



# Our Frozen Future

During the next 10 years, Western Australian seed biologists from the Department of Conservation and Land Management (CALM) will work with the Royal Botanic Gardens, KEW, UK in a global insurance policy to conserve one of the world's unique and diverse floras.

by Anne Cochrane



**T**he south-west of Western Australia is recognised as one of the world's top 20 biodiversity hotspots, and the only one in Australia. It is but a small part of the nation, yet some 75 per cent of its plant species are found nowhere else in Australia—in fact, nowhere else in the entire world. Without a doubt, Western Australia's flora is unique. It includes the spectacular scarlet banksia (*Banksia coccinea*), the kangaroo paws such as *Anigozanthos manglesii* in their red and green coats, the majestic karri trees (*Eucalyptus diversicolor*) and the triggerplants (*Stylidium* species) with their minute hammers. These plants are common, often occurring over wide expanses and in large numbers, easily seen and widely admired for their beauty and intricacy.

But the south-west of the State also has a high concentration of threatened species, such as those restricted to small areas or few plants, that are often cryptic or poorly known. These plants are recognised as important conservation species. They include the large-flowered regelia (*Regelia megacephala*), restricted to the Noondine Chert hills around Moora and Watheroo (see 'Endangered', *LANDSCOPE*, Spring 2000), the beautiful mountain bells (*Darwinia* species) of the peaks of the Stirling Range National Park, and some of the plants that border WA's naturally saline lake systems, such as the small



paperbarks (*Melaleuca dempta*, *M. fissurata* and *M. viminea* subsp. *appressa*) that are threatened with waterlogging and rising salt levels.

### PLANTS ON THE BRINK

War is being waged on many of these species. A war fueled by land clearing leading to habitat fragmentation, rising groundwater levels and salinisation (see 'Wheatbelt wonders under threat', *LANDSCOPE*, Summer 2000-2001), and by dieback (the root rot disease caused by *Phytophthora cinnamomi*), weed invasion and grazing by introduced herbivores such as rabbits. These issues are threatening the very survival of many of WA's threatened, rare, and poorly known plant species. Experts are predicting that many of our threatened species will become extinct in the wild within the next 50 years, even if we do our utmost to ameliorate the threats. And we haven't even considered the



possible adverse effects of long-term climate change on these plants, which are already restricted by their narrow environmental tolerances.

In short, we face an urgent and enormous task of conserving our plant biodiversity—if not for ourselves, then for our children and grandchildren. Any loss of WA's biodiversity will be a major tragedy. Once a species becomes extinct, it is lost forever. The extinction of any species represents an irreplaceable lost opportunity for plant utilisation, study and appreciation, not only for Western Australia, but also for the world. As a signatory to the Convention on Biological Diversity we have made a global commitment to biodiversity conservation.

In terms of flora conservation, conserving plants on the ground is the Department of Conservation and Land Management's (CALM) most important objective. But when there is no quick solution to threats such as dieback and

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The amazing diversity of plant species found in Western Australia parallels few places in the world, yet these plants bear seed that can be frozen and stored for many generations without loss of viability. Photos – (clockwise from left) Jiri Lochman, Andrew Brown/CALM, Ellen Hickman/CALM, Bill Benson/Lochman Transparencies, (centre) Dennis Sarson/Lochman Transparencies

**Above left:** Flowers of *Eucalyptus petila*, a small tree that is restricted to the Ravensthorpe area of Western Australia. Photo – Anne Cochrane/CALM

**Above:** The sun star orchid (*Thelymitra stellata*) is an endangered species. Photo – Andrew Burbidge/CALM

**Left:** Collecting seeds from *Eucalyptus halophila*, a species from the Esperance area threatened by rising salt and waterlogging. Photo – Anne Cochrane/CALM



**Right:** The exhibition in the Orange Room of the Wellcome Trust Millennium Building that provides information on seed conservation to visitors.

**Below right:** The Wellcome Trust Millennium Building that will hold seed from 24,000 wild plant species in its vaults.

Photos – courtesy of the Royal Botanic Gardens, Kew

salinity, off-site conservation strategies, such as the storage of seed, may be the last hope for conservation and future restoration of many of these threatened species.

## PLANT INSURANCE

Storing seed is like taking out an insurance policy. When a disaster happens, we can draw on the insurer to help us rebuild what we have lost. Stored seed can be used to rebuild our damaged or lost plant communities.

Almost 10 years ago, CALM established such a plant insurance policy: a seed storage facility for material from rare and threatened native plant species (see 'Banking for the Future', *LANDSCOPE*, Winter 1996). The Threatened Flora Seed Centre is part of CALM Science Division's Flora Recovery and Conservation Program, forming an integral part of the Western Everlasting Project that underpins plant recovery programs in Western Australia (see 'Restoring Diversity, Restoring Hope', *LANDSCOPE*, Spring 1999). Until recently, this insurance policy was supported from within Australia, from both State and Commonwealth sources. But in 2001, CALM's Threatened Flora Seed Centre became an international partner in what can be considered a major global conservation insurance policy: the Millennium Seed Bank Project of the Royal Botanic Gardens, Kew, United Kingdom.

