendly'.

In the metropolitan area, the key to building a 'frog-friendly' world lies in our own backyards. Frogs can be encouraged to repopulate large areas of the suburban environment by making only a few small changes in the way we design and manage our gardens:

- allow leaf litter to build up under trees and shrubs to help retain moisture and to encourage invertebrate life (= frog food)
- try to use the minimal amount of chemical sprays and additives
- add rock or logs to garden beds to provide shelter from predators and the summer heat
- think about installing a small garden pond where frogs might be able to breed.

In country areas, landholders should be encouraged and assisted to protect small natural wetlands such as seepages and areas of seasonally waterlogged soil, preferably with small patches of adjoining dense vegetation where frogs can forage and shelter outside of the breeding season. As a general principle, a patchwork of small remnant wetlands and bushlands are probably more effective in the long term for frog conservation, compared with a few large wetland reserves.

But is all of this futile in the face of the fungal threat? I think not.

Useful lessons can be taken from our own history. As a species, humans have suffered and survived

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innumerable epidemics of infectious disease, most notable several outbreaks of that most devastating of all diseases, the Black Death or Plague. In general, these epidemics have had their greatest impact in major cities and towns, where on-going transmission of diseases is guaranteed. Far fewer deaths have occurred in rural areas, where human population is widely dispersed and personal contact less frequent. In these latter cases, an infectious disease will often just pass by, or else burn itself out with only just a few casualties.

Extending this model to frogs, I believe that the fungus will probably have its greatest impact in large breeding populations, such as those found around the major wetland reserves. Less impact may be observed in areas that contain large numbers of sheltering and breeding sites, some of which may well remain free of infection or else recover soon after a wave of infection.

Summary

Frogs of the southwest have survived in a changing world for millions of years. Since European settlement, they have undergone large scale declines, caused mainly by land clearance and urban growth. With the recent introduction of the deadly amphibian fungus to WA, southwestern frogs may be facing their greatest challenge yet.

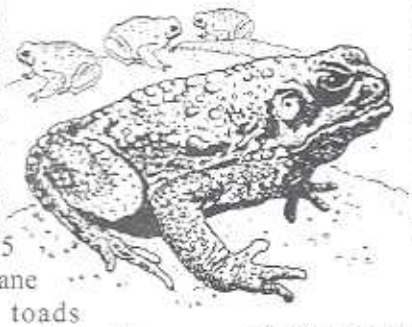
Community action is needed to help frogs overcome this new threat. All we may need to do is to make some small changes to how we live.

Ken Aplin is Curator of Amphibians at the WA Museum. He also coordinates the 'Frogwatch' programme. If you would like to know more, including obtaining a tape to identify frogs by their calls, contact him on 08 9427 2700.

Cane Toad - a potential threat in WA.

By Marion Massam

THE cane toad (*Bufo marinus*) is native to South and Central America, but has taken up residency in eastern Australia following its introduction to Queensland in 1935 to control sugar cane beetles. The toads multiplied and spread rapidly, preferring to eat many beneficial insects like bees instead of the cane beetles.



Like other amphibians, cane toads deter predators by producing a toxic substance from glands located behind the head. The liquid contains a compound called bufotenine, which is similar to the neurotransmitter serotonin, and also occurs in certain toadstools and plants. Animals which consume toads soon die as a result of the poison.

Cane toads currently occur over 50 per cent of Queensland and much of northern New South Wales and are spreading rapidly in the Northern Territory, towards Katherine. It is predicted they could eventually spread over most of the coastal areas of Australia. They pose a major threat to the Kimberley wetlands.

Toads eat whatever is available and consume any animal they can swallow. They are often found eating dog and cat food. It is thought that the toads out compete native amphibians possibly by competing for food, poisoning or consuming their rivals.

Cane toads are declared pests in Western Australia. They cannot be imported or kept in the State. Toads have been found in WA during inspections of imported fresh fruit, vegetables and nursery plants originating in the eastern states. If you see an unusual toad or frog, take note of its main features (see below) and contact Agriculture Western Australia on 08 9368 3333.

Profile of the Cane Toad

- Up to 23 cm in length and 1 kg in weight. Heavily built with short legs, no webs between toes and rough warty skin. Large poison glands are found behind the head.
- Found in warm temperate to semi-arid climates, abundant in the wet and seasonally dry tropics. Can survive dry conditions.
- Female toads can produce 8 000 to 50 000 eggs in a clutch. They can breed at least twice a year and normally lay their eggs in slow moving freshwater streams and dams.
- Domestic pets and native animals can die after eating or biting toads. Native species of reptiles (e.g. goannas) and mammals (e.g. chuditch) are also at risk. The eggs and tadpoles of toads are also poisonous. Toads represent an economic threat to apiarists as they consume bees.
- Biological control is probably the only practical means of limiting the spread or reducing the number of toads/ Research is currently being undertaken by the CSIRO.

Marion Massam works at AgWA's Vertebrate Pest Research Station, Forrestfield. She can be contacted on 9366 2301.

REVEGETATION

FUNGI WORK FOR HEALTHY TREES, SHRUBS AND SOIL 24 HOURS A DAY WHEATBELT WOODLANDS ARE RICH IN FUNGI

by Inez Tommerup and Neale Boucher

FUNGI are important to soil nutrient cycling processes. They need nurturing in remnant vegetation and re-establishing on farm land. Less than 1% re-establish in revegetation on badly degraded land or farm land. When we put the plants back we should also be putting the fungi back.

Fungi are the ties that bind many woody vegetation nutrient cycling processes together.

Fungi are visible and invisible members of woodland vegetation

Wheatbelt woodlands are rich in fungi. These woodlands have more species of fungi than plants. Fungi are often hidden from view but they are actively growing in soil, on roots and in litter. Fruitbodies are the easily-visible signs that fungi are present. Mushrooms, toadstools, puffballs, brackets, earth stars, horse-hoof, coral, truffles, morels and car-sized giant salmon gum fungus are all fungal fruiting bodies.

Look in woody vegetation litter. All the white and grey mould is fungi actively growing. Mould is like the body of the fungus and fruit bodies with their spores are like the flowers and seeds on plants. Visible mould is masses of fine threads. When mould has a few threads in the strands it is invisible to the naked eye but it is still present and is still doing its work for soil and plant community health.

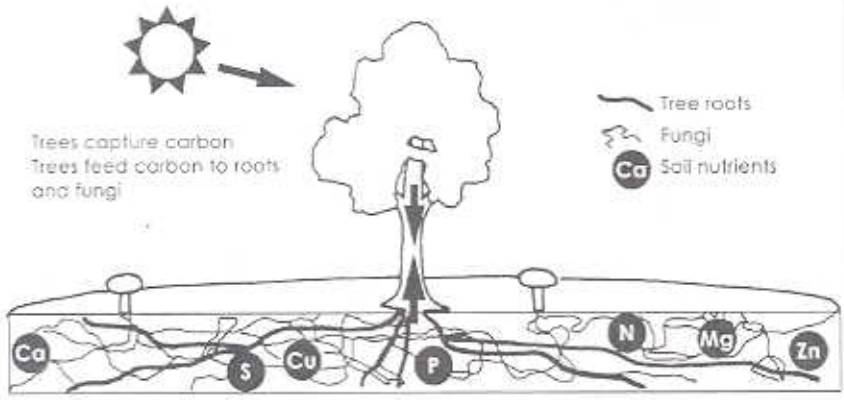
Fungi feed plants

Fine threads form symbiotic associations with living roots and act like an extra root system. Fungi capture nutrients in the soil often distant from roots. Fungi transport nutrients to roots and make them available to the plants. In return, plants make sugars (carbohydrates) available to fungi. They help capture scarce nutrients like phosphorous and transport them to plants.

Fungi decompose woody litter and leaves to make soil organic matter

Without fungi we would be buried in litter. Fine fungal threads decompose woody material making nutrients available to plants and organic matter available to soil.

