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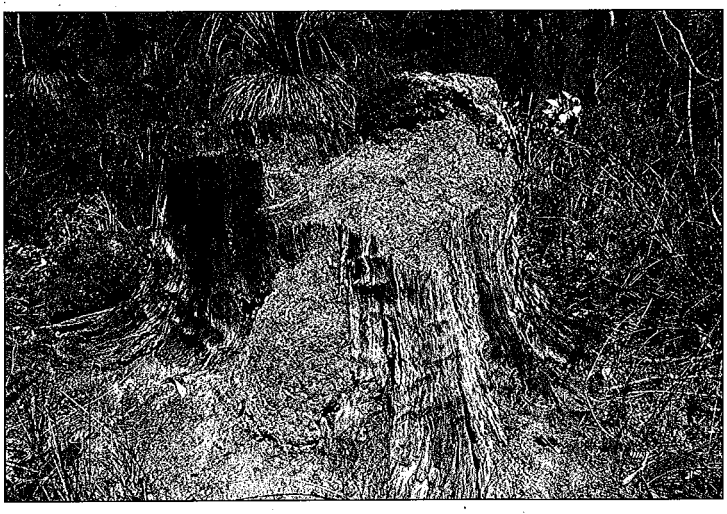
TERMITES AND YOU

Brian Heterick

'What about white ants?' is the question that is invariably put to me after I have given a public address on ants in general. This is a question that makes me sigh, because it immediately suggests the confusion in the public mind between two very different groups of insects.

TERMITES ARE NOT 'WHITE ANTS'

Well, what about white ants or termites, as they are more correctly known? For starters, termites have about as much in common with ants in an evolutionary sense as a human (an advanced placental mammal) has with a kangaroo (a marsupial). Termites, here regarded as comprising the insect order Isoptera, are insects with relatively primitive features that align them much more closely with cockroaches and preying mantids than with ants. In fact, American researchers often regard termites, cockroaches and preying mantids as a single order, Dictyoptera, although Australian researchers prefer to place these insects into three separate orders. Termites, in common with the group of insects that include cockroaches, mantids, grasshoppers and bugs (among others), do not have a complete metamorphosis from juvenile to adult. Hence, the juvenile termite looks much like the adult, but without wings or adult reproductive organs. This type of juvenile is called a nymph. By way of contrast, ants, bees, wasps, beetles, butterflies and moths and flies, along with several other orders, have juvenile stages that generally look nothing like the adult, and have to undergo full metamorphosis. The juvenile of these insects is called a larva, and larval ants are legless and have a grub- or maggot-like appearance.



This termite mound in the Perth Hills is occupying an old jarrah stump. It is probably constructed by an Amitermes *species.*
Photo: Allan Wills

MEMBERS OF THE TERMITE COLONY

Termites, being social insects, have both reproductive and non-reproductive castes. Queens and males possess wings, at least in one stage of their life history, but the non-reproductive castes (workers and soldiers) lack wings. The mandibles of queens and soldiers have very characteristic features within a given species, and so are valuable taxonomic aids for researchers. However, some soldiers do not rely on mandibles for defence of the colony. In soldiers of the genus *Nasutitermes* (Termitidae), the front of the head is produced into a long tube or rostrum and the mandibles are small or vestigial. The tube is hollow, and the soldier can exude sticky, glue-like secretions from the nozzle. These secretions are produced by a gland on the front of the head, and serve to entangle or chemically poison intruders such as ants. Unlike soldiers, males and queens, workers are relatively unspecialised. However, all castes in most species have only thin cuticle and are very

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EDITORIAL

Greetings all!

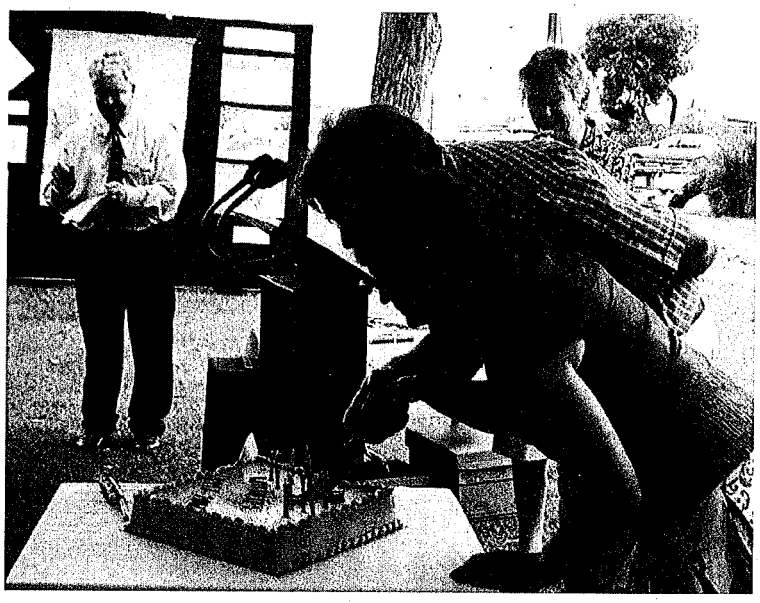
Thank you everybody for your wonderful response to the celebration of *Land for Wildlife's* tenth birthday. Over 400 people attended the various events held around the country, and another hundred came to Crawley for the party. Despite the fact that it rained – everyone was positive and cheerful. The Director General of the Department of Environment and Conservation, Keiran McNamara, outlined some of the programme's achievements and promised it would continue as a cornerstone of DEC's private land conservation initiatives. He then launched the 10-year Report "With Wildlife in Mind".

We were delighted that Sue and Paul Kelly, who are *LFW* registration number 1, were able to join us from Mingenew. Paul spoke about the pleasures and the hassles of farming and conserving biodiversity in this economically and environmentally changing world. They then cut the cake – it was supposed to look like a sign, and was rather a lurid blue!

My role was to thank everybody for their tremendous support for the programme over the years, and Gordon Wyre, DEC's Director of Nature Conservation, continued that theme. To everybody reading this, you really are an inspiring group of people!

A copy of "With Wildlife in Mind" is enclosed with this Western Wildlife. If you would like more copies, please contact Robyn Polini.

Penny Hussey



Sue and Paul Kelly cut the bright blue cake. Gordon Wyre and Penny Hussey are looking on.
Photo: Kathleen O'Brien

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FAUNA

Termites

vulnerable to heat and light. The characteristic carton or mud nests and galleries are essential if these soft-bodied insects are to survive in most environments. Expose a termite worker to strong, direct sunlight for just a few minutes, and it will die. Desiccation, as much as the effects of the sun, is the killer.

Queens are responsible for founding colonies. Like many ants, most termites have mating ('nuptial') flights. In Australia, there is normally a flight period in late spring or early summer and another in autumn. The winged reproductives usually fly only a short distance (unless there is a strong wind) before alighting. Males and females shed their wings by snapping them off along a suture at the base of the wing. Members of both sexes then form mating pairs and seek out new sites for colonies in soil or wood. During this time the reproductives do not feed. The first brood is therefore responsible for feeding the 'royal couple'. Mostly the male and female founders are the only functioning reproductives in the colony, and both can live for many years (unlike ants, in which the queen only is supported, males dying shortly after the nuptial flight, whether or not they have mated). The queen often becomes a pure 'egg-laying machine', and is physically distended by the vast numbers of eggs held in her ovaries: some African termite queens are over 12 cms long! Mating often continues periodically between the founding pair.