The Royal Botanic Gardens, Kew, began its life in 1750 as the private estate of the Prince and Princess of Wales. Over the next 250 years, it built its reputation as a world-class Botanic Gardens, as adventurers, botanists and travellers moved around the world collecting plant specimens. Many of Australia's early explorers provided plant material to Kew: not only herbarium specimens, but also material



in the form of seed and living plants for the gardens.

In 1974, the Royal Botanic Gardens, Kew established a modest seed bank for the long-term conservation of world flora at Wakehurst Place, a National Trust property 40 miles south of London, leased by the Royal Botanic Gardens as their 'Kew in the country'.

For more than 20 years, this seedbank actively conserved seed from many of the world's common and threatened species, and allowed important research into the seed germination and storage capacity of a range of floras to be carried out. The Millennium Seed Bank Project, funded in its early stages through a generous grant from the UK National Lottery's Millennium Commission, marks the expansion of this seed conservation facility and, with further support from the Wellcome Trust, allowed the creation of a much larger seed bank and

research facility. In November 2000, the Wellcome Trust Millennium Building, home to the Millennium Seed Bank itself, opened its doors to the public.

## MILLENNIUM SEED BANK

The Millennium Seed Bank Project (MSBP) provides the world's largest seed bank and associated research facility devoted solely to wild species conservation. The project is a collaborative collecting and conservation program managed by the Seed Conservation Department at the Royal Botanic Gardens, Kew, and is focusing primarily on the world's arid and semi-arid regions. The goal is to have stored seed from 10 per cent of the world's flora by the end of the year 2010. The goal is huge, and to achieve it Kew enlisted the help of people from around the world through the development of collaborative country partnerships.





**Left:** Threatened Flora Seed Centre, located in the grounds of CALM's Western Australian Herbarium.  
Photo – Anne Cochrane/CALM

**Below left:** Work on the seed biology of threatened species is conducted in the laboratory of CALM's Threatened Flora Seed Centre.

**Below:** Seeds are cleaned and dried under low humidity and low temperature conditions prior to freezing.  
Photos – Michael James/CALM

Not only is seed storage a major objective, but the project also aims to carry out research into aspects of seed conservation, promote education and encourage plant conservation worldwide, as well as to provide safe keeping of duplicate collections of seed for the partner countries. The project will provide capital input, training and technical expertise to its collaborators. With global collaboration in mind, legal agreements are being set up around the world to cover the collection, transfer and subsequent use of seeds in accordance with the Convention on Biological Diversity. To date, international partnerships have been entered into with countries as diverse as the USA, Madagascar, Burkina Faso, South Africa, Lebanon, Egypt, Jordan and Kenya.

Closer to home, the MSBP has recently negotiated a 10-year collaborative partnership with CALM

and the Botanic Garden and Parks Authority in Western Australia to support WA's existing seed conservation efforts. This partnership will contribute to the long-term objectives of CALM's Western Everlasting initiative (see 'Western Everlasting', *LANDSCOPE*, Autumn 1999), that is, the conservation and restoration of native plant biodiversity.

Within CALM, the collaboration will ensure that the Threatened Flora Seed Centre has adequate funds to employ a seed collector to support the collecting program. Seed scientists will benefit from opportunities to pursue collaborative research both at home and in the UK. The project will also ensure that all the necessary agreements are in place to transfer duplicate collections of seed to the MSBP for long-term storage. Our aim is to concentrate on collecting those species poorly known and in need of further survey within the south-west

of Western Australia. In addition to species on CALM's Priority Flora list, species identified by the Salinity Strategy as being at threat of extinction from rising salt levels and waterlogging will also be a prime target for collection during the life of the project. It is hoped that seed from more than 1,000 species will be collected during the period of collaboration, along with more common species associated with threatened ecological communities. In addition, the project will involve assistance to the Botanic Gardens and Parks Authority for their orchid research program and for collections of more commonly occurring orchid species in the Wheatbelt and arid zones of Western Australia.

## COMMUNITY BENEFITS

There are many good reasons for Western Australia's participation in the Millennium Seed Bank Project.





CALM's partnership with the MSBP can be seen as an extension of the existing functions of the Threatened Flora Seed Centre, namely the collection and long-term storage from seed of threatened Western Australian native species.

The input of financial assistance from the MSBP ensures that the task of collecting seed is undertaken as quickly and as efficiently as possible. With so many issues threatening our native flora, speed is of the essence.

Under CALM's existing funding limitations, these conservation seed collections would not be made in the short term without substantial financial input from an external source. And we are proud to be involved in such a major international conservation project. Over the life of the project, Kew will be contributing to the conservation of some 60 per cent of WA's poorly known flora including a large number of orchid species. The collection of this material, and the assessment of its germination characteristics, will advance our knowledge of the biology of the flora, and will provide information to assist in the long-term management of these plant species. Seed will be available for reintroduction programs should any species require interventionist activities to ensure survival.

