October 2000
Vol. 4, Number 4

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Western Wildlife

NEWSLETTER OF THE *LAND FOR WILDLIFE* SCHEME

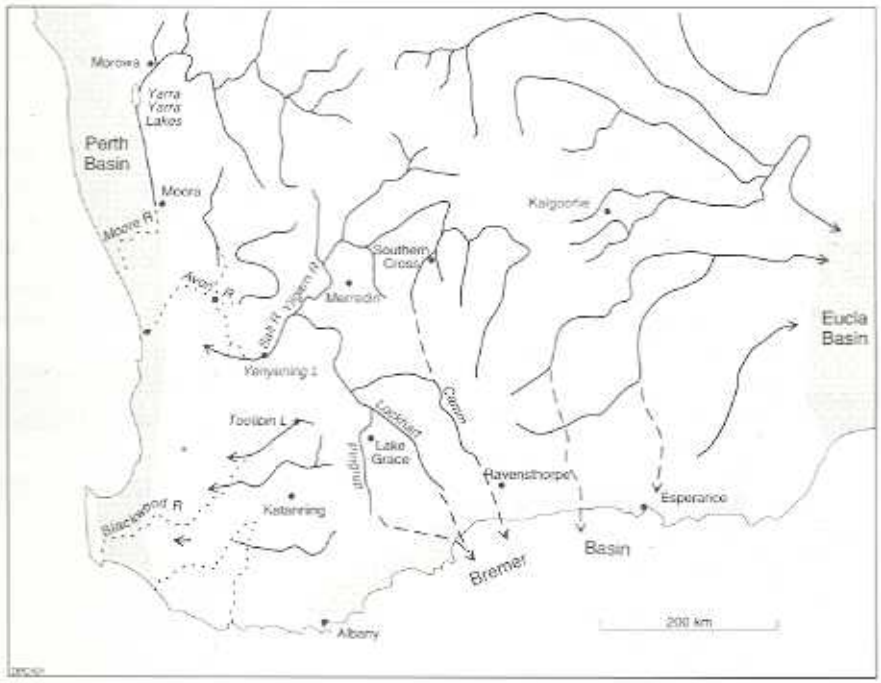
REGISTERED BY AUSTRALIA POST PRINT POST: 606811/00007

ANCIENT RIVERS IN THE WHEATBELT

by Philip Commander

THE flood in the Avon catchment in January this year demonstrated that rivers still flow in the normally internally draining wheatbelt when heavy rain centred on Corrigin and Hyden connected Lake Grace to the sea through the Lockhart River. An event of this magnitude may be only once in a generation, but illustrates the longer timescale of geological and geomorphic processes. In former times the wide flat valleys and salt lakes in the interior of South-West Western Australia were traversed by large rivers which formed the present landscape, but under the current climate exceptional intense rainfall is needed for runoff to occur.

These major valley systems preserved on the Darling Plateau are now filled with as much as 60 m of sediments, and are occupied by discontinuous chains of salt lakes. Not only are we in a comparatively dryer climatic phase, but uplift and tilting of the land has reduced the erosive power and led to increased sedimentation especially in north sloping valleys. The valleys are known as palaeodrainages (palaeo=old), and were first named by John Beard in the 1970s, in the course of vegetation mapping. In the intervening years, more information has come to light on the nature of the sediments and their history, and how they form a relict drainage pattern in the interior of the Australian continent.



Palaeodrainages are shown in solid lines, with possible southward courses dashed; modern rivers are dotted where they depart from the palaeodrainages

The landscape in the south west is ancient – essentially dating back to the Cretaceous Period (as much as 65 million years ago [mya]) when Australia was joined to Antarctica. The last major period of erosion may have been as long ago as the Lower Cretaceous (110mya), judging by the presence of the youngest terrestial sedimentary rocks deposited to the west in the Perth Basin and to the east in the Eucla Basin. Since that time, sediments surrounding the granite-greenstone Yilgarn Craton have mainly been of marine origin. By the Eocene (45mya) when Australia and Antarctica had parted company, many of the rivers ceased to erode downwards and the valleys began to fill with sediments.

The seaway opened up between the two continents is now part filled with sediments in the Bremer Basin – exposed in the Fitzgerald National Park and represented by spongolite and marine erosion benches at Mt Barren. The short south coast drainages have modified the previous systems, cutting off the headwaters of the Camm, Lockhart and Pingrup Rivers. Beard suggests

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EDITORIAL

Greetings everyone!

I am very pleased to say that we hope soon to have a *Land for Wildlife* Officer operating in Esperance. There is magnificent flora and fauna in the eastern agricultural areas, and a great tradition of landcare, so the person should find plenty of landholders to work with. If you know of anyone living in the area who might be interested in *LFW*, please encourage them to contact us.

Spring is the wildflower season, and this issue concentrates on flora. Our carpets of everlastings are a glorious heritage enjoyed by visitors and residents alike, even the slight rises within the course of our ancient rivers used to be covered with daisies. Perhaps someone could try to re-establish them on some secondary saline areas, instead of the ubiquitous barley grass? The story of those ancient rivers is amazing, too, and even salt lakes are rich in living creatures. The immense age and diversity of this landscape can make one feel very humble - it's an extraordinary heritage that is ours to hand on.

Now is the time to start planning to collect seed for your revegetation next year. Remember, direct seeding does work!

Best wishes for an excellent ending to the year.

Penny Hussey

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BUSH DETECTIVE

A Mudlark couple - who's who?

This black and white bird favours open areas, and clearing for agriculture and the provision of stock water has led to it increasing greatly in numbers and distribution. Recorded as being uncommon in 1903, it is now common in woodland, farmland and towns throughout the south-west. It's striking colour has led to the name magpie lark; it makes a mud nest, so mudlark, while its loud call gives rise to the name peewit. The scientific name is *Grallina cyanoleuca*.

Mudlarks feed principally on invertebrates such as snails, millipedes, grasshoppers, locusts, beetles, moths, bees, ants, flies and caterpillars, but they will also take small frogs and seed. In paddocks and around stock they are an important regulator of potentially harmful insects.

Mudlarks pair for life. Which is Mr and which Mrs?

Ans: A is Mrs Mudlark with a white front and B is Mr Mudlark with a black front.

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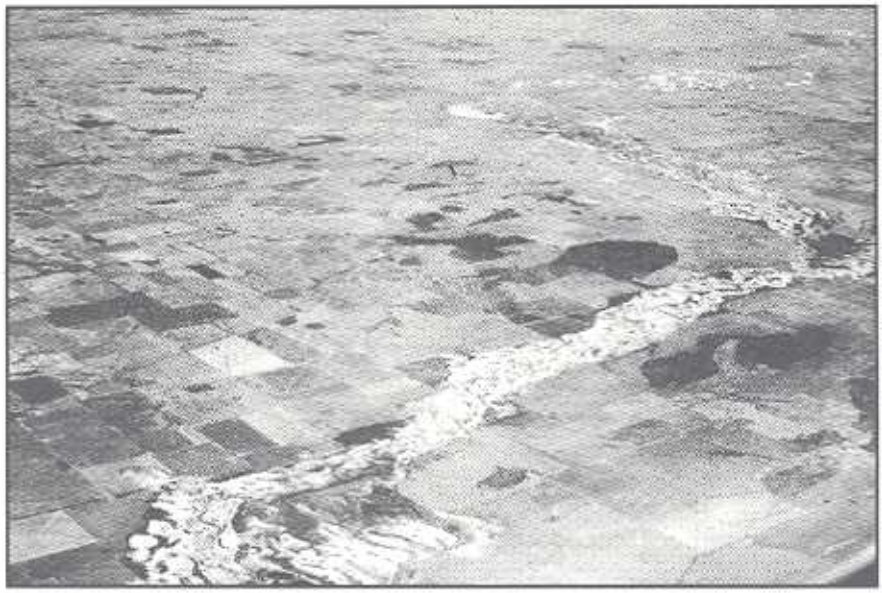
that these once flowed southwards, and have been reversed, with capture at Caroline Gap where the Yilgarn and Lockhart Rivers join. Other west flowing palaeodrainages have been captured by the Blackwood, Avon and Moore Rivers.

The bottoms of these valleys are referred to as palaeochannels, as they contain the sand laid down in former river beds during the Eocene (about 45mya). They are generally less than a kilometre wide, and occupy a small proportion of the broad flat valleys. The palaeochannels are completely concealed, and must be found with geophysical methods using the difference in gravitational electrical properties with the surrounding bedrock. Some of the Wheatbelt valleys, especially the west flowing ones, seem to be much younger. At Yenyening, Toolibin, and Yarra Yarra Lakes, the spores and pollen in the valley sediments indicate a Pliocene age (5mya), and the Eocene sediments have been eroded and are preserved high in the landscape in the Darling Range.

The low gradients and lack of surface outflow result in groundwater discharge within the valleys. The small amounts of salt brought in by rainfall have been concentrated over time, and groundwaters may commonly be six times the salinity of sea water, with salt deposits being formed in some of the salt lakes. Throughout the Quaternary (the last 1.5 mya), the salt lakes are likely to have expanded and contracted to take account of different rainfall and evaporation conditions during ice ages and interglacials. The balance of evaporation to salt lakes has now been upset by large scale clearing in the Wheatbelt. Greatly increased groundwater recharge has led to rising water levels in the valleys and expansion of the salt lake areas to account for increased evaporative discharge of groundwater. A consequence may be significant loss of valley floor vegetation if not reversed.

Pumping at Lake Toolibin is being trialled to see whether the saline water level can be lowered to protect the lake and its vegetation. The problem with pumping to lower the water table is that the sands in the palaeochannels occupy only a small proportion of the valley floors – less than a kilometre wide, and they are overlain by low permeability clay which does not allow water to pass through easily.



The Yilgarn River at the Caroline Gap, Mt Stirling (U-shaped darks blobs) to south, Mt Caroline (oval blob) to north.

