

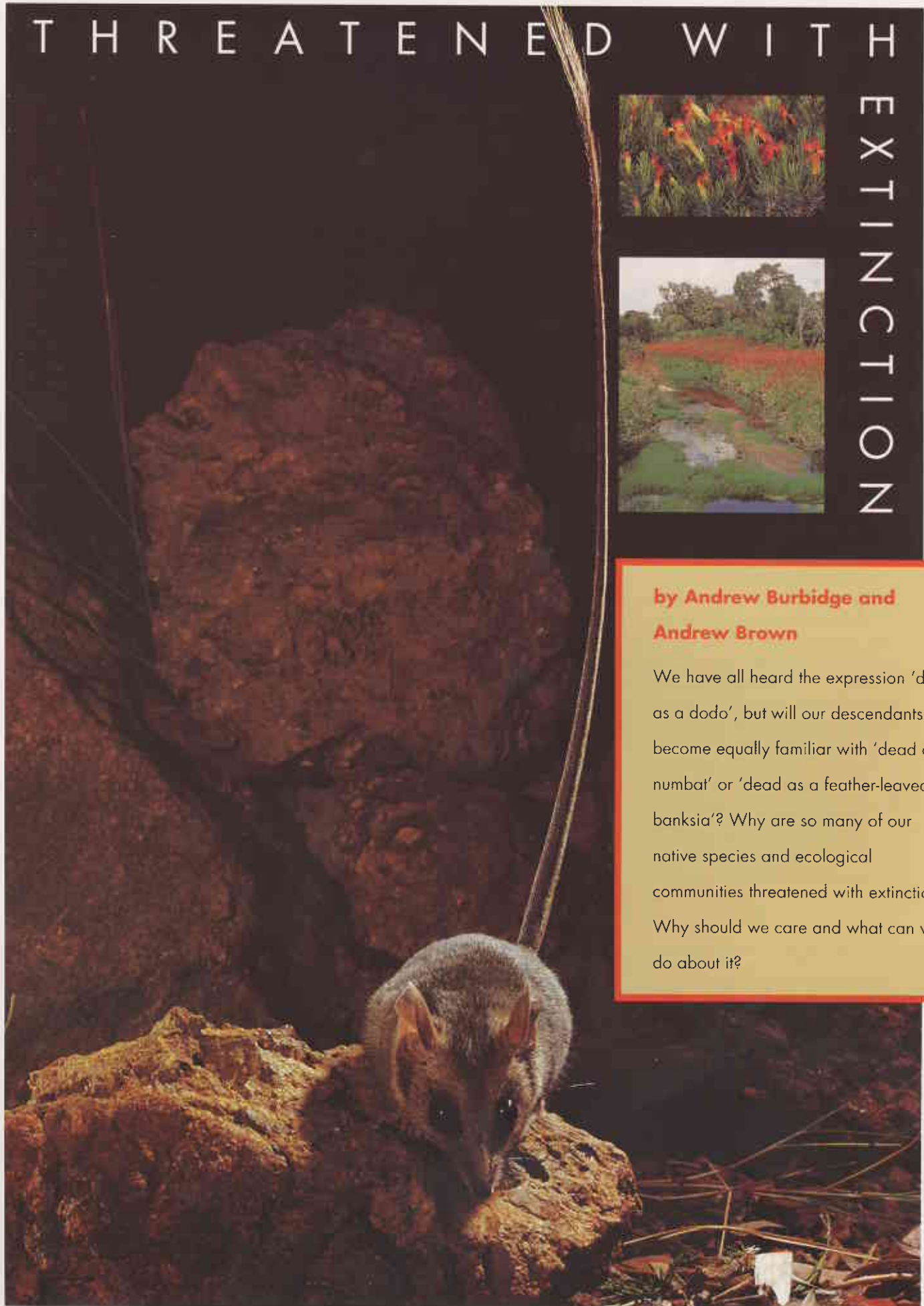
# T H R E A T E N E D   W I T H

# E X T I N C T I O N



by Andrew Burbidge and  
Andrew Brown

We have all heard the expression 'dead as a dodo', but will our descendants become equally familiar with 'dead as a numbat' or 'dead as a feather-leaved banksia'? Why are so many of our native species and ecological communities threatened with extinction? Why should we care and what can we do about it?



