



S.W.A.N.S.

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S.W.A.N.S.

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Issued by direction of the Hon. Gordon Masters,
M.L.C., Minister for Fisheries and Wildlife.

Director of Fisheries and Wildlife: B. K.
Bowen, B.Sc.

The support of the public is an essential component in any conservation or reserve management programme—but an informed, educated public is needed to ensure its continuing success.

This publication is designed as a medium by which the various organisations, individuals, and wildlife management personnel may be kept informed of the work being carried out by this department; of departmental policies and directions; and for promoting a better understanding and appreciation of Western Australian wildlife and the role it plays in maintaining a suitable environment in which man can live.

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COLIN WALDON – A TRIBUTE

The passing of Colin Waldon last December saddened all his colleagues in the Department of Fisheries and Wildlife.

Colin's appointment as Extension and Publicity Officer with the Department in January 1968 coincided with my own appointment as Director and, during the years of our association, we developed a friendship which extended to activities outside our office duties.

Colin was editor of S.W.A.N.S. from its inception in 1970 and thus became well known to many naturalists and others involved in wildlife conservation. In addition to his work on this publication, and its companion fisheries quarterly F.I.N.S., Colin was involved in many other departmental activities. One of his many fine qualities was the attention he devoted to detail. This was so evident in the fine displays he produced.

Those of us who spent many relaxed evenings at his home will never forget the banquets given by Colin and his gracious wife Phil. They were occasions on which officers of the Department and their wives were brought together in a happy, relaxed atmosphere.

I know I write on behalf of all staff members of the Department of Fisheries and Wildlife in recording my deep appreciation of Colin as a colleague and friend. To his wife, Phil, we offer our deepest sympathy.

Bernard K. Bowen.

IN THIS ISSUE . . .

Page

Draft Management Plans for Nature Reserves	3
To Kill a Kookaburra	5
Rose Banksias and Freckled Ducks	8
Have Poisonous Plants Helped Save Some of our Native Wildlife from Extinction?	10
Protecting our Flora	13
World Conservation Strategy	19
Mammals of the Warburton Region	22
Feral Cat Menace	24

DRAFT MANAGEMENT PLANS FOR NATURE RESERVES

The Western Australian Wildlife Authority has now acquired about 1 000 Nature Reserves throughout the State. These Nature Reserves are administered by the Department of Fisheries and Wildlife.

It is widely recognised that Nature Reserves cannot be acquired and then left to fend for themselves. They have to be managed according to the common Nature Conservation principles. Without management many Reserves, especially the small ones which are often subject to frequent fires, could lose their value as Reserves for Flora and Fauna. Weeds from surrounding farmland, or urban holdings will invade, nesting sites for birds and hiding places for marsupials will be destroyed.

Not all Nature Reserves can be managed in the same way. Some have been set aside for a particular purpose—a rare plant perhaps or an animal that may be close to extinction. Management of these Nature Reserves will put the requirements of the endangered plants and animals first, though these same management practices will usually ensure good management for the Nature Reserve as a whole as well.

It must be recognised when looking at Nature Reserve management that although the Reserves have been set aside for the conservation of our plants and animals they are also a part of the community. Local people *must* be involved in planning for the management for Nature Reserves.

Nature Reserves are an asset to any community but like most beneficial things they may also cause a few problems. They are an asset in that they are often the last remaining areas of bush “as it was” before it was cleared or modified. They therefore have considerable scientific and educational value. Nature Reserves are also vital habitats for wildlife. In many parts of the State they are the *only* places where our native animals can live and breed in safety and our rich flora exist undisturbed. These Nature Reserves will not only bring enjoyment to this generation but to future generations as well. Lastly, Nature Reserves are testimony to the men and women who first came to Australia and carved a living from the bush. They show the land as it was.



Much of the “Avon Valley” Nature Reserve consists of Jarrah/Marri forest but other trees are also represented. Among them are these Powderbark Wandooos (*Eucalyptus accedens*).

Photo Ian G. Crook

Nature Reserves can have side effects, especially in rural areas. They can cause problems when it comes to fire protection and they also harbour animals, such as kangaroos which may be a nuisance to farmers.

The Management of Nature Reserves is a three way process and involves:

1. Communication with the public,
2. ensuring the values of Nature Reserves are perpetuated, and,
3. co-operation with the local community and leaders of that community in such things as animal control and fire protection.

The Department of Fisheries and Wildlife has embarked upon a programme of management planning for Nature Reserves with the intention of ensuring that each of these facets of management are given equal weight. The first stage in the programme is the production of Draft Management Plans. These Draft

Management Plans will give the public the opportunity to comment on the Management proposals for Nature Reserves *before* they come into effect.

The following Draft Management Plans have been published:

"Avon Valley" Nature Reserve. No. 30191.
"Thompson Lake" Nature Reserve. No. 15556.
Nature Reserves of the Shire of Serpentine-Jarrahdale.

Draft Management Plans are in preparation for the Nature Reserves of the Albany Shire (excluding Two Peoples Bay, for which a separate Management Plan will be drafted); Nature Reserves of the Shire of Toodyay (excluding the "Avon Valley" Nature Reserve, for which a Draft Management Plan has already been prepared); and the Nature Reserves of the Dandaragan Shire.



This delightful stand of Swamp Paperbarks (*Melaleuca preissiana*) is a feature of "A" Class Reserve No. 25886, in the Peel Estate between Medina and Armadale south of Perth. Paperbark swamps such as this were once a common feature on low lying parts of the Swan Coastal Plain. Many have now been cleared and drained, but this one remains conserved in perpetuity in a Nature Reserve. The Aboriginal name for a "Paperbark growing in swampy ground" is "Modong", and one proposal is to name this particular Reserve the "Modong" Nature Reserve.

Photo Ian G. Crook

NEW MINISTER

The recent State Election and the subsequent allocation of Ministerial Portfolios resulted in the appointment of a new Minister for Fisheries and Wildlife.

The new Minister, the Hon. Gordon Masters, M.L.C., has represented West Province in the Legislative Council for 6 years. Mr Masters was a farmer in England prior to his arrival in Western Australia eighteen years ago. After farming at Balingup for a while, he moved to Kalamunda and established a contracting business. He is married with two sons.

Mr. Masters has also been appointed Minister for Conservation and the Environment. He stated that he was looking forward to the challenges of his ministerial responsibilities.



SAVING OUR NATIVE ORCHIDS

While the Main Roads Department was planning the realignment of a bridge, known as Muirs Bridge, over the Frankland River on the Manjimup to Mt. Barker Road, it was brought to their notice by the Curator of the Western Australian Herbarium that the roadworks being planned in conjunction with the bridge could destroy an area in which many orchids grew.

The bridge in question is made of local jarrah and was built in 1944. In the 1970s the bridge began to show signs of stress due to pile settlement and sections of the bridge were beginning to move. It was decided to construct a new timber span and approaches in 1978/79.

During the investigation stages three alternative crossings were examined and these showed that a new line down stream of the existing bridge appeared to be the best and most economic choice of route.

It was while the third line was being surveyed that the Curator of the Western Australian Herbarium wrote to the Main Roads Department and expressed concern about the fate of the orchids. It seems that twenty species of orchids have been recorded in the area as well as many hybrids. Some of these hybrids, like the one between the enamel orchids, *Elythranthera emarginata* and *Elythranthera brunonis* are known only from that locality. The area was also the site of orchid pollination studies by the visiting American botanist Dr. Warren Stoutamire in 1977.

The Curator of the Western Australian Herbarium asked that the Main Roads Department look at the possibility of avoiding the important orchid locality when the highway was reconstructed and asked for a meeting between Mr. Alex George of the Herbarium and the Main Roads Department. The meeting took place on the site and another line, which avoided the orchids, was investigated. This fourth line, which ran even further south of the existing bridge, was surveyed. It was found that although the length of the Manjimup approach was about the same, the length on the Mt. Barker approach was increased. Work started on the bridge and approaches in June 1979 and thanks to the interest and co-operation of the Main Roads Department many unique and scientifically important orchids have been saved from destruction.



The Purple Enamel Orchid (*Elythranthera brunonis*).

Photo Ian G. Crook

TO KILL A KOOKABURRA

by Vincent Serventy

For an Australian, the above heading is not only provocative, it's positively repugnant.

Yet some weeks ago a farmers' group in southern Western Australia called for a culling of kookaburras! The claim was made that these bloodthirsty birds were cutting a swathe through the blue wrens, thornbills, silver-eyes, robins, fantails and other small birds of the district.

The call for destruction of Australia's most popular bird (I have conducted several polls around Australia and the kookaburra always topped the list) aroused a vigorous debate and the matter is still under official investigation.

Yet the cry "death to the kookaburra" is not new. Some West Australians see the kookaburra as a "t'other sider" from the Eastern States, an introduction that has brought nothing but trouble.

The call to destroy kookaburras has come in regular succession in the south-west: in 1958, 1960, 1967, 1968 and 1971. The complaints followed the usual pattern, with eyewitness accounts of this jovial villian devouring robins, thornbills, honeyeaters and other small birds.

Now it is all on again! What should be done?