The saline water in palaeochannels is important for gold ore processing at Southern Cross, and in the Eastern Goldfields, and may have possibilities elsewhere for saline aquaculture. Although most of the palaeodrainages in the wheatbelt also contain saline water, in the west some of the palaeochannels now abandoned by modern drainage lines, form dry valleys and contain fresh water. The Beaufort, from Boscabel to Towerrinning, and westwards, and the Avon west of Mt Kokeby near Brookton to Darkin Swamp are two of the largest systems found to contain fresh groundwater. The modern rivers such as the Blackwood, Avon and Moore drain saline water from the palaeochannels at a low rate, which contributes to their high salinity.

The palaeodrainages in the wheatbelt preserve a record of the past climate, and the response to changing conditions. It is our challenge to understand the changes resulting from our land use, and to create a landscape which will accept the increased surface and groundwater flow.

Further reading

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FAUNA

IS THERE LIFE IN OUR INLAND SALT LAKES?

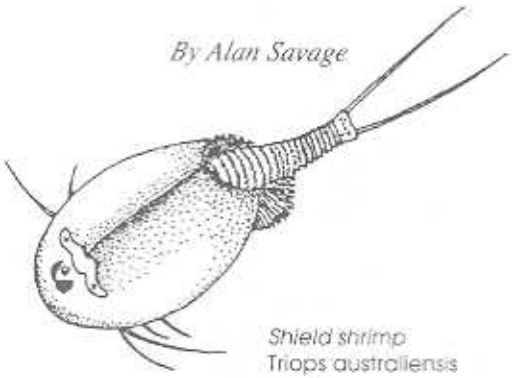
By Alan Savage

ONE of the obvious features of inland Western Australia, and the Wheatbelt in particular, is the presence of thousands of saline lakes, from tiny ponds to huge expanses of water stretching across the horizon. Most of these saline lakes are a natural and ancient feature of the inland environment and form the bulk of our inland wetlands. This is something we need to remember as we try to deal with the ecological and economic crisis resulting from rising saline water tables. Although they may appear on casual observation to be featureless, sterile ponds of salty water, closer examination will reveal that they are complex and diverse ecosystems. They are home to a wide array of flora, fauna and microorganisms, which are perfectly attuned to both the predicable and the random hydrological and environmental dynamics of the inland.

Despite their adaptations to these variables and their tolerance of salinity, some of the organisms inhabiting these saline ecosystems are under enormous stress from agricultural salinisation. Salt entering into lakes from natural and agricultural drainage can exceed the tolerance of the organisms inhabiting it. Moreover, this excess water can create permanent or semi-permanent lake environments to which many of these organisms have not adapted. To understand and recognise the occupants of these lakes and to see how they are both valuable and threatened, we will need to look at the lake environment in which they have evolved.

Lakes

The majority of inland lakes are ephemeral, which means that they fill seasonally and then dry out completely. These dry periods may be annual events as in the Wheatbelt lakes, or they can last for decades in lakes of the inland desert. These desert lakes only fill when rare rainbearing cyclonic depressions reach them.



Shield shrimp
Triops australiensis

Normally the Wheatbelt lakes fill with predicable winter rains in May and June. They remain full until late winter or early summer when evaporation exceeds rainfall and salinity increases. Finally the lakes dry, leaving a bed covered with a crust of salt crystals. Heavy cyclonic rainfall events, such as occurred in April 1999 and early this year, can also result in lakes filling during the summer months. WA lakes are very shallow (100-500mm deep) and because of this can experience very rapid changes in temperature and salinity. Temperature, pH and dissolved oxygen are important biological factors which can change rapidly over day/night cycles and, with salinity, will also change over months in response to changing weather conditions.

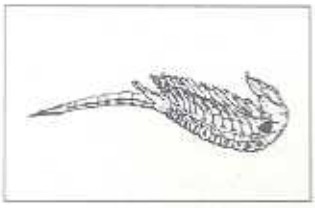
When full, individual lakes have salinities which are reasonably consistent over seasons. There are lakes with salinities of a few grams per litre to hypersaline lakes. Salinity is one of the major stressors to lake organisms and because of this lakes with different salinities contain characteristic groups of fauna and flora. Many of the productive, healthy Wheatbelt lakes contain less than 70 g/L salt - approximately twice the salinity of seawater - but they have a high diversity of living organisms. Generally, the higher the salinity, the smaller the number of species the lake can support. Degraded lakes with high inputs of salt may contain no fauna, or a restricted number of very salt tolerant fauna.

Inhabitants of salt lakes

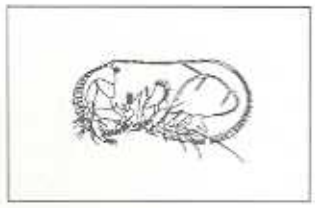
These temporary saline lakes pose great difficulties to organisms that cannot escape to alternative refuge areas. These inhabitants must have a dormant phase, which enables them to survive and persist during the period when the lake is a dry and extremely inhospitable environment. The algae, bacteria and other microorganisms persist by drying out and becoming inactive or by forming dormant cysts which remain buried in the mud. The aquatic plants produce seeds with a hard protective coat.

Algae are the primary producers in saline lakes. They include planktonic algae, benthic diatoms and the bacterially-dominated benthic microbial communities which form the slimy, thick, coloured layers on the bottom of many highly saline lakes.

Food chains in all these lakes are relatively simple; most of the food starts with growth by microscopic

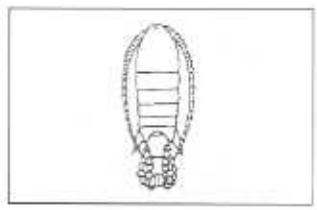


Brine shrimp Parartemia



Osctracod Australocypris

Waterflea Daphniopsis



Copepod Microcyclops

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plants, the microalgae. In some of the highly saline lakes, benthic mats, which are mostly bacteria and cyanobacteria, produce the food. In some less saline lakes, seagrasses like *Ruppia* and *Lamprothamium* will form the base of the food chain.

If you look closely at a salt lake or use a small net to scoop a sample, you will find an abundance of small shelled animals. These are the crustaceans and they dominate the fauna in both abundance and variety of species because they are superbly adapted to the specific characteristics of these harsh environments. The extent and the range of lakes mean that there is a rich diversity of crustaceans.

Crustaceans feed on planktonic microalgae and bacteria. Their faeces settle to the bottom of the lakes and are processed by bacteria and subsequently re-enter the food chain when consumed by bottom-feeding animals. The ecology of these lakes is intimately dependant on, and regulated by, both the feeding animals and the activities of the microorganisms. Serious disruption of these cycles of feeding and recycling can occur through the spread of exotic animals, including farmed fish, or through changes to the hydrology of the lakes.

The crustacea of ephemeral lakes also cope with the drying up of the lake by producing eggs, known as cysts, which survive desiccation and exposure. When the lakes fill, the dried eggs absorb water and the embryo develops very rapidly and emerges as a small larva, less than 0.5mm long. These larvae grow rapidly. The adults may produce live young early during the season but as the season progresses they switch to the production of cysts. After laying their cysts the adults die, their bodies decompose and the released nutrients are made available for the natural functioning of the lake in the coming season.

Although these salt lakes may only exist seasonally or even very sporadically, they are important habitats for a range of waterfowl. Birds are highly mobile animals and can migrate from permanent coastal swamps and inlets to the highly productive inland lakes when these are full. Indeed large inland lakes such as Lake Ballard are vital breeding grounds for the banded stilt, which only breeds when the lakes fill with cyclonic rains. Prolific populations of the brine shrimp *Parartemia* emerge and supply an abundant food source, enabling the chicks to grow quickly. When the lakes dry and the young birds mature, the flocks migrate back to the coast. Other birds including Australian shelducks, avocets, gulls and dotterels also use the salt lakes as essential habitats.

Saline lakes are ancient natural ecosystems, and are the major wetlands of inland arid Australia. Despite their superficial appearance of sterility they are important habitats for a wide range of living organisms. Many of these are endemic to small regions of WA. They are a significant part of our biodiversity and are fine examples of adaptation to the seasonal, extreme and unpredictable environment which characterises arid inland Australia. These organisms are threatened by excessive salinisation and by some of our attempts to address this through drainage. However, because of their adaptations to salinity and to extreme environments, they may be the genetic resource which contains some of the solutions to this ecological and economic crisis. We need to understand and protect this resource that we have, both for its inherent values and for the potential genetic resource that it contains.

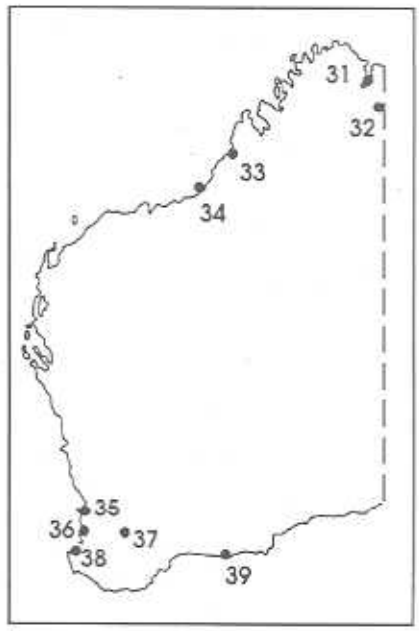
Alan Savage is studying brine shrimps in the Dept of Zoology at UWA. He can be contacted on ph: 9380 2223 or email: asavage@cyllene.uwa.edu.au

RAMSAR SITES

In 1971, a number of nations signed the Convention on Wetlands of International Importance. Australia has listed 53 wetlands under this Convention, nine in WA. The Convention was held at Ramsar, in Iran, and so the sites are popularly known as 'Ramsar Sites'.

Areas listed under this Convention need to be managed to ensure the special ecological values of the site will be maintained or improved. Australia uses a range of mechanisms to do this, including the creation of wetland legislation and policy, the development and implimentation of site management plans and running education and community awareness programmes.

