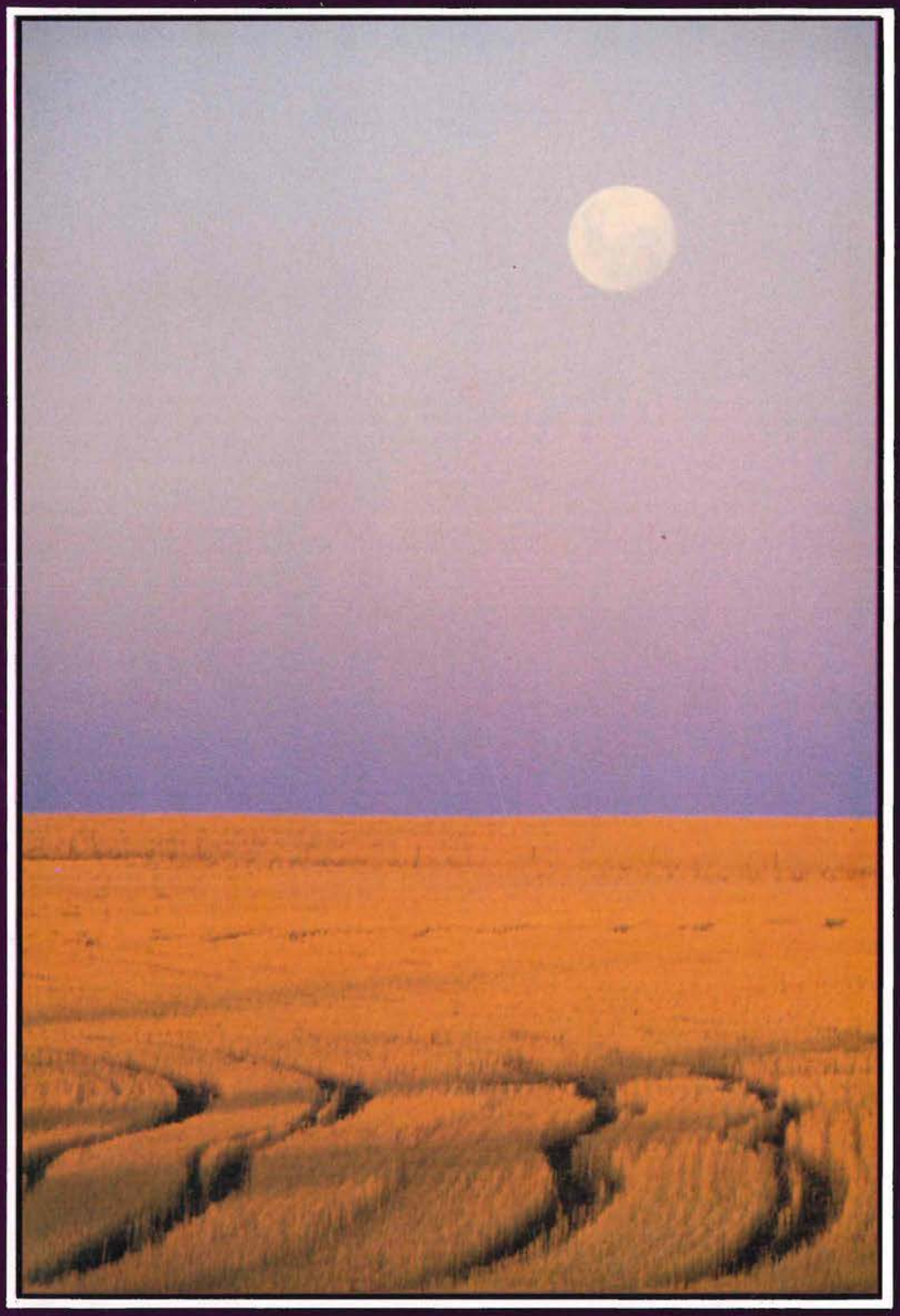
Landscope



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Landscope

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Contents

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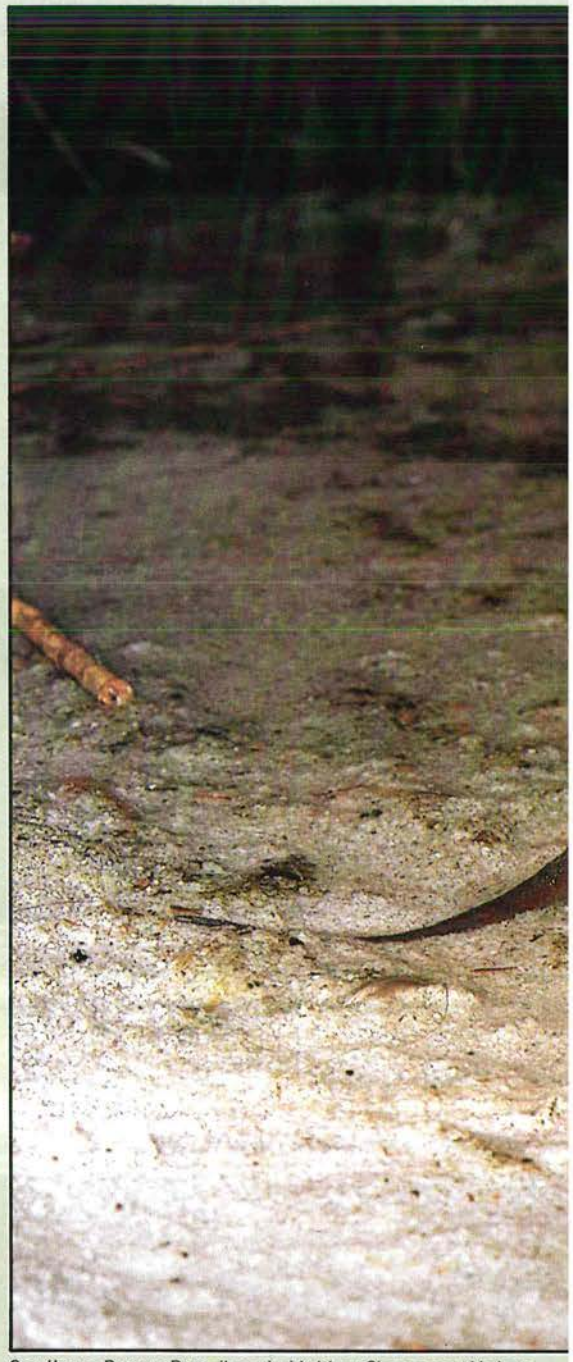
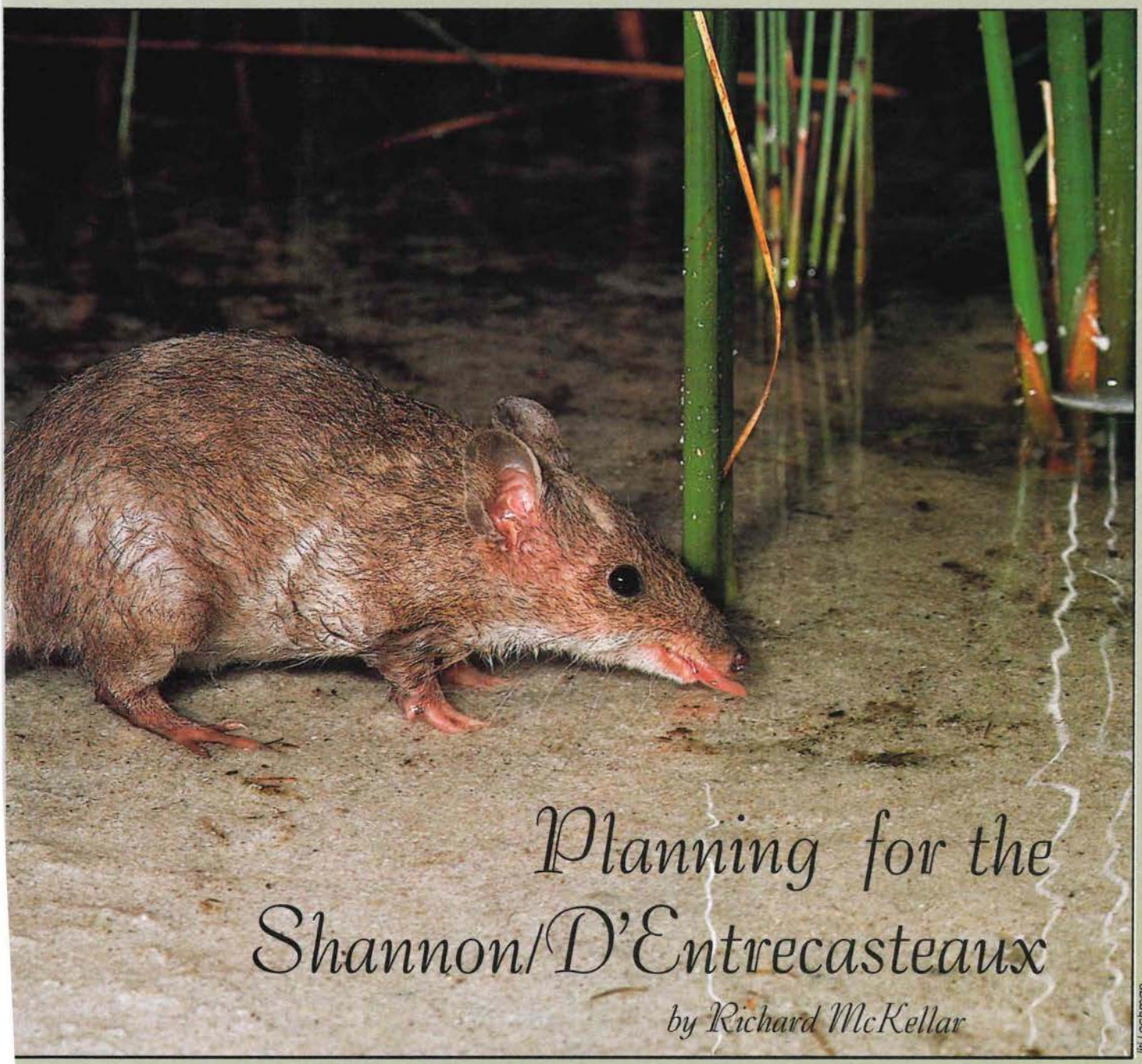
COVER
Moonrise on wheat stubble.
Cover photo by Cliff Winfield.



Southern Brown Bandicoot drinking Shannon Waters.

The more outstanding a natural environment, the greater the number of its potential uses, the more heated is the debate about its management.
This principle holds true in Western Australia as much as in Queensland's Daintree Forest and Tasmania's Farmhouse Creek.



Planning for the Shannon/D'Entrecasteaux

by Richard McKellar

Jiri Lochman

HOW should such public resources be managed? What is the proper role of land managers when there is no social consensus about an area's use?

Management agencies should provide decision-makers with a realistic assessment of various options and their social as well as technical implications. In addition, the management agency must foster communication between decision-makers and the people who will be affected by those decisions.