Under no circumstances should any culling of the kookaburras be allowed. If the authorities have the money to spare there can be an investigation into the problem of the low numbers of small birds in farming areas. It will be a useful exercise because the more we know about our wildlife, the better.

It is common sense that whatever happened to the balance of birdlife, all this took place 50 years ago when the kookaburras had colonised the whole of the south-west. Any recent changes must be due to new causes.

There are plenty to choose from.

First there is the disappearance of native plants from many farms. As mature trees die, they are not replaced since all seedlings are removed by those animated lawnmowers, the sheep.

With the disappearance of these patches of bush have gone the homes and breeding places of many birds. The larger trees were of enormous value to the birds not only for finding food but also for nesting hollows.

About 30 per cent of our birds need hollows of some kind. It is quite probable that even after nesting, birds need hollows for shelter during the rest of the year, particularly from night prowling tuans, brushtail possums and owls.

The first and major reason for the disappearance of any animal is the destruction of habitat, taking place not only in the south-west but over many other places in Australia.

The next reason is that the technique of firing roadside verges in late winter and early spring can cause havoc among nesting birdlife.

Another factor is the increasing use of pesticides on farms. Apart from direct poisoning of birds eating dying insects, there is also much less food available for many kinds of birds.

And of course kookaburras are not the only enemies of small birds. Grey butcherbirds are keen hunters, currawongs take their toll and, as already mentioned some of tree living marsupials eat eggs and nestlings.

Feral cats do not appear to be a major danger to birds around farms, concentrating their attacks on small ground-living mammals. Tree-climbing goannas, however, are a danger.

Most of these have been predators for thousands of years in a natural balance. The destruction of habitat, by direct clearing, by introducing new grazers, and by new burning policies, is the major reason why our wildlife has changed, often for the worse.

Despite all the calls for destruction, I can only echo the words of George Caley, the naturalist who explored the country around Sydney in the early 1800s:

NUMBERS OF THE RARE NOISY SCRUB-BIRD INCREASE

At Two Peoples Bay Nature Reserve east of Albany numbers of the Noisy Scrub-bird are increasing. Scientists from the Department of Fisheries and Wild-



Laughing Kookaburra (*Dacelo gigas*)

The Laughing Kookaburra has been introduced into Western Australia from the Eastern States. However, the Blue-winged Kookaburra (*Dacelo leachii*) is native to the tropical northern part of the country including Western Australia north of Shark Bay.

Photo Michael Morecombe

"The settlers call this bird the Laughing Jackass and the natives as I think, Cuck'unda . . . It makes a loud noise something like laughing . . . from which circumstance, and its uncouth appearance, it probably received the above extraordinary appellation from the settlers on their first arrival in the colony . . . When sleeping in the woods I have often found its singular voice most welcome in the morning".

Besides occasionally eating nesting birds in the breeding season, kookaburras eat insects and other small creatures. They devour a number of small reptiles, including snakes, frogs, freshwater tortoises, goldfish, rats and mice.

Veronica Parry, an American girl who, having heard a kookaburra call in San Diego Zoo in California, decided to come to Australia to study them, is now our foremost authority. She found that during the breeding season a group of birds she watched ate the following estimated amounts: 30 per cent snakes and lizards, the same percentage of insects, and 15 per cent earthworms. Freshwater crayfish provided 8 per cent and handouts from friendly humans 8 per cent. As kookaburras are strongly territorial, it is probable that the feeding pattern remains much the same for the rest of the year.

First published in *The Bulletin*. Copyright Vincent Serventy.

life report that birds can now be heard singing in moist and densely vegetated areas around Lake Gardner and Moates Lake.

This movement of birds out of their main habitat on the Mount Gardner peninsula, is the result of effective fire control, part of a management programme put into operation in 1971. Since then areas basically suitable to the Noisy Scrub-bird which previously suffered frequent fires have grown back. They are now dense enough to provide shelter and food for the birds.

Two Peoples Bay and a view across the dense scrub to Mt. Gardner. Mt. Gardner (408 m) dominates the eastern part of the Nature Reserve and forms a peninsula extending in a south-easterly direction into the Southern Ocean. Most of the Noisy Scrub-birds live in the densely vegetated gullies in this region. The area resounds with their song, especially in the spring.



Fires occur frequently in this type of coastal heath and it is a common practice to burn the country regularly every five years, however, research has shown that too frequent burns ruin the habitat for many birds including the Noisy Scrub-bird.

The Noisy Scrub-bird was generally thought to be extinct until its rediscovery in 1961. Up until 1973 the population remained fairly stable at between 40 and 50 pairs of birds. Since 1973, 2 years after the policy of no burning was adopted, the numbers of breeding pairs have nearly doubled. Today there are 72 breeding pairs plus about 20 non-breeding males which are holding territories. Each breeding male bird requires a territory of about 10 hectares, so population pressure is forcing young males out from the Mount Gardner peninsula into new areas where they can establish their own territories. It remains to be seen whether the birds will eventually move even further afield into areas outside the Nature Reserve.

However the frequent burning of the coastal heathland makes most areas unsuitable.

The Department of Fisheries and Wildlife is cautiously optimistic that numbers of Noisy Scrub-birds will continue to increase. But there is a limit to the numbers the Nature Reserve can support which brings up the question of whether other areas can be found and a separate colony of birds established. Any new area would have to be managed and fires prevented.

Three other rare bird species on Two Peoples Bay Nature Reserve are also increasing in numbers. These birds—the Western Whip-bird, the Brown Bristle-bird and the Southern Emu-wren—all require dense vegetation and frequent burning destroys their habitat.

If we want populations of these rare birds to spread outside the Two Peoples Bay Nature Reserve to other areas research has shown that fires on coastal heathlands will have to be minimised.



Noisy Scrub-bird (*Atrichornis clamosus*)

Photo Graham Chapman

ROSE BANKSIAS AND FRECKLED DUCKS

It is not unusual for a Nature Reserve to harbour a rare plant or animal, indeed some have been set aside specifically for this reason—Two Peoples Bay and the Noisy Scrub-bird is an example.

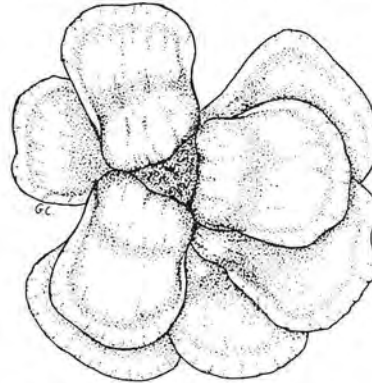
North of Perth in the Dandaragan Shire, 'Namming Lake Nature Reserve' [Reserve No. 28558], was set aside primarily because of its importance as waterfowl habitat. There are six freshwater lakes at the north of the Reserve and many species of waterfowl can be seen there regularly in large numbers—among them the Freckled Duck is often observed.

Although there are records of Freckled Ducks from most parts of Australia, there is no doubt that most of these birds are vagrants. They are only found regularly in a few places in the south-east of the Murray-Darling Basin and in the south-west of Western Australia. Their regular range in Western Australia is very limited and they only breed in a few places.

The Freckled Duck *Stictonetta naevosa* is a rare species of great interest to the scientific community. The duck shows primitive characteristics which link it with geese and swans as well as ducks. For example, it has a windpipe similar to that of a Magpie Goose; it has a voice like that of a swan; feeds, walks, swims and builds its nest like a swan; but it looks like, and has a skeleton like a duck.

Scientists do not agree as to where the bird should be placed in the evolution of waterfowl; but few would deny that the waterfowl family of today passed, in evolution, through duck-like ancestors before differentiating into swans, geese and others. The Freckled Duck is probably the closest living species of waterfowl to that ancestor and is yet another of the several primitive animals which survive only in Australia.

The waterfowl, and in particular the Freckled Duck, gave this relatively large Reserve (about 5411 hectares) an important place in the chain of Nature Reserves throughout the State. However, the value of the Reserve and surrounding area increased further when Wildlife Officers surveying the Reserve in late 1978 found a rare Banksia—*Banksia laricina* or the



Fruit of the Rose Banksia
(*Banksia laricina*)

Rose Banksia—in small isolated patches just outside the Reserve. This banksia is called the Rose Banksia because of the fruits—thin, wavy and rounded they radiate from the slender axis, each capsule like a rose petal.

These banksias were of interest because this species had not previously been found north of the Moore River. Commercial pickers know of this site and may have known of it for some time. They have been taking flowers and seeds of this banksia for at least two years. It is not known how much pressure of this kind these small populations of banksias can tolerate before their numbers start to dwindle. Fewer seeds will mean fewer shrubs to replace the old ones.



Freckled Duck (*Stictonetta naevosa*)

Down is used to line the nest. Between 5 and 7 eggs are usually laid though larger clutch sizes have been reported. Very little is known of the breeding and nesting behaviour of this species.

Another problem which affects the potential survival of these small populations of Rose Banksias is fire. Frequent wildfires will not only harm the parent shrubs they will kill the young ones. It takes about six years from germination for a Rose Banksia to reach the stage when it can produce seeds. Therefore, over a period of time frequent hot fires could destroy a population of Rose Banksias totally.