RAMSAR SITES IN WA



LEGEND

31 Ord River Floodplain
32 Lakes Argyle and Kununurra
33 Roebuck Bay
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35 Forrestdale and Thompson Lakes
36 Peel-Yalgorup System
37 Lake Toolibin
38 Vasse-Wonnerup System
39 Lake Warden System

FLORA

EVERLASTINGS

By Nicholas Lander

ONE of the most spectacular sights nature has to offer is the annual display of everlastings — yellow, pink and white — that spreads as far as the eye can see beneath the mulga, wattle scrub and spinifex of Western Australia. Each year after heavy autumn or winter rains the red soil is carpeted with these ephemeral members of the daisy family. By far the most prominent are *Rhodanthe chlorocephala* subsp. *splendida* with solitary cream or white flower-heads up to six cm across, the yellow-headed *Cephalipterum drummondii*, and the handsome pink-headed *Schoenia cassiniana*. Other everlastings found amongst these include *Helipterum craspedioides* (yellow), *Helipterum venustum* (yellow), *Myriocephalus guerinae* (yellow), *Rhodanthe chlorocephala* subsp. *roseum* (pink or cream), *Waitzia acuminata* (golden). Scattered amongst them are often species of *Brachyscome*, not themselves everlastings, but also daisies and remarkable for their blue and yellow flower heads.

Particularly dense displays of everlastings can often be found around Payne's Find where a most curious phenomenon can be observed, namely that the pink and white colours of everlastings are found on flats and depressions, and the yellow colours on rising ground. *Cephalipterum drummondii* has two colour forms, white and yellow, otherwise identical, which segregate in this way, the yellow form associating with other yellow-flowered species. Although this behaviour can be observed elsewhere it is not so marked as around Payne's Find.

Everlastings (alternatively known as sunrays or paper daisies) are so-called because of their ability to retain natural colour and apparent freshness for exceptionally long periods. They are easy to recognize by the crisp, papery texture of their flower heads. For this reason they form a vital component of the dried-flower export industry. Amongst the first plants cultivated by European horticulturalists during the 19th century was *Bracteantha bracteata* (Golden Everlasting) which was soon bred into a plethora of attractively coloured forms known simply as 'Immortelle'.

It is worth noting that whilst in the past many species of everlasting have been placed in the genera *Helichrysum* and *Helipterum*, recent research shows that these names are wrongly applied to Australian species. Furthermore, the variation within the many species of Australian everlasting is sufficient to necessitate not two genera but many. Thus species of everlasting formerly placed in *Helichrysum* are now distributed amongst *Bracteantha*, *Chrysocephalum*, *Lawrencella*, *Ozothamnus* and *Schoenia*. And most of those formerly placed in *Helipterum* have found a home in *Rhodanthe* with others scattered in smaller genera such as *Anemocarpa*, *Argentipallium*, *Hyalosperma*, *Leucochrysum* and *Triptilodiscus*.

Although they may differ in the microscopic features of their tiny flowers, a feature all everlastings have in common is the coloured petal-like bracts of each individual flower head. A curious fact is that the colour range of the petal-like bracts of each flower head of Western Australian everlastings is confined to the range pink, white and yellow. Red and orange colours are not found in everlastings in Western Australia, unlike in South Africa where they are common, even dominant.

The phenomenon of plant movement can readily be observed in everlastings, the flower heads of which tend to track the movement of the sun, a curious fact in itself. Furthermore, at night the heads fold up forming a bud-like structure once more. They also do so when it rains. If you watch carefully as evening approaches, you can often see insects (especially native bees) alight on the central disc of the flower head and remain there as the bracts close around them. Early in the morning, as the flower head directs itself towards the sun and opens up, the insects set off on their forays once more. Thus everlastings provides shelter and warmth for the insects. Nectar secreted at the base of the tiny flowers within the head provides food for its visitors.

An unexplained feature of one of our commonest everlastings, *Rhodanthe chlorocephala* subsp. *splendida*, is the presence of a black spot at the base of the inside surface of the bract in cream-coloured specimens.

The seeds of many everlastings are myxogenic, that is, when moistened the tiny hairs that cover them burst and exude mucilage. The function of this slime is presumably to bind the seeds to a moistened substrate, so preventing them from blowing away to somewhere less hospitable.

In Western Australia, our wildflower tourism industry markets many tours based fairly and squarely on the displays of everlastings. This spectacular annual event points to

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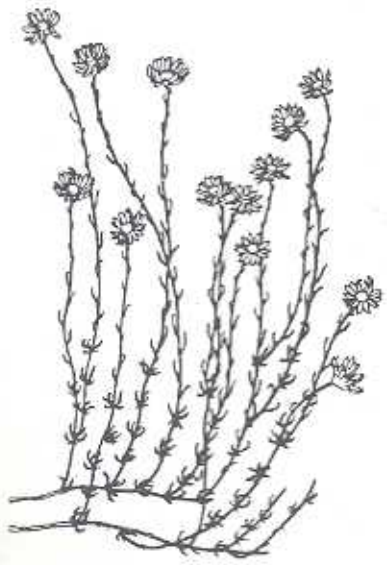
the importance of the Astereaceae, or daisy family, to which they belong. Australia is a centre of diversity for this, the largest of plant families. Indeed, some 1,000 or so species make their home here. Aster, Calendula, Chrysanthemum, Dahlia, Gazania and Zinnia are familiar as garden subjects. Chicory, Endive, Globe Artichoke, Jerusalem Artichoke, Lettuce and Salsify are common vegetables. Safflower and Sunflower are commonly used for cooking oil. Absinthe, Chamomile, Dandelion, Tansy, Tarragon and Yarrow are traditional herbs. And Bindi-eye, Boneseed, Capeweed, Fleabane, Noorgoora Burr, Sow Thistle and Skeleton Weed are troublesome weeds.

Those seeking more information on everlastings and their relatives will find brief descriptions, photographic images, maps and a useful interactive identification system on the WA Herbarium's FloraBase website at http://florabase.calm.wa.gov.au/

For current information on what is flowering visit The Wildflower News: Mid West Wildflower Watch at http://www.wn.com.au/wildflowernews/



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NEW BOOKS

WALKING THE CAPES: TWENTY-ONE WALKS IN AND AROUND THE LEEUWIN-NATURALISTE NATIONAL PARK

by Jane Scott
Cape to Cape Publishing
Cost: $25.00

This is a gem of a book, with lots of photographs and glorious illustrations (by Patricia Negus) of just about everything you are likely to encounter while walking through this magnificent countryside. Using it, you will be able to identify almost every plant you are likely to come across, and also birds, reptiles, invertebrates, seaweeds and seashore creatures. There is an excellent section on geology, and even suggestions for wining and dining! The walks themselves are clearly explained, and there are choices to suit every grade of fitness.
If you haven't been down to the Capes Region for a while, this is your excuse to go!

WALKS ON HYDEN ROCK

by Rowl Twidale and Jennie Bourne
Wave Rock Management P/L
Cost: $6.90 (obtainable from Wave Rock Kiosk or Wave Rock Wildflower Shop)

This pocket-sized book gives detailed descriptions of 4 walks around the popular tourist destination of Wave Rock at Hyden. The book concentrates on geological features, though there are brief plant notes. Many of the features illustrated are found on other granite outcrops in WA, so this guide introduces the reader to a very important type of geological structure.
Even if you are not going to visit Hyden, this booklet is worth obtaining just for the illustration of granite landforms, as they can all be found on other outcrops elsewhere in the SW.

NATIVE BEES ON WILDFLOWERS IN WESTERN AUSTRALIA

By Terry Houston
Special Publication No 2, WA Insect Study Society Inc, Perth
Cost: $22 + p&h (obtainable from Museum Bookshop: Ph 9427 2776)

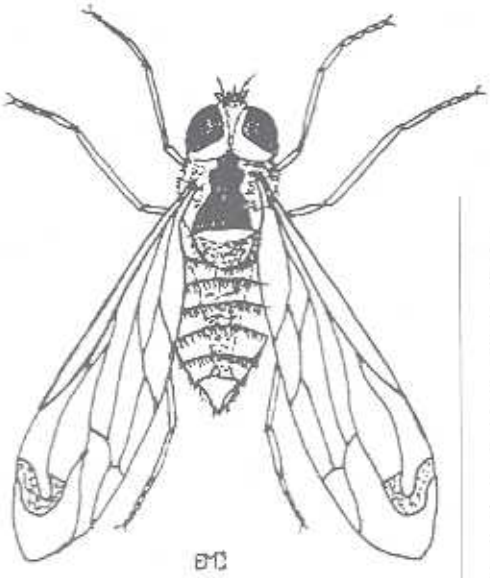
This is a book for entomologists and really keen naturalists. Using data from the WA Museum, it lists which native bees have been recorded visiting which flowers in WA. You can look up either the bee or the flower to find out the association. There is also a chapter of general information about native bees.
If you have a strong specialist interest in pollenation, you will find the information fascinating, but it is rather detailed and technical for the general reader.

HAKEAS OF WESTERN AUSTRALIA: BOTANICAL DISTRICTS OF ROE AND EYRE

By Jennifer Young
Cost: $20.00 + $5.00 p&h

The third in Jennifer's series of illustrated guides to hakeas, this one covers the Mallee and the Esperance Plains. As with the previous two books, it is clear, concise and useful. If you live on the South Coast (SCRIPT region), or the eastern wheatbelt, this is for you.
To obtain a copy, contact J. Young, PO Box 576, WEST PERTH, WA 6872.
Ph: 9242 2207.

FLORA



Comptosia fly

POLLINATION

By Eric McCrum

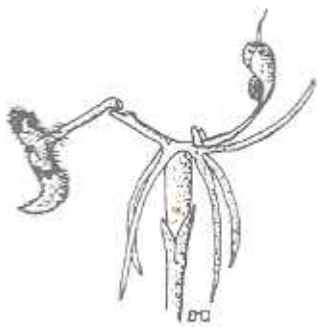
WHAT an amazing series of adaptations have occurred when plants sought various ways to have the pollen transferred from the stamen to the style! You would imagine that with the stamens and the style both in the one flower, this would be simple. However, flowers do not like, nor endorse, self pollination.