THE AUSTRALIAN TERMITE FAUNA

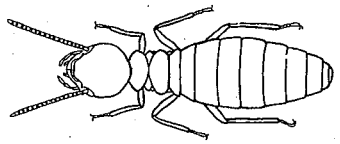
Australia has a relatively rich termite fauna, with 350 or so known species belonging to five families (Mastotermitidae, Kalotermitidae, Termopsidae, Rhinotermitidae and Termitidae), and of these more than 150 species occur in Western Australia. At least a few members of each of the five families can cause commercial damage to timber, but of the 30 odd species found in the Perth region, only a handful are of economic importance. Most damage is caused by subterranean termite species (*Coptotermes frenchi* and *Coptotermes acinaciformis*) and by *Nasutitermes exitiosus*. A couple of other species may attack paling fences (*Heterotermes ferox*) or damp areas in living eucalypts (*Porotermes adamsoni*).* In northern WA, the giant northern termite (*Mastotermes darwiniensis*) has been implicated in serious structural damage in places like the historic port of Cossack.

Many termite species, however, are inoffensive. As well as the recycling of wood facilitated by the workers, faecal remains of termites probably enrich soil nutrients, and the burrowing activities of termites may result in beneficial turnover of soil. Termites themselves are food for a wide variety of other arthropods, reptiles, frogs, birds and several mammals (e.g., echidna, numbat and bilby). Termites have recently been found to be useful bioindicators in some rehabilitated ecosystems, such as minesites. Finally, termites make an important contribution to the native landscape in many areas, culminating in the magnificent north-south oriented mounds of the magnetic termites (*Amitermes laurensis* and *A. meridionalis*) in north and north-eastern Australia.

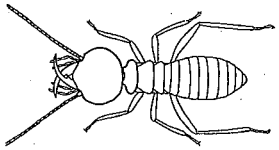
'What about white ants?' should, I think, be rephrased as 'How can we encourage the study of these fascinating and often much-maligned insects?'

Dr. Brian Heterick is a research associate and sessional academic with the Department of Environmental Biology at Curtin University of Technology. He specialises in the taxonomy of Australian ants. He can be contacted by email: B.Heterick@curtin.edu.au

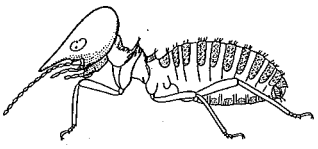
*Ref: * http://www.bestpest.com.au/pest-control-in-perth.html*



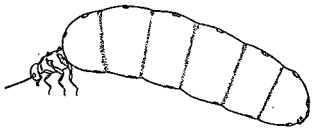
worker, Hamitermes, *length 4mm*



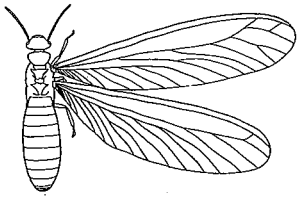
soldier, Hamitermes, *length 4.5mm.*



nasute soldier, Eutermes, *length 3mm.*



fertile queen, Coptotermes, *length 17mm.*



winged male, Hamitermes, *forewing length 15mm*

Illustrations from 'Insects of Australia' by John Goode

REVEGETATION

SANDALWOOD NUTS

PREPARING AUSTRALIAN AGRICULTURE FOR RISING ENERGY COSTS AND WATER INSECURITY

Aaron Edmonds

Agricultural technology has evolved with the assumption that oil and gas will always be cheap. Large amounts of energy are used in food production, making agriculture the third largest energy-consuming sector globally. Most people would be aware of the diesel fuel requirement to power the machinery used in crop production. What they would not realise is that diesel use is only a small component of the total energy demand in this process, in fact it is in the manufacture of fertilizers used to fuel crop growth where the largest energy liability occurs. To put it into perspective, it takes the energy from roughly one litre of oil to produce one kilogram of urea, the most widely used nitrogen fertiliser. Not to mention the petrochemicals and energy required for herbicide and pesticide manufacture. Quite clearly as energy concerns begin to emerge, agriculture must reduce its dependency on energy.

There are three areas in which total energy demand can be significantly reduced in Australian broadacre agriculture and, not surprisingly, these also bring sustainability gains almost as an added bonus. Sustainability in the true sense of the word, simply means turning agriculture from a net energy user to a significant net energy producer.

Firstly, it is highly desirable that crops be perennial in their growth habit. This means they survive from one year to the next and only need planting once. This saves on the need to annually sow common staple food crops like wheat, rice and corn. The environmental gains from a perennial plant are a large root system preventing soil erosion, enabling use of subsoil moisture to prevent salinity and allowing deep access to leached fertilizers and nutrients. Perennial plants are also far more competitive with weeds and have a level of drought proofing in having access to out of season rainfall at depth in the soil profile.

Secondly, there must be a legume base to the crop production system. Legumes (including both peas and wattles) are plants that enable nitrogen to be biologically fixed in their root systems and hence have no need for man-made nitrogen fertilizers. Some common legumes include soybeans, peas, beans, chickpeas and lentils. The energy savings in legume-based systems are enormous, simply because they do not require nitrogen fertilizer. All natural plant ecosystems have a legume base within them that is important for fertility.

Thirdly, in conventional agriculture, chemicals are required to control pests and diseases. They are produced in complex and energy-expensive industrial processes, often using petrochemical precursors. As our crops have been bred to focus almost completely on yield and not utilise traits that allow them to tolerate and compete with pests and weeds, man has ensured productivity is linked to the high use of chemical inputs. This effectively means that the energy required for pest and disease control in the plant is ultimately sourced from fossil fuels. On the other hand, wild plants and wild relatives of our commercialised crops have developed unique means to survive attack from pests and compete with other species.

Ironically it is a native plant that has not been exposed to modern man's breeding efforts that offers Australian farmers the ability to greatly reduce energy dependency in food production and achieve a degree of drought proofing. Australian sandalwood (*Santalum spicatum*) is a unique

Five year old sandalwood plantation.

Ripe sandalwood nuts.

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REVEGETATION

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Sandalwood

native tree crop highly adapted to Australia's harsh conditions. The tree produces nuts that are high in oil (60%) and protein (18%) with the kernel oil being largely monounsaturated (55%) - the healthiest of oils. It requires no nitrogen fertilizer inputs as it is hemi-parasitic on the root systems of Acacias, sourcing nitrogen needs that the host has fixed. This allows for a degree of biodiversity within the system that exists in no staple food production system in the world. The sandalwood nut will be an important dryland oilseed crop in the future

Trials for Australian sandalwood are underway at my farm east of Calingiri. I have been making selections from local trees for large-seededness and nut yield and have varieties whose nuts are as large as 29mm in diameter. Four year old trees in my plantings are yielding well in excess of 1kg per tree, with this yield set to increase as the trees mature further. A planting density of 300 trees per hectare in a 350mm rainfall zone, could lead to a conservative yield on a per hectare basis of around 300kg after 4 years. The major energy cost in this system is for weed control and harvesting, significantly below the energy cost of wheat production.