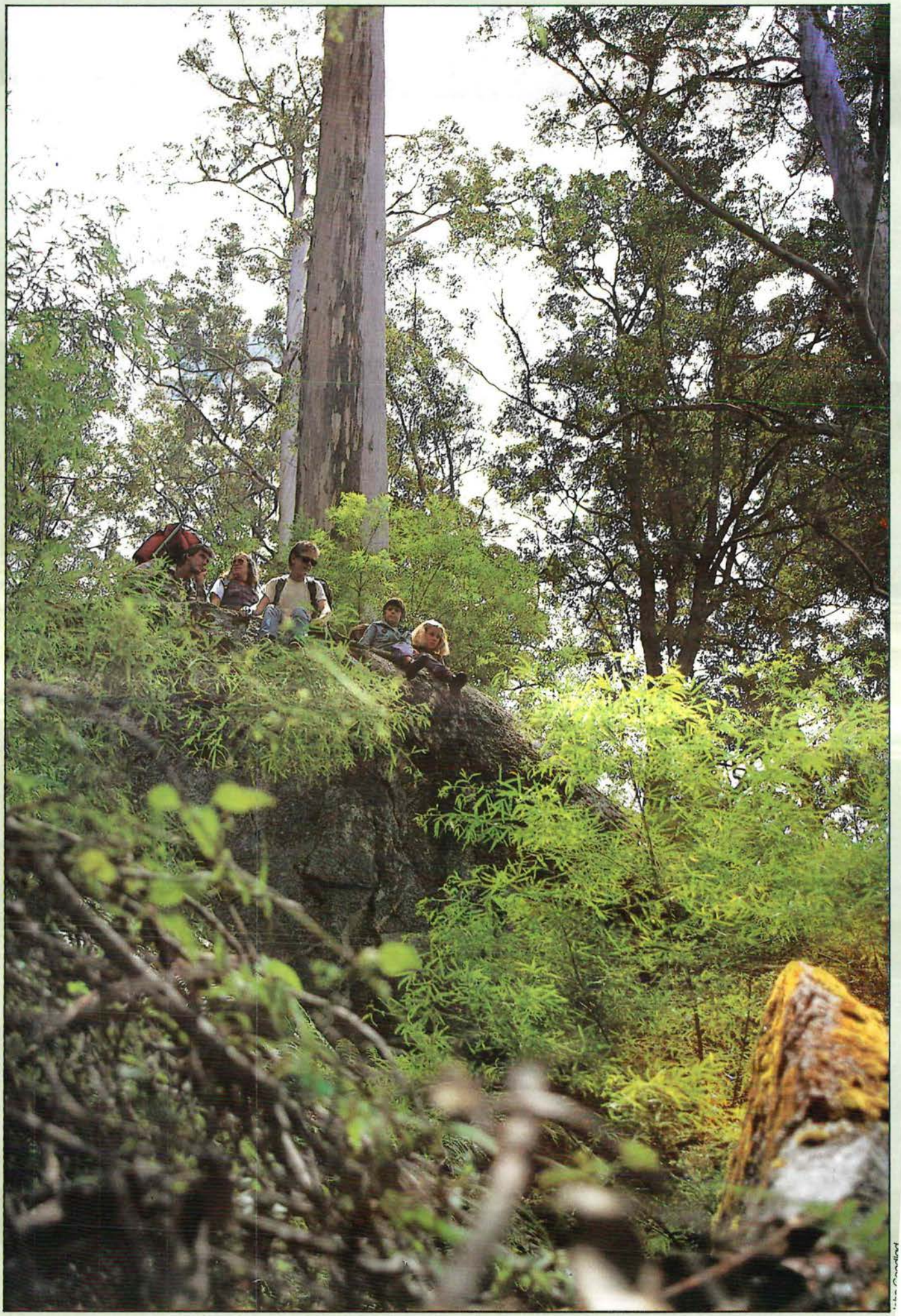
Analysing social implications and fostering communication are very different from the more technical activities for which most land managers have been trained, and which they have practised. Foresters, zoologists, botanists and ecologist, for example, possess technical skills essential for the proper management of natural environments. When they become land managers, however, they also need to acquire and apply social skills.

In the past year the Department of Conservation and Land Management has been taking positive steps towards achieving the two goals outlined above - seeking information on the social implications of use and management decisions, and providing a means for decisions to be assessed by the public.

One of our major planning concerns recently has been the Shannon Basin and D'Entrecasteaux National Parks, two of the most outstanding natural environments of the south-west of the State.

The Shannon Basin has been a focus of conflict since the Conservation Through Reserves Committee recommended in 1974 that it be reserved for conservation.

The Shannon Basin was



described by the Committee as being the river drainage basin best suited for conservation of a large area of essentially unmodified 'wet sclerophyl' forest (i.e. karri and karri associations). The Committee also noted that the Shannon River 'flows into Broke Inlet, one of the largest estuaries in the State which, because of its inaccessibility, is still in a fairly intact natural state'. Other features of the Basin include granite monadnocks, which host a variety of specialised plants and animals, and wetlands.

The recommendation delighted some sections of the environmental movement, but was opposed by logging, sawmilling and local worker and business interests, and sectors of the scientific community. The major reasons for opposition were the desire to maintain access to timber resources, the need to regenerate some sections of the forest and the fact that an excellent system of karri forest reserves was already in place.

Jiri Lochman

John Goodlad

A male Spotted Pardalote, common throughout the Shannon Basin, collects material for a nest (above).

Bushwalkers explore the Shannon forest (left).

Fungi of the forest floor (right).

Canoeing, one of many forms of recreation which can co-exist with conservation (below).

John Goodlad

Jiri Lochman

The Yellow-footed Antechinus (also called Mardo) occurs throughout the Shannon Basin.

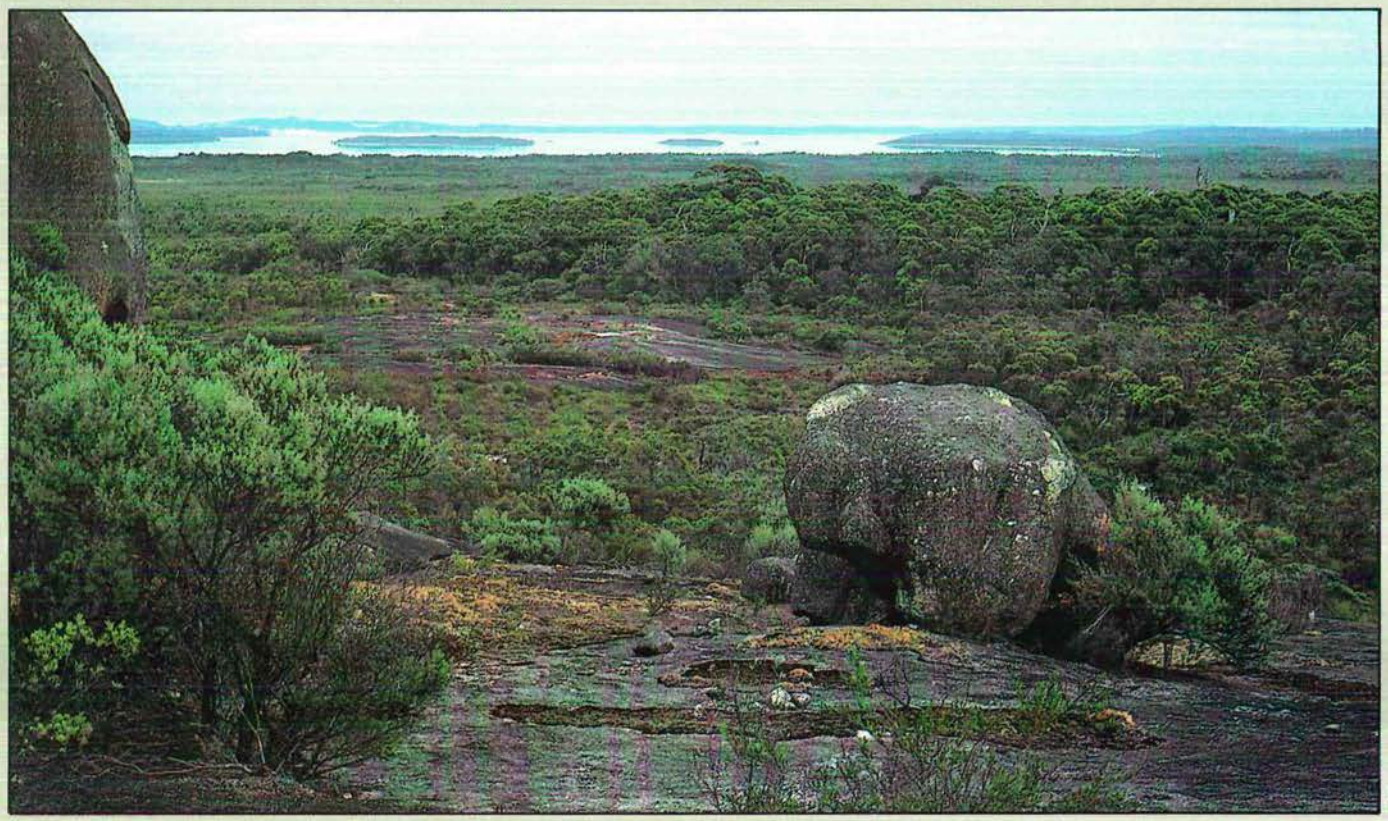
Weighing up various opinions, the Government decided in 1983 to manage the Basin 'as though it were National Park'. This meant that no further harvest of forest material was to be permitted; all but environmental groups were opposed to this outcome, and made their feelings well known through the media.

By contrast, the proposal to declare the coast adjoining the Shannon Basin as D'Entrecasteaux National Park received overwhelming approval from virtually every section of the local and state community.

The D'Entrecasteaux National Park proposal stemmed from a submission from the Institute of Foresters of Australia in 1972, and also was endorsed by the Conservation through Reserves Committee in 1974.

Stretching 130 km along the south coast, and up to 15 km inland, the Park is dominated by the meeting of sea and land. The long open beaches are a major

Broke Inlet, viewed from the south. In the foreground is a granite monadnock.



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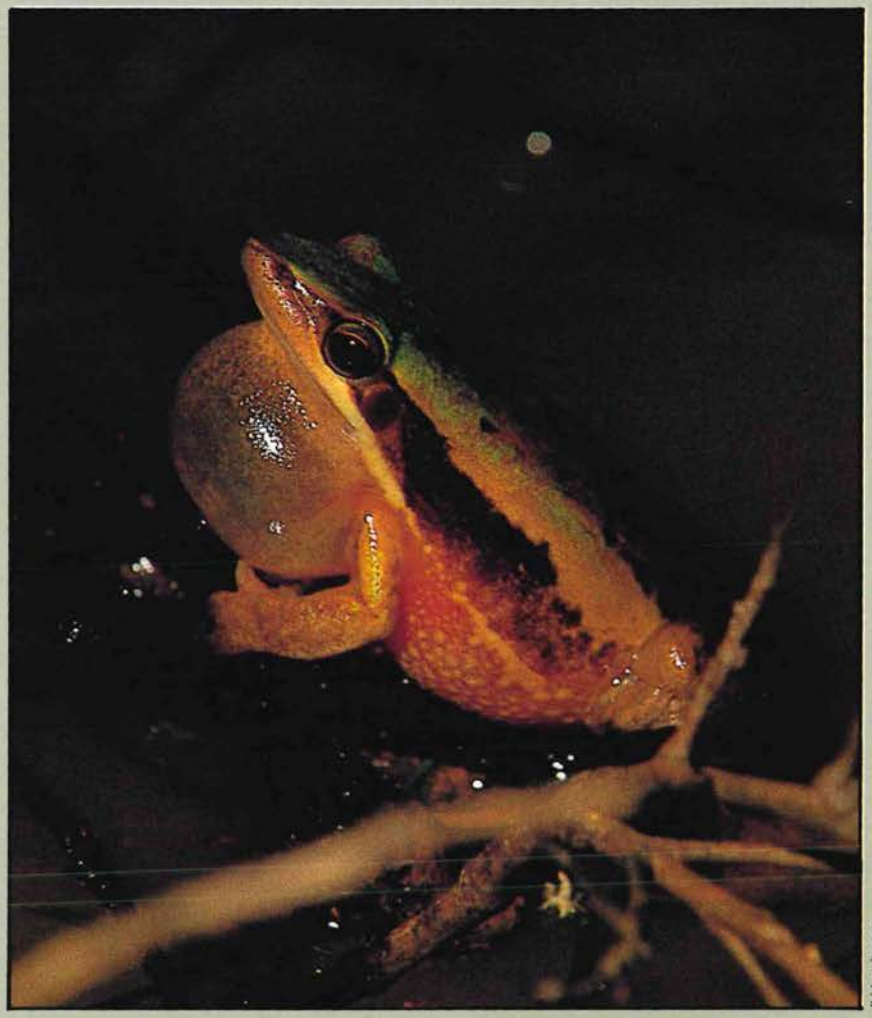
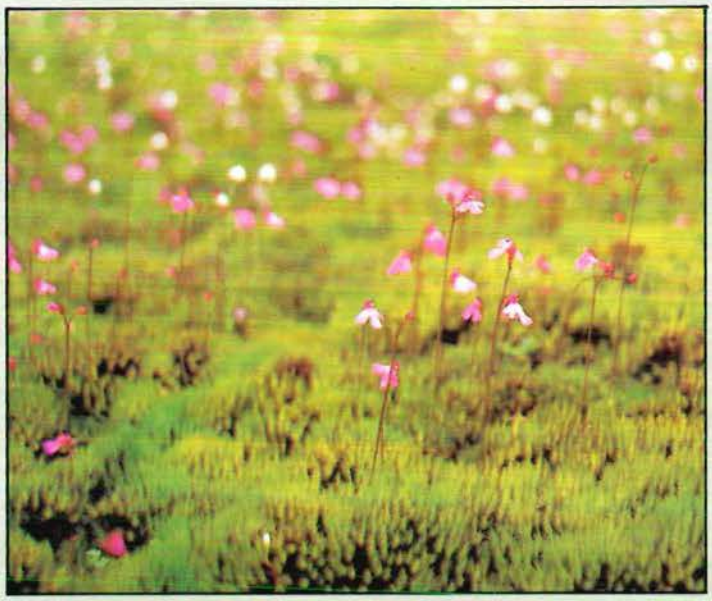