To avoid this, flowers become protandrous, or in a few cases protogynous. A protandrous flower develops and releases the pollen from the anther well before the sticky style develops and becomes ready to accept pollen. Most flowers are protandrous but one commonly eaten fruit – the banana, is protogynous [pollen released after the style develops – Ed]

Pollen can be transported from the stamen to the style by a variety of vectors. These are usually wind, water, insects, birds and mammals. The first vector used by plants was the wind, and the first pollen-bearing plants on the earth used wind. Grasses, sedges, bulrushes, pines, sheoaks and zamias all use the wind. Styles of these plants have become feathery or very sticky, to capture the wind-blown pollen which is released in abundance, weeks before the style becomes ready.

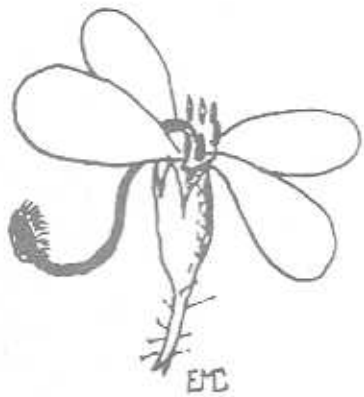
Often the pollen grains of these plants were ornate, bearing bumps, ornamentations or even wing-like projections. All these enabled the pollen grain to remain in the air longer, and thus have a greater chance of finding a style. Most of the wind-pollinated plants, even to this day, flower in winter to take advantage of the associated strong winds. Note that the sedges and some species of sheoak usually flower immediately after the first heavy rains fall. The moisture in the air helps keep the pollen grains close to the ground where most of these flowers are located.

By far the most common pollination vectors are the insects. Most of our plants have co-evolved with insects using a whole range of flowering modifications to suit the insect pollinator. Plants, in their urge to survive and succeed, modified their flower size, structure, colour, nectar and scent to exploit the vast range of insects. Because most insects fly, the plants could cut down on their pollen production and design their anthers to release pollen only when the insect visited the flower.



Hammer Orchid
Drakaea

Winter flowering plants exploited the moths and beetles, flowering at night (their pollinator's active time) and producing perfume to guide the insects to the flowers. To avoid the nectar being washed away by the rain, these flowers either hung down (like silver princess, *Eucalyptus caesia* and *Correa* spp) or had tubular flowers like many of our heaths. White flowers utilised the moonlight, to make the flowers more easily seen.



Triggerplant
Stylidium

Because insect life cycles vary considerably, adult insects emerge at different times of the year. Plants exploit this, by flowering at a certain time to match the pollinator's emergence. Hammer orchids (*Drakaea* spp), flower at the same time that the female Thynnid wasps emerge. These flowers have modified their third petal to resemble a female Thynnid wasp, and the tips of their sepals and petals emit a similar scent to that emitted by the wingless female.

Male Thynnid wasps pick up the 'scent' of a female and track it down. Seeing the modified petal, which looks (and smells) like a female, the male grasps it and tries to fly off. However, the petal swings the male into a pollen trap which glues a pair of pollinias onto his back. Realising he doesn't have a real female, he

continued on page 9

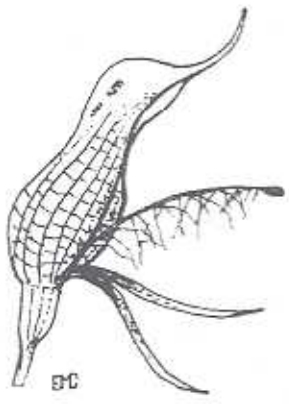
FLORA

continued from page 8

flies off to the next 'female', where the pollinias are taken from his back by that flower's glue.

Many flowers are structured to accommodate one group of insects. Watch the triggerplants (*Stylidium* spp) and see the flies involved in their pollination. They are often *Comptosia* flies, note the boomerang-shaped cell in their wingtips which readily identified this group of long-winged flies. If you look at the triggerplants' flower structure, some triggers come over the top, others from the side and a few from below. These triggers initially deposit pollen on the backs of the visiting insect. Once the pollen is exhausted, the same trigger is used to collect pollen from another visitor.

Few people realise that mosquitos are used as pollinators of certain orchids, for example bird orchids (*Pterostylis barbata*) and snail orchids (*P. nana*). These flowers emerge in late winter and early spring to correspond with the emergence of the adult mosquitos. Hairy 'labellums' or 'trapdoors' in the flowers, trap the mosquito and cause it to pick up the pollinias.



Bird Orchid
Pterostylis barbata

Quite a few blue or purple flowers have their pollen in tubular anthers which open in small pores at the tip. Many lilies (*Arthropodium* and *Dichopogon*) and the *Solanum* flowers have these tubular anthers. Native bees (*Amegilla* and *Nomia* spp) visit these flowers, curl themselves below the anthers and "buzz" their wings, causing the pollen to puff through the pores and onto the bee's belly.

Chocolate Lily
Arthropodium

On the ground, ants are often involved with pollination. Prostrate banksias and the underground dryandra (*D. bipinnatifida*) use ants and also bushrats. Ants are also involved in the pollination of the woollybush group (*Adenanthos* spp). To lure the ants to the dull-coloured flowers, the tips of the leaves surrounding the flowers bear pseudo-nectaries offering nectar to the ants.

Honeyeaters, honey possums, pygmy possums and silvereyes are animals involved with a wide variety of plant pollination. The open flowers of many species of eucalypts lure many birds and insects to the nectar supply. Some pendulous eucalypts (*E. caesia, E. stoatei, E. forrestiana*) have their stamens curling inwards to deposit pollen on the snout of the mammal or face of the bird as it gets nectar from the flower.

Kangaroo paws, grevilleas and woollybushes have their tubular flowers specifically designed for honeyeater pollination. Large inflorescences, like banksias, open the flowers from the base, allowing the birds to land on the unopened flowers above. One species (*B. tricuspis*), opens its flowers from the top of the flower head, allowing honey possums and pygmy possums to climb on the unopened lower flowers to get at the nectar.

To utilise one vector (honeyeaters), the banksias on the coastal plain around Perth open at different times. *B. attenuata* flowers from October through to February, *B. menziesii* from February to August, and *B. ilicifolia* from June to November. Thus the honeyeaters have a constant supply of nectar from the three common species of banksia in the area.

It is an interesting activity to keep a diary of the flowers that open and record the visitors as possible pollinators. If possible, make a note of whether the flower is scented or not, so it may be nocturnally pollinated. Many flowers have not had their pollinator recorded. Your observation may be the very one that registers the pollinator! For example, the beautiful babe-in-the-cradle orchid (*Epiblema grandiflorum*) has no known pollinator but, being a swamp lover, it may be a mosquito.

Eric McCrum will be known to generations of school children as the person who ran the Gould League's Herdsmans Lake Wildlife Centre. Now retired, he can be contacted on 9295 3344.

Illustrations: Eric McCrum

Note: In botanical latin, the shortened form of species, singular, is sp. Many species, plural, is spp.

FLORA

HAKEAS

by Jennifer Young

HAKEAS are very much part of the Australian landscape. They are unique to Australia. There are about 150 species, of which over 100 are found in the south-west of WA - a rich heritage indeed.

To date, the cultivation of hakeas has been limited, perhaps because many of the species have very prickly leaves which make them unsuitable for gardens. However, it is now time to recognise the value and potential of hakeas in the environment, particularly in revegetation projects. They offer huge benefits in the way of erosion control, windbreaks, shade, shelter and fauna habitat. These plants are hardy and adaptable and do well on all soil types from sands to granite outcrops and swamps. They are found from throughout the jarrah forest to low heathlands and exposed coastal areas and inland.

Hakeas are characterised by their intriguing woody fruits, each containing two winged seeds. These fruits vary with each species in shape, size and texture. Most species retain their fruits for several seasons, while others quickly shed them when ripe. The hard woody fruits help protect the seeds from bird and insect predators. Hakea plants have evolved to withstand fire - the surface of the fruits are often fire retardant, only opening and releasing their seeds onto the ashbed after the fire has swept through.

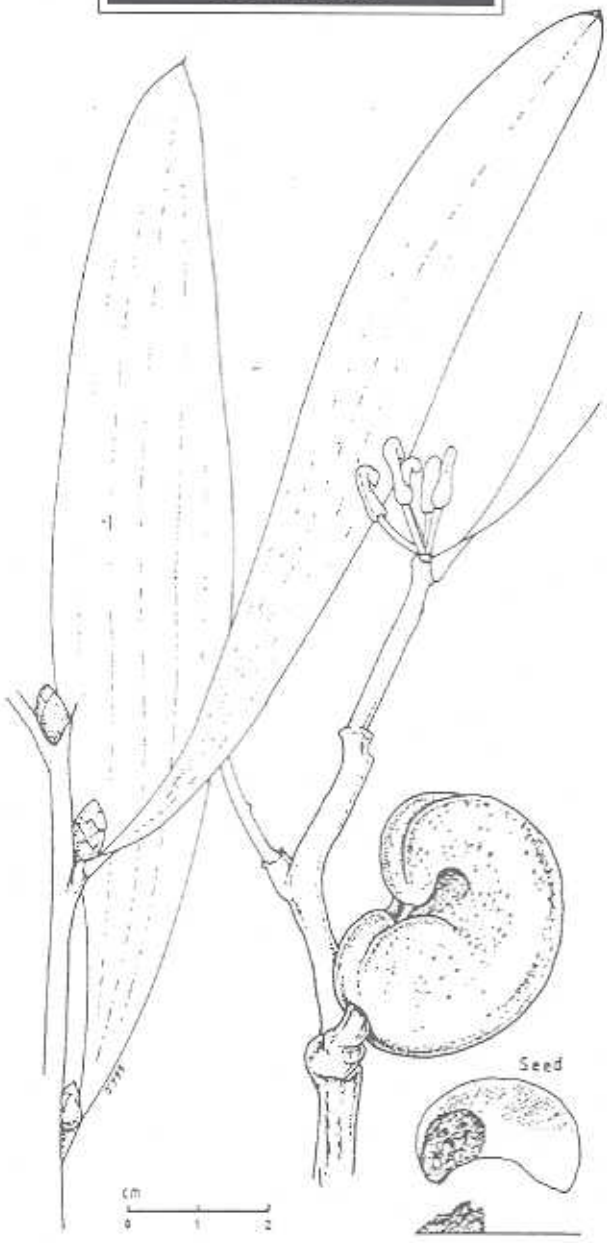
Some hakea plants are lignotuberous, the underground root system being protected from fire and resprouting after rain. The ability to withstand hostile conditions make the hakeas very desirable in new plantings.