Although it was unfortunate that these rare plants occurred outside Nature Reserve No. 28558, it was fortunate that they grew on unvested Crown Land. On the 11th May 1979, two areas of this Crown Land, containing the Rose Banksias were added to the Reserve.

'Namming Lake Nature Reserve' is of great importance to the conservation of Western Australia's wildlife. It contains a wealth of wildfowl, including the Freckled Duck. Many other birds and mammals are also found there. The flora is diverse and is characteristic of the rich flora of the Northern Sandplains. Now the Reserve has been vested in the Western Australian Wildlife Authority it has to be managed carefully to ensure it retains its value in the conservation of some of our unique plants and animals.



Freckled Duck (*Stricktonetta naevosa*)

A dark brownish-black duck with a large, pointed head. It is uniformly freckled with white or buff.

Rare Birds Survey

Can you help in the search for Australia's rarest birds? If so, the Royal Australasian Ornithologists' Union (RAOU) would be pleased to hear from you.

The RAOU is engaged in compiling the *Atlas of Australian Birds*, which aims to determine the distribution and breeding areas of all Australia's bird species. In the past three years, information covering about 85% of the continent has been collected from over 2 000 volunteers. Help is still needed, particularly from people living or travelling in the outback.

During 1980 and 1981, Simon Bennett (who has been closely involved with the *Atlas of Australian Birds*) will be trying to determine the distribution and abundance of 46 of Australia's rarest birds. He will be researching published reports and seeking information from bird-watchers to find what is known about each species, and then organising field work to fill the gaps in our knowledge. The major two-year project is being financed by World Wildlife Fund Australia.

About 55% of birds breeding in Australia are unique to this country. The distribution and abundance of many are unknown, as are their needs for survival. Some have always been rare while the decline of others has only recently become evident. The Rare Birds Search will identify those species most in need of detailed study and management, and will make recommendations on the steps necessary for their preservation.

As you will appreciate, Simon has a busy itinerary in his two year study and any assistance from bird watchers would be of great value to him. The rare species which may be found in Western Australia are listed below. If you have seen any of these species please forward your information to the RAOU at 21 Gladstone Street, Moonee Ponds, Victoria 3039 (telephone 03 370 1272). Any information is useful, but detailed notes as follows are especially valuable:

1. Description of adults and young.
2. Exact locality, grid reference if possible.
3. Date of sighting(s).
4. Description of habitat—vegetation, including its condition, landform, etc.
5. Recent weather.
6. Number of birds seen.
7. Breeding information: timing, nest site and description, incubation period, number of eggs and young, success.
8. Behaviour: feeding behaviour, food taken, displays, interaction with other birds of the same or different species, predation, parasitism, social grouping (single, pairs, flocks), calls. In other words, anything you observe the birds doing.
9. How you found them: any special techniques used.

Species sought in Western Australia.

- Red Goshawk *Erythrotriorchis radiatus*.
- Night Parrot *Geopsittacus occidentalis* (not Bourke's parrot).
- Rufous Bristle-bird *Dasyornis broadbenti litoralis* (race in south-western W.A.).
- Grey Falcon *Falco hypoleucos*.
- Princess (Alexandra's) Parrot *Polytelis alexandrae*.
- Crested Shrike-tit *Falcunculus frontatus whitei* (race in north-western Australia).
- Nullarbor Quail-thrush *Cincoloma alisteri*.
- Black Grass-wren *Amytornis housei*.
- Grey Honeyeater *Conopophila whitei*.
- Yellow Chat *Ephtianura crocea*.
- White-browed Robin *Poecilodryas superciliosa cerviniventris* (buff-sided race in north-western Australia).
- Purple-crowned Fairy-wren *Malurus coronatus*.
- Thick-billed Grass-wren *Amytornis textilis*.
- Gouldian Finch *Erythrura gouldiae*.
- Chestnut Rail *Eulabornis castaneiventris*.
- Rufous Owl *Ninox rufa*.
- Masked Owl *Tyto novaehollandiae* (mainland forms only).

Have Poisonous Plants Helped Save Some of our Native Wildlife from Extinction?

Monofluoroacetic acid is a poisonous substance. Most people know this chemical, or at least a form of it, as compound 1080. It is used to kill "vermin" such as foxes and rabbits. Monofluoroacetic acid occurs naturally in many plants in Australia and most of them—a total of 33 poisonous species of *Gastrolobium* and *Oxylobium*—occur in Western Australia. Fluoroacetates can also be found in some plants in Africa and South America.

These plants are readily eaten by herbivores and have frequently caused livestock losses. Native animals also feed on them but many appear to be able to tolerate quite high dosages of fluoroacetate.

In their paper "The Adaptation of Some Western Australian Mammals to Food Plants Containing Fluoroacetate", D. R. King, A. J. Oliver and R. J. Mead have shown that the balance between the animal's tolerance of the poison and the fact the plants need it as a deterrent against being grazed is a delicate one. Native herbivores are able to eat plants with low levels of fluoroacetate. They are also able to eat small amounts of plants with very high levels of fluoroacetate. Those plants with the higher levels of fluoroacetate survive this grazing pressure as the others are eaten out. The two are in balance, and the levels of fluoroacetate in plants and the tolerance of animals to it have evolved together, here in Western Australia.

There is a great advantage, even for generalised herbivores, in being able to feed on *Gastrolobium* and *Oxylobium* species. These genera are legumes, members of the 'pea' family, and are very nutritious. They are also abundant. Unlike many of the shrubs in Western Australia which are coarse, tough, spiny or otherwise physically adapted to resist grazing pressure, some *Gastrolobium* and *Oxylobium* species are soft and succulent. Heart-leaf Poison (*G. bilobum*) and Box Poison (*O. parviflorum*), are particularly good examples of this, and they contain extremely high levels of fluoroacetate. Some species of *Gastrolobium* and *Oxylobium* contain up to 2 600 parts per million of the poison fluoroacetate. In many areas a large percentage of the shrub species are poisonous. They may, in some cases, be the dominant species. This is quite often the case after fire in the south-west of Western Australia. The forest ecosystems show evidence of a long-term association with fires. Several species of macropods, including Grey Kangaroos, are abundant on recently burnt areas, to which they are probably attracted by the newly regenerated ground vegetation.

The climate in south-western Australia is characterised by dry summers. Effective rainfall is rarely recorded between spring and the following autumn. Once the autumn rains start, and before the herb layer has started to grow, the dry herbage becomes spoiled and unpalatable. This is a critical time for herbivores, and they are more dependent on the shrub layer than at any other time. At this time, the young foliage of the poisonous species of *Gastrolobium* and *Oxylobium* would be more attractive than the spoiled herb layer. The young shoots, following the autumn rain, and the flowers and young shoots in spring contain higher levels of fluoroacetate than other parts of the



Heart-leaf Poison (*Gastrolobium bilobum*)

This shrub ranges from 1 metre to over 4.5 metres in height. It occurs, typically, in association with granite rocks though it may also be found along the banks of streams as seeds are carried down after rains.



Box Poison (*Oxylobium parviflorum*)

This species assumes four distinct forms. Typically it is a shrub growing to about 2 metres high, though taller specimens can be found.

plant. They are most important to the survival of the plant, for if all the flowers are eaten the plants will not be able to reproduce. These high fluoroacetate levels at critical periods and in crucial parts of the plant appear to have survival value in providing additional protection against heavy grazing.

Although the Brush-tail Possums (*Trichosurus vulpecula*) from Western Australia can tolerate high levels of fluoroacetate, this tolerance would not allow them to browse exclusively for a long time on the flowers and young leaves of plants containing high levels of fluoroacetate. However, this degree of tolerance would allow a possum to include *some* of this material in its diet.

It would be possible for a two kilogram possum to eat 100 grams of fresh material per day, from a plant containing 500 parts per million of fluoroacetate, for several days without starting to avoid eating the plant. This would be approximately one-third of its daily intake of food. It could eat a smaller amount of the highly poisonous species for a longer period of time. Because animals, like possums, limit the amount of poisonous plant material they eat to that which their metabolism can cope with means that the plants have some protection from overgrazing.

The resistance to 1080 of macropods, phalangerids and rodents in the south-west of Western Australia, and limited unpublished data on birds and reptiles, indicate that the ability to tolerate some ingested fluoroacetate has evolved independently a number of times in the fauna of south-western Australia. Such resistance to fluoroacetate may also have evolved in fauna of other areas such as Africa and South America where the vegetation contains this poison.

These poisonous plants may have helped save some of our native animals from extinction—animals such as the Woylie or Brush-tailed Rat Kangaroo (*Bettongia penicillata*).

Woylies used to be found in most parts of southern Australia but were last recorded in New South Wales in 1857 and South Australia in the 1920s. The species is now confined to three forest and woodland areas in south-western Australia—Tutanning Nature Reserve, Dryandra State Forest, and Perup State Forest. Another population of Woylies has recently been found in Queensland.

Scientists studying the Woylie believe it requires areas of bush with a thick understorey to survive. It uses this thick understorey for shelter and nests. Frequent fires in most of our forests have destroyed this dense vegetation. These fires together with the introduction of the Fox *Vulpes vulpes* have caused the numbers of Woylies to decline. The Woylie is reasonably easily caught by the fox and except for running into the thick scrub it does not have any way of defending itself—that is, except in parts of Western Australia.