**E**xtinguishment is not a new phenomenon. Every schoolchild knows about the dinosaurs that became extinct many millions of years ago. The fossil record shows that many extinctions have occurred, mostly slowly, over the eons as new species evolved and replaced others, as climates changed, and as habitats developed and disappeared. Nowadays, however, human activity has overtaken these natural processes as a force for change, and the rate of extinction has accelerated dramatically.

Australia's vertebrates and vascular plants seem to be highly susceptible to decline and extinction. In the 200 years since European settlement began, a staggering 20 mammal, 10 bird and 71 vascular plant species are presumed to have become extinct in Australia and its island Territories. We have lost more mammals than any other country or continent in the world, and we are not doing much better with our plants.

Western Australia has a wide range of climates and habitats that support a rich variety of plant and animal species. This is particularly true of the south-west of the State, which is internationally recognised as an area of 'megadiversity'. Unfortunately, we also have many threatened species: 271 plants and 73 animals, about 45 per cent of Australia's

threatened vertebrate and vascular plant species, occur in Western Australia. Most of the State's threatened species occur nowhere else, so we have a special responsibility to conserve them. If 'our' threatened species were to disappear it would mean, in most cases, that they would be lost forever.

### WHY CONSERVE?

There is a widespread community view that other species have a right to exist and that the needs and desires of humans should not be the only basis for ethical decisions. But even if you do not believe in conservation on purely ethical grounds, there are compelling environmental and economic arguments for conserving species. Conservation is not just a 'cute furry animal' issue.

There are three main reasons for conserving species. The first is that animals and plants are vital components

of ecosystems that provide the life-support systems of our planet. They provide many, indispensable, 'free' services, such as generating the oxygen we breathe, removing waste products such as carbon dioxide, controlling and ameliorating the climate, regulating fresh water supplies, generating and maintaining the topsoil, preventing soil salinity, controlling pests and diseases, and pollinating crops.

But what does it matter if a few rare species became extinct? Will their disappearance have a noticeable effect on the environment? The contribution of rarer species to the planet's life-support systems has been poorly studied and we cannot say for sure. We do know that some of Australia's threatened species, especially some mammals, are survivors from groups that were recently dominant and that they must have played a major role in community ecology. Their

#### Previous page

Found infrequently in scattered localities in the Pilbara and central deserts, the long-tailed dunnart is probably not threatened with extinction, but regular surveys will be needed to monitor its status.

Photo - Babs and Bert Wells

*Inset top:* Weeds are a problem in bushland too! Here, *Watsonia*, from South Africa, is degrading a native plant community in the South West.

Photo - Jiri Lochman

*Inset:* A naturally rare species of very restricted habitat. *Barrens lechenaultia* is found only on a few rocky slopes on hills west of Hopetoun.

Photo - Babs and Bert Wells

Once common in the Kimberley and Northern Territory, Gouldian finches are being wiped out by an introduced parasite that infects their respiratory system.

Photo - Babs and Bert Wells

The world over, cities are replacing native vegetation as well as farmland! Sprawling Perth is destroying *Banksia* woodlands.

Photo - Jiri Lochman







**Left:** This unusual orchid spends its entire life underground. It may have once been quite common, but, due to massive land clearing, it is now restricted to a few remnant areas of bushland in the central and southern Wheatbelt.

Photo - Andrew Brown

**Below:** Only constant vigilance and action by the Agriculture Protection Board has prevented the introduced common starling becoming established in Western Australia. As well as damaging agricultural production, starlings compete with native birds for food and nest hollows.

Photo - Babs and Bert Wells

recovery will enable them to fill this role again. As well, environmental change in the future is inevitable and likely to be rapid, and today's rare species may turn out to be vital in carrying the world into new eras.

The second compelling reason for conserving Western Australia's wonderful diversity of species is based on the economic and practical benefits of biodiversity. Plants, animals and micro-organisms provide all of our food and many of our medicines and drugs, as well as renewable resources such as building materials, clothing, paper and leather. They are an essential resource for developing biological control of pests and diseases. In addition, the unique Australian flora and fauna, and the scenery they help create, attract tourists (see 'Our Natural Advantage', *LANDSCOPE*, Winter 1993). The medium-sized mammals that are vanishing from our arid and semi-arid areas, and many of the spectacular wildflowers that are threatened by plant diseases, have high tourist appeal.