Hakeas vary from ground covers to small trees and the habit may be spreading or upright, dense or open. The leaves are also variable, they may be terete, linear or wide with a prickly or entire margin. Probably the needle-like leaves are an adaptation to survive in poor soils and arid conditions.

The colour of the hakea flowers ranges mostly through white, yellow and red. The flowers are borne in axillary clusters or racemes and are usually very decorative and give an outstanding floral display in the wildflower season. Best known is the splendid *H. laurina* (pincushion hakea) which is now grown not only in Perth gardens but also extensively overseas. Other wonderful blossoms are seen in the scarlet racemes of *H. bucculenta* and the bright chrome yellow of *H. cinerea*. Planted in garden or revegetation, the hakea flowers attract birds and insect pollinators.

Many hakeas are sought after by florists for dried flower arrangements, mainly for the leaves and interesting seed pods. Beekeepers place their hives amongst *H. trifurcata* thickets which are an excellent source of nectar and woodturners relentlessly pursue *H. preissii* for the attractive grain of the trunk wood. North-west Aboriginal people tracked the hakeas for various reasons. Some species were used as a food source, others for medicinal purposes and still others for spears and boomerangs.

The landscaping potential of some of these lesser-known plants can already be seen. One may observe, driving along the Kwinana Freeway at Mt. Pleasant in Perth, how well the sturdy *H. corymbosa* and *H. petiolaris* have successfully established to enhance and stabilise the banks.



Hakea cyclocarpa *ram's-horn*

Jennifer Young is an artist who devotes a lot of time to revegetation work through Men of the Trees. She is the author of three field guides to hakeas - see 'New Books' section.

The unusual fruit shape of Hakea bicornata

FLORA

WWF FOCUSSING ON WHEATBELT WOODLANDS

LAND FOR WILDLIFE has a new pair of (unofficial) feet on the ground - in the form of World Wide Fund for Nature (WWF) Woodlands Conservation Officer Richard McLellan. Richard is heading a WWF conservation project centred on the Wheatbelt region aimed at 'working with the community to manage and protect tall eucalypt woodlands'.

The 'Woodland Watch' project aims to enhance the conservation of tall eucalypt woodlands in the western and central Wheatbelt – particularly those on privately-owned land - through the negotiation and implementation of a range of conservation strategies and incentives. These include conservation covenants, local Shire rebates, voluntary management agreements and, of course, *Land for Wildlife*.

Eucalypt woodland conservation is nationally recognised as being of high priority, and nowhere more so than in Western Australia's agricultural region, where tall woodland communities have been extensively cleared. Good-quality woodlands with a dominant overstorey of *Eucalyptus salmonophloia* (Salmon Gum), *E. longicornis* (Red Morrel), *E. salubris* (Gimlet) and *E. loxophleba* ssp. *loxophleba* (York Gum) are few and far between. What is more, these four woodlands are grossly under-represented in existing conservation reserves, only 3% of the original woodland vegetation communities remain. Maintaining this small amount and, where possible, extending the area, is a key goal behind Woodland Watch.

In the early phase of the project, examples of the four 'target' woodland communities on private and non State-agency land are being identified. This is done through a desk-top survey of spatial information (remote sensing and GIS data); researching published literature and available vegetation databases; and through consultation with the community. The latter has largely involved meetings with field-based conservation professionals, but feedback has also been sought

Richard studying the rare Acacia merrickiae in a salmon gum woodland at Kellerberrin.

directly from landholders through appeals made in local newspapers.

The dual outcomes of these consultations have been the collection of information about woodland locations and, at the same time, increasing public support for their identification and conservation.

With the permission of landholders, the sites identified through the processes outlined above are being visited to assess their condition, botanical composition and conservation significance. The next phase of the project involves carrying out botanical surveys, collaboratively with staff from the Western Australian Herbarium and, wherever possible, with volunteers from regional herbaria. The field surveys will provide important data on the floristic composition of the 'target' woodlands as well as their vegetation associations and distribution.

The feedback from these surveys is expected to have a significant impact on landholders' level of awareness of the complexity of their 'patches of bush'. It is hoped that this raised awareness will also flow-on to the wider community through the publication of important and relevant findings of the project.

A follow-up meeting is arranged with the landholder to discuss their further participation in the project. They will be provided with 'best practice' management information – from a wide variety of sources - as well as information on agencies and programs which are able to provide advice and assistance for future management of their woodland. The *Land for Wildlife* program is prominent among these. The goal of this phase of the project is to secure the woodlands into some form of long-term conservation planning and management.

In addition to the *Land for Wildlife*, other options which may be presented to landholders include:

- Conservation covenants;
- Conservation Agreement with WWF;
- Rate rebates;
- Land acquisition for conservation reserves;
- Australian Bush Heritage Fund;
- Bush Brokers;
- Bush Bank; and, if relevant,
- Threatened Species (and Ecological Communities) Network.

Landholders will be encouraged to develop long-term management plans and perhaps adopt one of these conservation incentive and management schemes. This would either help protect their woodland or to obtain a financial return through selling the land while, at the same time, securing its future conservation.

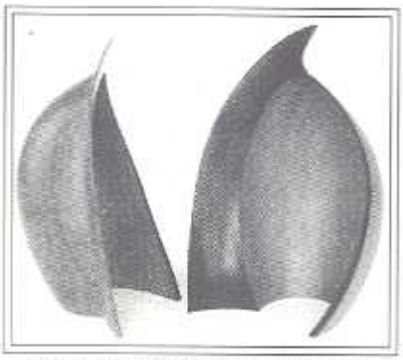
World Wide Fund for Nature Woodlands Conservation Officer Richard McLellan can be contacted at the Avon Catchment Network in Northam on 9690 2267 (rmclellan@agric.wa.gov.au) or at Beverley on 9646 4080 (santalum@agn.net.au)

This project is supported by the Natural Heritage Trust and Alcoa Australia.

MEMBERS PAGE

A Craftwood Story

TWELVE years ago, Chris and Cheryl Reid purchased a 200 acre property 20 km north-west of Denmark. It carries about 75% of remnant vegetation, predominantly jarrah, marri and sheoak woodland interspersed with teatree and paperbark wetlands. Chris and Cheryl picked teatree off the property and sold it to the local wildflower industry but found that it was not economically viable. The need to find some other source of income led Chris to try his hand at wood craft and Cheryl to begin studies in landcare - she now works as a contractor in the landcare industry.



"Atlantic Crossing" and "Close to the Wind". Sheoak. Photo: Chris Reid

The fine wood crafting industry is relatively new in the south west of WA. Wood crafting differs from wood turning in that the resulting works have variable heights within a single form. Chris's main carving tool is a small chainsaw, however the final touches involve the long process of sanding, giving the wood a silky smooth finish.

Many of Chris's designs are largely controlled by the shape of the wood and the direction of the grain. Most of the timber he uses for his work is gathered from dead wood on the property - he believes in sustainably harvesting the timber so as not to upset the ecological balance. He has also planted some small lots of sought-after timber species such as *Acacia melanoxylon* and red cedar, so that he is growing attractive hardwood timbers for the future.

Chris commenced exhibiting in 1990 and supplies a lot of his works to the Woodcraft Gallery in Pemberton where he is considered to be amongst the top three carvers in the south west. Already he has work in collections at the Art Gallery of WA, Parliament House Canberra and the City of Hitachi, Japan.

The fine-wood industry has huge potential for value-adding, Chris points out. As an example, a jarrah dining table was recently sold overseas by the Woodcraft Gallery for $4,500. The value the Government places on the 500 kg of 800 year old jarrah that became this table is just $3 - the royalty due if the wood were to be sold as firewood. Makes you think, doesn't it!

Cheryl and Chris are concerned that their remnant bushland is now surrounded by cleared properties and has become an isolated island. They hope that one day there will be increased interest in the long term preservation of remnant bush in their catchment and that neighbours will consider installing wildlife corridors.

Sylvia Leighton

Cheryl and Chris, with children Daniel and Nick, on a fallen log on the property. Perhaps this one is a bit big to carve? Photo: Sylvia Leighton

Brush-Tail

by
Jenny de Garis

Cupboardlover
she'll come to your call
tolerate stroking for gluttony's sake.
Greedy only for gourmet delights
like muesli or apple,
she'll throw down what's NOT
to her taste.

Her coat invites stroking - but
touching is risky - her claws
must hold her in head-down descent.
Mostly a loner, she's used to
defending her space.

Sniffing, though, is addictive.
Bury your nose in her perfume of fur
- dark balm of summer, nectar
of marri, velvet of moon.

When she comes first with
a little one out of her pouch
you'll see it cling to her back
- the forest unfold.

"Possette" photo: J. de Garis - Balingup.

IN BRIEF

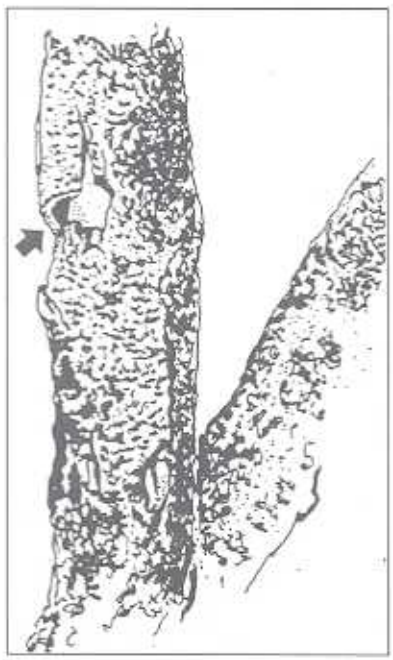
GROUND FLORA

Under gigantic wandoo trees the ground often looks devoid of plants, but look carefully! These participants at the Wandoo Woodlands Workshop last year have found several plants of the gorgeous *Thelymitra azurea* (pale blue with dark stripes and a purple centre).