Plantings will continue on the farm, maybe we will become the world's first broadacre producer to achieve significant energy efficiencies in food production. Fifty hectares are earmarked for 2007 on top of the 30 hectares already established. Poorer soil types such as sands over gravel and areas prone to frost are being targeted first. These are the areas where energy investments in the form of fertilizer and herbicides are generally high.

Such oilseed crops as the sandalwood are essential to the future farm landscape. They will allow farmers to profit rather than pain from the energy market, to achieve energy self-sufficiency in food production and finally attain some degree of drought proofing in the production profile. My vision is to see significantly more plantings of this amazing production system throughout the Wheatbelt, other Australian southern dryland cropping zones and eventually arid regions around the world.

Aaron Edmonds can be contacted via www.australianuts.com

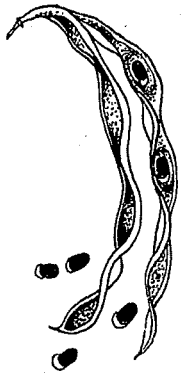
For more information about Sandalwood, contact the Secretary, Australian Sandalwood Network, ph: 9621 2400 or email: temmott@gawa.org.au

THE VALUE OF SEED STORE AND TOP SOIL

Revegetating the Denmark Shire tip was not an easy task, as the Denmark Shire Nursery Officer, Mark Parre, explained to Sylvia Leighton:

"When I first assessed the site it was full of garden rubbish with lots of nasty weeds like tagasaste, Victorian teatree, watsonia, gladioli, dolichos pea, arum, black nightshade and feral wattles. The first attempt at replanting the site to native plant species didn't work, as the weed species were too aggressive, no matter what pre-planting weed control was carried out. The soils were also extremely nutrient-rich making them almost hostile to native plants and favouring the weed species. It was recognised that weeds do have a positive function in taking up excess nutrients - but then they need to be harvested from the site to remove these nutrients, and that requires a lot of labour.

"For the second attempt, we scalped the site, taking all the weedy material and weed seed store away. Top soil full of native plant seed was brought in from a comparable vegetation community adapted to the original soil types of the site. I also collected suitable seed and direct seeded it onto the site. As well, we planted suitable native plant seedlings one pace apart. Because one of my goals was to have a closed canopy within three years to assist with weed control, I deliberately chose lots of Myrtaceae and wattles as they are quick to establish. We also ripped up the clayey parts of the site in several directions so that roots could expand out. In areas where I felt the soil was still too nutrient rich, I spread inert soil under the new top soil."



This has been very successful and the tip site really looks fabulous! However, Mark also had to battle with fellow Shire workers who took some of his precious top soil to put under a road surface. Mark informed them (in very strong words!) that Kings Park and Botanic Gardens actually sells seeded topsoil at $45,000/ha!

Sylvia Leighton

PRACTICALITIES

TRANSFORMING FARM DAMS INTO WETLANDS FOR WILDLIFE

Steve Newbey

Farm dams can be transformed into valuable wetlands that not only provide a reliable source of stock water but also provide safe shelter and an important source of food for many species of fauna.

Design considerations

• Varying depth of water in wetlands is important because it creates different habitats as water temperature and light infiltration decreases with depth.

• Plants in wetlands are important as they oxygenate the water, protect banks, use nutrients and shade the water reducing the risk of algal blooms. They also provide food for fauna.

• Water depth is very important when selecting species to plant, as different species prefer to grow in different water depths. The water depth can also vary throughout the year and some sites may remain dry for many years before filling and then may remain full for 12 months or more. Some plant species can cope with fluctuating water levels, others can not.

Swamp lily

• It is also very important to have an area of open water where birds can land safely without having the navigation hazard of surface vegetation and an area free of fringing trees that make taking off and landing less hazardous.

• If stock water is important, the best option is to pump to a trough outside the dam. Alternatively, the revegetation can be fenced off from the area used for stock watering.

It is therefore important to plant the most suitable plants into the niche that they prefer. Below are a series of recognised wetland zones together with some attractive and useful species that prefer to grow in each zone. (Note, these notes apply to fresh water wetlands.)

Submergent zone (always covered with water)

Native water plants such as *Ottelia ovalifolia* (swamp lily) and *Marsilea* species (nardoos) have leaves that float on the surface of the water. *Triglochin huegelii* and *T. lineare* (water ribbons) also have long linear leaves that trail through the water. Some *Marsilea* and *Triglochin* species are not native to the southwest and non-local species should be avoided as they may become weeds.

Typha domingensis, a native bulrush (Noongyar people called it yanget), will grow in water up to 3 metres deep and will produce leaves and flower stems that emerge 1.5-3 metres above the water level. Do not plant *Typha orientalis*, also called bulrush, which has wider leaves and larger seed heads, it is an introduced weed that quickly takes over wetlands.

All of these plants can be planted as seedlings and propagated by division.

Emergent zone (shallow water most of the year)

Various rushes and sedges will grow in this zone and are important in reducing the impact of waves, lessening bank erosion. Some attractive species are *Lepidosperma effusum* (spreading sword sedge), *L. tetatraquetrum* (four-angled sedge) and *Baumea articulata* (jointed rush).

Myriophyllum crispatum (milfoil) is an attractive fern-like plant that grows in shallow water. Do not plant *M. aquaticum* (Brazilian water-milfoil) a common aquarium plant that is a serious weed in creeks and wetlands, or any of the Kimberley species, as they too could become weedy.

Riparian zone (may be inundated temporarily following heavy rainfall)

Some larger trees such as *Eucalyptus rudis* (flooded gum), *Melaleuca rhaphiophylla* (freshwater paperbark) and *M. preissiana* (modong) grow on banks and also in the ephemeral zone. These trees provide shade over the water, roosting places and nesting hollows when mature. *Agonis flexuosa* (W.A. peppermint) and *E. patens* (W.A. blackbutt) will also grow in this zone, but prefer better drained soil.

Taxandria linearifolia (swamp peppermint), T.

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PRACTICALITIES

Creating wetlands

parviceps and *Astartea fascicularis* form dense thickets fringing wetlands that provide excellent habitat for waterbirds, frogs, small mammals, reptiles and smaller terrestrial birds.

Rushes and sedges also thrive in this zone and help to hold the soil together in times of flood. *Mesomelaena tetragona* (semaphore sedge) and *Leptocarpus diffusus* are interesting sedges and rushes that prefer this zone.

Ephemeral zone (in water sometimes)

Astartea fascicularis is a shrub that fringes the very edge of watercourses, flooded gum, freshwater paperbark and modong are trees that will grow in areas that are inundated seasonally and for extended periods of time. Many rushes and sedges thrive in this zone.

Seepage areas (permanently wet)

Villarsia species and *Centella asiatica* are ground covering plants that grow on seepage areas, as do many rushes and sedges.

Dead trees, logs and rocks

Dead trees may look unsightly to some people but provide very important habitat in the form of nesting hollows and roosting sites, especially when they stand in water as then they provide protection from cats. Logs and rocks in, and around the edge of, water provide nesting, roosting and hiding places for most aquatic animals and safer places for birds to land and drink.