In their paper "Fluoroacetate Tolerance, a Genetic Marker in some Australian Mammals", A. J. Oliver, D. R. King and R. J. Mead have shown that of all our native mammals, Woylies have one of the highest levels of tolerance to the poison 1080.

They can tolerate levels of fluoroacetate in plants of more than 100 mg per kilogram, while the Tammar Wallaby *Macropus eugenii* can only tolerate levels of 5-10 mg per kilogram and the Western Grey Kangaroo *Macropus fuliginosus* can tolerate levels somewhere in between these two.



The Woylie (*Bettongia penicillata*) is also known as the Brush-tailed Bettong and Brush-tailed Rat-kangaroo.

Photo A. G. Wells

This high tolerance to fluoroacetate in the Western Australian Woylie as well as other mammals has evolved over the 30 000 years the animals have been exposed to the fluoroacetate bearing vegetation.

In Western Australia, Woylies still survive where poisonous species of *Gastrolobium* and *Oxylobium* are abundant. Woylies have evolved a tolerance to the fluoroacetate and they are able to feed on these plants. But foxes are very susceptible to fluoroacetate. Therefore when a fox kills a Woylie which has been feeding in these *Oxylobium* and *Gastrolobium* dominated plant communities, the fox will die of 1080 poisoning within a few hours of eating the Woylie. This could be one way predation pressure on the Woylie is reduced. Even so, in recent years fox numbers have increased, and this is putting considerable pressure on what few Woylies are left.

Although the reasons for the decline of the Woylies can be blamed fairly conclusively on frequent fires and predation by foxes (and probably on the occasional outbreak of disease), the role that poisonous *Gastrolobium* and *Oxylobium* species have played in Woylie survival in these three areas of Western Australia has yet to be proven. However, since Woylies are now extinct in New South Wales and South Australia where there are no poisonous *Gastrolobium* and *Oxylobium* species, and where foxes abound, and because they can only be found in three areas of Western Australia where poisonous *Gastrolobium* and *Oxylobium* species

are abundant, circumstantial evidence certainly leads one to suspect that poisonous plants have played a vital role in the survival of Woylies in Western Australia. (The Woylies that have been found in Queensland recently are believed to be in an area where foxes have not yet penetrated).

Attempts to manage habitats for Woylies have centred around control of wildfires and poisoning programmes for the eradication of foxes. Colonies of Woylies are also being re-established in areas where they have become extinct, but perhaps before they are released into these areas wildfires should be prevented so that large numbers of *Gastrolobium* and *Oxylobium* plants can become established and the Woylies can take advantage of their natural tolerance to 1080 at the expense of the fox.

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Kangaroo Culling Programme

Statement by the Minister for Fisheries and Wildlife, Mr. Gordon Masters

The Minister for Fisheries and Wildlife, Mr. Masters said that Western Australia's kangaroo culling programme was conducted in such a way that there was no possibility whatsoever of the animal's existence being placed in jeopardy.

The Western Australian Government, working within a responsible kangaroo management programme, had supported the export of kangaroo products and would continue to do so.

Mr. Masters said the programme allowed for the culling of red kangaroos in the pastoral areas and the western grey kangaroo in farming districts.

Under license, about 150 000 reds were taken each year and 50 000 western greys.

"It is worth noting that the distribution and numbers of the red kangaroo have in fact expanded with pastoral development because they have access to water supplies developed by pastoralists.

"Therefore we have a case where man's activity has been beneficial to the kangaroo".

Mr. Masters said the States and the Commonwealth had reviewed the whole situation about seven years ago. Since then an effective management programme has existed, allowing for culling to be carried out in a responsible way.

That programme took into account both the interests of the landholder and those of wildlife conservation.

The licensing of professional shooters was carried out by the Fisheries and Wildlife Department. Shooters were given specific quotas which were reviewed annually.

Mr. Masters said that because kangaroo populations were much greater on the eastern seaboard, Western Australian activity was not a dominant factor in the Australian trade scene.

"However, Western Australia is firmly of the view that exports of kangaroo products needs to take place to make it a commercial proposition.

"We support the review on imports being undertaken by the United States authorities. We believe that we've been able to demonstrate to their officials that our culling programmes in no way endanger the existence of the kangaroo population," Mr. Masters said.

PROTECTING OUR FLORA

AMENDMENTS TO THE WILDLIFE CONSERVATION ACT

Background

It has been almost three hundred years since William Dampier first collected plant specimens in Western Australia, but even today there is still a considerable amount to be discovered about our plants. For instance, it has been estimated that between one and three thousand species of flowering plants in Western Australia remain undescribed.

Australia has an extremely rich flora. There are around 20 000 species of plants in all, and of these, more than 80 per cent are *only* found in Australia. Many Australian plants are primitive and this has led some scientists to suggest that this country could have been the centre of the origin of the flowering plants.

Changes in land use are threatening our plants. Their distribution is being modified and species which were once abundant in a certain area can no longer be found there. The numbers of our native plants are also being greatly reduced. Many species are in grave danger of becoming extinct.

THE NUMBER OF PLANTS AT RISK IN EACH STATE

	families	genera	species
W.A.	62	233	936
N.T.	45	85	108
S.A.	52	119	249
Qld.	68	187	311
N.S.W.	64	160	305
Vic.	39	83	136
Tas.	45	83	139
Australia	141	596	2 053

In all of Australia, the greatest number of plants at risk occur in the south-west corner of Western Australia (about 820 species). This large number of plants at risk highlights the fact that this area is very rich in species many of which can *only* be found in the south-west corner of this State.

Looking at the conservation status of Australia's native plants as a whole, nine species are believed to be extinct and about 220 species are regarded as endangered, and of these, one third occur in Western Australia. Many more plants are considered vulnerable.

Quite a few species are subject to heavy commercial exploitation in the wild state. Banksias, kangaroo paws, boronias and ferns are some of the plants which are especially attractive to florists, seed collectors, and nurserymen. Many banksias are used as centre pieces for flower arrangements and command high prices. They are often air freighted overseas. Other native flowers are valued for dried arrangements.

Of the 1100 commercially exploited Western Australian species, 200 are regarded as being rare, geographically restricted or few have been collected, and some of these are endangered. All the endangered ones are from the south-west of the State.

The creation of National Parks and Nature Reserves is of tremendous value in protecting our endangered plants. However, some existing Reserves are just too small to allow a plant community to be self perpetuating. Others contain inadequate buffer zones and are just 'islands' of the original landscape surrounded by urban, rural or forestry development. These plant populations are unable to expand. Many of the Nature Reserves may be invaded by 'weeds', this is especially so if they are subjected to frequent fires. Frequent fires can also kill plant species or prevent them from reproducing. Water-table changes resulting from irrigation or draining can also have far-reaching effects on small Nature Reserves.

Many of Western Australia's most spectacular flowers occur on poor, nutrient-deficient soils. The plants have adapted to these meagre soils. Therefore, fertilizer rich dust from adjacent farmland and debris from road making and agricultural activity can harm



Banksia goodii

A rare species of banksia with a very limited distribution. It is a prostrate plant with erect leaves and flower spikes. This specimen was photographed in a Nature Reserve in the south-west of the State.

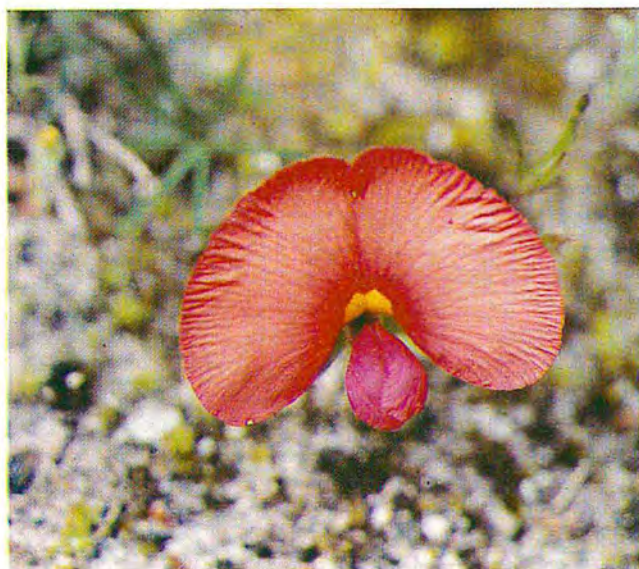


Wild Wisteria or Wild Sarsparilla (*Hardenbergia comptoniana*) left

The only species of this genus in Western Australia. In September and October it becomes one of the features of the sandy coastal bush country between the Swan River and King George Sound.

Coral Vine (*Kennedia coccinea*) below

Common in the south-west of the State, especially in the Jarrah forest. This species is one of the first to colonise the bare gravel pits especially in the southern forests.