BATS CAN LIVE IN VERY SMALL HOLLOWS!

Don't 'tidy up' your dead trees! Peeling bark may be vital for bat roosts. A study of the lesser long-eared bat, *Nyctophilus geoffroyi*, at the Harry Waring Marsupial reserve, Wattleup, showed that it roosts under bark on dead banksias, in holes you would hardly think could be useful even to spiders.

For the full story, read: "Roost selection by the lesser long-eared bat, *Nyctophilus geoffroyi*, and the greater long-eared bat, *N. major* (Chiroptera: Vespertilionidae) in banksia woodlands." D.J. Hosken. J. Roy. Soc. WA, 79: 211 - 216, 1996.



EVOLVING TO EAT UP POLLUTANTS?

A recent study of Lake Constance in Germany has shown that water fleas can respond to environmental degradation with rapid evolution.

In the late 1960s, the lake was polluted by phosphates, which led to an abundance of cyanobacteria (blue green 'algae'). These are toxic and contain little nutrition for the micro-organisms, including water fleas *Daphnia galeata*, which eat them. Buried water flea eggs can remain dormant for centuries, and can be aged from their position in the sediment which builds up on the lake bed. By hatching eggs from various depths, scientists developed an evolutionary history of these animals.

Daphnias from pre-pollution times showed reduced growth when fed cyanobacteria. By the 1970s – at the height of the pollution – the most susceptible animals had been eliminated, leaving only those able to tolerate the poor diet. This ability has been passed on to the current population in the lake. "It's a neat demonstration of evolution by natural selection" say the scientists, "and shows how zooplankton can, by evolving, play a significant part in the natural control of the effects of pollution."

Ref: Hairston *et al*, Nature vol 401, p446.

?

Did you know ... ?

That the scales on night-flying moths are a sound absorbant covering that confuses bat sonar? They serve exactly the same function as radar-avoiding coatings on modern fighter planes.

PRACTICALITIES

GROWING *JUNCUS PALLIDUS* FROM SEED

Jenny Mackintosh – Rocky Gully Catchment Group, Mt Helena.

Check your parent plants for ripe seed from the middle of December. Tap the 'flower head' into the palm of your hand, and if a very fine powder falls out, that is the seed. Sow when the hot weather arrives in late Dec and Jan.

We have had success with two methods.

The first was to sow into sand trays and prick out later. Sow the seed very thinly, it helps to mix it with a little sand or rock dust. Cover with a fine layer of sand to stop the seed splashing out when the trays are watered. They do not have to stand in water, just keep them damp like any other seed. Prick out into tubes when they are big enough to handle.

The second method was to sow a tiny pinch of seed onto potting mix straight into individual tubes, sprinkle with a thin layer of very fine blue metal chips, either 2mm or 5mm in size. Keep them damp, again there is no need to stand them in water. The blue metal helps to keep the dreaded 'nursery slime' at bay. This method means much less time is consumed in pricking out, though you get a huge number of plants in each pot no matter how small a pinch you try to put in! They can of course be divided when you plant if you are doing it by hand.

If planting on creek edges, plant towards the end of winter when they are less likely to be washed away and are still growing strongly.

Juncus pallidus planted in and near Rocky Gully in Aug and Sept 1999 have done extremely well and some are about a metre high and already flowering on Jan 2000.

PALE RUSH - *JUNCUS PALLIDUS*

Forms large tufts to 2m high, in wet or seasonally damp soils from Dandaragan to Ravensthorpe. Requires fresh water, and often grows along seepage lines in sandy paddocks. It can withstand water fluctuations from surface dry in summer to seasonal inundation.

In revegetation, it is ideal ground cover in freshwater sandy seeps and creeklines.

(Note, as the groundwater turns saline, pale rush is replaced by the introduced sharp rush, *J. acutus*, originally from European salt marshes, which can tolerate very high levels of surface salt. Where they grow together, these two plants can be used to indicate exactly where freshwater turns to salt.)

MAKING FARMS LESS ATTRACTIVE TO GALAHS, LITTLE CORELLAS AND RINGNECK PARROTS

Some birds have increased in numbers since clearing for agriculture, and now large numbers may do quite a lot of damage to remnant and replanted trees. Along with clearing for agriculture, the provision of food (grain) and water (stock troughs) has enabled them to increase in numbers and extend their range. To help keep numbers down, landholders should organise their activities so that, as far as possible, food and water is available to stock but not to parrots.

1 Hand feed stock in the late evening

If grain is put out for stock during the day, parrots will share it. However, parrots do not feed at night, so, if hand feeding is done at dusk, the stock get to eat all of it and only the left-overs remain for the parrots to glean. Thus, with less food available, there should be lower survival rate of the parrots.

2 Farm hygiene

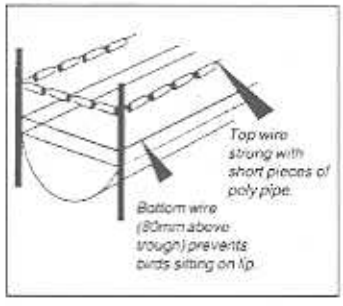
It is important to deny parrots access to spilt grain around silos and storage bunkers. Spills should be swept up and buried, while open bunkers should be covered or netted to exclude the birds. This is most important during autumn/ early winter when seed sources on the farm are at their lowest.

3 Scare flocks when they first begin to congregate

When flocks of corellas and galahs first start coming together to congretate at their summer roosting sites, they can be scared away and 'moved on' if they are continually disturbed during the evening for the first week or so. If a group of property owners do this over a large area, the birds will lose condition as they are continually harassed, and survival rate into the next season will be lower.

4 Limit parrot access to stock troughs.

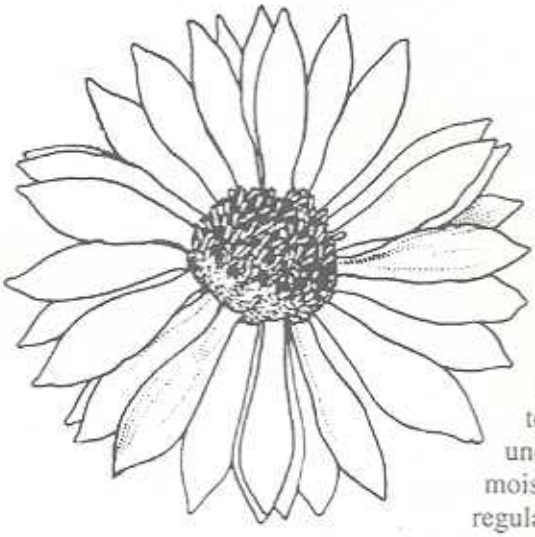
During investigation into the problem of corella damage in South Australia, the following design was found to be effective in keeping birds away from stock troughs. It could also, however, have a detrimental effect on other bird species, such as mudlarks, whose insect control activities mean they should be encouraged on the farm. So if you decide to try it, choose a trough near the house, which you can monitor carefully for effect.



Tanks should be covered and troughs modified as shown to prevent the birds perching on the edge to drink. Corellas need fresh water daily, so if you limit their access, you should limit the numbers which can survive in your area. However, the equipment needs to be in good repair, as leaking or overflowing troughs or tanks provide puddles where the birds will preferentially drink.

None of these suggestions provides a 'final answer' to the parrot problem, but every little helps.

PRACTICALITIES



PRESERVING EVERLASTINGS

By Carol Davies

REMNANT bush areas in the Wheatbelt contain a wide variety of native flowers that can be harvested in advance and utilised for homecraft activities or that special occasion - like a dinner party, wedding, birth or conference - successful business functions always 'get the flowers right'. (I should mention that you may need a collecting licence from CALM - check with your *LFW* Officer.)

The 'Immortelles', as they are known overseas, are really the least immortal of all our wildflowers but the most romantic. Mention 'wildflowers' and people smile and think of the unending fields (after good rains of course!) of everlastings. Some of my favourites are the *Rhodanthe*, including *chlorocephala* subsp. *rosea* (roseum), *chlorocephala* subsp. *splendida* (splendid everlasting), *humboldtiana* (Humboldt's everlasting) and *manglesii* (Mangles' everlasting); though I have to say that *Bracteantha bracteata* (tall yellow strawflower), *Helichrysum macranthum* (tall white strawflower) *Waitzia acuminata* and *W. suaeveolens* (waitzias) should also be included. These are the easiest of our wildflowers to preserve.

When gathering everlastings, if you plan to use them for arrangements, they are best gathered early in their flowering, not when fully blown. Small bunches picked in the morning and secured loosely with a rubber band can be strung upside down in a dark, airy corner of the shed for up to three weeks to dry. After a week, check under the rubber band to see if the moisture has gone, if not, then regular checks after that will ensure that you don't allow them to dry out too much. This procedure will give you a product that will have opened up further during the drying process, will retain its natural colour longer and remain upright in an arrangement. The use of glycerine in preserving may cause the heads to droop. However, a solution of one part glycerine to ten parts of warm water, wherein freshly-cut stems are immersed up to about 5 cms and allowed to stand in a reasonably constant temperature for two to three days before being hung upside down to dry, can be experimented with as well.

Once the moisture has left the bunches, they should be taken down and lightly but firmly wrapped in tissue paper and stored in a box with camphor, moth balls or naphthalene flakes to ensure that insect damage does not occur before you need to use them.

Another method of preserving some of the everlastings is to pick only the buds as they are about to open and while still fresh poke them onto fine floristry wire. The moisture in the base of the head will 'rust' them firmly onto the wire stem. These can be dried upright by placing them loosely in a vase. As the buds dry and rust onto the wire, they will open. This method is great for adding colourful everlastings to fresh arrangements of foliage and the like when there aren't any fresh flowers around.

If you are collecting everlastings for pressed-flower cards, lampshades or similar craft activities, they can be picked when fully out. They should be placed between sheets of smooth, absorbent paper such as blotting paper and weighted down on a flat surface. Many years ago I have used an old iron print press with a brass screw-down handle to press wildflowers, but today you can use a microwave oven. Put two pieces of thick cardboard on either side of the blotting paper and the flowers, weigh it down with plates, and then zap for up to a minute. You will need to experiment with the times and settings for each variety. I have used this method with *Swainsona formosa* (Sturt's desert pea) without any colour loss.