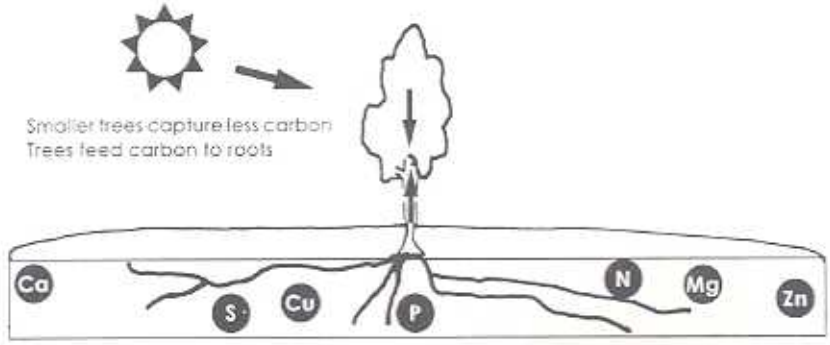
Fungi help to retain soil nutrients and sustain ecosystems



Fungi and tree roots capture nutrients
Fungi feed nutrients to trees

Fungi capture nutrients from soil far out beyond roots
Fungi distribute carbon into soil far out beyond roots

Without key fungi, degraded soil loses nutrients and ecosystems decline



Tree roots capture only some nutrients
If key fungi absent, nutrients are not fed to trees and are lost out of reach of trees

If key fungi absent, nutrients are not captured from soil far out beyond roots
If key fungi absent, carbon is not distributed into soil far out beyond roots

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REVEGETATION

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Fungi bind soil particles and help soil structure

Fungi associated with roots and fungi decomposing litter bind soil particles and give soil structure. Fungi are very important contributors to coarse soil structure and soil organic matter. Fungi feed bacteria on the surfaces of the threads and the bacteria help to form fine soil structure.

Fungi capture nutrients from soil and help prevent leaching

Fungi form networks through soil deep in the profile near and distant from roots. The network throughout the soil captures nutrients, helping to prevent leaching.

Fungi are food for small mammals

Fungi have high value as mineral nutrients and energy for small mammals like bandicoots and woylies. The rare and endangered potoroo on the south coast has mostly fungal fruitbodies as its diet. To re-establish animals like woylies in the Wheatbelt in the future, we need to re-establish their fungal food with the revegetation.

Fungi are food for soil fauna

Fungi are eaten by myriads of small soil animals. These animals are important to soil organic matter and to the food web which feeds larger animals and birds.

Large trees and dense shrublands grow in infertile soils of the WA agricultural regions. How do the plants manage without fertiliser applications?

Fungi help the tight nutrient cycling processes, minimising nutrient losses and making captured nutrients available to plants and animals.

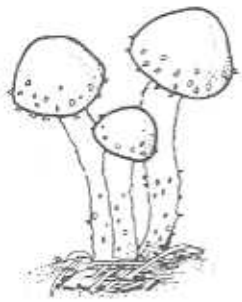
What happens if fungi are not present in revegetation soils?

Absence of fungi in revegetation soils puts the ecosystems at risk of

(i) rundown in plant-available nutrients in the soil,
(ii) loss of plant vigour,
(iii) loss of soil quality, and
(iv) inadequate food supply for some small mammals.

Inez Tommerup and Neale Boucher are doing experimental work in the Wheatbelt to study how best to put the appropriate fungi into revegetation areas. They can be contacted at CSIRO Forestry and Forest Products, CCMAR Lab., Perth. (08) 9333 6674.

CHECK OUT YOUR FUNGI!



Bushland with lots of different fungi, is healthy bushland – how many can YOU find in your patch?

Inez reports that even a moderate quality, heavily-grazed York gum remnant still has 50 species of fungi. But revegetated corridors, in a paddock next door, has only 5 ..... Clearly, this could begin to explain the poor growth of some reveg.

Once you've found the fungi, a closeup photo should be OK for general identification. With toadstools, place one on its side so that underneath the cap can be seen in the pic.

NB: This makes a great school project!

BUSH DETECTIVE

Yeuk– squidge – cuckoo-spit!

Ever inadvertantly put your hand into a squidgy mass of frothy stuff on a stem or leaf? Popularly called 'cuckoo-spit', this is actually the protective case over a spittal-bug or froghopper. Under the spit, the body of the insect nymph can be seen, sucking the plant sap. The slightly sticky 'spit' is produced from the rear of the body and by movement of the tail, an abdominal bellows pumps air into the spit to produce bubbles. As these are formed, the insects moves them until its whole body is covered. It helps to insulate them from temperature changes and to deter predators. The adult insects are winged, but still suck sap.

PRACTICALITIES

WETLANDS IN SOUTH-WESTERN AUSTRALIA AND THEIR ORGANIC MATERIAL – TO BURN OR NOT TO BURN?

by Pierre Horwitz

IF you live in the wetter areas of the south-west, you may have a peat swamp on your property. Peat swamps are comparatively rare in WA, because their formation depends on accumulation of organic material under cool, wet, and usually stagnant conditions. The water becomes anoxic (no oxygen left) near the sediment, so the breakdown of plant material is dramatically slowed, and peat accumulates. These unusual sites support specialised communities of plants and animals which are rare elsewhere. The peat itself is a record of the plants which grew in or alongside the wetland swamp for thousands of years. A careful examination might tell you what grew on your block 4-5000 years ago!

Why are peatlands special and how should they be managed?

A swamp, lake or peatland is an area where water accumulates faster than its runs off. It may be seasonally dry or permanently wet but, because the water does not flow away, the remains of plants and animals accumulate as organic carbon. If the carbon is in a dissolved form it stains the water like tannin stains tea. Otherwise, it accumulates as partly decomposed material in the soil.

Wetlands vary in the amount of organic material they contain, from those with very little, for example a pool of water in a mobile sand dune, to a peatland with darkly-stained acidic water and deep, organic-rich soils. Together with other attributes such as the amount of other nutrients (including nitrogen and phosphorous), the amount of salt, the type of mineral soil present, the vegetation, and so on, this gives each wetland its individual character.

Since organic material is predominantly carbon, and carbon burns, fire is an environmental factor which must be considered. If we ask the question "Can fire influence the ecological functioning of a wetland?" the answer is "Yes", because it can change the nature of the wetland by altering the nature of the carbon in it.

If fire occurs in or near a wetland, the plant material (ie organic matter) produced since the area was last burnt will be lost to the atmosphere, mainly as carbon dioxide or as particulates of carbon. But, in addition, if the peat soil dries out, especially under warm temperatures, it decomposes more rapidly. Finally, if dry peat comes into contact with fire it will burn and, left alone, the fire could smoulder for months and remove structural soil in the process. After the next rain, a pond would form. Undoubtedly, this process has occurred throughout WA's geological history. However nowadays, when we are trying to preserve the remaining peat swamp communities in our fragmented landscape, we need to take care this does not happen.

There are four axioms for fire management in wetlands:

- organic-rich wetlands should be constantly gaining carbon, not losing it
- organic-rich wetlands should only rarely, or never, become dry because then they would cease to accumulate organic material
- fire should be prevented from entering habitats with organic-rich soils
- wet habitats should be less susceptible to burning anyway.

In short, give your wetland every opportunity to resist fire by mulching!

In WA the climatic region in which these types of soils develop is in the south-western corner, where it is cool and relatively wet and where the rainfall and/or soil moisture levels are least seasonal. Organic-rich soils can develop in coastal ecosystems and in forested ecosystems. Wetlands are very much a part of these ecosystems: along the Swan Coastal Plain from Bunbury to north of Perth; extensive swamp systems from Augusta to Albany; and numerous wetlands dotted throughout forested landscapes. These areas are susceptible to climate change, like increasing temperatures and decreasing rainfall, and also to management fires designed to remove plant material in order to reduce fire hazard.