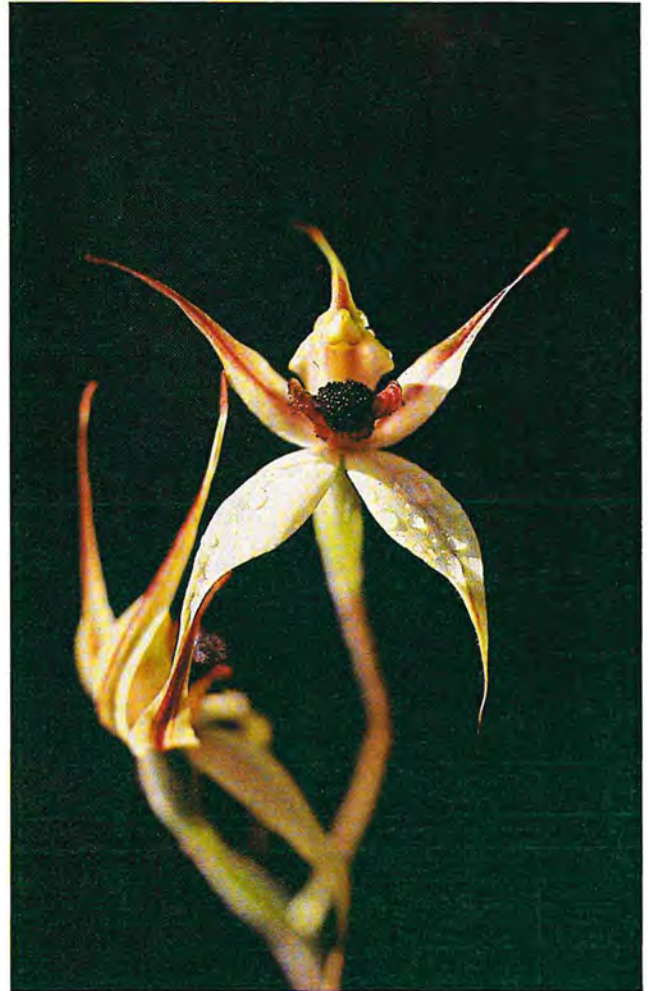
Albany Pitcher Plant (*Cephalotus follicularis*)

An insectivorous plant which grows amongst dense shrubs and sedges. It has two types of leaf, flat ones and leaves modified into pitchers. The pitcher leaf is often highly coloured and turns brilliant red or purplish in sunlight. The pitchers contain a watery liquid in which insects drown and later decompose. The plant makes use of the nutrients from the decomposed victim. The actual flowers of the plant are white and small.





Left: Cowslip Orchids (*Caladenia flava*) and Everlastings (*Helichrysum roseum*) in Tutanning Nature Reserve.



Leaping Spider Orchid (*Caladenia macrostylis*) above

Fairly common in the lower south-west of the State. It is found mainly on laterite soils in the forests from Perth to Albany. Each petal and sepal is tipped with a small club. Flowers Sept.-Dec.



Scarlet Banksia (*Banksia coccinea*) left

A shrub or small tree growing to 2-4 metres. These plants were photographed in the Stirling Ranges. The species is fairly common between Albany and Hopetoun.

these communities. Even fruit peelings, cigarette butts, and papers dropped along tracks and roadsides can inadvertently contribute to an excess of nutrients.

In general, few plant communities are really adequately conserved just within the Nature Reserve and National Parks network. More than one Reserve may be essential to cover the genetic and structural diversity contained in a wide ranging species such as the York Gum (*Eucalyptus loxophleba*). The most obvious gaps in the Nature Reserve network are, not surprisingly, in the areas subject to the greatest demands for other uses, such as grazing land and forestry. In Western Australia the south-west corner has the highest rainfall in the State and is therefore of great value for both forestry and farmland.

Most of the information included in the above Section comes from the work of Mr. W. Hartley and Dr. J. Leigh, published in the booklet 'Plants at Risk in Australia', by the Australian National Parks and Wildlife Service; and an article published in 'Ecos' by Andrew Bell entitled 'Plants at Risk'.

Against this background whereby many of our unique plants are being threatened with extinction the Wildlife Conservation Act has been amended to conserve threatened plant species *outside* the existing Nature Reserve system as well as within it.

The following is a brief outline of the amendments to the Wildlife Conservation Act and the licenses which have to be obtained before protected flora can be taken.

Basket Flower (*Adenanthos obovatus*)

Adenanthos is an Australian genus of 20 species. They are found mostly in the south-west of this State.



AMENDMENTS TO THE WILDLIFE CONSERVATION ACT

Section 6

The Minister may—

(a) by notice published in the *Government Gazette* declare any class or description of flora to be protected flora for the purposes of this Act, either throughout the whole of the State or in such part or parts of the State as are specified in the notice.

(b) by notice so published, declare—

(i) all flora; or

(ii) all flora other than such classes or descriptions of flora as are specified in the notice,

in such part or parts of the State as is or are specified in the notice to be protected flora for the purposes of this Act;

"Flora" means any plant (including any wild-flower, palm, shrub, tree, fern, creeper or vine) which is—

(a) native to the State; or

(b) declared to be flora . . .

and includes any part of flora and all seeds and spores thereof;

"to take" in relation to any flora includes to gather, pluck, cut, pull up, destroy, dig up, remove, or injure the flora or to cause or permit the same to be done by any means;

23B. (1) A person shall not on Crown land wilfully take any protected flora unless the taking of the protected flora is authorised by, and carried out in accordance with the terms and conditions of, a license issued to him under section twenty-three C of this Act.

23C. (1) Any person may, in the prescribed form containing or accompanied by the prescribed particulars and on payment of the prescribed fee, apply to the Minister for the issue to him of a license to take protected flora on Crown land—

- (a) for commercial purposes; or
- (b) for scientific purposes or any prescribed purpose, and the Minister may issue or refuse to issue such a license.

23D. (1) A person shall not take any protected flora on private land unless—

- (a) he is the owner or occupier of the private land; or
- (b) he is authorised so to do by the owner or occupier of the private land.

(2) A person shall not sell any protected flora taken by him on private land unless—

- (a) he is the holder of a commercial producer's license or a nurseryman's license issued under this section;
- (b) the flora—
 - (i) if taken by a person who is the holder of a commercial producer's license—is of a class or description specified in his license and is taken from the private land specified in the license; and
 - (ii) if taken by a person who is the holder of a nurseryman's license—is of a class or description specified in his license and has been grown and cultivated by him on the private land specified in the license; and
- (c) the flora is marked, tagged or otherwise identified in accordance with the terms and conditions of his license.

(3) Any owner or occupier of private land may on payment of the prescribed fee apply to the Minister for the issue to him of a commercial producer's license or a nurseryman's license.

23E. (1) A person shall not sell any protected flora unless—

- (a) the sale is lawful by virtue of the provisions of section twenty-three C or twenty-three D of this Act; or
- (b) he purchased the flora from another person lawfully entitled to sell the flora to him and forthwith after the purchase he made or obtained a legible record of—
 - (i) the quantity and class or description of flora so purchased;
 - (ii) the date of the purchase; and
 - (iii) the name and address of the person from whom he purchased the flora.

(2) A person who makes or obtains a record pursuant to paragraph (b) of subsection (1) of this section shall retain the record for not less than twelve months and produce it on demand to a wildlife officer.

23F. (1) In this section "rare flora" means flora for the time being declared to be rare flora for the purposes of this section.

(2) Where the Minister is of opinion that any class or description of protected flora is likely to become extinct or is rare or otherwise in need of special

protection, he may, by notice published in the *Government Gazette* declare that class or description of flora to be rare flora for the purposes of this section throughout the State.

(3) The Minister may vary or revoke a notice published under subsection (2) of this section by subsequent notice or notices published in the *Government Gazette*.

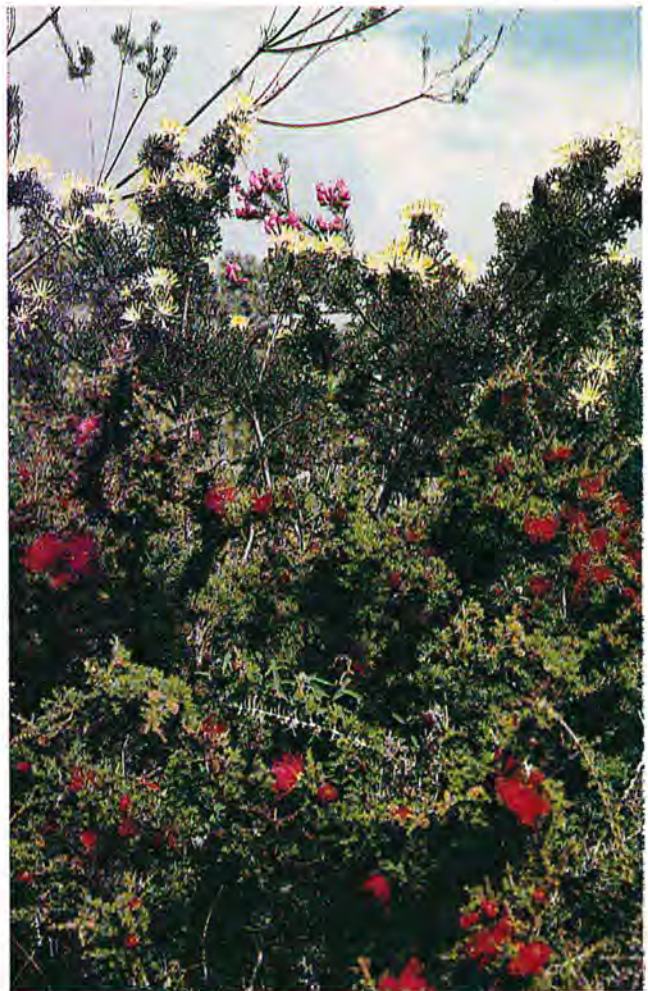
(4) A person shall not, whether or not he is—

- (a) the holder of a license issued under this Act to take protected flora;
- (b) the owner or occupier of private land on which rare flora exists; or
- (c) authorised by the owner or occupier of land on which rare flora exists,

take any rare flora unless—

- (d) where he is not the holder of a license issued under this Act, he first obtains the consent thereto in writing of the Minister;
- (e) where he is the holder of a license issued under this Act, he first obtains the further consent thereto in writing of the Minister.