Rushes and sedges

Most rushes and sedges occur in monocultures at their preferred water depth and permanency. Provenance is generally not an issue but watch you don't spread dieback and the frog virus in soil and on plant material. Take care not to use the severe weed *Juncus acutus*, sharp rush. (see WW 10/4)

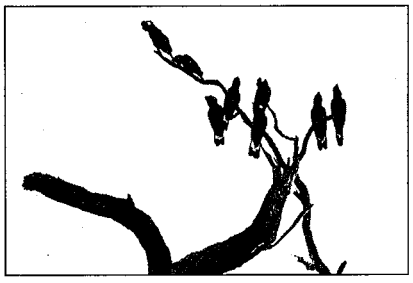
Rushes and sedges have two growth habitats, clumpers and spreaders. Clumpers radiate outward slowly from the original plant spreading a few centimetres each year, whereas spreaders send out rhizomes and can spread rapidly popping up some distance from the parent plant and can rapidly colonise all suitable habitat. Clumpers are therefore easier to control and keep where you want them to grow. Some species such as *Juncus pallidus* (pale rush) germinate readily from seed and can become weedy, not only around wetlands but on dry land as well. As mentioned previously it is important to have open water, so be careful not to plant species that spread by rhizome in shallower dams, as they may colonise the entire area.

Steve Newbey is Field Officer for the National Trust covenant programme. Contact him by email: stephen.newbey@ntwa.com.au for a more detailed list of wetland species (including rushes and sedges) that occur in the wetter south-west.

Illustration previous page: Helen Aston.

Fauna

CARNABY'S COCKATOO - TWO FAMILIES IN ONE YEAR!



Late afternoon in early September there was an unholy racket in the bush - to our delight the blacks were back, eight of them in the old dead tree, carrying on because the wood ducks were still in one of the hollows (not, I might add, that the Carnaby's had ever to our knowledge used this tree for nesting). After a couple of days peace was restored and they had all selected hollows in trees around the property (which is only seven acres in Bindoon). Ultimately the pair in the tree nearest the house brought out the new fledgling and showed it off to one and all.

Black cocky in black hollow in wandoo

Surprisingly they didn't leave and seemed to be part of a bigger flock of 40 birds that came over late afternoon every few days. Around mid-November our two were showing interest in the old hollow and Mum, Dad and chick were in and out for a couple of days. To our amazement it seemed that they were sitting again, then around the end of December another chick was heard in the nest. Then there were four, two proud parents one large sibling and a newborn! Is this common? If this is climate change, at least it suits our Carnaby's!

Anne Irwin

FLORA

TREES WITH SUNSTROKE?

Avril Baxter and Peter White

Saturday 3 February and it was hot. By midday, temperatures had soared to the mid 40s, relative humidity (RH) levels had plummeted and a searing northerly wind was scorching the landscape. Most people had retreated into an air-conditioned building or had found some other refuge from the intense conditions. However, some of nature's other creatures were not so fortunate. Birds died, and a few days later the canopies of many trees changed to a pale brown colour.

This browning of trees was reported from Coorow through to Wagin and across to Lake Grace. From valley flats to hilltops, species such as York gum, red morrell, salmon gum and wandoo felt the intense conditions. In some cases only part of the tree was affected, but mostly it was the entire crown. In some areas there were more salmon gum affected, in others it was the red morrell and the wandoo. One tree could be affected and its neighbour not; saplings through to large trees appeared to suffer equally.

The high temperature, and low relative humidity were records for many localities; but it was the unusual combination of these factors, exacerbated by the hot strong winds, that resulted in the desiccation of leaves and hence browning of the canopy of trees.

Whilst conditions were similar across much of the wheatbelt, this browning did not appear to affect trees in the eastern wheatbelt, even though the same species, ie salmon gum and red morrell, were present.

For example, York had many affected trees and 47.4°C with 9% RH, whilst in Hyden, which experienced the highest temperature ever recorded in the south of WA (48.6°C and 11% RH), trees did not appear to be affected.

This browning of the canopy has recently been reported in the newspapers and is reflected by the concern expressed by wheatbelt residents. However, this event is not without its parallels; a similar event happened in the southern wheatbelt in 1991 when temperatures reached 46°C. That year browning trees were reported from Albany to Lake King. Many were species such as *Pinus radiata*, *Eucalyptus globulus* and other trees planted outside their range, but a significant amount were of well established native trees in bushland.

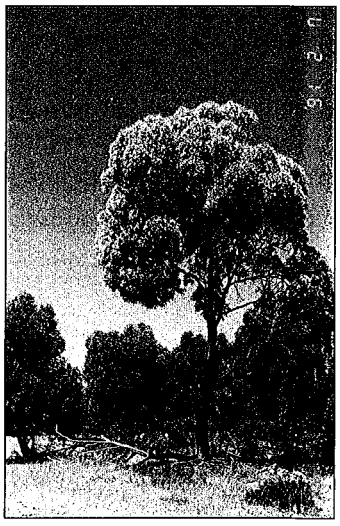
Affected sites were visited in February 1991 and photographic monitoring points established. One year later, the areas were revisited and rephotographed (see photos below). The crown recovery was almost complete in that time. It was significant to note that the crown had been replenished from the growing tips and not from epicormic shoots along the stems.

Leaves have already started to fall from the currently affected trees, but from the above evidence, we do not think we should worry that they have "died". If a tree is dying, the process probably began before this event. Nor is the defoliation related to disease.

The full extent of this defoliation event is not known and we would like your help in mapping the area. If you noted a browning of the canopy shortly after 3 February please contact us with information on the location, species of trees affected and, if possible, your local weather observations on that day.

Contact: Peter White, Rural Advisory Officer, DEC Wheatbelt Regional Office, Narrogin, 98819215, peter.white@dec.wa.gov.au

(Weather conditions taken from the Australian Government Bureau of Meteorology website.)



Eucalyptus wandoo affected by heat stress, Tambellup. Feb 1991.

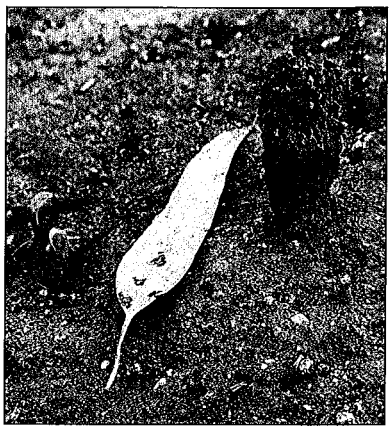
The same tree with new leaves on a year later. Photos: Peter White.

MEMBERS PAGE

TERMITE RELEASE TOWER

Remember these? They are termite 'release towers' to allow the winged adults to leap into their mating flight. Mike Griffiths wrote about them in WW 7/3 (July 2003).

Alison Creagh spotted this one on her block at Boddington in summer. It was a slender upright structure, club-shaped but without a handle, made of blobs of clay. The worker termites make them soon after heavy summer rain so that the sexually-reproductive adults (who are only very weak flyers) can get airborne.