In some other countries peat fires are a serious concern The major fires in Indonesia in 1998 burnt peat soils in forests, putting vast amounts of smoke into the atmosphere and creating haze problems for surrounding countries. In the past, peat fires have drawn on management resources in Scandinavia, South Africa, Alaska and Russia, to name just a few parts of the world where peatlands occur.

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The inappropriate use of fire which burns peat releases carbon into the atmosphere and this can negate governments' current efforts to minimise the "Greenhouse Effect" by creating carbon "sinks". For whatever reason, it seems much more appropriate to design management strategies which will enable organic carbon to remain and build up in wetlands.

Fire management and your wetland

The key is to keep your wetland accumulating organic material in the soil in its customary fashion. Essentially, if you have an organic-rich wetland, fire suppression is critical. You should give your wetland every opportunity to resist a wildfire by making sure it stays moist during the drier months of the year. One option is to "mulch" your wetland by allowing plant material to accumulate in and around the wetlands, and by not burning to remove this plant material.

If burning is necessary for fire hazard reduction, then only small areas of vegetation should be burnt at any one time, and only when the soil is wet or very damp.

For the full story, read: *"Catastrophic loss of organic carbon from a management fire in a peatland in southwestern Australia"*. 1999. Horwitz, P., Pemberton, M. & Ryder, D. **IN** "Wetlands for the Future" Eds McComb, AJ & Davis JA. Gleneagles Press, Adelaide.

Pierre Horwitz is a senior lecturer at the Centre for Ecosystem Management, Edith Cowan University, Joondalup, WA. His main interests include the freshwater fauna of wetlands and the management of inland waterways. He can be contacted on 08 9400 5558.

LFW NEWS

Year 11 biology students, with teacher Mrs Donna Birch. Photo: R. McElroy

Warwick SHS Bushland

By Robyn McElroy

WARWICK Senior High School students are justly proud of their school bushland – a piece of banksia woodland in remarkably good condition.

In 1997 the school's bushland was registered as *Land for Wildlife* to help preserve this very important corridor for wildlife between Warwick Open Space. A "Friends" group had previously been set up through the school's P&C Assn. because of concern over increasing weed invasion and fire risk. Our aim is to maintain and as much as possible improve the condition of the bushland so that it remains a natural tuart/jarrah/banksia woodland. Our group has been busy hand weeding, removing rubbish, collecting seeds and controlling rabbits - among other things. The fence in the photo was one such project, to deter cyclists from short-cutting through the bush. It was erected with the aid of a grant from the Gordon Reid Foundation for Conservation and funds from the P&C and the school. Another grant – this time from the Minister for the Environment's 'Community Conservation Grants' will pay for a contractor to spray the bush with Fusilade® to control veld grass and wild oats. This is very important, not just for bush regeneration, but to reduce the fire hazard.

On 18th Sept Alinta Gas/Ecoplan/ Australian Trust for Conservation will sponsor a 'Bushland Care Workday', when ATCV volunteers will come to help the Friends group with weeds such as Cape tulip and Paterson's curse, which don't respond to Fusilade®. Would any *Land for Wildlifers* care to join us on that day – you'd be very welcome!

As well as all this, the group with help from Karen Clarke is setting up a herbarium and has produced notes towards preparation of a management plan.

With enthusiasm such as this, Warwick High School bushland will continue to be an important piece of urban bushland and an educational resource for generations to come.

Robyn McElroy is the Coordinator of Friends of Warwick SHS Bushland. She can be contacted on 9342 6840.

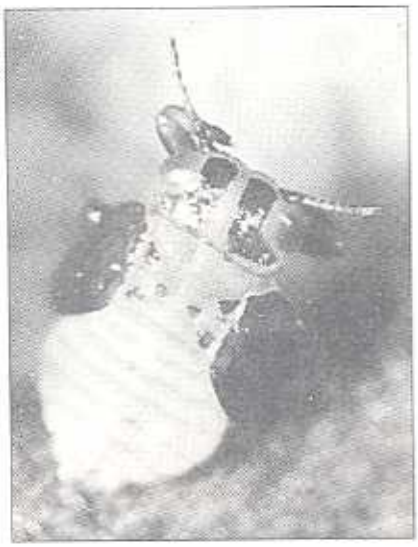
FAUNA

FLAT-TOPPED YATE – WHAT IS RURAL TREE DECLINE?

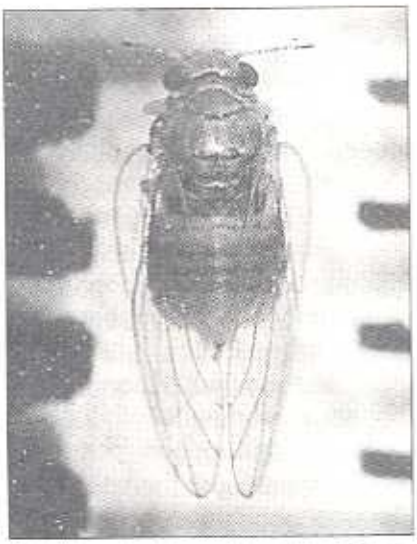
By Janet Farr

FLAT-TOPPED yate (*Eucalyptus occidentalis*) in the Lower Great Southern has been visibly declining for 17 years. The decline is most evident in remnant yate swamps and along creek lines between Tambellup and Jerramungup. The cause of this decline has been attributed to a species of lerp, or more accurately, psyllid, now called *Cardiaspina jerramungae*.

This insect was first discovered at Kebaringup in 1982, when the fire-scorched appearance of flat-topped yate alerted locals to a potential problem. Initially identified as a species found in 1923 near Sydney on grey ironbark, this posed questions on how the insect got to Western Australia. However the possibility of an introduction explained the sudden occurrence of an insect at outbreak levels which until 1980 was unknown in this State. But there was some dispute on the original identification. Psyllids in the genus *Cardiaspina* usually have a limited host range, restricting their host plants to closely related eucalypts. Therefore this insect seemed out of character. Closer scrutiny of the original Sydney specimens compared with Western Australian specimens finally confirmed that the insect on flat-topped yate was in fact a new species. The insect was therefore named *Cardiaspina jerramungae* after the town Jerramungup, meaning place of the flat-topped yate. Now that we knew this insect was a new species, new questions arose. What is the biology of this psyllid? Does its biology compare with existing knowledge of the genus? And, why has there been a dramatic population increase when prior to 1980 this insect was in such low numbers as not to be noticed?



Late nymph with wing buds



Adult female (shows size as about 3mm)

The main preferred hosts of *C. jerramungae* are *E. occidentalis* and *E. platypus* var *heterophylla* (coastal moort) and it has also been found on wandoo. However the greatest damage impact is on *E. occidentalis*. Eggs are laid preferably on mature leaves and are attached to the leaf by a stalk. Newly emerged nymphs crawl over the leaf until they find a suitable feeding site. Whilst feeding, nymphs build a lerp case under which they live. The lerp case starts as a disc and is built up through five nymphal stages into a distinctively shaped protective covering. The finished lerp resembles a sea shell shaped inverted basket with dark bands. The adults are winged and look like mini cicadas. There are three generations a year: two short generations in summer and autumn (Dec - Feb, Feb - May) and one long winter-spring generation (May - Dec).

The general biology and life cycle are comparable with other species of *Cardiaspina* studied in the eastern states of Australia. Some of these species are known to outbreak on their eucalypt hosts causing severe crown damage. These insects are called cyclic outbreakers. This means that every so many years, populations increase dramatically followed by a drop back to population maintenance levels. There is no evidence prior to 1980 to suggest *C. jerramungae* followed the cyclic outbreaking pattern. Fluctuations in an insect's population levels is inevitable. But prior to this time fluctuations in *C. jerramungae* must have been so low as to remain unnoticeable. Therefore for an insect to shift its population dynamics from unnoticeable to around 300 eggs per leaf in peak outbreak times means something has changed.