Jiri Lochman

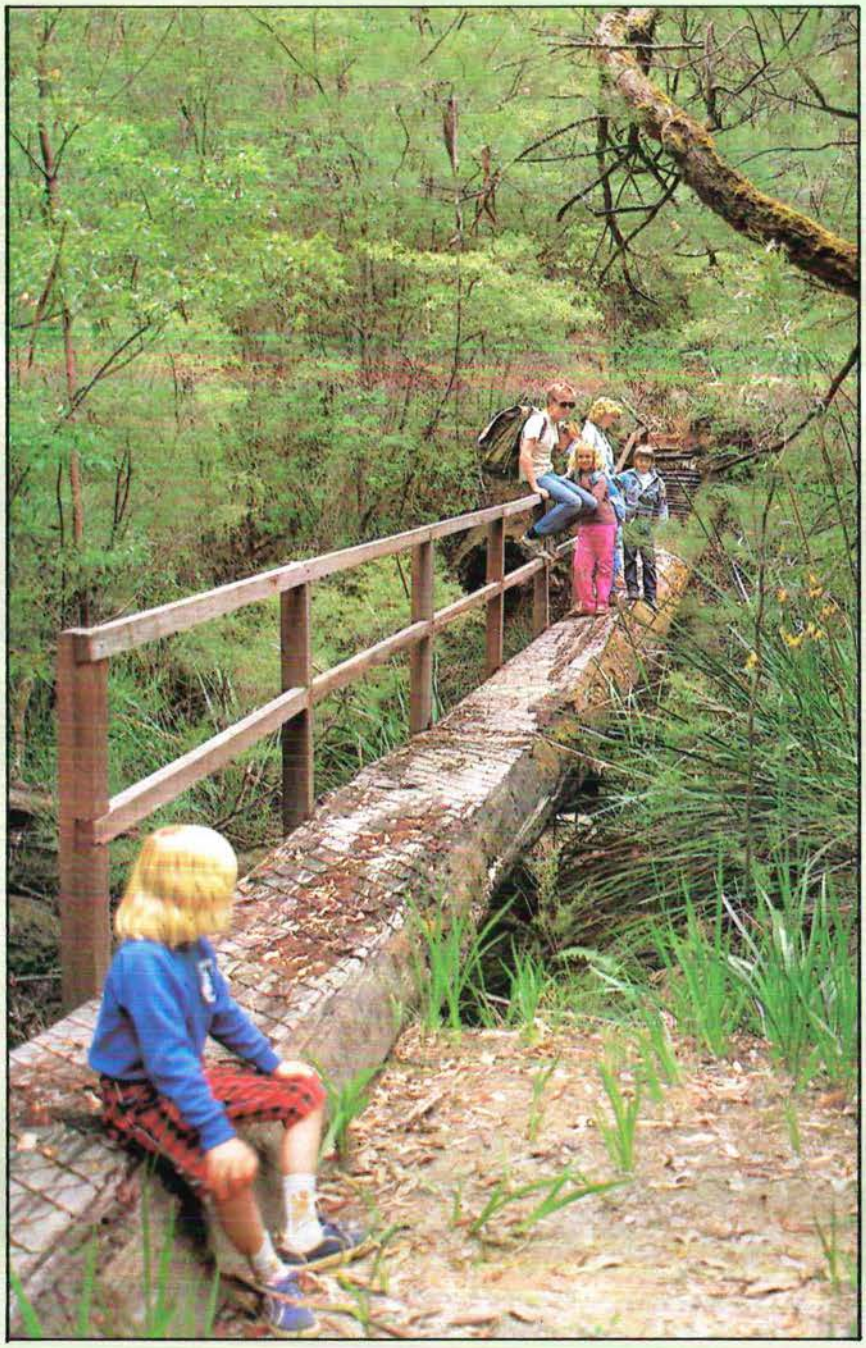
A male Slender Tree Frog calling. These frogs live in the waters and streamside vegetation of the Shannon (right).

A profusion of life on a granite monadnock — one of many microcommunities within the Shannon/D'Entrecasteaux (below).

John Goodlad



John Goodlad



John Goodlad

attraction. Many of the park's natural features have been created or exposed by the action of the sea on coastal areas, including extensive dune systems, limestone sea cliffs and the columnar basalt flows at Black Point. Other natural features include extensive wetlands, granite hills such as Mt Chudalup, and bullich, yate and karri forests.

Opposition to D'Entrecasteaux arose only when a strategy for management planning was released in 1984 which did not meet the expectations of either environmental or recreation interests. Apart from opposition to specific proposals for use of the park, complaints were made that

— there was little indication as to how decisions about various proposals had been reached;

— there was little indication of what information was available and used in decision-making; and, overall

— the public felt alienated from the decision-making process.

The public told the Government clearly that this was not good enough. To its credit, the Government listened.

A Draft Management Plan for the Shannon and D'Entrecasteaux was recently released; public submissions on its proposals are now being sought. There have been several important changes.

First, the major emphasis in the Draft Plan has been to explain how decisions were made. This was done in two ways:

(a) a set of explicit decision criteria were established and described.

Tiny wildflowers and fungi on a mossy sward (top left).

The walkway constructed to help visitors enjoy the Shannon (left).

These consisted of:

— legislation and policy,

— biological and geophysical opportunities and restrictions,

— considerations of equity, and

— management implications.

(b) each issue was worked through these criteria and a suggested option was described. It is hoped that a reader who disagrees with a proposal (for bushwalking, horseriding or other issues) will determine how it was arrived at and so attempt in his or her submission to show through logical argument why the decision should be altered.

Second, an Advisory Committee has been established that is composed of 12 members of the public, one CALM officer, and Mr Dave Evans, the local M.L.A. While the committee was established so recently that it could not advise on the early stages of the draft plan, it will be in a position to provide both general and detailed public reaction to the draft and to advise on the final plan.

Third, public meetings have been held with various interest groups both during preparation of the draft plan and since its release. Significantly, CALM officers have resisted the temptation to convince members of the public that they should like or approve of provisions in the draft plan; the objective has been to explain the plan rather than to sell it.

These changes indicate a basic development in the attitude of the Department to the public. The Department is learning to be open and responsive. It is seeking help from the public so that CALM managers can learn what the social views and implications are about various resource use and management options early in the planning and decision-making process. In this way it is hoped that fruitful discussions of resource management issues can take place.

Similar programs exist or are being started in other CALM regions. These include community workshops in the Mundaring District, public surveys in the Leeuwin-Naturaliste National and 'Friends' groups in several parks. Volunteer groups are playing an increasingly vital role in various research programs.

Everyone who wishes to be involved will have an opportunity in the next few years to be so.

This King's Skink, photographed on Shannon Island, is one of only a few lizard species known to care actively for its offspring.

Jiri Lochman

Some of the oldest traces of human habitation in the south-west were found in the Devil's Lair cave which was occupied by Aborigines at least 25 000, and possibly 30 000 years ago.

Devil's Lair — so-called because it also contained fossil remains of a Tasmanian Devil — is part of a system of limestone caves which run under the Boranup karri forest. To the Aborigines, the area was known as the place of a male dingo.

The Boranup has many fascinating tales to tell. Here Cliff Winfield recounts one part of Boranup's history.

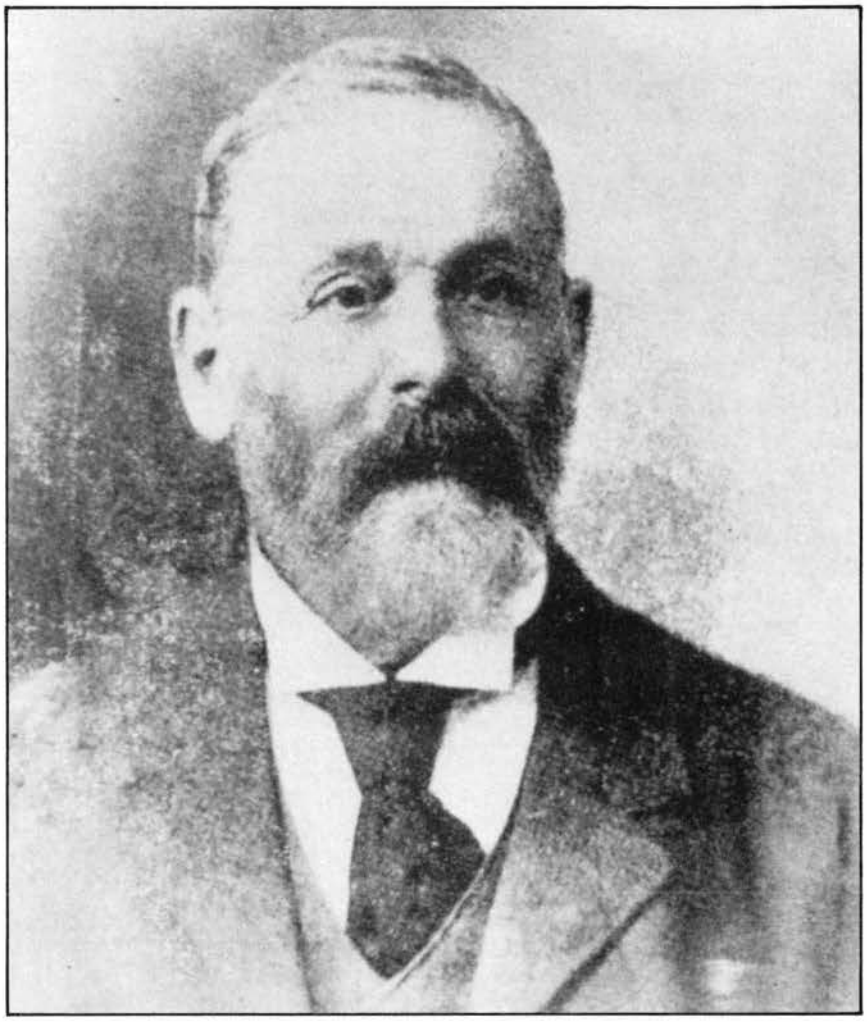
The story of—

Maurice Coleman Davies: TIMBER TYCOON

Cliff Winfield

A LITTLE over a hundred and ten years ago an enterprising colonialist from Adelaide visited the south-west of Western Australia. The projects he envisaged in 1875 influenced the development, economy and environment of this State for a very long time.

Maurice Coleman Davies began his career on the Victorian goldfields where he built a business trading in mining engineering supplies. In a partnership of Davies, Wishart and Baillie he successfully tendered for the construction of a major part of the Melbourne to Adelaide railway. South Australia was bereft of structural timber, so in search of 14 000 cubic feet of timber he looked to the tuart (*Eucalyptus gomphocephala*) forest of the west. After surveying the timber resources of the south-west during his 1875 visit Davies decided to invest in the industry. Early in 1876 he returned and purchased a large share in Jarrahdale and Rockingham Timber Company — the State's first timber export company.



Once the big trees grew almost to the seashore.