One last piece of advice on preserved everlastings is that over the course of the year they will deteriorate, they will fade, they will not look the same as when you first harvested them, even though you could swear they do! So please throw them out and gather some new ones!

Carol Davies has been associated with the wildflower industry for over 17 years, both as a picker and as an exporter. She can be contacted through Heritage Wildflowers on 9277 1321.

LFW NEWS

FUNGIMAP

MERREDIN

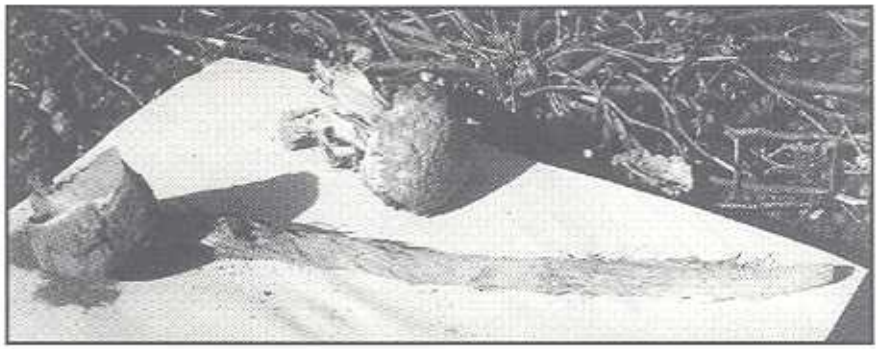
In 1947 an enthusiastic local resident, Mrs Margaret Mills, collected *Battarea stevenii* near Merredin. This unusual-looking fungus had not been seen in WA since - until Kastelle Adamson collected it on the family property at Booraan on 21/5/00. Great excitement, as it is a 'target species' for Fungimap.

Fungimap is a nation-wide project which is attempting to record where fungi occur in Australia. On 8th-9th July, 20 people gathered at Merredin for a workshop with the State Fungimap Coordinator, Katie Syme. After some introductory study, we travelled to Totadgin Nature Reserve and were soon finding all sorts of fungi. Specifically, we were searching for 'target species', which are specifically listed to encourage people to find and record them. We found one too, *Xerula australis*!

Beautiful weather made Sunday's fungi search all the more exhilarating. Gathering on the north side of Merredin Peak we searched for two hours through thickets near the granite rock. The children with us were excellent, darting about like rabbits under the shrubbery, collecting all sorts of fungi with great excitement. Thirty-four species were found, including three as yet unidentified truffles and three more target species.

Before leaving Merredin, Katie and Mrs Mills met. It was an overwhelming occasion, as they chatted together of fungi as though they had been friends since they were girls. She could clearly remember the locations where she had collected and illustrated fungi fifty years ago! (The WA Naturalists' Club has loaned Katie it's copy of Mrs Mills' drawings of fungi from the Merredin district - a wonderful record.)

Heather Adamson



▲Battarea stevenii, *young and mature plants.*

Mrs Mills, now confined to a nursing home, and Katie Syme talk about fungi. ▲

DRYANDRA

Everyone had a great day, smiling even despite the rain! Seventy-five fungi, including five target species, were found. Photo: Kim Kershaw ▼

LFW NEWS

LFW IN BROOME

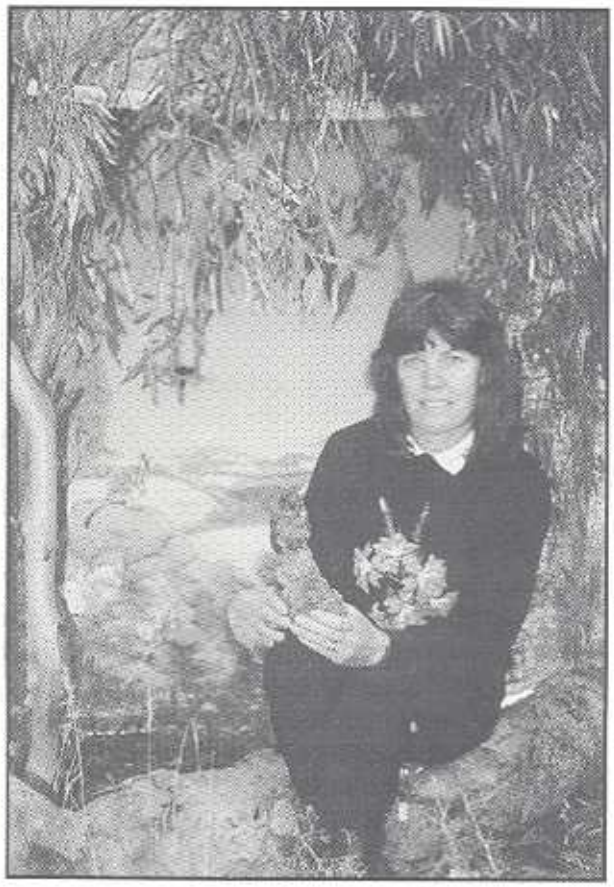
Recently, a number of landholders in Broome have joined *LFW*.

The tropical environment of the Kimberley is very different indeed from what is found in the south-west; around Broome it is mostly dominated by sandplain called 'pindan'. This is a grassy woodland with an upper layer of eucalypts and a dense, thicket-forming middle layer of wattles. It provides abundant resources for many species of birds and reptiles and, of course, invertebrates. Fire sweeps though the country every 5-7 years, causing regeneration from seed and rootstock. Without fire, mistletoes often kill the wattles. Townsite blocks need to manage this regeneration cycle very carefully indeed.

Closer to the coast very interesting dense pockets of vegetation called 'vine thickets' occur. They contain plants related to those in Indonesian jungles and are extremely productive biologically. Many produce fruit that is eaten by birds and bats, and they are also excellent cover for agile wallabies. Fire is not a management option for these areas.

LFW is very fortunate that Tim Willing has agreed to be our representative in the region. Tim is a long-time resident of Broome, and is currently Conservation Officer at CALM. He has extensive knowledge of the local ecosystem and is an expert on flora and 'bush tucker'.

If you are visiting the Kimberley, you might like to make contact with some *LFWers* there ... and don't forget to take a copy of "Broome and Beyond", the superb plant book, for which Tim is one of the co-authors.



CONGRATULATIONS!

to Heather Adamson and the rest of the 'conservation crew' for winning 'Best Sustainable Farm Practice Display' at Dowerin Field Days. The salmon gum woodland they created was outstanding. Photo: David Lamont

The conservation team and their winning plaque. Left to right: David Lamont, Richard McLellan, Anne Smith, Mark Octhman. Front: Heather Adamson.

FLORA

BLOODROOTS

IN late spring and early summer, strange-looking black plants poke stiffly upwards among the lower vegetation in bushland throughout the south-west of WA. They are Bloodroots, and they are odd in more than colour .....

Botanically, Bloodroots are called *Haemodorum*, and they give their name to the Haemodoraceae, the family to which Kangaroo Paws belong. They all are geophytes - perennials which grow from a (blood-red) underground storage organ and die back each summer. The leaves are either terete (cylindrical) or strap-like. As the flowering stem elongates, it becomes blackish and in our south-western species, the flowers are completely black, and rather shiny. They have six perianth segments and three stamens.

There are about 20 species of Bloodroots , of which 15 occur in WA, 10 in the south-west but there are also 5 species in the Kimberley. The south-west species grow in damplands, woodlands, sandplains and granite outcrops, often being very common in winter-wet areas. The commonest and most widespread species are *H. laxum*, *H. simplex* and *H. spicatum*.

Black flowers are rather rare, so there is considerable interest in what could be pollinating these plants. It would seem, for some species at least, that it is Blue-banded Bees, *Amegilla* spp. These are quite large for native bees (about the size of a Honeybee) and are active during summer. Bees, of course, can see colour, and it is thought that the bloodroot flowers show up in ultra-violet, which the bees see well. On the Darling Scarp, at the same time that they are pushing their way into the bloodroot flowers, they can be seen visiting blue-flowered species out at that time, *Scaevola glandulifera*, *S. platyphylla* and *Goodenia caerulea*. The bees make solitary nests, often in a borer hole in dead wood. (*ref:* 'Native Bees' by Terry Houston. WW 1/3)

Fires in winter or spring, when the plant is growing, may kill it, but the underground bulb is perfect protection from a summer or autumn fire, and the nutrients released, together with lack of competion, will cause prolific flowering the following year. Some species seem to only flower after fire - one such is *H. brevisepalum* which occurs from Dongara to the Stirling Range and east to Newdegate. Without a fire, its single, grass-like leaf would easily be missed on surveys, so it is probably much more common than Herbarium records would show.

Blue-banded bee forcing open a flower of H. discolor to obtain nectar
(drawing: Greg Keighery)

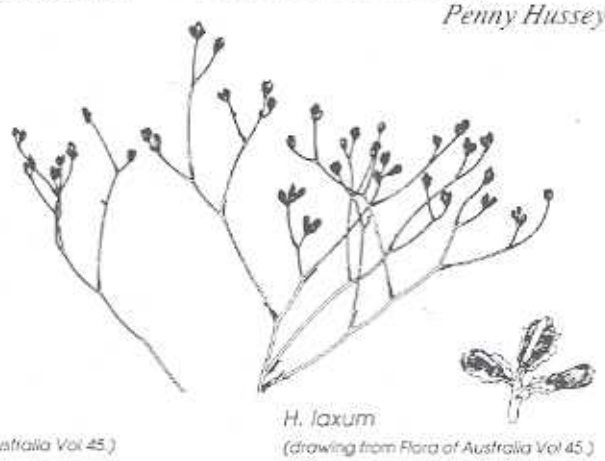
The fruit dries to a hard capsule which splits and the tiny, winged seeds are shaken out as the stalk sways in the wind. Capsules are easy to collect, but I have had no luck with direct seeding of *H. simplex* and *H. spicatum* (the only ones I have tried) although I have not used smoke, to which they would probably respond well.