So far, only a minute portion of the economic potential of Australian plants and animals has been realised. Eucalypts are now planted as cash crops throughout the world and Queensland's macadamia nut is widely cultivated as food. If the attractive wildflowers of the south-west of the State had been lost during settlement, the present wildflower industry, worth many millions of dollars, would not exist. Many other biological resources, including species considered 'useless' today, will be found to have new values in the future; the species of smokebush now being tested for its anti-viral properties may provide a new

method of fighting AIDS. The more species we lose, the more we limit our future options.

The third reason for conservation is based on aesthetic and cultural values. The fauna, flora and associated communities are central to traditional Aboriginal culture. Most people think that species should be preserved because of their beauty, symbolic value or intrinsic interest. Kangaroos and other large mammals, wildflowers of striking beauty, corals of amazing variety and colour, and butterflies of iridescent hue appeal automatically to most members of our society. We would feel a loss if they and the wild places they live in disappeared. Many Australians wish to conserve the plants and animals of their country because of pride in their natural heritage.

## ECOLOGICAL COMMUNITIES

It is vital that we identify and conserve threatened species, but even more

alarming in the long term is the threat to whole ecological communities. An ecological community is an integrated assemblage of species that inhabits a particular area in nature. Together with physical and chemical factors such as soil, water and nutrients, they form ecosystems. The boundaries of ecological communities may be sharp and easy to define, such as for those communities that occupy a spring, cave or freshwater wetland, or they may be more diffuse, such as where a woodland community gradually changes to a grassland community. Like species, some ecological communities have also been placed at risk. For example, Lake Toolibin, east of Narrogin, is the only remaining example in the southern Wheatbelt of a wetland with extensive thickets of living swamp sheoak (*Casuarina obesa*). This was one of the main types of inland freshwater wetland in the South West before clearing for agriculture resulted in most inland wetlands becoming saline, leading to the death of the vegetation and the species that depended on it.

Species cannot survive in the wild unless they are part of a functioning ecological community, so species conservation will fail unless it goes hand in hand with community conservation. As well, the only way to conserve the vast majority of species that are undescribed or poorly studied lies in the conservation of ecological communities. Ideally, we should be managing ecosystems, not species; at present we are having to target individual species because of emergency situations. More emphasis needs to be placed on community and ecosystem



conservation. Our knowledge of ecological communities is currently so poor that we have yet to produce authoritative lists of them, and action to conserve threatened communities is only just beginning.

## THREATENING PROCESSES

How could so many species have disappeared in a country as large as Australia, most of which is sparsely settled and apparently undisturbed? Why are ecological communities also under threat? What are the causes of the massive extinctions and declines? We are now finding answers to these intriguing and vital questions.

Natural disturbances of ecological communities do occur and most Australian species have evolved mechanisms to recover from disturbances such as occasional fires and storm damage. Some human-induced disturbances are similar to

natural ones and species and ecological communities can recover from them, given time. But others are too overwhelming for natural recovery mechanisms and have led to species and ecological communities becoming extinct or threatened. Such disturbances are called threatening processes. Some of the human-induced disturbances that are now recognised as threatening processes are outlined below.

Most extinct, endangered or vulnerable species are the unintended casualties of the habitat destruction caused by expanding human populations and activities. Surviving remnants of vegetation may be too small to support all the species and communities that occurred there previously, and those that do survive may be extremely vulnerable. A species may disappear from a remnant because of a local event, such as a fire, and it may not be able to re-colonise across the surrounding farmland.

Important species in communities, such as pollinators, may disappear, leading to downstream effects on other species.

Even where habitats have not been destroyed, threatening processes such as changed fire regimes, the presence of introduced animals and environmental weeds, salinisation, erosion, overgrazing by introduced and native herbivores (both domestic and wild) and loss of shelter or breeding places, such as hollow-bearing trees, continue to degrade them, putting pressure on the communities that occupy them.