Little is known about which species of termite make which type of tower – there's a great research project here for some interested student!

photo: Alison Creagh

PHONE TOWER RADIATION AND WILDLIFE HEALTH

On 18/2/2007 a new phone tower was erected outside the Herdsman Wildlife Centre and WWF's Panda House on the south-east side of Herdsman Lake. There has been much discussion as to the effect of radiation from these towers on human health, particularly child health. It is estimated that maximum radiation occurs between 150 and 350 metres from the tower, peaking at approximately 0.58 microwatts / sq cm at 170m. Although there has been no consensus as to the effect of this radiation, there have been reported clusters of ill-health in children living around such towers.

Perhaps this could be a good opportunity to monitor the effect of this radiation on the abundant bird and frog life at Herdsman Lake. The frogs are sedentary and the water birds both sedentary and locally nomadic. A study over three breeding seasons might help to elucidate the medical worries.

Mary Bremner

Dr Mary Bremner is a distinguished specialist in children's health. The issue she has raised here is of concern to everyone. Tadpole development is relatively easy to study, and the northern side of the lake could be used as a control site – perhaps there is someone in an academic institution that could take on this call?

BIRDS AND EXTREME HEAT

As *Land for Wildlife* member Bill Dawes of Yealering retreated to the coolness of his kitchen on Saturday 3 February, he watched the twenty-eight parrots jostling for places in the trees outside his kitchen window. The temperature was around 45°C and the wind was howling from the northwest. The birds were sheltering on the southeast side of the trees, but it was not enough protection, within two hours, they were all dead.

Driving around his Yealering property the next day, Bill counted around 200 dead birds – mainly twenty-eight parrots, but also a few yellow-throated miners. The most dramatic sight was 12 dead parrots and four yellow- throated miners under an isolated small jam tree. Bill wonders why they choose to shelter in this isolated tree and not in nearby tree belts.

Bill is a great observer of nature and has never seen anything like this in the 78 years he has been living in the area.

WOULD YOU LIKE TO HOST A 'COFFEE MORNING'?

'Coffee mornings' held in the Margaret River area recently have proved very popular. *LFWers* meet at someone's place, ramble through the bushland while points of interest are explained, then return to base for a cuppa and further chat. This type of excursion is very suitable for areas with smaller properties, perhaps on the Coastal Plain, the Perth Hills, or the Avon Valley. To start with, there must be a site to look at, on your own block or a nearby reserve - eg revegetation, creation of a wetland, etc.

Is anyone interested? Especially, would anyone be prepared to host such an occasion? Please contact Heather Adamson (Coastal Plain) or Zara Kivell (Hills and Avon Valley). *LFW* will do the rest of the organisation.

FAUNA

WHY DID THE MEGAFAUNA BECOME EXTINCT?

In the Pleistocene, about half a million years ago, Australia had a much richer fauna than it has today. Particularly, it had a number of very large animals, collectively called the megafauna – giant wombats, possums, kangaroos, snakes, goannas, flightless birds - none of which were here when Europeans arrived. Why did they become extinct?

There are two general theories to account for this extinction. Firstly that, as Australia drifted northwards, the climate became more arid and the larger animals couldn't cope. The second theory links Aboriginal occupation with changes in fire regime and so vegetation structure, making conditions no longer suitable for the megafauna. A recent paper * has shown that a very wide range of megafauna were living in an arid climate, so the first theory cannot be correct.

A magnificent deposit of fossils was found by cavers exploring under the Nullarbor in 2002, and have been dated to between 400,000-200,000 years ago. Fortunately the cavers realized what they had discovered, and immediately called in Museum paeleontologists. A lot of publicity was given to the first complete skeleton ever found of *Thylacoleo*, the Marsupial Lion, but lots of other animals died after falling through a hole in a cave roof. So far, 69 vertebrate species have been identified in this set of caves, including 23 kangaroo species, eight of which are undescribed. Most of the animals are mixed feeders and grazers, and their very diversity suggests a much wider variety of vegetation than occurs in the area now, including a higher proportion of plants with palatable leaves and fleshy fruits. In addition, two of the new species are tree-kangaroos (whose modern relatives inhabit rainforests) and there are also parrots, implying trees with nesting hollows, close by.

But what was the climate like, was it wetter? Several complex analyses say no, the climate was very similar to today, with an annual mean rainfall of about 200mm falling in a non-seasonal, but slightly winter-biased, pattern. Thus these animals were adapted to survive in an arid climate. Increasing aridity was not responsible for their extinction.

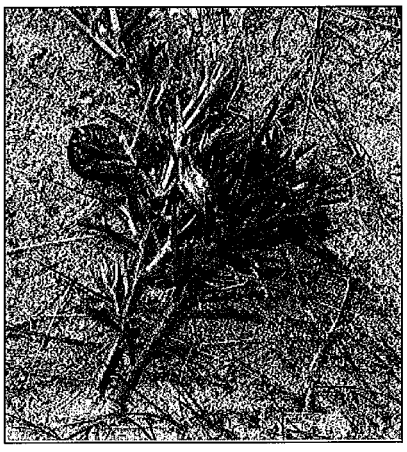
What was responsible, then? The authors suggest that: "... increased wildfires in the Nullarbor region best explain the conversion of a floristically diverse plant community into the modern, fire-resistant, chenopod shrub steppe." They continue: "Our data do not directly explain the timing of extinctions, but it is significant that the general extinction pattern (the loss of most larger herbivores and *Thylacoleo*) is identical to that witnessed in all southern Australian climatic zones. Most southern species of megafauna were evidently extinct by or soon after 40,000 years ago, at about the time humans reached the south-central coast."

So, human-caused fires changed the vegetation, and so the resource base for the fauna.

Penny Hussey

** An arid-adapted middle Pleistocene vertebrate fauna from south-central Australia. Prideaux et al. 2007. Nature 445: 422-425.*

Bush Detective



Here are two pieces of *Hakea varia,* each with a fruit. Or are they? Look carefully. The one on the left is **squishy**!

It is a very clever piece of mimicry by the caterpillar of the grevillea looper moth (*Oenochroma vinaria*). Presumably it adopts this posture as camouflage to fool predators.

The caterpillars are smooth, with two dorsal 'horns' and taper slightly towards the head. They move with a looping action, feed on grevilleas and hakeas, and can totally defoliate the bush.

The moths have a wing span of up to 5 cm and are usually rosy-purple on top with a purplish spot on the underside of the forewing. They are found from the Atherton Tableland right around the south of Australia to WA.

Thank you to Wayne Gill for this puzzle.

THE SECOND MARGARET RIVER COFFEE MORNING

A *Land for Wildlife* 10th anniversary event

This coffee morning was held on 7 December last year on Janne and Pat O'Dwyer's property which is a small lot in semi rural subdivision near Margaret River with a creekline and a small dam. When they moved in, the property was mainly paddocks with some peppermint trees along the creek. They proceeded to plant along the creek and around the dam with local indigenous species. A windbreak/wildlife corridor was also planted around the property and more recently a corridor across the property to link all areas together. They also have planted vegie gardens and fruit trees close to the house as well as having chicken pens.

The 17 attendees were split into two groups, with Pat taking one group to one end of the property and Janne to the other. They showed everyone their achievements both in the native gardens which are full of birdlife, bandicoots and black skinks (and more recently a dugite as Janne found out to her surprise!) and also the revegetation efforts, weed control, feral animal control and wildlife habitat creation.