In the Kimberley, Aboriginal people dug up bloodroots, and ate the bulb. They also used a red dye obtained from the underground parts, but there is no record of SW Aboriginal people doing so. However, children growing up during early settlement days in the Avon Valley apparantly made war-paint from the bulbs - they must have learned to do this from their Aboriginal companions. One Kimberley species, *H. ensifolium*, was used as an antidote for snakebite.

If the bushland is intact, bloodroots survive well, coping even with veld grass infestation of banksia woodland, for example. Heavy grazing pressure, whether it be from stock, rabbits or kangaroos, will remove the growing stem and so prevent seed spread. If this happens in the season after a fire, it could have dire consequences for the species' survival at that site. Another good reason to fence even small areas of bushland.

Penny Hussey

H. spicatum
(drawing from Flora of Australia Vol 45.)



H. laxum
(drawing from Flora of Australia Vol 45.)

THE WAY WE WERE ...

A VISIT TO NEWCASTLE

IN early December 1880, the noted lady traveller and flower painter, Marianne North, visited Western Australia. During a stay at Government House, she described a visit to the area we now call Toodyay.

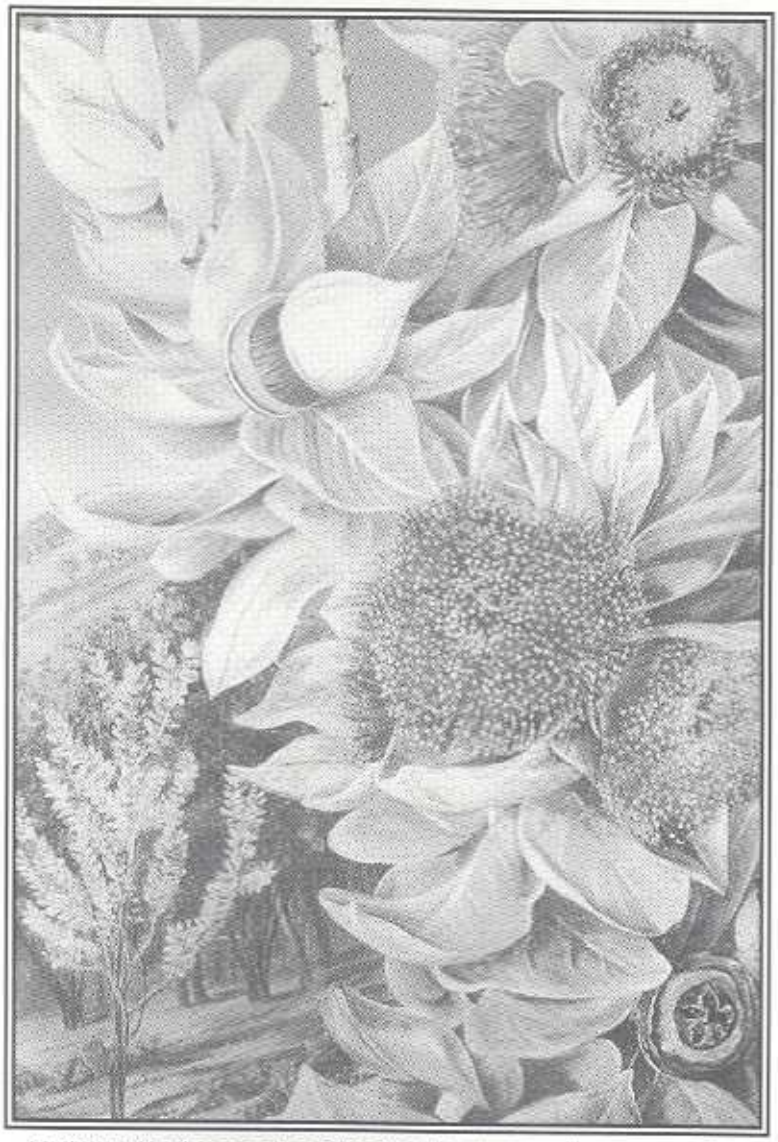
"When I heard that the *Eucalyptus macrocarpa* was to be seen in flower at Newcastle, horses were again ordered for me, and I was sent over there. Mrs Forrest came with me [her husband, John, was at that time governor of the prison at Fremantle] and we enjoyed our 8 hours' journey, with three relays of good horses. We went only too fast through all the forest wonders, and I screamed with delight when the small tree came in sight close to Mrs Harper's house [Braybrook].

Every leaf and stalk was pure floury white, and the great flowers (as big as Hollyhocks) of the brightest carnation, with gold ends to their stamens. It was well worth coming for. The tree had been common enough in the old days, on the edge of the desert, but the sheep had taken a fancy to it and had gradually eaten it all up, and they were carefully saving the seeds of this one that they might sow them and raise up more food for the sheep!

It stood close to the verandah of an old-fashioned house, full of small rooms, belonging to a very dear old lady, a Mrs Harper. She was a great reader, and had a great memory for remembering what she read, and she was never dull. A long-beaked cockatoo sat on the back of her chair, making confidential remarks in her ear, with a curiously smiling expression, his head on one side; and she fed him with a teaspoon. She said he sometimes took naughty fits, and would peck off all the buds from her flowers; then she whipped him, and when he saw the whip coming he used to retire into a tree, and sulk all day until he felt good or hungry, when he would come down and approach his mistress most humbly, making low bows all the way, and seeming to beg forgiveness. She also had seven magpies, and a most odd bird called 'more pork', with an owl's head, lovely tortoiseshell feathers, and blue eyes. It was only lively at night, when it caught mice better than any cat.

Newcastle is a mere village. The hills all round are covered with pretty green round-topped little trees, looking in the distance like Italian pines. They are really a sort of acacia, called 'jam' trees, from their wood smelling like raspberry jam – the same plant as the myall tree in Queensland, I believe. The wood is very hard and good for carving and, with the so-called sandalwood which grows near it, is sent out to China to make into workboxes and other ornaments. The latter has a leaf like a gum tree, and a mistletoe which grows on and mimics it.

The road to and from Newcastle was hilly, and gave us some fine distant views over the plain and broad valley of Swan River, with piles of large granite boulders in the foreground, and many curious plants among them. The grevilleas were especially beautiful: one of them had blue metallic leaves, and long flower-bunches of graduated tints, from pink through orange into green, but they would not keep an hour, so I often had to draw them at once, finishing them from a dried specimen and my notes."



Marianne North's painting of the Mottlecah, as well as many others, including a lovely study of granite boulders and WA Christmas trees at Red Hill, can be seen in the gallery she designed and donated to Kew Gardens, in the UK. As she said – well worth a visit! This quotation is taken from "Some Recollections of a Happy Life: Marianne North in Australia and New Zealand" edited by Helen Vellacott. Pub Edward Arnold Australia, 1986.

FUNDING

NATURAL HERITAGE TRUST FUNDING FOR 2001/2002

Guidelines and application forms for the 2001/2002 NHT funding are expected to be available from October 2000. Groups intending to apply for funding for new projects should start planning now to meet deadlines in late February 2001.

Applicants should aim to ensure that their projects are integrated with other local, catchment and regional activities - particularly where regional strategies and catchment plans exist - and consist of a range of activities.

BUSHCARE

Bushcare is one of the key programs under the NHT. It aims to support projects that protect, manage and restore bushland, mainly outside the reserve system. The principle objectives are to conserve biodiversity and to restore the productive capacity of degraded land.

Bushcare encourages activities that will:

- protect and manage native vegetation - especially areas assessed as having high conservation value;
- rehabilitate degraded native vegetation;
- strategically revegetate degraded land to restore productivity; and
- enhance the knowledge and skills of land managers to better manage native bushland.

Land for Wildlifers intending to seek funding can use the values identified in your *LFW* assessment as the 'conservation core' of your group's project to emphasise how the project will address these issues.

Eligibility

NHT funding is mainly intended for incorporated community groups, although other bodies, such as Local Governments, can apply. Individuals are not eligible.

Funding

All applications must be submitted on the form provided in the Guidelines. The Guidelines provide detailed instructions on how to complete the form as well as the types of activities which will be funded. Projects are subjected to rigorous assessment and successful projects will be announced in October 2001.

Further Information

Contact: Sophie Moller
Bushcare Administration Officer
CALM, Locked Bag 104,
Bentley Delivery Centre, WA 6983
Phone: (08) 9334 0442
Fax: (08) 9334 0199

For information about the National Landcare Program and the National Rivercare Initiative, contact:
Landcare - Natalie Moore, AGWEST ph: (08) 9325 0009
Rivercare - Luke Pen, WRC ph: (08) 9278 0376

COMING EVENTS

PRELIMINARY NOTICE - INAUGURAL FUNGIMAP CONFERENCE

DENMARK, WESTERN AUSTRALIA
June 21-28, 2001

FUNGIMAP is an exciting project in which a network of volunteer recorders across the continent is putting Australian fungi on the map. FUNGIMAP aims to map the distribution of 100 species of easily identifiable fungi and is the first such scheme in the southern hemisphere. It will answer questions about biodiversity, including distribution, rarity and conservation status and ecology. There is also a WEB page with information and illustrations of target species: http//calcite.apana.org.au/fungimap

Plans are under way to hold the first FUNGIMAP conference in Western Australia in winter, 2001. It will be staged in particular for all Fungimap volunteers, both amateur and professional, but will be open to anyone interested in fungi and advertised both within Australia and overseas. Reaction to news of the conference so far by Fungimap volunteers attending workshops in WA has been very positive and we are assured of a good turnout.

For more information contact:
Katrina Syme
FUNGIMAP coordinator
FUNGIMAP CONFERENCE 2001
c/- Denmark Environment Centre, PO Box 142, Denmark, Western Australia 6333
Email: <environ@denmarkwa.net.au>

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.
Published by the Department of Conservation and Land Management, Perth. All correspondence should be addressed to:
The Editor 'Western Wildlife', CALM Wildlife Branch, Locked Bag 104, Bentley Delivery Centre, WA 6983.
Design and Desktop publishing by Louise C. Burch Graphic Designer.