Fire has long been a significant environmental factor in Australia and the life cycles of many Australian plants and animals are well adapted to survive fire and other natural disturbances. However, in parts of Australia there have been major changes in fire regimes (fire frequency, intensity, season, pattern and size) since European settlement - fire regimes resulting from Aboriginal land



Feral donkeys, descendants from domestic animals, roam the Kimberley, damaging native vegetation and causing soil erosion. Photo - Babs and Bert Wells

Lake Toolibin (below left), the last freshwater lake of its type in the southern Wheatbelt, is an ecological community under threat. Management of its catchment and pumping of saline groundwater are needed to prevent it becoming saline, as has been the fate of Lake Yoting (below right). Photos - Andrew Burbidge, Babs and Bert Wells





management practices, and those followed currently by Europeans may be quite different. It is these changed fire regimes that have threatened some species and communities. For example, frequent, extensive or ill-timed fires in remnants may promote the spread of introduced weeds to the detriment of native species. In turn, this may allow introduced predators to prey more easily on species whose shelter has disappeared.

Although introduced species have played a key part in the economic development of Australia, many introductions have also had significant environmental impact. Australia has a large number of introduced mammals, birds, fish, an introduced toad and several introduced invertebrates that have caused, or have the potential to cause, habitat destruction and modification, and extinction of native species. Introduced herbivores that have become wild and caused significant environmental degradation include rabbits, goats, cattle, buffalo, pigs, donkeys, horses and camels (see 'Vandals in a Vulnerable Land', *LANDSCOPE*, Spring 1990). Introduced rats have caused the loss of small mammals, reptiles and birds on islands, and two introduced predators, the cat and the fox, are now abundant and a major threat to many native animals (see 'Masterly Marauders', *LANDSCOPE*, Summer 1992-3).

Environmental weeds (from overseas and other States) have replaced and are replacing native plants over wide areas of Western Australia. Examples include the invasion of exotic grasses into many areas of remnant vegetation in the South West and the invasion of the annual herb Ward's weed (*Carrichtera annua*) over much of the Nullarbor Plain. Such introduced plants can pose a double threat, both displacing native plants and eliminating native animal species that are not adapted to using them for food or shelter.

Introduced plant diseases pose a serious threat in some areas. More than 1 000 plant species in the South West, including most species of *Banksia*, are at risk from the root fungus *Phytophthora cinnamomi* and other *Phytophthora* species. It is not just plants that are at risk; a *Phytophthora* infection can destroy habitat necessary for animals



and non-susceptible plants. For example, in some places the death of most nectar-producing plants leads to the loss of nectar-feeding animals (see 'Possum in Peril', *LANDSCOPE*, Autumn 1992).

Freshwater habitats have been substantially altered by drainage, infill, dredging, damming, flow regulation for irrigation, eutrophication and other pollution, salinisation, de-snagging, bank modification and flood mitigation. In 1964 it was estimated that more than 75 per cent of wetlands on the Swan Coastal Plain had been lost and there have been similarly dramatic reductions in wetlands throughout Australia since European settlement. Some habitats, such as mountain tops, caves, springs and freshwater swamps, are very restricted in extent and their associated species and ecological communities are particularly vulnerable to habitat disturbances.

Many marine and estuarine habitats have been either destroyed or substantially altered. Growing urbanisation and coastal development results in aquatic habitat degradation through, for example, pollution from stormwater runoff and sewage disposal. Many important fish nursery areas, such as mangroves and seagrass beds, are adversely affected by human activity. With increasing urbanisation and a rising human population, pressure on coastal zone habitats, both terrestrial and aquatic, can only increase unless carefully managed.

## HUNTING AND COLLECTING

Hunting has not been a major cause of extinctions on the Australian mainland, but on islands, where the

Nutrients washing into waterways can cause algal blooms and the loss of nature conservation values, fish production and recreational dollars.  
Photo - Jiri Lochman

trusting nature of birdlife makes species vulnerable, four species and three subspecies of birds have been hunted to extinction. In the sea, many whales were hunted to the edge of extinction. In Australian waters, southern right whales were exploited to such an extent, that by 1840 they were no longer seen in areas where they were once abundant. Seals suffered similarly from harvesting, which was an important industry in the settlement of southern Australia.

Illegal hunting, fishing and collecting for trade still have the potential to cause extinctions of endangered or localised species. For example, illegal collection of plants for the wildflower trade or for horticulture could cause extinctions, and poaching of cockatoos and parrots often destroys nesting hollows. Hunting of migratory species in neighbouring countries and seas threatens populations of some species in Australia, such as marine turtles.

It is often a combination of factors, rather than a single factor, that may finally tip the scales against some species. For example, smaller wallabies, such as the woylie, are more vulnerable to introduced predators if a fire opens up their habitat, but does not also regenerate it, and populations that are fragmented by habitat clearing or degradation are more vulnerable than those that are not.