Janne explained how she sets traps for the rabbits and foxes and feral dogs - the local rangers support rabbit, cat and dog trapping and they will collect anything trapped and either find its correct home or, if feral, dispose of it humanely. In a small semi rural subdivision, you cannot lay baits or set off firearms, which makes feral animal control more difficult. Over the years there have been struggles with many issues but Janne and Pat have remained dedicated to wildlife management on their property throughout the whole time.

The day went longer than expected, finishing with a very welcome home brewed coffee, cake and biscuits. Everyone stayed and chatted and enjoyed the social aspect of meeting other *LFWers* from the area.

Thank you, Janne and Pat.

A COFFEE MORNING AT WYADUP

A *Land for Wildlife* 10th anniversary event

On 17 January, the third *LFW* coffee morning in the Busselton/Margaret River area was held on Neil and Gail Taylor's property in Wyadup. It has 19ha of bushland, creekline, olives, proteas and an orchard.

Neil at culvert feral barrier

We started off with morning tea and a welcome to the 13 visitors from Neil. He outlined the property's main features which includes the 1.7km feral-proof fence he researched, designed and built. Handouts on feral-proof fence construction and an interesting one on how high different animals can jump/climb a fence were distributed.

We walked to the creekline and had a look at the marron ponds, as well as the new regeneration occurring since the construction of the feral-proof fence. Previously there were high numbers of kangaroos and rabbits on the property that were causing disturbance. Neil and Gail 'shooed' out some of the kangaroos, leaving a manageable number inside the fence. The rabbit warrens are fumigated regularly to control numbers, while traps are laid for feral cats. Neil gave a few special hints on feral control that he has picked up along the way

The next stop was to look at the feral proof fence - its design of skirt on the bottom and electric wires on the top. Neil says he has since learnt that there are many other effective ways to construct a fence such as this, but that his second hand materials were of excellent quality and strength and will last well into the future. Neil made the entrance gate himself - electronic and powered by solar panels. On the western boundary, he has installed a system where water rats can escape under the fence.

Returning to the house, we had another cuppa and Neil and Gail showed us how the blue wrens will come and feed off meal worms bred especially for the little birds. It was a great opportunity to catch up with local *LFW* property owners of the area, most knew each other already but had not had time to touch base for quite a while, others met new people and enjoyed the company and chatted about their individual properties while sitting in the cool shade overlooking the creek with blue wrens curious as to what was going on.

Another excellent day! Thanks to Neil and Gail.

IN BRIEF

WHY FARMERS DO - OR DON'T - MONITOR THEIR PIEZOMETERS

In order to understand what is happening to the water table, a large number of monitoring bores (piezometers) have been installed throughout the south-west of WA. Most of them were installed during a funded project, so it is a sizeable investment by society. They provide information such as soil salt storage and depth to water table. When built up over time, the records from these bores describe the movement of groundwater (fresh or saline) and the subsequent threat to agricultural production (and biodiversity) through waterlogging and salinisation of soils.

However, it is a sad fact that many of these bores are not – and never have been - monitored. A recent paper* explores the social reasons why farmers do, or do not, keep up with the monitoring. It analyses the monitoring done in the Jerramungup region, where landholders are unusual in displaying a very high level of monitoring, and makes interesting, though slightly disturbing, reading.

The initial concept for installing piezometers was to raise awareness, the reasoning being that if farmers realised the rising threat of salinity to their land, they would be motivated to install mitigation practices. In practice, this did not occur, most landholders did not want confirmation of potential bad news! However, this survey shows that farmers who are using the information from monitoring to assess the performance of salinity management strategies *that they have already implemented on their farms*, are more likely to monitor more frequently.

The paper concludes that if landholders are being asked to monitor environmental indicators (such as water table level) then "the indicators most likely to be successful will be those perceived by farmers to be practically relevant to their farm management." There is a message here for all people concerned with sustainable land use in agricultural areas.

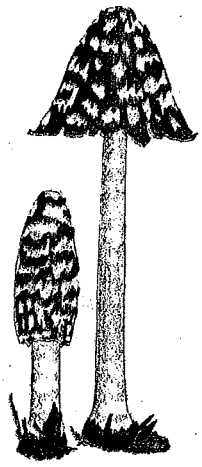
** Marsh, SP, Burton, MP & DJ Pannell. 2006. Understanding farmers' monitoring of water tables for salinity management. Australian Journal of Experimental Agriculture 46: 1113-1122*

FOR OUR NEXT TRICK - A WEEDY FUNGUS!

Everyone has heard about introduced plants becoming weeds – well, now there's a weedy introduced fungus! (Well – maybe there are lots, only we are not aware of them!) This one is an ink cap, a group of dark-spored fungi whose caps deliquesce (auto-digest) into a black liquid as they mature.

Ink caps are decomposers, living off decaying plant or animal remains. Like all such fungi, they are an important part of the soil recycling system. Their generic name '*Coprinus*' comes from the fact many species can be found growing on dung. There are at least 15 native species in WA.

Over the last 10 years, observers have noticed a large, distinctive species in highly disturbed patches within numerous urban bushlands in the Perth region, particularly tuart and banksia woodlands. It is tall, up to 20cm, with a white stipe (stalk) while the cap is initially white, then it becomes black and weepy, sometimes with distinctive white patches attached. It has been identified as *Coprinopsis stangliana*, a rare but widespread European species found on calcareous soil. It had not been seen in WA previously, so, how did it get here? No suggestions given, but perhaps it could have been on the humus in plant pots?



If you are working in urban bushland this wet season, look for this interloper and be careful not to spread material that might contain its spores..

The illustration shows a closely related European species, the magpie fungus (*Coprinopsis picacea*).

Reference: Bougher, NL. 2006. Coprinopsis stangliana – a recently introduced fungus expanding in urban bushlands of the Perth region of Western Australia. Nuytsia 16: 3-10.

Did you know ...?

Why some animals' eyes shine at night?

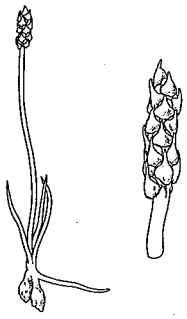
As the time for the Great Marsupial Night Stalk comes around again, have you wondered what makes some animals' eyes shine in the torchlight beam? It is all part of their ability to 'see in the dark'.

Some animals have a shiny layer, called the tapetum lucidum, behind the light-sensitive cells in the eye. When light enters their eyes, it passes over these cells, hits the shiny surface and reflects back a second time. Each light cell is thus stimulated twice, allowing the animal to see better in dim light. Humans (and birds) do not have this layer, and spiders' eyes reflect light quite differently.

IN BRIEF - FLORA

HOW ART THE MIGHTY FALLEN!

This winter, search winter-wet soils on granite swards and around freshwater swamps for the pygmy clubmoss (*Phylloglossum drummondii).* It often grows among damp moss, with other tiny plants such as trigger plants, bladderworts, sundews and *Centrolepis*. You'll have to get down on your knees though – this little feller is seldom taller than 10cm, if that, and so is very easy to miss.



It has been found from Dandaragan to Cape Arid, mainly in the higher rainfall areas, but occurs through the jarrah and karri forests and the wetter wandoo woodland, always in winter-wet sites. It has once been collected as far inland as Dryandra Woodland, on a granite sward, and it may be more widespread than we know. If you have a granite outcrop or a freshwater swamp in good condition, why not have a look for it? (It cannot take salinity.)