In 1879 Davies began pestering the government for a lease on what was described as a 'forest wilderness' in a strip a few kilometres wide and stretching some 40 km south of the Margaret River. Conveniently adjacent were two natural ports at Flinders Bay and Hamelin Bay— where once the big trees grew almost to the seashore. The only trouble was that the majority of the big trees were karri (*Eucalyptus diversicolour*), unheard of in London where 'West Australian timber' meant jarrah (*Eucalyptus marginata*).

Trial consignments, some of which Davies accompanied personally, were sent to bridge builders, mining and railway engineers all over the world. In his inimitable way, Davies had a magistrate come down from Vasse to take a declaration from Alfred Bussell that karri logs hauled out of the Blackwood River were those that he and his brothers had toppled in there nearly 50 years earlier. The magistrate testified that despite the immersion the logs were as 'sound as a bell'. Davies came upon a log which had been submerged in the southern ocean for a known 30 years. It was sent to Kew gardens so that clients might witness karri's durability themselves. The British Admiralty timber inspector tested karri and found it stronger than jarrah. Armed with these testimonials, Davies convinced prospective customers that karri was superior to jarrah in every situation. In time this proved to be not quite true as jarrah outlasts karri in moist underground applications and termite-prone areas — nevertheless karri timber was available in immense unbroken lengths, the best available for superstructures such as bridges and wharf scantlings, and mine poppet heads.

The government of 1882 granted Davies a 42-year-lease on 46 000 acres at a miniscule fee of £150 per year, the freehold option on some land adjoining and eight 50 acre blocks at Hamelin Bay for 10 shillings each. Two-thirds of the land was forested with jarrah/marri (*Eucalyptus calophylla*) and the rest karri. The lease allowed Davies to take all millable timber available on the land for the duration, on condition that he develop an industry producing 120 000 superfeet* per month of sawn

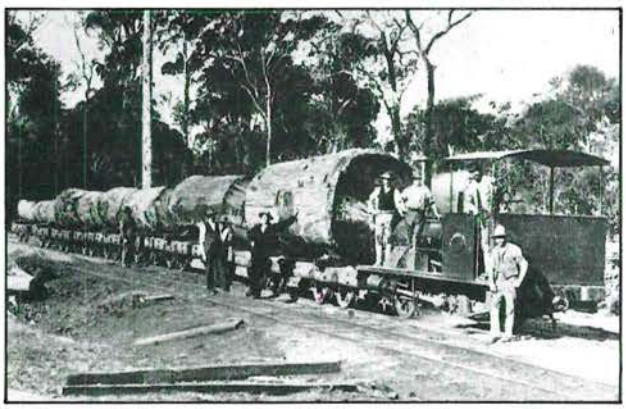
* A superficial foot is strange measurement to people outside sawmilling circles. It is a theoretical volume measurement of a piece of sawn timber 12 inches wide by 1 inch thick by 12 inches (1 foot) long. That is 1/12 cubic foot. Timber, however, is rarely cut 1" thick or 12" wide. A more typical beam might have been 6" x 4" x 20ft — 40 superfeet. An easier conversion might be 1 000 superfeet = 2.4 cubic metres.

timber within three years and a jetty at Hamelin Bay of 13 foot minimum draft within 12 months. The Hamelin jetty was built promptly, 1 800 feet long, capable of berthing three ships at a time with steam cranes alongside, fresh water laid on from a spring and telephone facilities to the company's new head office in nearby Karridale.

In 1884 a new mill, the most advanced in the colony, with the first vertical breaking down bench and a capacity of 12 000 superfeet per day was built at Karridale. The forests, mills and port were interconnected with a railway. Two small steam engines were purchased and numerous rolling stock were built at the company's new workshop at Karridale. Already the business was much too big for one man to manage.

Davies was the father of a large family - six boys and two girls. The boys had joined him as assistant managers, all being taught by experience every aspect of the timber milling business from felling to selling. His wife and daughters were to remain in Adelaide until a comfortable residence was built in Karridale. In his 50th year Davies constructed a 29 room mansion, known as the 'Big House' at Karridale, and in 1885 the whole family called Karridale home.

Davies treated his workers as though they were a big family. Although wages were low — from seven to thirteen shillings per day the company provided workers with a cottage rent free. It paid for a doctor and a clergyman and built a hospital, town hall, school, racecourse and a library regularly stocked with books from Mudies in



A rake of logs from one giant karri tree (left).

All that remains of the huge jetty that was built to export timber from Hamelin Bay. The anchorage now serves anglers and pleasure craft (right).

M. C. Davies and his sons in front of the 'Big House' in 1899 (below).

London. Consumables, including fresh fruit and vegetables from the company orchards and gardens and meat from its farm, as well as every conceivable item, could be bought from the company's store. The company had an agreement with the workers allowing a 10 per cent mark-up on Perth prices to cover freight.

Being so isolated, the company was able to instigate a cash-free society, with workers having an account with the company against which they could trade at the store. Workers who had more than £10 in credit attracted interest at a rate of five per cent per annum. When workers left the community they were paid in Davies & Co. 'banknotes' — cheques which could be redeemed for cash at any bank in the colony. The isolation also enabled the company to keep the community virtually free of alcohol, apart from the gift of a bottle of rum to adult males and a bottle of port to adult females at Christmas time. When Davies ordered a grand piano for the Big House, his wife Sarah insisted on ordering a second for the community hall. These workers' benefits were obviously a small price to pay for industrial peace and worker dedication whilst the profits rolled in.

And the best was yet to come. The 1890's were to be the heydays for the Davies family. In 1891 a new steam mill was commissioned at Boranup but was destroyed by fire a few years later and promptly replaced with a bigger one. In 1895 the Jarrahdene mill opened with a capacity of 21 000 superfeet per day. During this period Davies restructured his company to take his sons in as partners; they were all experienced in every aspect of the timber industry by now, and they were subsequently assigned tasks of importance within the operation.

In 1900, however, the company started to sink. The lack of buoyancy was attributed (in the London Financial Times' report to shareholders informing them that there would be no dividend for the past financial year) to 'keen competition, over-production, increase of freights, and, lastly, the war in South Africa'. They were not alone; all of the major Western Australian timber traders were in dire straits. After protracted negotiations, mostly in London boardrooms, the company amalgamated with its major opposition and several others to become Millars' Karri and Jarrah Forests (1902) Limited. Davies stepped aside, but most of his sons held management positions in the new company in other mills and overseas for many years. The Millars company traded its way out of difficulty, but by 1907 the timber resource at Karridale had dwindled and the Hamelin port closed. Davies retired to his house in Perth near the old Barracks where he died in 1913, within weeks of the closure of the last mill on the Karridale estate.

Cliff Winfield

Cliff Winfield

Cliff Winfield

The 'Big House' — now a restaurant in Margaret River (above).

Once a timber yard, the peppermints have grown back to form what is now a popular campsite at Hamelin Bay (left and below).

Looking at the forest today it is hard to believe that for over thirty years every stick of millable timber was removed (right).

In 1961 fire eventually claimed the remnants of Karridale estate which had once housed 800 residents. Today a magnificent young karri forest, regrown from the cut out timber lease, stands in national park and State forest as testament to nature's amazing recuperative powers. Only remnant foundations and chimneys remain of the mills, and rotting stumps jutting out into the Southern Ocean verify the existence of the magnificent piers.

Only the Big House - moved to Margaret River in the 1950's to become a convent and later a restaurant - remains. Davies' Karridale estate has disappeared almost without trace.

ACKNOWLEDGMENT

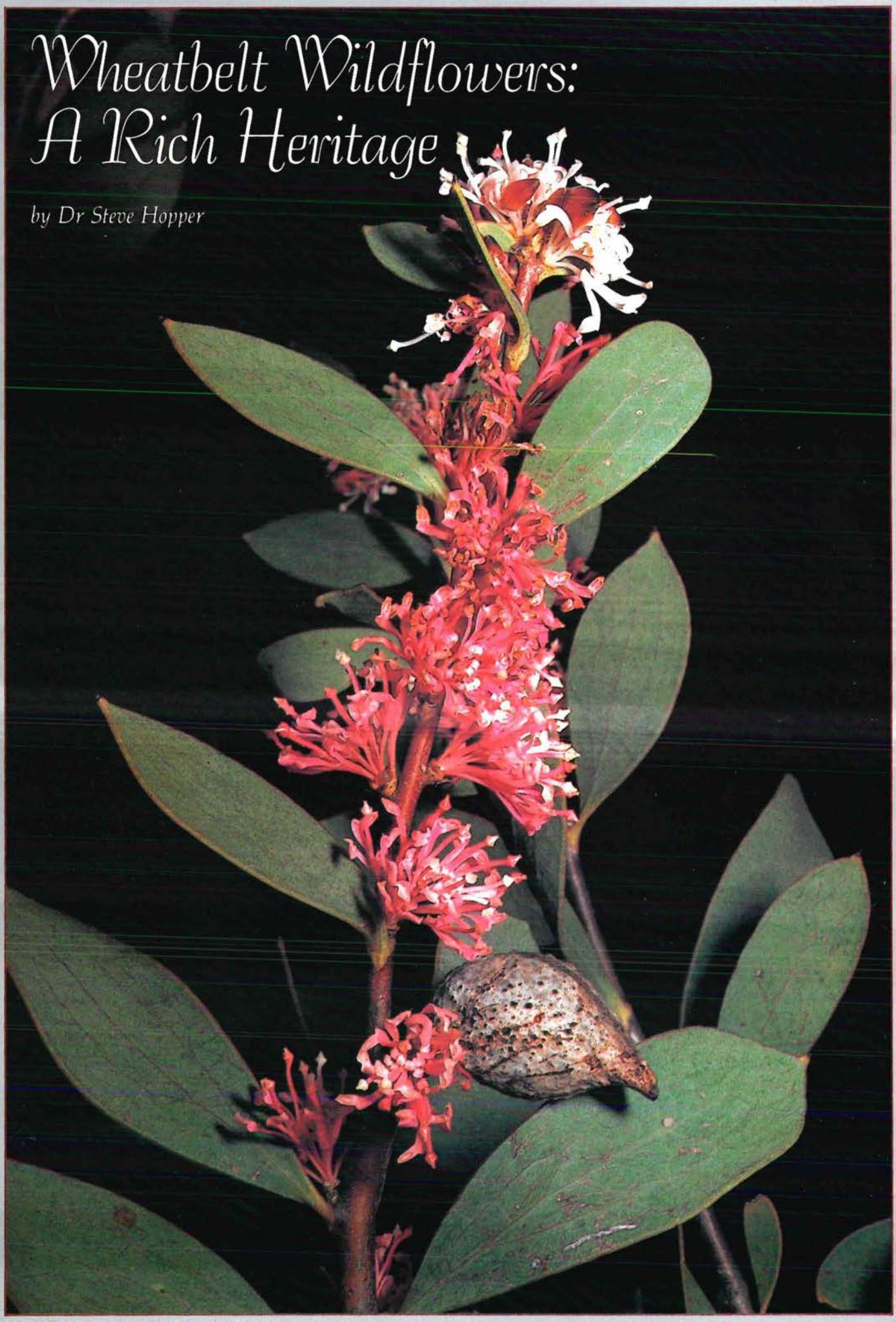
Thanks to the Davies family for access to family records and newspaper clippings.