(7) Where an owner or occupier of private land who has been refused consent to take rare flora on that land satisfies the Minister that he will suffer loss of use or enjoyment of the land by reason of that refusal, the Minister shall inform the Treasurer in



A road verge in the south-west of the State showing the wealth of wildflowers to be seen in the spring. In this photograph *Beaufortia* sp., *Petrophile* sp. and *Burtonia* sp. can be seen.

writing accordingly and the owner or occupier shall be paid compensation for that loss at such rate or rates per annum as—

- (a) is agreed between the owner or occupier and the Treasurer; or
- (b) in default of agreement, is determined by a valuer appointed by agreement between the Treasurer and the owner or occupier, or in default of agreement on such an appointment, by a valuer appointed by the Minister, for such period, not exceeding five years, as the loss continues.

LICENSES

Crown Land

All persons picking protected flora on Crown Land must have a license.

Commercial pickers must have a commercial purposes license and submit monthly returns of all flora picked by them, on Crown Land.

The holder of a license for scientific purposes or prescribed purposes may take flora in sufficient quantities for scientific or hobby purposes only—no flora shall be sold. A return of flora taken may be required.

Private Land

It is an offence to pick protected flora on private land unless the person is the owner or occupier or has the owner or occupier's permission.

The owners, occupants or persons authorised by them are permitted to take flora from their land, but shall not sell it, unless they hold a commercial producer's or nurseryman's license.

A commercial producer is a person who sells flora picked by him or his employee from private land.

A nurseryman is a person who sells flora grown or cultivated by him on private land. It is not intended to license those who grow or cultivate plants in pots initially. This may eventuate if control proves necessary.

The following outlines the licenses that will be required to meet varying situations on private land.

- (a) A person who sells protected flora taken by him or his employees on private land will require a commercial producer's license and will have to produce a return of flora sold.
- (b) A company which sells protected flora taken by their employees on private land will require a commercial producer's license and have to submit a return of the flora sold.
- (c) Contractors or sub-contractors who take flora on private land and sell the flora to the company to which they are contracted will require a commercial producer's license and have to submit individual returns of flora sold.

Combination of Crown and Private Land

The following outlines the licenses that will be required where protected flora is taken on both Crown Land and private land.

- (a) Where a person who is selling protected flora taken by him or his employees on private land is also taking protected flora on Crown Land (both himself or his employees) each person taking protected flora will require a commercial purposes license in addition to the commercial producer's license held by the employer, and have to submit a separate return for each license unless a special arrangement is made whereby the employer submits a return for the total operation separating the flora taken on Crown Land from that taken on private land.
- (b) An employee who picks on Crown Land and also on private land must have a commercial purposes license and his employer must have a commercial producer's license. An arrangement can probably be made whereby the employer would submit the return for protected flora taken by all his employees showing that which was taken on Crown Land and that which was taken on private land.
- (c) A contract or sub-contract picker who takes protected flora on Crown Land and also on private land must have both a commercial purposes license and a commercial producer's license. A separate return will be required for each license.

Further information on the regulations concerning the taking of native flora can be obtained from the Department of Fisheries and Wildlife on request.



Red Spider Orchid (*Caladenia filamentosa*)

"WORLD CONSERVATION STRATEGY" — HOW TO SAVE THE WORLD

The 'World Conservation Strategy' was launched worldwide by leaders of thirty countries on March 5-6th. In Western Australia Mr. Harry Butler presented a copy of the document to the Premier, Sir Charles Court.

The document is important to the preservation of mankind as well as animal and plant life. For the first time in history priorities for Governments within a global conservation framework have been established.

The document calls for a marriage between conservation and development.

The global strategy has three main objectives:

1. To maintain essential ecological processes and life support systems. This includes soil regeneration and protection, the recycling of nutrients, and the cleansing of waters on which human survival and development depend.
2. To preserve genetic diversity. This involves the breeding programmes necessary for the protection and improvement of cultivated plants, domestic animals and micro-organisms, as well as much scientific and technical innovation, and the security of many industries that use living resources.
3. To ensure the sustainable utilization of species and ecosystems. This covers wildlife, forests and grazing lands which support millions of rural communities and major industries.

These objectives have become urgent because the planet's capacity to support people is being severely reduced.

For example:

1. 3 000 square kilometres of prime farmland disappear every year under buildings and roads in developed countries alone.
2. Thousands of millions of tonnes of soil are lost annually as a result of deforestation and poor land management.
3. Hundreds of millions of rural people in developing countries including 500 million malnourished and 800 million destitute, are compelled to destroy the very resources they need to free themselves from starvation and poverty; they strip the land of trees and shrubs in widening swathes around their villages, because they lack wood to cook or to keep warm and they are obliged to burn every year 400 million tonnes of dung and crop residues badly needed to regenerate the soils.
4. Siltation is reducing the lifetime of reservoirs supplying water and hydro-electricity by as much as 50 per cent.
5. The annual cost of floods that devastate settlements and crops in India alone ranges from 140 to 750 million dollars.



Harry Butler speaking about the importance of the "World Conservation Strategy". He presented a copy of the document to the Premier, Sir Charles Court.

6. Tropical forests are contracting so rapidly that by the end of this century the remaining area of unlogged productive forest will have been reduced by 50 per cent.
7. The coastal support systems of many fisheries are being destroyed or polluted, and in the United States annual losses are put at 86 million dollars.

A number of points in the Strategy are of relevance to Western Australia. In some cases, such as the establishment of National Parks and Nature Reserves, Western Australia is doing quite well compared with many other countries. However, the State does have problems such as salinity and water quality in the south-west, bad agricultural practices which could turn some of our low rainfall areas into deserts, the preservation of rare species of plants and animals and the allocation of sufficient staff and resources to manage Nature Reserves.

The Strategy highlights the south-west of Western Australia as an area of global significance—an ecosystem with large numbers of unique plants and animals some of which are in danger of becoming extinct.

The Strategy proposes concrete solutions to government policy-makers and their advisors, to conservationists directly concerned with living resources, and to those involved in development, such as development agencies, financing institutions, industry, etc. The Strategy proposes many practical solutions for example:

1. An integrated method for evaluating land and water resources, and outlines a procedure for the rational allocation of land and water uses.
2. Suggests ways of improving the organizational capacities for soil conservation and of marine living resources.
3. Recommends anticipatory environmental policies, a cross-sectional conservation policy and a broader system of national accounting in order to integrate conservation with development at the policy making level.
4. Proposes the adoption of national and sub-national strategies.
5. Recommends review of legislation concerning living resources.
6. Urges international programmes for the preservation of tropical forests and drylands, and for the conservation of global 'commons'—the open oceans, the atmosphere and Antarctica.

In the past conservation has often been thought of as the opposite of progress. The Strategy demolishes this fallacy; indeed it makes a compelling case that

without conservation there can be no satisfactory development. The Strategy calls for a marriage between conservation and development.

More than 450 Government agencies and conservation organizations in over 100 countries were involved in its preparation.

The idea came during discussions between UNEP (United Nations Environment Programme) and IUCN (International Union for the Conservation of Nature and Natural Resources) in 1975. Both organizations saw the need for a clear statement for conservation priorities, with a broad plan for achieving them. UNEP therefore commissioned IUCN to prepare a Strategy. WWF (World Wildlife Fund) also recognized the need for a Strategy and offered to help finance its preparation. Work on the Strategy began in 1977. It is not a document of gloom but one of warning and reflects an unprecedented agreement in the world's scientific community on what to do to ensure that the earth's natural resources are safeguarded, not only for ourselves, but for future generations.

The one weakness of the "World Conservation Strategy" is the scarcity of documents. No copies of the Strategy are available, however, there are small supplies of the book "How to Save the World" which is based on the "World Conservation Strategy". Anyone interested should write to:

World Wildlife Fund,
G.P.O. Box 528,
Sydney, N.S.W. 2001

and they will be advised when copies are available.

IMPORTANT RESERVE IN LAKE GRACE AREA

The Dragon Rocks Reserve is located in the Shires of Kulin and Lake Grace. It is near the town of Hyden. Historical records show that the rocks were called Dragon Rocks in 1893 by Mr. Holland in his exploration plan 113. They were probably named after the dragon lizards that are found there.