In Western Australia, widespread replacement of native perennial deep-rooted vegetation with annual shallow-rooted crops and pastures has led to increasing ground water recharge and rising water tables. Thus the surface and ground water hydrology of the entire south-west has fundamentally changed on a scale that is only just being appreciated. Flat-topped yate is salt tolerant, not salt resistant and naturally exists in lower areas of the landscape where salinity problems

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FAUNA

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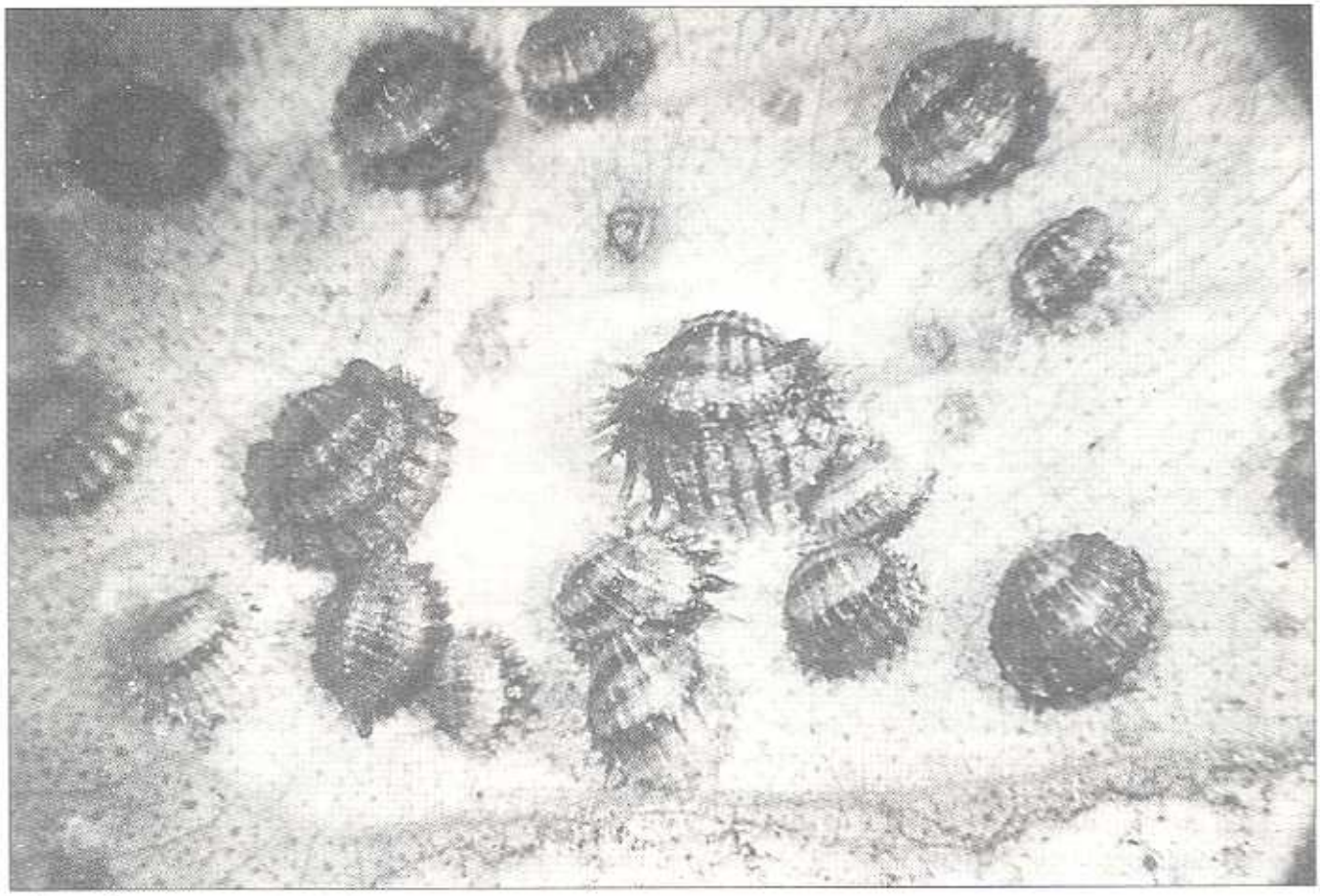


Mixture of lerp cases, mainly late stage

are often first recognised. Furthermore this tree species originally existed in a complex heath and open woodland vegetation system which was highly species diverse. Remnant stands of flat-topped yate are often species poor. Our research has shown that during the initial stages of the outbreak, natural parasitism of *C. jerramungae* was negligible in remnant stands. However within the Fitzgerald National Park, parasitism was as high as 15%. Also in an intensive study area near Cranbrook, survival from egg to adult of the outbreaking psyllid fell from 36% to 0.05% when a flock of striated pardalotes invaded the area. This is an isolated case however, in general parasites and predators have little influence on psyllid populations in the peak of an outbreak. Parasites and predators usually keep an insect population in check within its normal maintenance levels. Populations dramatically fall after most of the preferred food resource is depleted, essentially causing starvation. Following such a decline the trees will reflush with new young leaves. Once these leaves mature the psyllid population will again rise. Thus *C. jerramungae* has now become a cyclic outbreaker, comparable to other outbreaking species in the eastern states. The population dynamics of this insect has now changed such that, even maintenance population levels are far higher than the original pre outbreak level.

The recurring outbreaks of *C. jerramungae* are thus a symptom rather than a cause of decline. The dramatic change in the population dynamics of this insect is one of many symptoms of a drastically altered environment. Agro-forestry schemes, the work of Landcare groups, schemes such as *Land for Wildlife* and recovery plans similar to that devised for Toolibin Lake, are steps being taken to halt the degradation of our environment. Flat-topped yate resistant to *C. jerramungae* has been found. These trees are rare but CALM is investigating the possibility of using seed from such trees to breed resistant stock. The research is in its infancy. But should we be successful, resistant trees could be used for revegetation and reclamation projects in salt affected areas.

Further information
"Lerps Bugs and Gum Leaves" LANDSCOPE, Spring 1992.
"Recovering Lake Toolibin" LANDSCOPE, Spring 1994.

Janet Farr is a Research Scientist, specialising in entomology, at CALM, Manjimup. She can be contacted on 08 9771 7985
All photos by J. Farr.

FLORA

DIEBACK – PLANT PATHOGEN

by Roger Armstrong, Kevin Vear and Frank Podger

SINCE 1921 it has been evident that an increasing number of patches of formerly healthy jarrah forest has become afflicted with a lethal disease now known as "jarrah dieback".

It wasn't until 1964 that the role of the fungal plant pathogen *Phytophthora cinnamomi* as the cause of dieback was established. Since then it has been isolated in a wide variety of vegetation types in the southwest.

P.cinnamomi is a soil-borne fungus of foreign origins. It almost certainly entered Western Australia for the first time on soil around the roots of cultivated plants, shortly after European settlement in 1827. Until the effective implementation by Australia of quarantine regulations over the import of exotic soil and plant products there must have been innumerable introductions at many points of entry around the continent and its redistribution within the country over a period of some 150 years.

P.cinnamomi has now extended its largely unfettered colonisation of the southwest by human movement of infested soils. This epidemic of colonisation has produced a complex mosaic of infested and uninfested areas.

Infested sites are very widely distributed over some 20% or more of the natural vegetation in areas throughout that part of the Southwest Land Division which receives mean annual rainfall in excess of 800mm and occur sporadically at lower rainfall.

Within the 600-800mm rainfall zone the occurrence of *P.cinnamomi* is also widespread but much less extensive. In this zone severe damage to native vegetation is largely confined to water-gaining sites or to years of abnormally high summer rains. In these circumstances localised patches of the vegetation may periodically suffer severe damage with intervals of recovery during dryer periods.