## THE CONSERVATION CHALLENGE

In describing the reasons for the declines and extinctions of species and ecological communities, it is not intended to apportion blame. Modification of our natural environment was inevitable in the establishment of the economic and social structure of Australia. The actions that led to extinctions were the result of attitudes held by the community at that time, and the resulting extinctions were, in the main, unintended. What we must do now is learn from the past and ensure that in the future we do not allow more species and communities to become extinct.

Now that we have a much better understanding of the processes that threaten our native flora and fauna, we can take the necessary steps to conserve species and communities that are on the brink of extinction. We can also reduce our impact on the environment. Prevention is much better than cure! By acting now to conserve habitat and control threatening processes, before more species or communities become threatened, we can be much more effective and save money. The longer we wait, the more expensive and the more difficult recovery becomes.

Our actions can prevent additions to the litany of extinct species that may be learned by schoolchildren in generations to come.

In future issues of *LANDSCOPE*, we will describe the approach of the Department of Conservation and Land Management (CALM) to bringing threatened species and communities back from the edge of extinction, and the initiatives it is implementing to prevent more from become threatened.

Goats are only too capable of living in Western Australia's arid lands. Left unchecked, they can cause massive degradation of native communities. Photo - Jiri Lochman

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## Numbers of non-marine extinct and declared threatened animals and plants in Western Australia

GROUP	PRESUMED EXTINGUISHED	DECLARED THREATENED	PERCENTAGE OF NON-MARINE SPECIES DECLARED THREATENED
Vascular plants	43	271	3
Mammals	11	28	14
Birds	2	34	5
Reptiles	0	7	1
Frogs	0	2	2
Freshwater fish	0	2	3



## COMING TO TERMS WITH CONSERVATION

It is easy to get confused by the different terms applied to species that are threatened with extinction. CALM uses the definitions of the World Conservation Union (IUCN); however, these are currently under review. The following provides a summary of definitions and terms. These terms were developed to apply to species, but can, with some modification for 'presumed extinct', be applied equally to ecological communities.

**presumed extinct:** species not definitely located in the wild during the past 50 years or species that have not been found in recent years despite thorough searching. Ecological communities presumed extinct are those that have been destroyed totally or those that have been so extensively modified that they are unlikely to recover their species composition and structure or re-establish their ecosystem processes in the foreseeable future.

**threatened:** a collective term used for all levels of threat to living species - critical, endangered and vulnerable. Some people use threatened to include other categories, such as rare or insufficiently known.

**critical:** species or communities that are facing an extremely high probability of extinction in the wild in the immediate future. (A new category, still under discussion internationally.)

**endangered:** species or communities in danger of extinction and whose survival is unlikely if the causal factors continue operating.

**vulnerable:** species or communities believed likely to move into the 'endangered' category in the near future if the causal factors continue to operate, or for which there are significant potential threats to their survival.

**rare:** species or communities that are uncommon but that are not currently considered endangered or vulnerable. Such species may be represented by a relatively large population in a very restricted area or by smaller populations thinly spread over a wider range, or some intermediate combination. Such communities may be naturally geographically restricted, such as those that occupy a cave or spring.

**threatening process:** process that threatens the survival or evolutionary development of any species or ecological community.



# LANDSCOPE

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Wildfires are synonymous with Western Australian summers, but what can be done to lessen the threat to life and property? Lachlan McCaw discusses the problem on page 49.



Daisies belong to the Asteraceae family, one of the world's largest families of flowering plants. Suzanne Curry presents some of them in 'Delightful Daisies' on page 41.



Aborigines have eked out a living in the harsh Western Desert region for thousands of years. Their intimate knowledge of the desert is helping scientists learn more about its plants and animals. See 'Digging Sticks and Desert Dwellers' on page 10.



'Rainforests and Bats', on page 34, tells the story of the recent LANDSCOPE Expedition to the Mitchell Plateau.



Can images from space help locate desert mammals? See 'From Buckshot to Breakaways' on page 23.

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## COVER

Cape Barren geese live on the islands and rocks of the Archipelago of Recherche. A few years ago their numbers appeared very low and their survival was in doubt. However, a recent survey of the islands has brought good news with a marked increase in the bird's population.

The illustration is by Philippa Nikulinsky.



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