Cliff Winfield

Cliff Winfield

Wheatbelt Wildflowers: A Rich Heritage

by Dr Steve Hopper

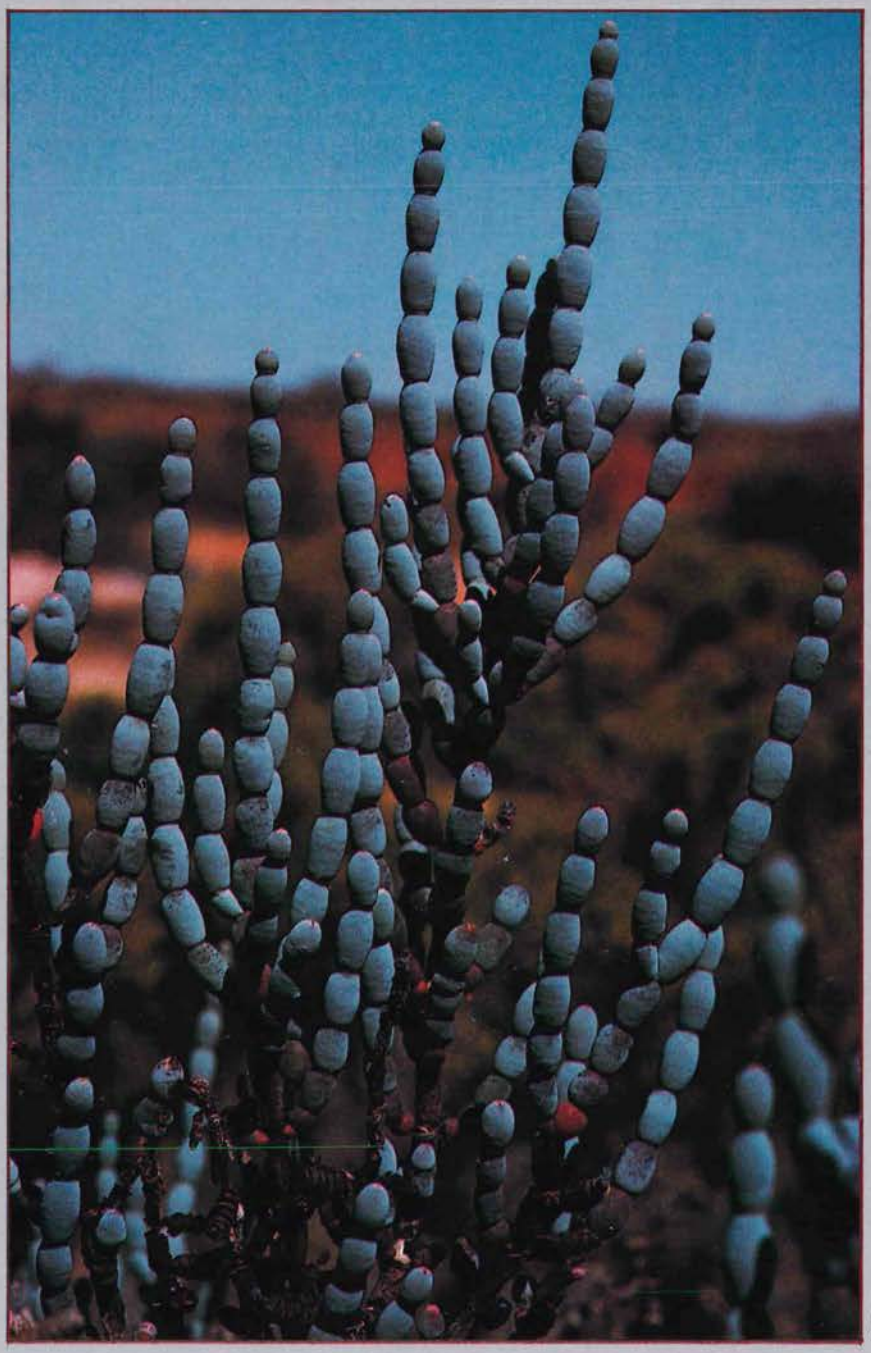


S. D. Hopper

W.A.'s wheatbelt arcs from the lower reaches of the Murchison river southwards, and extends eastwards some 1 100 km to Cape Arid National Park. Although largely cleared of natural vegetation, it contains one of the highest concentrations of rare and threatened native plants in Australia.

EVOLUTIONARY biologists are actively researching the reasons for the occurrence of so many rare and localised species in the wheatbelt. Turbulent climatic fluctuations over the past few million years are considered one major contribution to this prolific development of species. Substantial tracts of wheatbelt vegetation remain to be surveyed by botanists; the State is many decades away from having a complete inventory of the wheatbelt's flora.

The conservation problems caused by this lack of knowledge were highlighted recently by a survey of the mallee belt between Ravensthorpe and Cape Arid National Park. The mallee belt was proposed for major new agricultural land releases. Vehicle access was difficult until the mid 1960's



S D Hopper

Hakea neurophylla, a rare and endangered species that is protected on Don and Joy Williams' farm at Badgingarra (left).

Samphires are commonly seen lining salt lake systems throughout the wheatbelt. *Halosarcia bulbosa* is one of the rarest and most beautiful, its large blue bulbous stems are only seen at a few locations near Geraldton (right).

S. D. Hopper

A rare starflower, *Urocarpus grandiflorus*, flowers in July on a nature reserve near Toodyay.

S. D. Hopper

The stems and flowers of the rare Wongan cactus (*Daviesia euphorbioides*) exemplify the bizarre shapes often found in wheatbelt wildflowers (above).

Eucalyptus pendens on the Williams' farm (below).

S. D. Hopper

Crimson snakebush (*Hemiandra gardneri*), a beautiful groundcover confined to a small area of yellow sandplain near Moora.

S. D. Hopper

when tracks were cut for soil surveys to assess the agricultural potential of the land. The flora was poorly known. A survey funded by the Australian Biological Resources Study was, therefore, initiated.

During the two years of the flora survey, consultant botanist Mark Burgman collected 3 635 plant specimens. With the help of specialists in the W.A. Herbarium and elsewhere, these specimens were identified, and a list of 1 220 taxa (species, subspecies or varieties) was produced.

A significant proportion (18 per cent) of these taxa could not be matched with any known species, suggesting that the plants were new to science. Moreover, it was estimated that 20 per cent of the plants in the study area were not collected because of sampling restrictions, hence the above figures are conservative.

Of particular importance is that 188 species (15 per cent of the total) were considered rare and localised, 21 (2 per cent) were endangered and 37 (3 per cent) were vulnerable if agricultural clearing continues at present rates.

Burgman's findings are typical of the wheatbelt. Recent surveys in regions such as Ongerup-Fitzgerald River National Park, Wongan Hills, Jurien-Eneabba, Stirling Range, Geraldton-Northampton and on wheatbelt granite outcrops have all yielded discoveries of numerous localized species, many new to science. Even many named wheatbelt plants have been seen and recorded only once or twice since their discovery. A number have remained lost to science since their original collection by colonial botanist James Drummond or noted visiting collectors such as Ludwig Preiss.

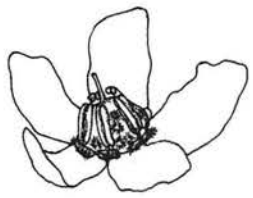
S. D. Hopper

Rose mallee, *Eucalyptus rhodantha*, has flowers up to 8 cm across. It is known in significant numbers from only one location, on a farm left uncleared by an owner interested in conservation.

S. D. Hopper

The nut of fishbone banksia (*B. chamaephyton*) emerges from soil on a farm near Badgingarra.

Two of the presumed extinct plants of the Wheatbelt of Western Australia.



Thomasia gardneri

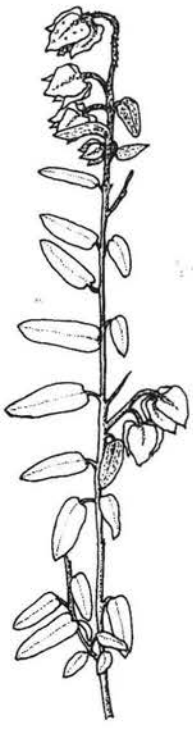
lepidote stem

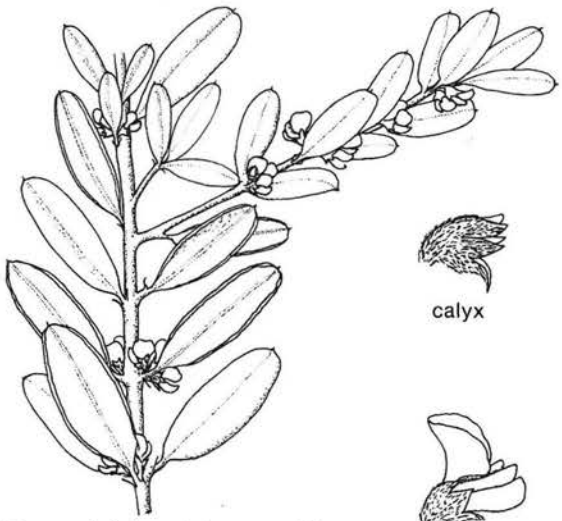
ovary

ovary

hair clusters

petal





Gastrolobium lehmannii

calyx

flower

underside of leaf

pod

Drawings by Susan Patrick

A. P. Brown

S. D. Hopper

Spider orchids have some of the most intricate flowers seen in the wheatbelt, many adapted for pollination by sexual deception of male wasps. *Caladenia integra* is seen sporadically on rich soils in the western wheatbelt (above).

An unnamed species of spider orchid from the Morseby Range-Kalbarri area, which was recently found several hundred kilometres south-east near Pingaring (left).

Eremophila virens, with its unusual green flowers adapted for bird pollination, is one of the wheatbelt's rarest wildflowers. It is now known from only two locations, both adjacent to granite outcrops (below).

S. D. Hopper

TABLE 1 RARE W.A. PLANTS THAT HAVE BEEN REDISCOVERED RECENTLY

Name	First Collection	Recent Collection
Acacia forrestiana	1901 L. Diels	1979 E. A. Griffin
A. vassalii	1935, E. H. Ising	1983 P. Roberts
		1984 R. Cummings
Actinotus rhomboideus	c. 1840 J. Drummond	1979 G. Keighery
Adenanthos cunninghamii	1827 C. Frazer	1973 E. C. Nelson
Angianthus axilliflorus	1904 M. Koch	1978 K. Newbey
A. connatus	1903 W.A. Fitzgerald	1980 P. Short
Boronia adamsiana	pre 1890 A. Adams	1984 A. S. George
Caladenia cristata	1923 E.J. Simpson	1977 D. Voigt
Daviesia ovata	pre 1884 J. Drummond	1982 Mrs D. Davison, Mrs B. Swainson
D. purpurascens	1891 R. Helms	1979 M. D. Crisp
Drummondita ericoides	1901 L. Diels	1980 G. Keighery, D. Mell
Eichlerago tysoniana	1892 I. Tyson	1984 R. Cranfield
Eremophila microtheca	pre 1870 Oldfield	1980 R. Chinnock
E. resinosa	pre 1860 T. S. Roe	1980 R. Chinnock
Eucalyptus steedmanii	1928 H. Steedman	1978 T. Tapper
Gunniopsis divisa	1898 I. Tyson	1983 S. D. Hopper
Gyrostemon ditrigynus	1909 L. Diels	1983 M. Burgman
Hakea tamminensis	1941 C. A. Gardner	1983 J. W. Wrigley
Hemigenia viscida	1920 Stoward	1983 R. Roberts
Hydatella australis	1904 L. Diels	1982 G. Keighery
H. dioica	1898 A. Morrison	1982 G. Keighery
Labichea eremaea	1931 C. A. Gardner	1982 P. S. Short
Lawrencia diffusa	pre 1863 J. Drummond	1983 N. Lander, K. Newbey
Lepidosperma rupestre	pre 1878 Oldfield	1985 A. Brown
Leucopogon obtectus	pre 1867 J. Drummond	1978 E. A. Griffin
Mitrasacme palustris	1902 M. V. Fitzgerald	1984 G. Keighery
Persoonia brachystylis	pre 1868 Oldfield	1980 P. Weston
Petrophile plumosa	pre 1856 J. Drummond	1984 B. Haberley
Platysace filiformis	1839 Preiss etc.	1980 J. Green
Pomaderris intangenda	pre 1876 F. Mueller	1975 M. Trudgen
		1981 K. Newbey
Pultanaea pauciflora	1914 F. Stoward	1984 T. D. McFarlane
Rhizanthella gardneri	1928 J. Trott and J. H. Plant	1979 J. McGuiness
Rumicastrum chamacladum	1904 L. Diels	1982 G. Keighery
Schoenus indutus	pre 1878 J. Drummond	1979 K. Wilson
		1981 K. Newbey
Sellieria exigua	pre 1878 J. Drummond	1979 G. Keighery
Tetratheca aphylla	pre 1882 J. Drummond	1980 K. Newbey
Verticordia fimbrilepis	pre 1847 J. Drummond	1983 N. Stephens
V. helichrysantha	pre 1867 Maxwell	1968 K. Newbey
		1982 N. Stephens
V. hughanii	pre 1878 A. Hughan	1982 B. and M. Smith

Searches for such poorly known rare plants have increased markedly since 1977 when the Department of Fisheries and Wildlife (now Department of Conservation and Land Management) appointed staff and consultants to work on flora conservation. Surveys by these and other botanists have led to the recent rediscovery of 39 rare wildflowers.