In areas receiving <600mm, dieback due to *P.cinnamomi* is restricted to circumstances where localised hydrological effects, such as the shed from granite bosses or rising ground water tables associated with upslope land clearance in the catchment, cause effective rainfall to substantially exceed the regional patterns.

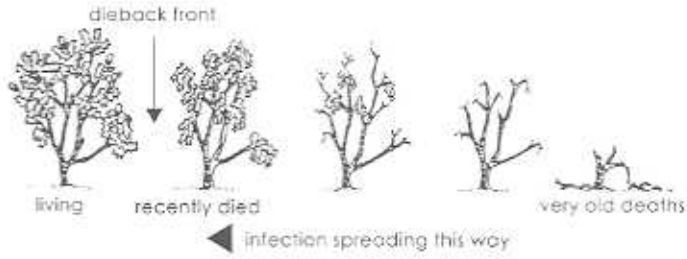
There is no record of *P.cinnamomi* in regions receiving <400mm.

The effect of *P.cinnamomi* upon the health of plant communities, and upon the species in them, varies greatly. In many places, where environmental factors favour the pathogen and plant communities contain many susceptible species, lethal root-disease destroys the structure of many native communities, reduces their floristic diversity, decimates their primary productivity and destroys habitat for dependant native fauna. In other places where environmental factors and susceptibility of the flora do not favour disease development the pathogen causes little damage at all. Unfortunately the extent of susceptible communities in vulnerable environments is much greater than that of communities which occur in environments which are inherently unfavourable to the pathogen.

As landowners with vegetation on your properties that may be susceptible to dieback, you should be aware of some of the basic symptoms of the disease and the risks that need to be managed to minimise the chance of the disease affecting your remnant vegetation.

There are many other organisms and stochastic events that can result in the death of plants. Frost, herbicide drift, insect attack, fire and other fungi are just a few. Determining if the death of plants is associated with *P.cinnamomi* is a specialised task that takes many years of experience to become accomplished at. However, a few simple observations will help you decide if you need help (see table).

An experienced person has knowledge on what species of plants are more susceptible to disease than



Likely to be *P.cinnamomi*	Less likely to be *P.cinnamomi*
More than one species of plant dying.	Only one species of plant dying
In a moisture gaining site	On an upslope well drained soil
Plants have continued to die over time	Borer holes or insect frass evident around plant
Plants do not recover from looking sick	Plants looked sick but some are recovering
All of the plant appears to be dying	Only a small part of the plant is dying

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others and the impact that the pathogen is likely to have on those plants in various environmental situations. Assistance may be available at your local CALM office.

The pathogen can be introduced to your property via infested soil or infected plant material. Common routes for these materials to enter the property are as dirt and mud on machinery, gravel used to surface tracks etc and as infested plant seedling stock. Simple precautions associated with vehicle cleanliness and ensuring that seedlings come from nurseries accredited by the Nursery Industry Assoc. will minimise this risk. The pathogen will also move down hill in soil water. Any infested areas above your remnant in the landscape represent a source of the pathogen that could spread to, and affect your remnant.

Once an area becomes infested the native vegetation may be able to be protected from the ravages of the disease by treating it with a Phosphite solution. This can either be applied by injection into larger trees or as a foliar spray over smaller shrubs. Phosphite is available commercially under a number of product names and enquiries at your local nursery of rural retailer will guide you to the appropriate product.

If you have remnant containing susceptible vegetation, you must be aware that access to this area by dirty machinery, water from infested sites or infested plant material could lead to the infection and death of plant species within the remnant. This will affect the commercial, aesthetic and biodiversity values of your remnant. Constant vigilance and care is required to minimise the risk of introducing *P.cinnamomi.*

All the authors have extensive experience in Phytophthora Dieback management. Roger Armstrong is Senior Environmental Officer at CALM Bunbury, Kevin Vear is Dieback Coordinator at CALM Crawley, and Frank Podger is an Environmental Consultant specialising in plant disease.

IN BRIEF

Jan's Banded Snake

By Robert Huston

Jan's banded snake. Photo: Fredrick Gillings

BRIGHT colours in small animals are usually recognised as warning colours for others to steer away from. Blue-ringed octopus and red-backed spider are well known classic examples where the colour pattern means danger. It was thus with understandable caution that Fredrick Gillings photographed an orange and black banded snake discovered on his bush block in Bindoon. The snake seemed to have danger written all over it.

What Fredrick had photographed was a Jan's banded snake (*Simoselaps bertholdi*) which, to his amazement, is not considered dangerous. The snake's distinctive colour pattern is possibly intended to discourage predators or help conceal it as it moves about hunting for burrowing skinks. Sometines this snake is mistaken for a small tiger snake but, unlike venomous snakes, it strangles its victim much like a python. They prefer the cover of leaf litter, overhanging foliage from small shrubs and the sanctuary found amongst rocks and fallen logs. Their rounded, wedge-shaped snout, small eyes and glossy scales make them well adapted as sand swimmers and burrowers through the leaf litter.

Fredrick's discovery may be a little special, as Jan's banded snake is generally not found in the Darling Range area. It is more commonly seen inhabiting coastal dunes to sandplain woodlands. The photograph is a clever and effective way of recording his find and is documentary evidence of the less obvious wildlife found on the 2 ha property. The find also highlights the value of preserving healthy ground cover to encourage a diverse range of fauna on your *Land for Wildlife.*

Ref: Reptiles and Frogs of the Perth Region (1995) by B. Bush, B. Maryan, R. Browne-Cooper & D. Robinson. Uni WA Press, Perth.

Bob Huston is Land for Wildlife Officer at Mundaring. He can be contacted on 9265 1955.

PRACTICALITIES

LIVING DRAINS

by Emma Bramwell

Drains in general

MOST people are familiar with the network of drains that occur both in and around most urban and rural areas. Recently a friend asked me a question about the relevance of drains, and the importance of vegetation in open drainage channels. She was curious as to why their local city council had cleared all the vegetation from the edges of an open drain behind her property, when she was well aware of the importance of vegetation in reducing water flow and nutrient levels, and providing habitat for wildlife.

Drains are designed to carry and divert about 12% of a year's rainfall from surrounding areas. The spread of urban development has increased both surface run-off and groundwater levels, creating a necessity for drains to prevent water-logging. Within most urban areas the most common drainage system is a closed one, existing as a network of pipes lying below building developments. Open drains are also found in some urban areas, but are more common in rural areas, where they provide much the same function but are exposed at the surface and mostly unlined. Water entering drains is usually diverted to natural drainage channels that eventually flow to the sea, highlighting the importance of waterway management as a component of environmental protection.

Pollutants and nutrients

Depending on the soil type, which affects how quickly nutrients and pollutants filter through, quite often substances that are placed on the soil end up in waterways. This is particularly true in the 'bottomless sand pits' on areas of the Swan Coastal Plain, where almost anything liquid drains through. As a result it is very important for landholders to be aware of this when using fertilisers or disposing of manure, and when planting or clearing vegetation around drains. It is also useful to be aware of what the local authorities are doing around your drains.

Unfortunately many people are not aware of the various substances that often enter drains along with water, and may only be aware of the obvious effects, such as algal blooms. The pollutants most likely to enter waterways include nutrients (mostly nitrogen and phosphorus), toxins (including petroleum products, pesticides and heavy metals such as lead from petrol), pathogens (from animal manures, septic and sewage wastes) and physical pollutants (plastic, oil, sediment), all of which have potential to cause death and disease in plants and animals.

Who's responsible?

Most local councils in the rural Perth area are very much aware of the importance of vegetation along open drainage channels, and subsequently they will clear vegetation only when overflow of drain banks occurs as a result of excessive growth. Drains are usually managed either by local government or the Water Corporation, or jointly managed by both depending on their situation.