Clubmosses are in the family Lycopodiaceae (one of the 'fern allies') that reproduce by spores rather than flowers. Pygmy clubmoss has a tuft of bright yellow-green, grass-like, slightly fleshy leaves with a single stem carrying a cone containing spores. In summer it dies back to a small tuber.

So why is it especially interesting? Well, it is a survivor from dinosaur times, when its ancestors were huge trees forming vast forests across the swampy landscape. Their remains later became coal. In those days, 250–300 million years ago, lycopods were the dominant plants, but flowering plants with their more efficient physiology and reproductive systems have taken over. Now, all we have left in WA is this little fellow and two close relatives that look more like stiff mosses, one in the Denmark-Walpole region and the other in the Kimberley. Indeed, how art the mighty fallen!

Plants like this are 'Gondwanan relics' and the sites where they are still hanging on through all our millions of years of changing climate are 'refugia'. In WA there are many 'relictual species', both plants and animals, in shallow, winter-wet freshwater swamps and seepage areas. In terms of evolutionary biology – and general interest - they have an importance far greater than their areal extent would lead one to believe. If you have such a site on your property, guard it like the precious relic it is.

Penny Hussey

Illustration from 'Flora of the South West'.

GRANITITES – A PLANT OF THE 'FOREVER HILLS'

On some granite outcrops in the central and eastern Wheatbelt and into the Goldfields, occurs a small, dense, spiny shrub with an interesting history – *Granitites intangendus*. It appears, perhaps, that it is a survivor from that wet period 40 million years ago that was discussed in WW last October.

Granitites is not spectacular to look at. It is dense and spiny, with tiny pinkish-white flowers well hidden in the bush. The fruits, though small, are quite distinctive, superficially resembling little black acorns, containing seeds with bright red arils. Little is known about its natural history, but other south-west plants with red arils rely on ants to disperse the seeds. The ants carry them away and eat the fatty arils, but cast the seeds onto their underground waste dumps, perfectly positioned away from other predators, ready to be stimulated into growth by chemicals in the smoke of a bushfire. Maybe this also happens with *Granitites*?

The plant is a member of the Buckthorn family, Rhamnaceae, which has a number of species spread throughout the south-west of WA, mostly growing in harsh laterite or sandplain environments. This plant was first named *Pomaderris intangenda* by Baron von Mueller in 1876, from a specimen collected at Mt Ridley, north of Esperance. Later, in 1899, S. Moore named a specimen from Donkey Rocks at Goongarrie, *Cryptandrapetraea*. As the first name given, *Pomaderris intangenda* it remained, until Herbarium botanist Barbara Rye started to study the plant, and realized that it wasn't closely related to the south-west Rhamnaceae at all; its closest relative is a genus called *Alphitonia*, a tropical, rain forest genus. So she called it *Granitites intangendus* – 'granitites' because it grows on granite. Genetic studies confirmed this relationship.

What does this mean in evolutionary terms?

In the Cretaceous and Tertiary eras, some 40-30 million years ago, when south-west WA was further south, it was colder and wetter. The vegetation was temperate rainforest. But sticking up out of that rainforest were granite hills, just as they stand up like islands amid the wheatfields today. *Granitites* is found only on the

continued on page 14

MEMBERS PAGE

THOSE DAM SWANS!

Fostering and Assistance for Wildlife Needing Aid (FAWNA Inc) had received into care approximately 80 cygnets, apparently as a result of parents abandoning them and heading inland when food on the coast became scarce (came to the coast because of lack of rain/food inland, but after rain moved back?). These abandoned cygnets were cared for by FAWNA wildlife carers but, due to the large numbers already on waterways along the coast, FAWNA were seeking other suitable release sites.

As the dam on our property (in the Kirup area) had some native vegetation around it and was of a suitable size it was decided to release 22 cygnets there. The cygnets stayed in a pen that had been erected on the edge and into part of the dam for three days and were then released. They were fed twice a day while in the pen and this was continued after their release. Although they were whistled to at first to let them know it was feed time they rapidly got to know the sound of an approaching vehicle usually meant food.

Some of the fully feathered cygnets did not remain long and, after a short move to some ponds on the property next door, eventually flew off. Two cygnets were lost to predators when a family of four wedge-tailed eagles decided to place young swan on their diet before moving on to other parts of their territory. There are still nine almost fully grown swans on the dam that are not yet showing any inclination to move on, probably because we still give them a (gradually reducing) quantity of feed once a day, and even a few of the resident coots and ducks now come in to see if there is a free snack in the afternoon.

Peter Vickridge

continued from page 13

Granitites

highest of these hills, eg Billycatting, Nungarin Rock, The Humps and the aforementioned Mt. Ridley. Rowl Twidale and Jenny Bourne have shown that these outcrops have stood out from the surrounding plain since at least the Cretaceous (see WW 8/2) – in other words, they have been 'forever hills'.

So it seems likely that *Granitites* evolved as a specialist in the difficult granite rock habitat all those millions of years ago, and has managed to hang on in a drying landscape because run-off from the rock concentrates water at its roots.

Another fascinating relictual genus that helps to confirm south-west WA's 'biodiversity hot spot' status.

Penny Hussey

Illustration: Margaret Pieroni
Full reference list available – Ed.

WANDOO CROWN DECLINE SITUATION STATEMENT

The Wandoo Recovery Group (WRG) has released a 'situation statement' concerning the health of Wandoo as at July 2006. It reports on the research and data compilation that has been completed or is underway. If you would like to know more, contact the WRG Executive Officer, Liz Manning, on 0427 441 482 or email lizmanning@bigpond.com

Did you know ...?

why we sometimes feel we need a 'chocolate fix'?

Production of a neurotransmitter chemical called dopamine, associated with feelings of pleasure and elation, is increased when chocolate is eaten. The chemical is thought to be connected with the processes involved in learning, memory – and addiction. (What's this got to do with *LFW*? Nothing really, but I thought the chocaholics amongst us might be interested! – Ed.)

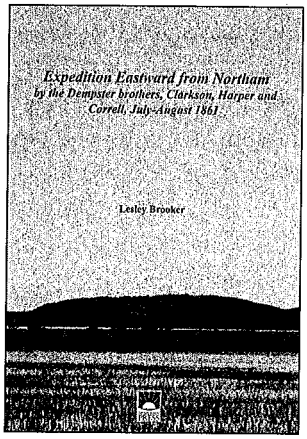
NEW BOOKS

Expedition Eastward from Northam by the Dempster brothers, Clarkson, Harper and Correll, July-August 1861

Lesley Brooker

Pub: 2006. Hesperion Press

Cost: $30.00 + $2.50 p&h, from good booksellers or publisher: books@hesperionpress.com



This book follows the route of the first European expedition east from Northam into the Wheatbelt and Yilgarn. A group of settlers and their Aboriginal guide set out eastwards, looking for new agricultural land. Although they were the first Europeans to travel as far as the Lake Deborah area, their exploits have been overshadowed by the later official journeys of C. C. Hunt. In this book, each day's travel is examined, and the locations of landmarks, wells and campsites plotted onto modern maps. The plants and animals described by the explorers are identified and Harper's plant collection (now in the Melbourne Herbarium) is illustrated. Names that the explorers gave to landscape features are placed in their historical context and the importance of the local indigenous guide to the success of the expedition is explained.