The rediscovery of some of these plants (e.g. the Underground Orchid *Rhizanthella gardneri*) has attracted considerable publicity, whereas others have been unannounced until now. All have been significant to botany, and are a credit to the persistence and competence of the botanists involved.

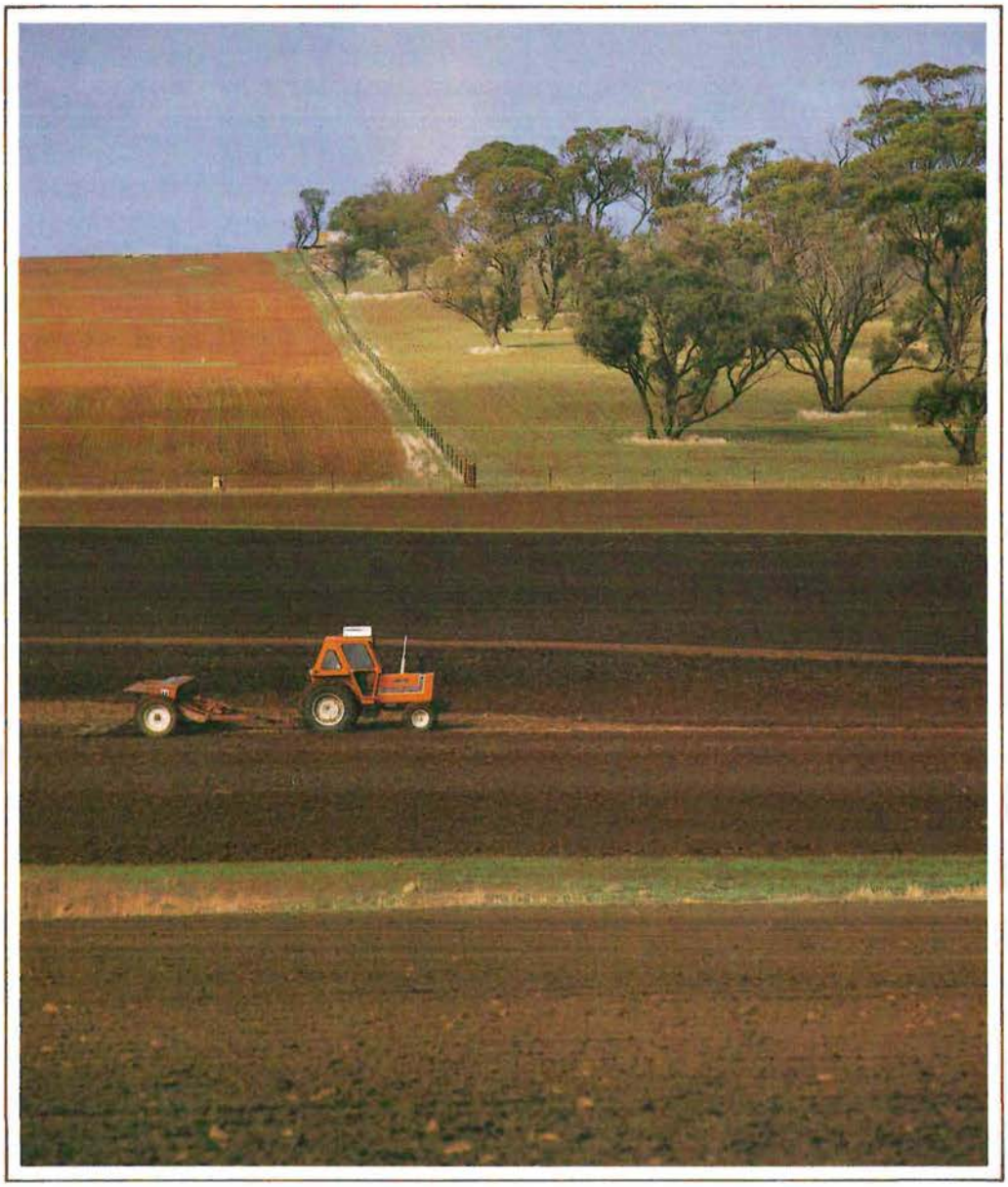
Much remains to be done, however. A project funded by the Australian Heritage Commission, and recently completed by consultant botanist Susan Patrick, identified 52 wheatbelt species which may be extinct Despite surveys mounted specifically to find them, they have not been collected in the last 50 years. None of the surveys were exhaustive, however, and populations of some of these plants may still exist in remnant native vegetation yet to be surveyed.

Landholders can also play their part, for only about three per cent of the wheatbelt is set aside as reserves for wildlife conservation. A fine example of the effectiveness of individual contributions is found at Joy and Don Williams' Badgingarra farm. Four rare eucalypts (one on the rare and endangered list), *Hakea neurophylla, Banksia chamaephyton* (also on the list) and an unnamed Darwinia species are protected within a 350 ha reserve on the Williams' farm. That area is uncleared and free from grazing, and the Williams have half completed a 4 km fence around the reserve. Although the area contains some excellent farming soil at the base of the steep slopes, the Williams decided to set it aside to protect the flora and to avoid water erosion of the slopes.

The reserve contains many representatives of local species previously only known to occur at Mt Lesueur, a proposed nature reserve 25 km away. For one eucalypt, Badgingarra mallee (*E. pendens*), this farm has the largest single population - more than 3 000 plants. *Eucalyptus suberea* and the Mt Lesueur mallee (*E. lateritica*), brought to the attention of botanists by Don Williams, are only found on two or three other farms and around Mt Lesueur. Landowners in the wheatbelt are clearly custodians of one of the world's richest wildflower floras, a high proportion of which is found nowhere else.

The future promises ample rewards for further study of rare wheatbelt plants, provided they are protected, monitored and managed so as to prevent their extinction.

GREENING THE WHEATBELT



S. Eyres/Department of Agriculture

by Kevin Goss

While it is true that clearing for agriculture is the cause of many conservation problems in W.A.'s wheatbelt, today's farmers are just as likely to be planting trees as clearing them.

FARMING families who have been in the wheatbelt for years have shifted in their attitudes to trees. The Coakleys, for example, have been farming near Shackleton (200 km east of Perth) for over 50 years. In 1948 John Coakley took up some new land south of his father's farm.

'It was 4 444 acres of salmon gum, morrel and mottelcah on the sandy country. We left some of the big trees for shade, but boy did we have trouble getting rid of that mottlecah.'

Mottlecah (*Eucalyptus macrocarpa*) has all but disappeared from the wheatbelt now, but, as John points out, new land developers were glad to see it go.

To clear the new block John bought a bulldozer, and to pay for the bulldozer he began clearing on contract. He saw thousands of hectares of native bush pass beneath his blade — 14 000 ha in one year.

'Most of the farmers were pretty good, and so I was able to talk them into leaving a bit of bush for shelter, but the banks were the problem. If a fellow

was developing the land with borrowed money the banks used to inspect the property; if he'd borrowed money to clear the land then to the banks that meant cleared of every stick in some cases - or they didn't come good with the loan.'

John recalls some interesting incidents which reflect the differences in thinking between then and now.

'One chap out east of here asked me to do an 800 acre block for him. I asked if he wanted me to leave some trees for shelter and he said yes, so I left clumps here and there - about 50 acres in total. I was quite proud of the job, it looked good. When the owner came to see it he hit the roof and accused me of trying to pull a swifty on him by leaving all those trees. He made me go and knock most of them down.'

John continued his clearing business for 20 years, and he speaks of it more as a craft than a task.

Since he started, however, things have changed dramatically. There has been a 'quiet revolution' in attitudes towards the land.

'I think farmers could see the deterioration of the land — after all we rely on it for our livelihood, and we look at our farms every day. When we look we see ways we could improve our productivity and our quality of life.'

'I think the drought in the seventies, and then cyclone Alby, really influenced people to start planting trees. Up till then we'd only ever planted a few exotics around the house.'

June Coakley took on the task of managing the farm's tree planting program. Five years ago they planted about 100 a year; last year that figure was more like 1 000.

'City people might think that's a lot of trees,' says June, 'but you can hardly see where we've been.'

And there is more to it than just planting seedlings. The Coakleys raised their own seedlings last summer in a nursery converted from a chook pen. The areas to be planted are fenced off from stock for a few years, so the more trees to be planted the more fencing there is to be done.

The young trees need to be watered in their first summer, and sprayed against insects from time to time through the early years. John and June estimate that they spend as much as 10 per cent of their work-time in tending trees.

Last summer the Coakley farm again echoed to the rattle of a bulldozer. This time it was preparing about 12 ha of land for a direct seeding experiment by deep ripping through the clay crust. This allows the seedlings to get their roots well down into the soil, so they require less watering. The tree seed is sown straight into the ground, and in ideal conditions tens of thousands of seeds will germinate, and the toughest will survive.

When successful, direct seeding saves time and money. Like all aspects of farming, however, direct

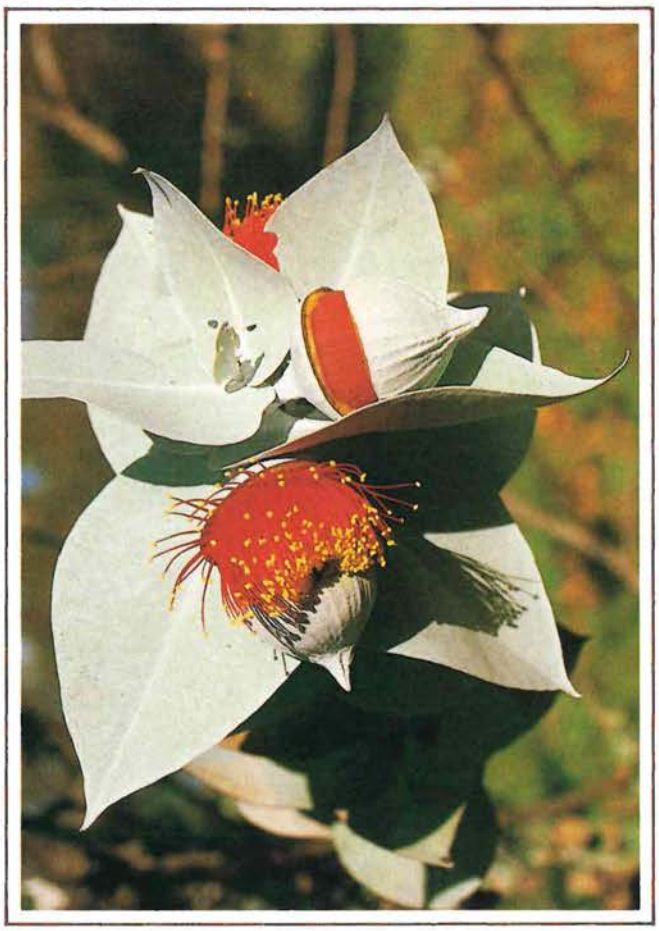
Cliff Winfield

About 10 per cent of each wheatbelt farm remains uncleared.

The Coakley family spend a tenth of their time tending trees on the Shackleton farm.

Cliff Winfield

Mottlecah, a very attractive plant that has largely disappeared from the wheatbelt.



Cliff Winfield

seeding programs are at the mercy of the clouds. Last year, for the first time ever the Coakleys didn't sow a crop. Shackleton received only a few millimetres of rain for the whole winter.

In many ways, the Coakley's experience typifies the changes that have been occurring in the wheatbelt. There has been a great deal of support off the farm for tree planting programs such as the Coakleys. The National Tree Planting Program, jointly funded by Federal and State Governments, has given more than $100 000 to 200 projects. In 1984, 270 000 seedlings were planted. The great majority of these were on farms, with typical grants of $100 to $1 000. Many of these plantings would not have occurred without the money to partly offset the cost of fencing.