Why is native fringing vegetation important?

There are a number of functions provided by native vegetation in and along watercourses. These include the natural removal nutrients, reduction of water flow to allow sediments to settle, reduction of water turbidity, prevention of bank erosion, and provision of shade and habitat for wildlife such as frogs, fish, birds and small mammals.

Introduced species of vegetation may also help to reduce water flow and prevent bank erosion, but offer little in the way of wildlife habitat, and often will grow excessively due to lack of natural pests, and as a result impede the function of the drain.

What can be done to improve a drain?

The most obvious response is to plant suitable species of native vegetation in and along the drain, but not so densely that the plants impede the flow of water. Ideally, a wide corridor (or buffer) of native vegetation would occur for the entire length of a drain. Reeds and sedges such as *Carex* spp., *Baumea* spp., *Isolepis* spp., *Lepidosperma* spp., and *Juncus* spp. are all found in the Perth region, and provide habitats for various invertebrates, frogs and fish. Vegetation along the banks may include small sedges and shrubs, gradually developing into larger shrubs such as the swamp peppermint *Agonis linearifolia*, and trees such as the paperbark *Melaleuca preissiana* further from the bank. Have a look at a nearby natural wetland or river to get some idea of the species of plants that grow there, make a note of the types growing in the water and along the banks, and find a nursery that can supply the appropriate species. Alternatively, planting a dense corridor of a mixture of locally native shrubs and trees on properties adjacent to drains will help to reduce groundwater and nutrient levels, and provide shelter for stock.

The actual physical appearance of a drain can be altered to make it more useful than just as a drain.

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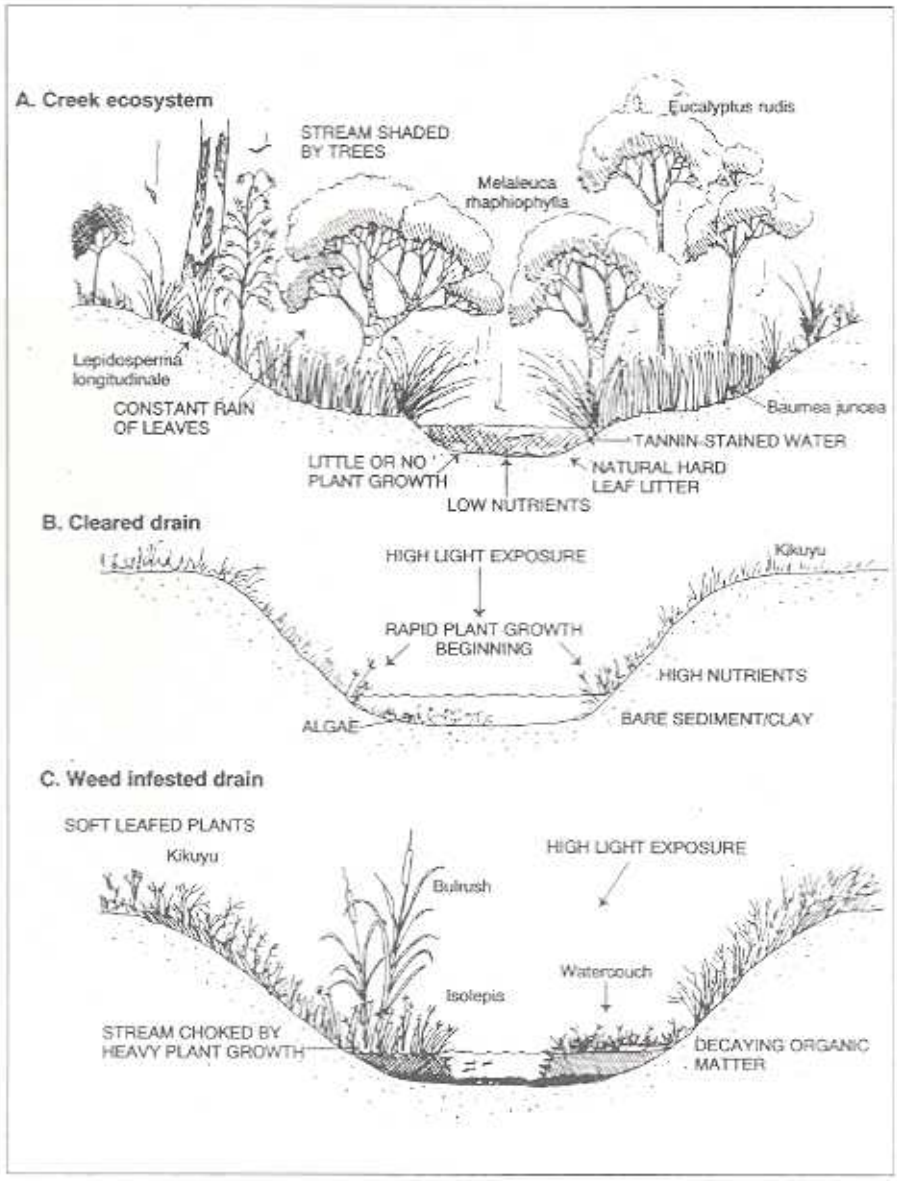
Where a drain rounds a corner, riffles may be created to prevent bank erosion and provide habitat for wildlife. Riffles may simply be a few large rocks deposited down the outside bank, or a log placed across the flow of water, but not impeding it. By slowing the flow of water, sediments and nutrients are able to settle, thereby reducing turbidity or potential eutrophication. The edges of a drain can be modified to have sloping banks rather than vertical walls, which will allow wildlife access to the water without becoming trapped. Sloping banks also provide shallow areas as habitats for frogs, gilgies and wading birds.

Before embarking on any project to improve the status of a drain, it is most important that contact be made with the relevant managing authority (the best place to start is the local council's Environmental Officer) to gain advice and permission.

Further information

The "Water Facts" series of information sheets produced by the Water and Rivers Commission are a good reference source, and contain information on various issues relating to waterway management and function. They are available on request from the Water and Rivers Commission, phone (08) 9278 0300. In one leaflet called 'Living Streams' (Water and Rivers Commission, 1998), several suggestions are made for the creation of habitats from open drainage channels.



The environment of the natural creek ecosystem (A) compared to a cleared drain (B) and a weed infested drain (C)

Diagram courtesy of Luke Pen and Marg Scott from "Stream Foreshore Assessment in Farming Areas"

In conclusion

The plant communities found in and around a waterway depend on several factors, including nutrient levels, soil type, and water regime. Over time, the clearing of an open drain may cause it to become deeper and wider as water flows faster, and more susceptible to invasion by fast growing introduced weed species. However while fringing vegetation is highly important, it cannot be allowed to impede the function of a drain, and therefore from time to time it might be carefully reduced by the managing authority to prevent a damming effect.

This article was made available for publication courtesy of The Green Horse (number 5), a Hoofbeat Publication, Dec/Jan 1996, and edited for Western Wildlife by the author.

Emma Bramwell is Land for Wildlife *Administration Officer at CALM Wildlife Branch, Como. She is contactable by phone on (08) 9334 0427.*

FAUNA

BIRD NESTING BOXES

Carole Sutton

IN the early weeks of 1998 I asked *Land for Wildlife* if they had any information on bird nesting boxes. We were duly sent a set of drawings (see Wildlife Notes No 3 January 1997) from which my husband, Bill, made seven boxes. He chose rough sawn untreated pine and made them with entrance holes varying between 8cm to 16cm and styled three with plain fronts (which we called A's) and four with a hollow log front entrance (B's), in the hope of attracting different species of birds. He notched the front inside as required and spread the bases with mulched jarrah bark for nesting material. To these home-made units we added three natural hollow logs of suitable size and shape.