There is a lot of fascinating information in this book, which casts new light on a forgotten period of exploration history. It will be especially interesting to everyone who knows and loves the Central and Eastern Wheatbelt.

The State of Australia's Birds 2006 – Invasive Species

Pub: Birds Australia, Supplement to Wingspan.

For copies of this and previous reports: www.birdsaustralia.com.au/wingspan/supplements.html

This publication is packed with information on the effect of introduced species – both native and exotic – on birds across Australia. Attractive and well-illustrated, it should be read by everyone concerned with natural wildlife.

CSIRO has a large publishing programme, and many of the books have agricultural or natural history themes. Check out their website, there could be something that interests you. www.publish.csiro.au

Reptiles of the Western Australian Goldfields

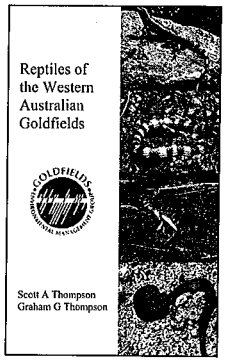
Scott Thompson and Graham Thompson

Pub: Goldfields Environmental Management Group

Cost: $25 + $5 postage from the Treasurer, GEMG, PO Box 2414, Boulder, WA 6430.

This attractive book covers all the reptiles known to occur in the Goldfields region of WA. It includes dragon lizards, geckos, legless lizards, skinks, monitors and snakes.

The book is not a scientific guide – there are no detailed keys for identification, for example – rather, the user would be expected to leaf through, looking for a picture, description and location that fits the animal you have seen. In several instances, photos show different colour forms of the animal, helping to make identification easier. Technical terms have been avoided wherever possible, but a glossary is included if the reader comes across an unfamiliar word.



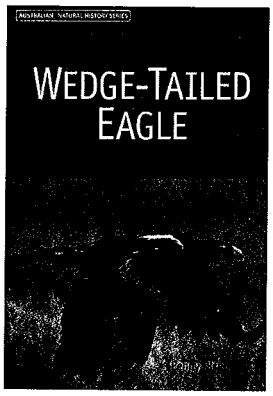
Although the focus is the Goldfields, many of these species will also occur in the eastern Wheatbelt, and even further afield. So, if you want to put a name to that speedy little dragon, racing away into hiding, this is the book for you!

Wedge-tailed Eagle

Penny Olsen

Pub: 2005, CSIRO, Australian Natural History Series

Cost: $ 39.95 from good bookstores or CSIRO direct



If you admire these majestic birds, you will enjoy this comprehensive overview of Australia's largest true eagle. Not only does it cover obvious topics such as hunting and breeding, but it also describes courting, playing and even having a bath.

The author is one of the world's foremost authorities on raptors, and has studied birds of prey as well as caring for hundreds of sick or injured animals. The book is written in clear, non-scientific prose (though there are 13 pages of references to follow up if you want to go into the science) and illustrated with photographs and evocative sketches. Recommended reading for those who would like to learn about eagles as personalities.

COMING EVENTS

Karakamia Sanctuary Twilight Walk

Chidlow

Sunday 27th May 4.30pm

Karakamia is a feral proof sanctuary owned and run by the Australian Wildlife Conservancy. It provides a safe haven for many threatened mammals. On the guided tour you are likely to see a number of nocturnal animals including Woylies, Tammar Wallabies, & Quenda (Southern Brown Bandicoots). This is a special experience as many of the animals you will see cannot readily be seen in a national park.

***Numbers are strictly limited**, so book early.*

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

For details contact Zara Kivell on 9295 9112 or email : zara.kivell@dec.wa.gov.au

A Land for Wildlife 10th Anniversary event

Victoria Plains Wildflower Walk

Wyening Mission Farm, Calingiri

Sunday 9th September, 9.30 am

Morning tea, lunch, guided walks, entertainment and stalls selling local produce.

For more information contact Shire of WVictoria Plains on phone 9628 or email reception@victoriaplains. wa.gov.au

(This annual event is always informative and great fun! - Ed.)

NEWS

LFW AT WOOLORAMA

The theme of the landcare display at Wagin Woolorama this year was 'Water where we need it', which is particularly pertinent for the climatic conditions prevailing at the moment. It attracted a constant stream of interested visitors.

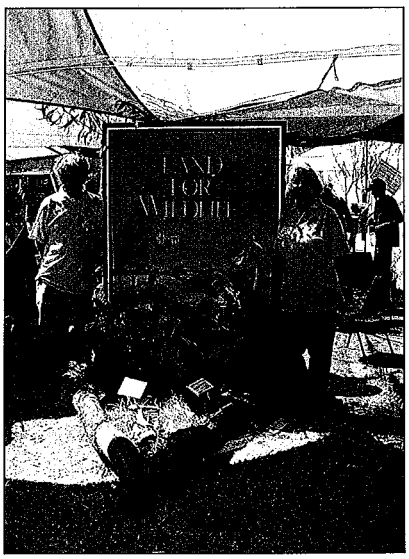
Fourteen different groups mounted a display in the landcare tent. Rivercare, roadside management, alternative production systems, the work of Recovery Catchments and many others were shown. The most pleasing feature of the display was that was all under the one roof and was an integrated and holistic display showing many aspects of land care by different groups, all heading in the direction of sustainable farming, combined with maintenance and enhancement of remnant vegetation for the protection of our native flora and fauna.

A highlight of the display was the model of a living stream showing very brilliantly the dynamics of stream flow and the effect that human intervention can have on erosion and deposition in streams, with the consequent effects upon farm productivity and the maintenance and preservation of native and planted flora and, as a consequence, native fauna. Another highlight was the display of wild animals both native and feral. The necessity to control foxes and cats in order to preserve wallabies, dunnarts, chuditch, phascogales and other wildlife was illustrated by different exhibitors.

The *LFW* exhibit emphasised the voluntary nature of the scheme. It also showed the importance of managing granite rocks correctly, as they are especially vulnerable to weed invasion, rabbit incursion and soil erosion.

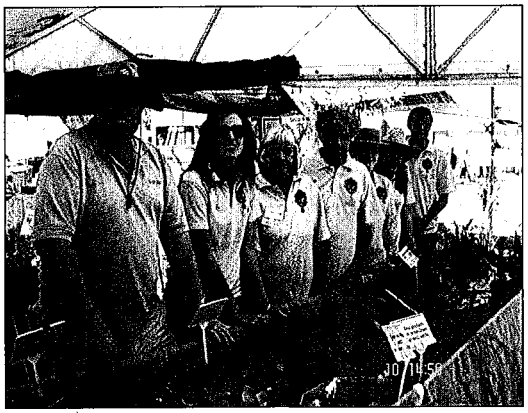
The result of all this hard work and dedication was that the Landcare exhibit won an award for 'best display on the ground', which was a fitting finale to Woolorama for all those working on the theme.

Mal Harper



At Woolorama:
Mal Harper and Avril Baxter

'The DEChands' with the river model



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