The National Tree Planting Program aims to prevent tree loss, and help restore adequate tree and vegetation cover over the Australian landscape. Greening Australia, its community branch, has been operating in W.A. since 1984, and supports the national program with promotion, sponsorship and public awareness activities.

Planting thousands of trees has caused an expansion in the nursery industry. Many country towns now boast a nursery; the one at Wickepin, for instance, provided 5 000 seedlings for the Lake Toolibin project (see below). The Department of Conservation and Land Management's nurseries at Narrogin and Hamel increased their supply of Eucalypt species to the wheatbelt from 160 000 in 1980 to 180 500 in 1985. More than 90 groups have ordered nearly 300 000 trees from Alcoa's Marrinup nursery during 1986.

A good example of the people and resources that are involved with revegetation is a project near Wickepin. Lake Toolibin, 20km south-east of Wickepin, is one of the only major fresh water sources in the district. Monitoring studies since 1977 confirm that it is threatened with salinisation - a legacy of earlier timber clearing, the consequent rise in the salt water table, and the increased salinity of runoff in the catchment. Action was taken in the form of a cooperative project involving:

Department of Agriculture
Greening Australia (W.A.)
Department of Conservation and Land Management
Wickepin Soil Conservation District
Wickepin Shire Council
Local schools in Wickepin and Narrogin.

In June 1985 24 000 trees were planted, many grown from locally collected seeds, including flat-topped yates (*Eucalyptus occidentalis*) and swamp sheoaks (*Casuarina obesa*). A similar number of trees is being planted in 1986.

Planting of individual seedlings and follow-up watering is very labour intensive, however, which puts severe restrictions on how many trees one farm family can cope with. Because of this there has been a significant shift in the approach to revegetating agricultural areas. The development of mechanical planters, and the availability of contractors, increases the potential plantings from thousands to tens of thousands. With correct site preparation, deep ripping and good weed control, most seedlings will survive without summer watering.

Several farmers have had real success with direct seeding of tree and shrub species. Here the seeds are mixed with superphosphate and dropped onto prepared ground with a combine seeder, at a rate of 250 g to 1.5 kg/ha. Potential re-establishment can now be measured in hectares, with much less labour needed.

Direct seeding can be a risky venture, however. Offsetting the well publicised successes were a series of failures in 1985, including that of trial plots seeded by the Department of Conservation and Land Management. Consequently, Paul Brown of the Tree Research Centre, Narrogin, started a major research program for 1986. Direct seeding trials of ten species, using several weed control

Modern nurseries supply hundreds of thousands of seedlings to the wheatbelt.

Cliff Winfield

One hundred farmers in the Bruce Rock and Corrigin districts (representative of a large proportion of the wheatbelt) were surveyed in 1981. About 10 per cent of their farms was uncleared - mostly creeks, salt lakes and channels, and rocky areas. There was an average of 62 ha set aside for shelterbelts, salinity prevention and nature conservation. Of the farmers themselves:

47 have not cleared any land of natural vegetation.

53 cleared 15 000 ha during the period 1924 to 1981, but half was done before 1964, and half was also done by 7 farmers.

5 intended to clear 470 ha.

59 retained a total of 3 500 ha of arable land for shelterbelts.

4 reserved 990 ha for nature or fauna conservation.

56 planted 23 000 trees (not including amenity trees around the house), although more than half were planted by 7 farmers.

28 were still planting trees in 1981.

TABLE 1
THE REASONS FOR PLANTING TREES ON FARMS, CENTRAL WHEATBELT, 1981*

Reason	Number of Farmers
Aesthetic	32
Windbreak — preventing wind erosion	27
Lowering water table — salinity rehabilitation	25
Windbreak — stock shelter	23
Shade — stock shelter	17
Reducing runoff — water control	3
Micro climate changes	2
Agroforestry	—
Other	17

* 'Communication Networks and the Adoption of Three Farm Practices', a study funded by the Rural Credits Development Fund and the Western Australian Department of Agriculture.

techniques, have been started at many sites in the wheatbelt. A survey of existing trials, including farm sowings, may help identify the major problems.

A third way to revegetate is natural regeneration from existing trees. This approach is even less demanding on farm labour, but is limited by the distribution of trees with a viable seed source. The first step, though simple, is costly: fence the area to exclude livestock. Controlling weeds to reduce competition and prevent wildfire is much more complex. The Tree Research Centre and the Department's rural advisory officers began research and field evaluation in 1986 trying to determine the most successful methods.

A variety of new legislation provides a back-up for the 'grass roots' movement towards revegetation. The Soil Conservation Act was extensively revised in 1982. Landholder involvement is encouraged and made possible through the formation of soil conservation districts and district advisory committees (consisting of local land users, with local government representation). These committees provide a basis for cooperative action against land degradation problems which, after all, are not confined by farm boundaries.

The response of the farming community has been dramatic. By February 1986, 36 districts were declared and committees appointed, six districts are declared with advisory committees yet to be appointed, and a further 18 districts are proposed. District projects were assisted by $128 000 granted from the State Government in 1984/85. Several of the projects include re-establishing trees.

Under the Soil Conservation Act new regulations require the Commissioner of Soil Conservation to be notified of 'intent to clear' any area larger than one hectare. Preventative action can now be taken against soil erosion and other problems. Since 1980 new settlers acquiring land under 'conditional purchase' schemes have been required to submit conservation-based farm development plans to the Minister for Lands.

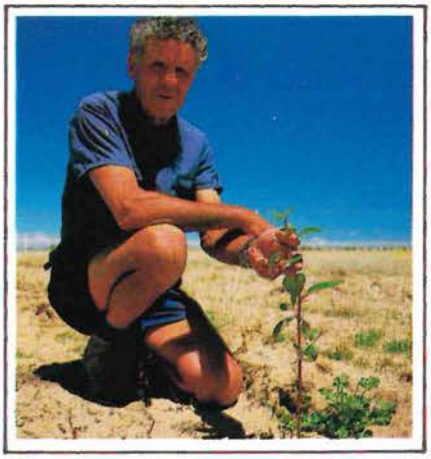
In 1983 the State Government placed a moratorium on the release of crown lands for agriculture, and that still exists with two exceptions:

Compensation for the conversion of farm land to pine plantations at Manjimup.

Farm blocks for 'build-up', adding land area to adjacent farms.

Overall, the actions of landholders and government have meant that little further clearing of wheatbelt vegetation is occurring.

The quiet revolution in the countryside has done much to reverse the trend of bush clearing and boost the re-establishment of trees, but there is still a long way to go. The single row of river gums or double rows of pines, the patches of tamarisks circling a salt area might play their part in reducing land degradation, but they do not make a viable natural habitat. They ought to be augmented with bush areas naturally regenerated or seeded with local species, strategically placed to improve soil conservation, nature conservation and the aesthetics of farm living.



John Coakley

Cliff Winfield

M. & I Marcombe

Managing Kangaroos — Striking A Balance

by Keiran McNamara

The kangaroo is recognised around the world as a symbol of Australia, yet large numbers are killed as agricultural pests in what critics label 'the greatest commercial slaughter of wildlife in the world'. How are our kangaroos managed, and what does the future hold for them?

THE killing of kangaroos is a focus of attention for many conservation and animal welfare groups in Australia, Europe and the U.S.A., yet to talk of 'the kangaroo' is an over-simplification. The superfamily Macropodoidea includes 48 species of kangaroos and their relatives, 22 of which occur, or used to occur, in W.A.

Commercial exploitation of kangaroos dates back at least to 1843 in W.A.; today the kangaroo industry operates within a management program administered by the Department of Conservation and Land Management. Three species are killed commercially — the red kangaroo *Macropus rufus*, western grey kangaroo *M. fuliginosus* and euro *M. robustus*.

The dual aims of the kangaroo management program are to maintain populations of harvested kangaroos over their natural ranges and to contain their deleterious effects on pastoral and agricultural activities. The present program started in 1970/71 following what was considered to be excessive harvesting of red kangaroos in the four years from 1967 to 1970, when more than one million were killed.

For each of the three species annual quotas are set in consultation with the Commonwealth Government. Average annual harvests since 1970 have been 151 000 red kangaroos, 24 000 grey kangaroos and 5 000 euros, and the 1986 quotas are 180 000, 50 000 and 10 000, respectively.

Wildlife Research Centre

Advice to the Minister for Conservation and Land Management on quotas is one of the roles of the State Kangaroo Management Advisory Committee, which includes representatives of pastoral and agricultural interests, the kangaroo industry and conservation organisations, as well as government departments.

The management program and its monitoring system draw heavily upon research conducted over 15 years by Dr Bob Prince, of the Department's Wildlife Research Centre.

An essential element of the management program is monitoring of kangaroo populations. This is done largely through a comprehensive system of records providing information on how many kangaroos are taken, where they are taken, sex ratios in the harvest, and average weights. These data are analysed to detect long-term trends in the distribution and abundance of the harvested species.

Another component of the program is that kangaroos are fully protected in large areas of the State, in national parks, nature reserves and State forests.

In summary, the Department's primary concern is the conservation of kangaroos. At the same time, the Department is responsive to the needs of primary producers whose livelihood is affected when kangaroo numbers are excessive. The need for damage mitigation is met largely through the controlled culling of kangaroos by a commercial industry. The industry is therefore the tool of management, aimed at keeping kangaroo numbers within limits tolerable to landholders.

How Many Kangaroos Are There?

It is often stated that there are more of the large kangaroo species now than before European settlement of Australia. This is not true for all areas, and such generalisations must be viewed with caution. There is evidence, however, that the combined effects of dingo control and provision of water and pasture have allowed numbers to increase, at least in the sheep pastoral areas.

Western grey kangaroo (*Macropus fuliginosus*) (left).

An inspector checks tags (above).

Wildlife officers checking a shooter's licence (right).

There has been much argument over kangaroo numbers, with many critics of the kangaroo industry claiming in the past that the harvested species were being shot into extinction.

The advent of the aerial survey technique has allowed this 'numbers argument' to be investigated. The technique involves two experienced observers counting kangaroos in a 200 m strip either side of an aircraft flying at a fixed speed and height. The raw counts provide an index of kangaroo abundance; when corrected using factors determined experimentally to take account of the kangaroos present but not seen by the observers, the raw counts are converted into estimates of absolute numbers. The accuracy of these estimates is often questioned, and scientists are continuing to investigate the effects of factors such as temperature and habitat type on counting efficiency.

At the very least, however, the technique provides a useful guide to population numbers, and, when repeated, it allows population trends to be monitored over time. The monitoring of population trends, rather than absolute numbers, is what is important in the management program.

There have been two large-scale aerial surveys of kangaroos in W.A., in 1981 and 1984. The first indicated that there were about one million red kangaroos and 430 000 grey kangaroos, compared with 1984 estimates of two million and 680 000 respectively. Populations are known to increase in response to good seasonal conditions, as these results indicate. On the other hand, droughts can result in heavy mortality in kangaroo populations. Aerial surveys in W.A. provide a back-up to the system of records outlined earlier, so kangaroo populations are being monitored by two independent methods. Further aerial surveys are planned.

Aerial surveys are not used to estimate euro populations, however, because of the hilly habitat occupied by the species.