Once finished, all ten were fastened to the boughs of trees, mainly Tasmanian blue gums and lemon scented gums on our one-hectare block in the foothills. Amongst the larger birds in the area kookaburra, black cockatoo (red and white tail) galah, redcap, Port Lincoln ringneck, heron, egret, ibis, magpie, ravens, butcher birds, numerous ducks and doves were amongst those we had been able to identify, and some of these we knew nested in holes in trees.

Now, with ten homes open and ready for inspection we sat back to await results. It was July before we got our first prospective clients. A pair of Port Lincoln ringnecks (28's) showed interest one of the plain fronted boxes, which we named A3 for easy identification. Surprisingly it was one nearest the house and the greatest area of human activity. The box was four metres from the ground and proved very popular.

Another pair of 28's investigated it, followed shortly by a pair of maned wood ducks. The MWDs spent half an hour examining the nest box both inside and out, from roof to its underside. They returned twice more that day, then vanished. A fortnight later the 28's returned for a further inspection, a second pair alighted in the same tree but were chased off after a short noisy argument. The victorious 28's returned and were about to claim their house when a maned wood duck swooped and flew straight inside the entrance claiming it for herself.

From then on we watched the activity of both the male and female ducks as daily they returned to their nest site. For the first few days the male sat on the roof of the box, leaned over and chatted to his partner. Sometimes he shared the box with her, on several occasions we saw both ducks leave the box one after the other, though it did not appear to be large enough to accommodate both of these large breed of duck. Even the entrance seemed a tight squeeze. Often when she was sitting the female would show herself by putting her head out of the hole, or perching on its rim.

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IN BRIEF

Quenda "Safe Houses"

by Robert Huston

THE old saying "necessity is the mother of invention" also holds true for *innovation*. Sylvia Garlick of Sawyer's Valley has discovered an innovative way of providing artificial shelter for young quendas living around her home. Sylvia feared that they were quite vulnerable to attack from cats, dogs and foxes, so, in an effort to provide them with places to escape, she located little safe havens around her house for them to retreat into.

Sylvia's quenda safe houses are simply tunnels made out of lengths of PVC piping which she places around her native garden. The diameter of the pipe can range from 80mm to 100mm, and can vary in length to about 2m or more. The length of the tunnel must be long enough so that the quendas are a good arm's length from prying predators. Sylvia suggests placing the tunnels on the surface near bushes and securing them firmly to the ground with rocks and logs so that they will not move about. She then covers the pipe with leaf mulch, leaving the openings nice and clear. The entrances to the tunnels may need to be checked now and again to keep them clear of debris.

A straight length of pipe is not the only design as "L" or "Y" shaped tunnels may also prove effective. In order to encourage the quendas to become familiar with the tunnels, food parcels may be placed in them. Sylvia has also considered moving the safe havens every few weeks, so that cats and other predators may not get the idea of setting up ambushes at the entrances. It is clear that this novel idea still has room for innovative thought.

The very successful fox baiting program implemented by CALM has led to increased numbers of quendas moving into household gardens in the outer metropolitan area. So, if we haven't got natural hollow logs we can recycle old drainpipes and so help wildlife to survive on our properties. Sylvia's creative action is an invitation for *Land for Wildlifers* to conceive other practical ideas to assist the return of wildlife to their *Land for Wildlife* area.

Ref: Encouraging Quendas - Wildlife Note No 5.

Robert Huston is LFW Officer at Mundaring, contact: 9295 1955.

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By September the ducks in A3 (the one nearest the house) had left with their family, unfortunately we missed this event. They had been so evident that when we had no sighting of them for two days we checked the box and found the remains of at least three hatched eggs and two infertile. We removed all the debris and to our surprise another pair of maned wood ducks moved in the next day.

The birds appeared to be queuing up for homes. As each box was vacated it was taken over by another pair.

A3 housed 2 pairs of maned wood ducks and one of 28's

A1 - one pair MWD's

B2 - 2 pairs of 28's and one pair MWD

B3 - 2 pairs of 28's

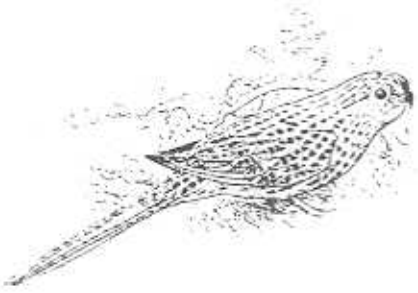
Out of a total of ten nesting sites, only four were used, but used repeatedly to raise nine families. The remaining boxes stayed empty over the whole period. The three hollow logs were more inaccessible and could not be observed clearly. Kookaburras constantly cavorted around one of the relevant trees, but we were unable to confirm use of these partricular sites without causing possible interference.

After carefully comparing the most popular ones, A3, and B2 with those not used, we came to the conclusion that their popularity rested on having a small branch in front of them, where the birds could perch and peer inside. Also the entrance holes of the three unused boxes were larger than the 12cm of the popular ones.

The experiment has shown us which birds on our patch need homes, and it seems they need more of them. So, for the coming year we have altered the unused boxes slightly to match the popular A3 and have built on a perch - like a balcony so they too can be peered into - we wait with great interest for the next nesting season!

IN BRIEF

Western Ground Parrot Survey



THE western ground parrot (*Pezoporus wallicus flaviventris*) is a Critically Endangered species. Confined to the dense heathlands of the south coast, clearing for agriculture and unsuitable fire regimes have condensed its range down to just 3 known sites: Cape Arid NP, Fitzgerald River NP and the Waychinicup-Manypeaks area. In 1998, volunteers surveyed the Waychinicup- Manypeaks area to try to determine how many birds were still present.

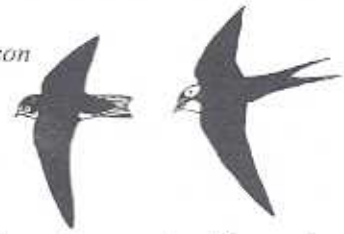
The birds are located by call, as they are difficult to see in the dense low vegetation that they inhabit. They call just after sunrise and just before sunset. Surveying the birds consists of having a line of "Listeners", 200m apart, recording the time and direction of calls. "People became charged with the mystery of the dusk and night hours and the excitement of having heard ground parrots. Even the mosquitoes were forgotten (well, almost)..." says the Birds Australia report on the project. Approximately half of the suitable habitat in the area was surveyed and three sub-populations were located, containing a total of 29 birds.

A "Friends of the Ground Parrot" group has been set up in Albany. If you are interested in being part of future surveys, contact them at CALM, Albany.

For the full story, read "Report on Western Ground Parrot Survey at Waychinicup and Manypeaks". 1999. Birds Australia, WA Group.

Bird Report – Eastern Wheatbelt

By Heather Adamson



DURING Easter the Birds Australia WA Group stayed in Merredin, visiting a number of reserves around the district. A convoy headed east to the 529ha Tank Hill Nature Reserve. Before arriving, all 'little grey dots' sitting on fence wires or telegraph lines were identified. First stop was an active malleefowl mound – fresh tracks and mound activity revealed that the owners weren't far away. Next, a loud carrying whistle was instantly recognised by all (except me!) as a southern scrub-robin. The call was heard frequently but only one bird was sighted. A white-eared honeyeater posed perfectly for everyone from a high vantage point.

Amidst white gum woodland we separated into smaller groups arranging to meet back at the vehicles and compare notes. Here we sighted some elegant parrots, weebills, pardalotes, a crested bellbird, grey shrike-thrush, white-browed babblers and many others. Travelling on to Westonia, the town was alive with bird noises and the antics of grey currawongs, pied butcherbirds and red-tailed black cockatoos.

Sandford Rocks NR, north of Westonia, seemed to be a heaven for small birds, much to my delight, with three different types of thornbills flitting around, grey fantails, purple-gaped honeyeaters, golden whistlers – I nearly forgot to eat my lunch! There were also red-throats further around the south side of the rock, over all a wonderful habitat area.