In 1966, Mr. Richard J. Lane, Secretary of the Lake Grace Farmers Union sent a letter to the Chief Warden of Fauna of this Department suggesting an area of land, which adjoined his property, should be gazetted as a Fauna and Flora Reserve. The land included the Dragon Rocks. This proposal received a great deal of support from a number of people and organisations including the Department of Fisheries and Wildlife. However, a soil survey had to be carried out by the Department of Lands and Surveys before any decision could be made. This was completed in August of 1972.

The area around Dragon Rocks was the last large area of vacant Crown Land remaining in that part of the State. Although this Department had not surveyed the area in detail by 1966, preliminary surveys had shown that it was potentially of great scientific value. The local people had seen several rare species, such as the Numbat, bandicoots and marsupial mice

in the area. There were a number of small Nature Reserves in that region already but none of these were large enough to support populations of animals such as Numbats or small wallabies. The two nearest reasonably large Reserves are the Lake Barker Nature Reserve (96.6 km north east) and the Lake Magenta Nature Reserve (80.5 km south). Surveys by the Western Australian Museum and this Department did not find the same variety of animals in these Reserves as was thought to be in the Dragon Rocks area.

It was not until August 1972, that the Department of Fisheries and Wildlife undertook the first detailed wildlife survey of the area and they were not disappointed in the numbers and variety of animals and plants they found. In 1973 "Results of a Biological Survey of a Proposed Wildlife Sanctuary* at Dragon Rocks, near Hyden, Western Australia" (Report No. 12) was published. (A more detailed article giving an outline of this survey appeared in S.W.A.N.S. Vol. 3, No. 3. Winter 1972).

* Since December 1975 the words 'Nature Reserve' have been used instead of 'Wildlife Sanctuary' for an area of Crown land set aside for the protection of flora and fauna.

The report listed the following animals which were either seen or captured within the proposed Nature Reserve: Western Grey Kangaroo, Western Brush Wallaby, Brush-tailed Possum, Honey Possum, Red-tailed Wambenger, Common Dunnart, Fat-tailed Dunnart, Wuhl-wuhl, Mitchell's Hopping Mouse, Western Mouse, Lesser Long-eared Bat, Little Bat, Gould's Wattled Bat, Echidna, House Mouse, Fox, Cat, Rabbit, Short-nosed Bandicoot, Western Native Cat, Numbat.

Of the birds, fifty-nine species were recorded. This number alone reflects the diversity and size of the Dragon Rocks area. Some reptiles were also collected, these included: geckoes, legless lizards, dragon lizards, skinks, snakes and blind snakes.

The 1973 survey therefore confirmed what Mr. Lane and others already knew—the Dragon Rocks area with its diverse range of marsupials, birds and reptiles, combined with the rich vegetation formations was of considerable biological value.

In order to retain the full diversity of fauna, all vegetation types found in the area had to be adequately represented in any proposed Reserve. The greatest problem in the Dragon Rocks case was to keep sufficient Salmon Gum woodland. There is little of this type of vegetation left in the area as most has been included in the adjoining farming properties.

It must be emphasised that the size of the Dragon Rocks area was of great importance to the survival of many of the animals found there, especially the larger ones. The larger the area the more animals it can support—there is a certain amount of truth in the saying "safety in numbers".

As early as 1965 Mr. Lane recognized the importance of making the area a Reserve. Over a period of seventeen years our Departmental files show letters of advice, knowledge and queries from Mr. Lane; informing the Department of changes taking place in and around the proposed Reserve, for example, shifting bird populations; re-appearance of animals not seen in the area for a period of time. However, it was not until August 1979 that 32 097 ha of the Dragon Rocks area was proclaimed a Nature Reserve, vested in the Western Australian Wildlife Authority, for the purpose of the conservation of flora and fauna.



Red-tailed Wambenger (*Phascogale calura*) in captivity. The Red-tailed Wambenger is closely related to the Common Wambenger which is also called the Tuan or Brush-tailed Phascogale. Wambengers live in trees and usually make their nests in hollows. They live on nectar as well as insects and flesh. The Red-tailed Wambenger is smaller than the Common Wambenger and is reddish brown in colour. The part of the tail between the body and the brush is bright rufus.



Common Dunnart (*Sminthopsis murina*)

A soft-furred and delicately built little marsupial, about the size of a domestic mouse. The Common Dunnart can easily be distinguished from a mouse by its pointed nose and large number of incisor teeth. When a dunnart is cornered it will adopt a threatening posture with widely opened mouth, often accompanied by noisy exhalations.

Photo A. G. Wells

Short-nosed Bandicoot (*Isoodon obesulus*)—left

This bandicoot is also called the Quenda. It is thought to occur in the Dragon Rocks area. Short-nosed Bandicoots have harsh, almost spiny, fur. The spiny fur consists of specialised outer guard hairs beneath which is a soft under-fur. Bandicoots feed mostly on invertebrates which they are able to dig out of the ground.

MAMMALS OF THE WARBURTON REGION

Dr. Andrew Burbidge and Mr. Phillip Fuller of the Western Australian Wildlife Research Centre have recently published the results of research on the mammals of the Warburton Region in "Records of the Western Australian Museum".

The Warburton Region occupies an extensive area bordering the Northern Territory and South Australia from Lake MacDonalld at latitude 24° to the Blyth Range at latitude 27° and extending westward, at a maximum distance of 260 km, to the Warburton Range. It includes numerous rocky ranges surrounded by loamy flats and sand dunes.

In their paper, the authors present an annotated list of 28 indigenous and five exotic mammals recorded from the region. The list, which appears on page 23, was compiled from the records of the Western Australian Museum, scientific literature and the collections made by the authors in the course of their fieldwork in the area. Discussions with Aboriginal people of the region provided supplementary data on the past and present distribution of species and the Aboriginal names used in the various dialects of the Western Desert Language.

The status of the indigenous species has been categorised as common, moderately common, rare or extinct and it is noteworthy that the eight species listed as locally extinct are all of "intermediate" size, for example the Boodie and the Golden Bandicoot; larger mammals such as kangaroos and smaller mammals such as the Hopping Mouse are still plentiful. Other species of "intermediate" size, apart from the Echidna, were found to have declined in numbers.

Although the reason for the decline or disappearance of so many species of mammals is open to question, one obvious possibility is the establishment of exotic

mammals: both carnivores like the cat and fox and herbivores like the rabbit. Predation by cats was often cited by Aborigines as the reason for the disappearance of native mammals in the region and Dr. Burbidge's earlier studies on Dirk Hartog Island and the Monte Bello Islands indicate that cats have been responsible for the extinction of similar sized species on those islands.

Another possible reason for the decline of some species is the changes in the timing, extent and frequency of fires in the interior following the concentration of the Aboriginal population in a few settlements. It was the practice of Aborigines to use fire in hunting and in encouraging the regeneration of food plants. It is thought that this activity limited the accumulation of fuel, thereby preventing extensive summer fires. Consistent winter burning, resulting in a tight mosaic of vegetation in various stages of growth, has been found to be beneficial to certain species. Today, however, infrequent but very extensive summer fires are the rule rather than the exception.

The Mulgara (*Dasycercus cristicauda*)

A rat-sized carnivorous marsupial which lives in holes in the ground. It is found in arid regions and has the ability to live without drinking water as it has specially adapted kidneys. The Mulgara is also called Canning's Little Dog and the Crest-tailed Marsupial Mouse owing to the crest of shining black hair along the upper part of the tail.

Photo A. G. Wells





The Boodie (*Bettongia lesueur*)—left

This marsupial is also known as the Tungoo, Lesueur's Rat-kangaroo and the Burrowing Rat-kangaroo. It is now extinct from this region, in fact it appears to be extinct from all of mainland Australia. However, populations are still found on some islands around the coast, most notably Barrow Island, and Bernier and Dorre Islands. Boodies are about the size of a cat and usually live in burrows. They are entirely nocturnal.

The Dalgyte (*Macrotis lagotis*)—below

This animal is also known as the Bilby or the Rabbit-eared Bandicoot. The Dalgyte lives in a burrow which it digs using the powerful claws on the fore-feet. The burrow is deep and in this way the Dalgyte is able to escape the intense heat of the central desert. The Dalgyte is carnivorous and eats meat, insects and other invertebrates.

Photo A. G. Wells



Hairy-footed Dunnart (*Sminthopsis hirtipes*)—below

A small marsupial about the size of a house mouse, in fact dunnarts are often called marsupial mice. They live mainly on insects. You can distinguish the Hairy-footed Dunnart, as its name suggests, by the fact that the pads of its feet are covered with bristles. It also has very large ears and a sharply pointed nose.