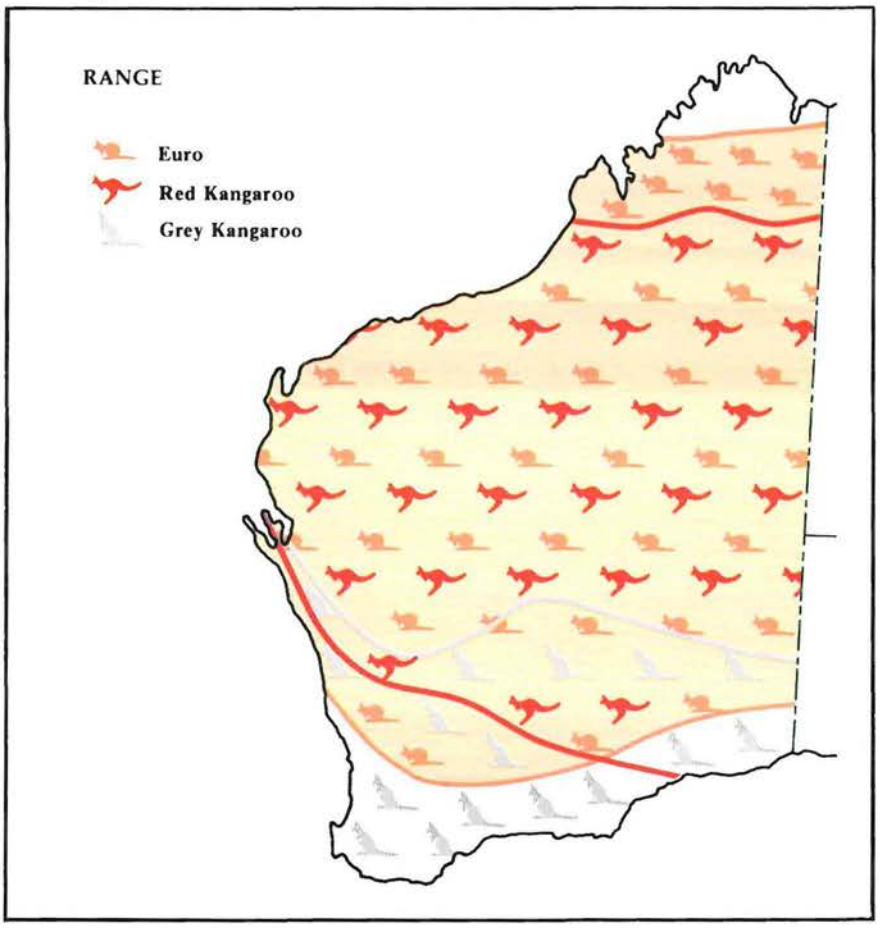
Using aerial survey results from across the continent, as well as other data, it has been demonstrated conclusively that red and grey kangaroos are widespread and abundant. Most people now accept that these species are not in danger of extinction and, as a consequence, the 'kangaroo debate' has now turned largely to other issues.

Impact on Agriculture

Kangaroos have long been regarded as agricultural and pastoral pests and have been killed in large numbers for this reason for more than a hundred years. Their destruction has in the past been a legal requirement in many areas. Their 'pest' status is now being subjected to greater scrutiny, however, and increasingly the question is being asked: 'Does the amount of damage caused justify the killing of such large numbers of kangaroos?'.

An inspector examines kangaroo tracks under a fence.

The distribution in W.A. of the Western Grey, Red and Euro species of kangaroos.



Cliff Winfield

Euro (*Macropus robustus*).

Most landholders accept reasonable numbers of kangaroos on their properties, but they will not tolerate what they consider to be excessive numbers, particularly in times of drought. Furthermore, perceptions vary widely, and what is a problem to one landholder might be acceptable to another.

Damage mitigation is the basis of the management program. Field investigations supported by the practical experience of landholders, show that kangaroos do compete with livestock for food and water, as well as damage crops and fences, but the degree of damage varies widely according to factors such as seasonal conditions and kangaroo population levels. Pastoralists often argue that spelling paddocks from grazing by livestock is virtually a waste of time because kangaroos concentrate on the spelled pasture.

Impact

The impact of kangaroos on agricultural and pastoral production is real, even though it has not been accurately quantified. Our knowledge in this key area is incomplete and research by the CSIRO and other bodies is continuing.

A related issue is the extent to which commercial shooting actually fulfils its stated objective of damage mitigation. While seasonal conditions rather than shooting control overall kangaroo numbers, shooting - through local, short-term reductions in abundance - effectively and immediately mitigates pastoral damage. Landholders appreciate that the management program is for culling not extermination, and provides for the continuation of kangaroos on their land.

Animal Welfare

An issue of growing importance to the community is whether the shooting of kangaroos causes unnecessary pain and suffering. Some critics suggest that cruelty is rife. On the contrary, licensed professional shooters are generally expert marksmen who operate efficiently and humanely. Poor marksmanship and cruelty seem more likely outside the industry, among amateur and illegal shooters.

A Code of Practice for the Humane Shooting of Kangaroos has been developed as a cooperative effort among Commonwealth and State wildlife authorities, in recognition of the obligation to ensure that appropriate standards of humane conduct are applied to the shooting of kangaroos. The Code is being implemented in W.A. as a condition on shooters' licences. Essentially it requires that kangaroos be shot in the head, thus maximising the likelihood of consistently achieving a sudden and painless kill.

Ethical Arguments

An increasing number of conservation and animal welfare groups base their opposition to the kangaroo industry on ethical or philosophical arguments. These proponents of 'animal rights' argue that wild animals have a right to exist free from human interference. Some hold the view that it is wrong to kill any wildlife, while others can accept killing if it is shown to be necessary, but they vigorously oppose commercialisation of wildlife.

National and international attention has been directed towards kangaroos for many years. In 1971 a House of Representatives committee reported on the conservation and commercial exploitation of kangaroos, and in recent years a Senate Select Committee on Animal Welfare has been investigating the subject.

In between, the Commonwealth Government has imposed an export ban, then subsequently lifted it, and there has been increasing national coordination of, and interest in, State kangaroo management programs.

Because the kangaroo industry relies heavily on exports, conservation and animal welfare groups have taken their case overseas. The European Parliament has been investigating an import ban, while the U.S. Government has lifted its earlier import ban. The U.S. Government, however, retains the red, eastern grey and western grey kangaroos on the

threatened list under its Endangered Species Act, despite evidence that they are not threatened with extinction.

The debate has become divisive and confrontationist, but there is more common ground than many people realise. Conservation and animal welfare groups generally agree that the commercially harvested species are not in any danger of extinction, that there is a need to reduce numbers in certain circumstances, and that shooting, which must be done humanely, is the only practical means available at present. There is disagreement, however, over the level of culling, who should do the culling, and whether commercial use should be made of culled kangaroos.

Where do we go from here? There is a need for continuing research in a number of areas, but equally important is a need for dialogue between the various interest groups. Also, government agencies must be accountable to the public for their kangaroo management programs.

The current approach to kangaroo management in W.A. is based on scientific knowledge and sound practical experience. It has worked well over many years: kangaroos remain widespread and abundant while relief is available to those who make their living from the land. The Department of Conservation and Land Management strives for a sensible balance among the various needs and interests involved in this complex issue.

Some people say there must be a better way to manage kangaroos, but no-one has formulated a practical, generally acceptable alternative where kangaroos come into conflict with primary producers. The current approach is not perfect in every respect, and the Department is constantly seeking to improve its management program. There is concern, however, that loss of the existing industry will, in the absence of a viable alternative, lessen control over kangaroo shooting and lead to increased cruelty.

REFERENCES

Strahan, R. (Ed.) (1983). The Australian Museum Complete Book of Australian Mammals. (Angus and Robertson: Sydney).

McNamara, K.J. and Prince, R.I.T. (in press). Kangaroo Management in Western Australia. Wildlife Management Program No. 3 (Department of Conservation and Land Management: Perth).

Prince, R.I.T. (1984). Exploitation of Kangaroos and Wallabies in Western Australia. I. A Review to 1970, with special emphasis on the red and western grey kangaroos. Wildlife Research Bulletin Western Australia 13 (Department of Fisheries and Wildlife: Perth).

Prince, R.I.T. (1984). Exploitation of Kangaroos and Wallabies in Western Australia. II. Exploitation and management of the red kangaroo: 1970-1979. Wildlife Research Bulletin Western Australia 14 (Department of Fisheries and Wildlife: Perth).

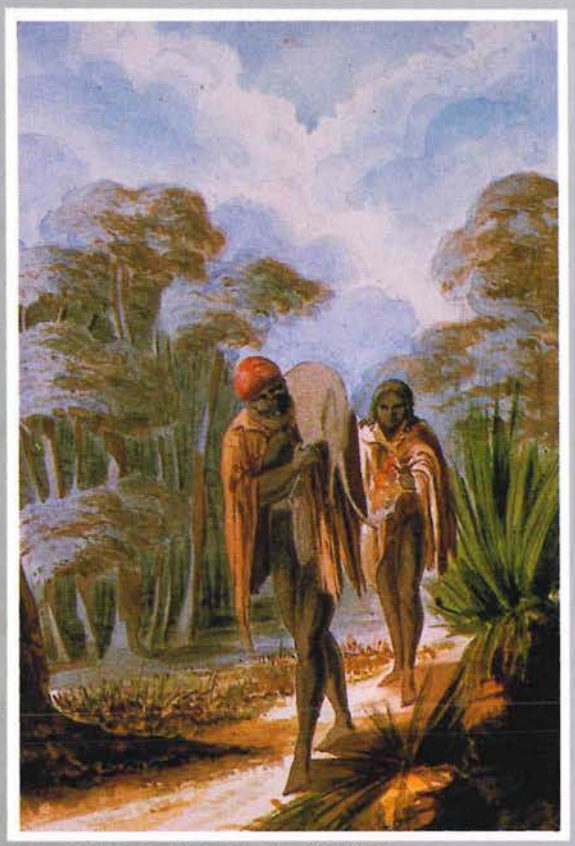
Caughley, G., Grigg, G.C. and Short, J. (1983). How many Kangaroos? Search, 14: 151-2.

Grigg, G.C., Beard, L.A., Caughley, G., Grice, D., Caughley, J.A., Sheppard, N., Fletcher, M., and Southwell, C. (1985). The Australian kangaroo populations, 1984. Search, 16: 277-9.

Red kangaroos (*Macropus rufous*)

Cliff Winfield

EXHIBITION



Returning home after the hunt c 1843-1847.

Bunbury West Australia 120 miles from Perth c 1845-1847.

King George Sound c 1843-1845.

Watercolours of Aborigines and landscapes in Western Australia, 1843-1847

After very competitive and exciting bidding, the Art Gallery of Western Australia recently purchased an important album of watercolours and drawings by Richard Atherton Ffarington. To mark Western Australia week 1986 the Gallery organized an exhibition which included this important album plus an earlier album of drawings produced during his passage to Australia.

Richard Atherton Ffarington drew these sketches of Australian Aborigines and views of Western Australia between 1843 and 1847 when he was stationed with the 51st Regiment in the Swan River Colony.

Born in 1823, Ffarington had risen to the rank of Lieutenant by the time of his arrival in the colony in 1843. He was stationed at Albany, Leschenault and Williams before being posted to Perth.

In 1845, he was granted a Perth Suburban Lot (in present day Leederville), but left for Calcutta with his regiment only two years later. His wife and young family remained behind in the colony. Richard Atherton Ffarington did not return to Western Australia. He died in Lancashire, England in 1855, from injuries received in India.

During the four years he was in the colony, Ffarington compiled a comprehensive artistic record of the way of life and customs of the south-west Aborigines. The album of watercolours and drawings illustrates daily activities like hunting and fishing, but also includes a drawing of a dramatic evening corroboree.

These works form the subject of the exhibition and are accompanied in the catalogue by an extensively researched essay by the Western Australian Aboriginal Historian, Lois Tilbrook.

The exhibition was displayed at the Art Gallery of Western Australia from 24 May to 29 June 1986.

Looking Back

In our March issue we featured the work of wildlife officers, and their fight against poaching and smuggling wildlife.

The two snakes pictured right are a part of a success story.

The Pilbara Olive Python (top) and the south-west Carpet Python (below) were confiscated from someone who was keeping them illegally.

A small box was used to house the 3 m Olive Python, and the snake was obviously listless and ill. Fortunately, with proper care and attention the snake was cured of the fungal infection which had resulted from poor treatment.

Once rehabilitated, the snakes were re-introduced to their natural environments, where they now have every chance of enjoying a normal life-span.

The Pilbara Olive Python's range is restricted to rocky pools in the Pilbara. It can grow as long as 7 m, and likes to lie half-submerged in the water awaiting its prey.

Between those who would like to collect it and those who would kill it because of misplaced fear, its existence as a species is threatened.

Although the south-west Carpet Python is more common, it has also suffered a decline in numbers. An arboreal species, it was once found all along the coastal plain, but is now restricted to the Darling Scarp and the forested south-west.