The next day we visited Totadgin NR 12 kms south of Merredin where, among others, we saw several brown quails, red-capped robins and a rufous whistler. Other areas visited included Chiddarcooping NR, Lake Campion NR, Lake Brown NR, Merredin tree plantation (see last issue of Western Wildlife) and Billycatting Reserve.

Back at camp each night all observations were collated and confirmed. Over the five day period, 83 different species of birds were recorded (this is, of course, without any wet-weather birds). A great result to confirm that such a lot of bird diversity remains. An amazing, fascinating weekend in truly wonderful company! I can recommend "Bird Atlassing" to everyone!

Heather Adamson is LFW Officer at Merredin. Phone: 9041 2488.

Did you know ... ?

Parasitic plants such as quandong, sandalwood and the WA Christmas tree actually leak nutrients from their leaves, providing a very rich soil immediately under their canopies. Perhaps this explains the amount of weeds which grow there!

(From Lyn Atkins of CSIRO Wildlife and Ecology)

THE WAY WE WERE ...

Hints to settlers on tree preservation

Dept of Lands and Surveys, 1959

This little booklet was given out to Conditional Purchase Leaseholders. It makes points which are still valid ...

"Many farms now being developed carry large areas of treeless land in some cases dotted with clumps of trees such as wandoo or mallet. These often occur on stoney or gravelly soil, which is of low agricultural value. Any farmer possessing these tree groups who contemplates incurring the expense of destroying them should think long and hard on the unique place they occupy. It is better that such groups should be *retained and maintained* (my italics – Ed) as they represent valuable woodlots providing not only shade and shelter, but also timber and fuel, items which tend to become in short supply as agricultural development increases. Moreover, they provide information which nature has taken countless centuries to work out, viz., just what areas will support tree growth.

"In planning what areas shall be retained under forest, consideration might be given to a number of points:

- protection for the farm homestead:
- retention of tree cover on stoney or gravelly hills which are of low agricultural value and which, if cleared, have a high run-off during rains which causes scouring of adjacent cultivated land:
- stock shade or shelter near watering points and small groups or isolated large-crowned trees at reasonable intervals through the various paddocks.
- vegetation belts for protecting roads from sand drift from cultivated areas or for breaking the force of the wind on to cultivated paddocks.

"Modern scientific farming involves departures from the old rectangular geometric pattern of subdivision, more consideration being given to natural features, slope, drainage etc, and every effort should be made to so fit these areas of natural vegetation into the scheme of subdivision that they can exert their greatest benefit."

Many landholders took this advice and left small areas of vegetation. But now, fifty years on, they are declining, and need fencing and positive management.

NEW BOOKS

"Rock of Ages: human use and natural history of Australian granites"

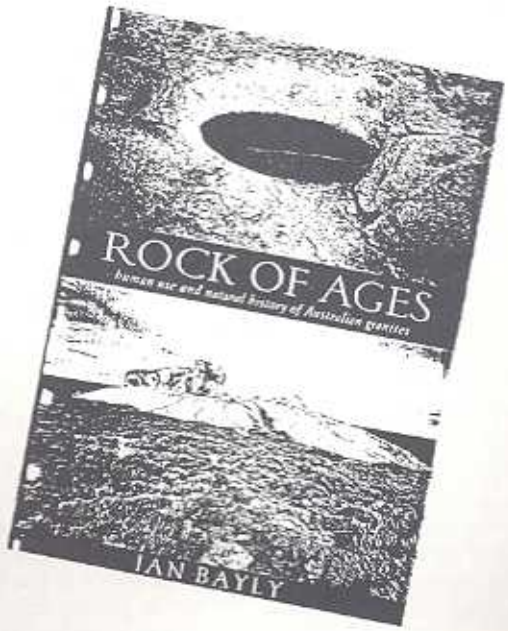
Ian Bayly

Pub: Uni WA Press

Ian's "gnamma" book is now out!

Anyone who loves granite outcrops should read this. Comprehensive, very readable and stunningly illustrated, it is a both an informative text and a 'coffee table' book. Buy it for yourself, and as a present for your friends. You won't be disappointed!

It will help you to love and appreciate your granites even more - if that's possible!



COMING EVENTS

Agroforestry Expo,
Boyup Brook. 14th August
Contact: Monica Durcan,
Box 953, Kalamunda, 6076.

Plants and Pollenators Bush Picnic,
Mukinbudin. 16th September
Contact: Heather Adamson,
Merredin. 9041 2488

Bushland Care Workday –
Warwick Senior High School.
18th September
Help needed with weed control – everyone welcome!
Contact: Robyn MacElroy.
9342 6840

Managing Granites,
Canna. 22nd September
Contact: Robyn Stephens,
Morawa. 9971 1598

Wandoo Woodlands Day,
Toodyay. 10th October.
Joint excursion with the WA Naturalists' Club and the Toodyay Naturalists' Club.
Contact: Penny Hussey, 9334 0530.

Agricultural Shows

Beverley	24 August
Dowerin	24-26 August
York	28 August
Newdegate	1-2 September
Northam	10-11 September
Mingenew	17-18 September
Merredin	9 October
Busselton	29-30 October
Gidgegannup	30 October

Weedbuster Week

October 10 - 17
"Weed Prevention is the Intention"
What will YOU DO?
Together we can make a difference!
Contact your *LFW* Officer for ideas and assistance.

WEED ALERT

The Curse of the Everlastings

FOR much of the year the arid shrublands of WA seem to consist only of bushes separated by expanses of bare ground. But in winter and spring, when there is an excess of soil moisture, annual plants grow and flower rapidly, covering millions of hectares with their floral beauty. Many are daisies with papery flowers and these 'carpets of everlastings' are justly famous as part of WA's wildflower wonderland.

But a smothering threat is hovering in the wings - Paterson's Curse!

Introduced for its attractive purple flowers, The Curse has large rosettes of leaves that smother surrounding seedlings and so maximise its portion of the available moisture and nutrients. Each plant also produces hundreds of long-lived seeds. Given the encouragement of disturbed soil, it will establish and spread relentlessly. Droves of tourists view the spectacular drifts of purple in the Flinders Range, South Australia, thinking they are seeing 'wildflowers'. Wild all right, but not native! What was there before - perhaps everlastings?

The Curse is indeed beautiful, and beloved of bee-keepers, but do we really want our everlastings to be taken over by it?

The weed occurs in agricultural areas west of the mulga belt and seeds, along with topsoil, are blown eastwards by windstorms during autumn. It is also spread by vehicles and machinery along roads and tracks. The disturbed ground along roadsides provides ideal establishment sites from which weeds can spread out into the surrounding shrublands. And that is where YOU CAN HELP.

The easiest time to control a weed is when it is just getting established. If you intend to drive up to look at the everlastings this year, perhaps camping or staying a night at one of the friendly stations that cater for tourists, carry some Roundup© with you. A puffer pack is the best, you can buy them from garden stores or make your own from a spray bottle. Wrap it up well so that it cannot break during the journey and include plastic gloves for use during application.

Then, when you see a Paterson's Curse plant among the everlastings, race out and spray the **** out of it! If all of us were to do this, perhaps we could keep the Curse of the Everlastings at bay!

Penny Hussey

Biocontrol of Blackberries

Kathy Evans from Adelaide Uni is researching biological control of blackberries. The European rust fungus *Phragmidium violaceum* was widely reased in WA in 1991 and 1992 but, although it has been very effective in the east, it has had little effect here. It turns out that this may be because our blackberries are not from Europe at all, but may be the North American species *Rubus bellobatus*. Looks like Kathy's got herself a trip to the States, looking for rusts!

This Newsletter is a compendium of articles written by many different people. The views expressed are those of the authors, not necessarily those of the Department of Conservation and Land Management.
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