SCIENTIFIC NAME	COMMON NAME	ABORIGINAL NAME(S)	STATUS
<i>Macropus robustus</i>	Euro	Kanyarla, Nyatunya	Common
<i>Megaleia rufa</i>	Red Kangaroo	Marlu	Common
<i>Onychogalea lunata</i>	Crescent Nail-tailed Wallaby	Tjawalpa	Extinct
<i>Lagorchestes hirsutus</i>	Western Hare-wallaby	Mala	Extinct
<i>Petrogale ? lateralis</i>	Black-flanked Rock Wallaby	Warru	Rare
<i>Bettongia lesueur</i>	Boodie	Mitika, Tjungku	Extinct
<i>Trichosurus vulpecula</i>	Brush Possum	Wayurta	Rare
<i>Isoodon auratus</i>	Golden Bandicoot	Windtaru, Makurra, Nyulu	Extinct
<i>Perameles eremiana</i>	Desert Bandicoot	Walilya	Extinct
<i>Macrotis lagotis</i>	Rabbit-eared Bandicoot or Dalgyte	Nirnu, Marara	Rare
<i>Dasyurus geoffroii</i>	Western Native-cat	Parrtjarta	Extinct
<i>Dasyercus cristicauda</i>	Mulgara	Minghiri	Moderately Common
<i>Antechinus macdonnellensis</i>	Red-eared Antechinus	Nyaluti, Murrta	Common
<i>Ningau sp.</i>	Ningau	—	Not known—probably common
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart	—	Common
<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart	—	Not known—probably common
<i>Sminthopsis ooldea</i>	—	—	Not known—probably common
<i>Antechinomys laniger</i>	Wuhl-Wuhl	Wuurl-wuurlpa, Pitji-pitji	Common
<i>Myrmecobius fasciatus</i>	Numbat	Walpuriti	Extinct
<i>Notoryctes typhlops</i>	Marsupial-mole	Yirtarrutju, Yirtarri-yirtarri	Moderately common
<i>Leporillus spp.</i>	Stick-nest Rats	Tjuwalpi, Yinima	Extinct
<i>Notomys alexis</i>	Spinifex Hopping Mouse	Tarrkawarra	Common
<i>Pseudomys hermannsburgensis</i>	Sandy Mouse	—	Common
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	Patjupirri	Common
<i>Eptesicus pumilis caurinus</i>	Little Bat	Parturta	Common
<i>Chalinobulus gouldii</i>	Gould's Wattled Bat	Tintinti	Common
<i>Tachyglossus aculeatus</i>	Echidna	Tjilkamarta	Common
<i>Canis familiaris dingo</i>	Dingo	Papa, Ngupanu, Yinura	Common

EXOTIC MAMMALS RECORDED: House Mouse, Rabbit, Camel, Fox, Feral Cat—all common.

FERAL CAT MENACE

The New South Wales National Parks and Wildlife Service has produced a leaflet on feral cats. This leaflet explains the effects that feral cats can have on the wildlife in National Parks and Reserves, affecting the populations of such native animals as birds, mice, snakes, frogs, lizards and possums.

The leaflet provides the following information:

"Feral animals are domestic animals that live and breed in the wild and include cats, dogs, pigs, horses, donkeys, camels and goats.

All of these animals have been able to adapt their way of life to survive in the wild and may have adapted so well that they are now considered pests to agriculture and nature. Feral animals, such as pigs have become major pests to agriculture and have been declared noxious animals by the Department of Agriculture. They must be destroyed by all property owners.

The introduction of feral animals into nature's delicate balance has tipped the scales to the detriment of many of our native species. Some introduced species may prey on native species or compete for food. Others may graze an area so completely that the ground cover is removed, resulting in the vegetation structure being substantially modified or the soil being eroded by wind and rain. Still others become a reservoir and a vector for diseases of domestic stock and man. In all, the effect of feral animals on Australia has been uniformly disastrous.

Feral Cats

The domestic animal gone wild is a great destroyer of wildlife. It stalks small native animals, climbs trees and steals the young and eggs of birds.

As far back as the 1850s colonies of feral cats were established in the wild. These colonies were increased by strays and by the abandonment of unwanted pets. They found ample food and faced little competition from predators. The feral cat population was given a further boost in the 1880s when farmers liberated and encouraged cats to live on bushland properties to control rabbits, rats and mice. Their value in this capacity is hard to assess. In the case of rabbits, feral cats have proven ineffective in controlling their build up and spread. Feral cats also seem to do little to curb the frequent outbreaks of rodent plagues.

Habits: Feral cats are commonly found in almost all environments except rainforests.

When properly trained and supervised most household cats are delightful pets. Once roaming wild in the bush a feral cat becomes extremely cunning, ferocious and shy of people. It becomes a skilful night hunter, preying on small rats, mice and marsupials.

Foods: Feral cats are opportunistic predators and scavengers. They will prey on the most available and most easily caught animals in the area where they live. They eat a variety of small animals, including rabbits, birds, reptiles, amphibians and insects. They also feed on garbage scraps near towns and farm buildings and eat carrion of large dead animals.

Because of their difficulty of capture, birds are usually a minor part of the diet of feral cats, except on islands where many sea birds nest and migratory birds rest and breed in large numbers. The birds which nest in burrows are the most vulnerable. Significant declines in populations of these birds have been reported on islands infested with feral cats.

In forests and natural areas, feral cats feed mainly on *native* rats and mice, possums and lizards, while in agricultural areas where there are very few native animals, the introduced rabbit, black rat and house mouse make up a large proportion of their diet.

It is open to question whether the feral cat has been responsible for the decline of some native animals through predation or direct competition for food. The once common Eastern native cat (*Dasyurus viverrinus*) is now either rare or extinct over much of its former range and the feral cat may now be doing little more than filling a vacant ecological niche left by the disappearance of this native predator.

Even the most lovable of our house cats can prey upon wildlife if allowed to roam bushland areas.

Below is the record of one well fed domestic cat from Wahroonga, a bushland suburb of Sydney. This list, of course, represents the minimum of the destructive efforts of one cat as a large amount of prey would not be returned to be seen by the owner.

Year—Animals Captured

- 1969—1 skink, 3 frogs, tiger snake and house mouse.
- 1970—4 magpie larks, 5 red wattle birds, lesser long eared bat, common mynah.
- 1971—2 magpie larks, 1 red wattle bird, 1 rat.
- 1972—2 fan tail cuckoos, common mynah, grey thrush, bluetongue skink, 3 red wattle birds, magpie lark, 3 yellow winged honeyeaters, eastern spinebill.
- 1973—6 red wattle birds, 2 rats, 2 white eared honeyeaters.
- 1974—2 rats (different species), 3 red wattle birds, 2 little wattle birds, winged termites, 3 skinks.
- 1975—2 mynahs, 1 small bluetongue skink, 1 skink, 1 little wattle bird, 4 red wattle birds, grey thrush, 1 grey butcher-bird, 1 white eared honeyeater, 1 king cricket, 1 longicorn beetle.
(Based on A. B. Rose, 1976).

The effect of feral cats on native wildlife does not stop at competition and predation, it extends to disease. Although not well documented it is known that feral cats and dogs have introduced diseases, such as sarcoptic mange and toxoplasmosis, into native populations. The latter is a disease which can affect man and produce spontaneous abortion, ulcerations and blindness.

Control of Feral Cats

Feral cats are extremely difficult to control because they are shy, generally wary of traps and baits, and often frequent inaccessible areas.

There are two methods of attacking the feral cat problem. One is to eradicate feral cats living in natural and agricultural areas and the other is to prevent the release of more domestic cats into the bush-land areas.

To eradicate feral cats from the wild is very difficult because of the attitude which still persists among many landholders that cats keep rabbit and mice numbers down. This is only true when these introduced animals are already in low numbers and are not widespread. Consequently little has been done to effectively control feral cats.

Other techniques such as shooting and poisoning are highly selective and labour intensive. Trapping is difficult, but if a feral cat is caught it should be taken to the local veterinarian or the R.S.P.C.A. to be humanely destroyed. Do not remove the feral cat from the trap yourself as they are ferocious and can seriously damage your legs and arms.

Research is continuing into the use of pathogens and parasites, and pheromones are being investigated to control or attract feral cats to traps.

Other methods of preventing the release or dumping of household cats have centred on the legal requirements of the National Parks and Wildlife Acts, which contain penalties for liberating cats into the bush.

Perhaps the most useful approach is to educate the community of the dangers caused to wildlife and the health of stock by releasing or dumping domestic cats or kittens in the bush.

Your support is needed to make it work."

Further reading

Anon. (1977). Domestic Animals gone Bush. *Ecos.* No. 13: 10-18.

Frith, H. J. (1973). *Wildlife Conservation*, Angus and Robertson, p.414.

Rolls, E. C. (1969). *They all ran wild*—the story of pests on the land in Australia. Angus and Robertson.

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FAUNA IN NATIONAL PARKS

In the last edition of S.W.A.N.S., an article was published relating to the status of dingoes and venomous snakes in Nature Reserves and National Parks.

The article concerned a notice published in the *Government Gazette* on June 16, 1978 declaring these species unprotected throughout the State. It was stated that the provisions of the notice permitted officers of the Agriculture Protection Board to enter National Parks and Nature Reserves 'without special authority' for the purpose of dingo control.

It should be noted that the notice was issued under the authority of the Wildlife Conservation Act and relates only to the provisions of that Act, therefore no 'special authority' is required from the Department of Fisheries and Wildlife. The declaration of dingoes and venomous snakes as unprotected fauna does NOT imply that these species or ANY FAUNA may be taken from National Parks without the authorisation of the National Parks Authority. The Authority's approval must also be sought for the use of guns, traps or baits in a National Park.