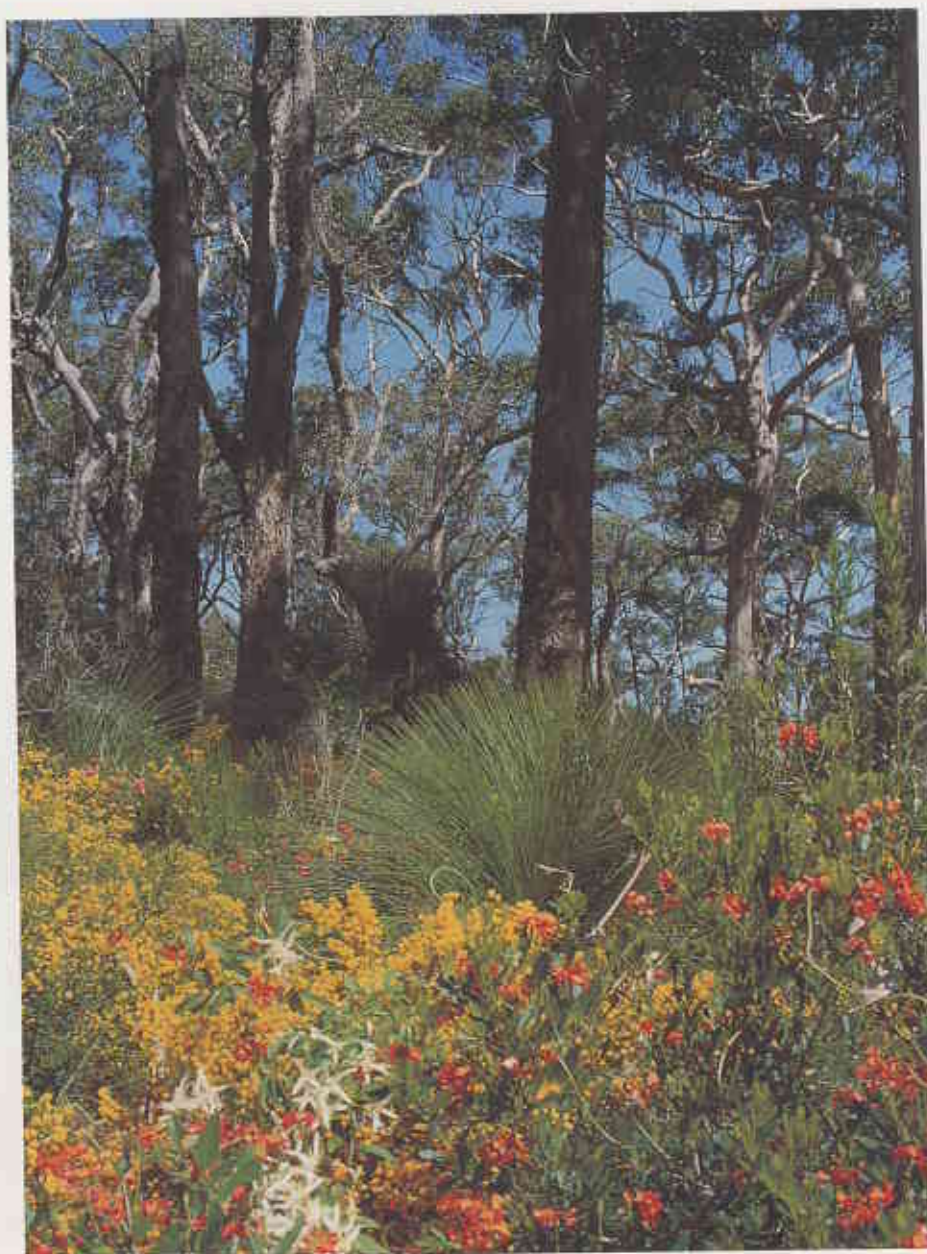
Duplicate storage of seed from conservation species in both Western Australia and the UK will help to prevent natural and human-induced catastrophes eliminating seed stocks. Benefit sharing, in the form of data exchange, technology transfer and training, is an essential component of the project, and staff from the Threatened Flora Seed Centre and Botanic Gardens and Parks Authority will derive benefits from closer contact with researchers at the Millennium Seed Bank. This benefit-sharing partnership will ensure the success and long-term sustainability of the project after 2010.

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**Above:** Collecting seed from the poorly known *Goodenia stenophylla* in the Ravensthorpe Range.  
Photo - Anne Cochrane/CALM

**Below:** Flowering understorey of jarrah-marri forest.  
Photo - Brian L Downs/Lochman Transparencies





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# LANDSCOPE



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Western Australian botanists are taking part in a global plan to store seed from 10 per cent of the world's flora by 2010. See page 23.



Discover the rich bird life and tranquillity of the Canning River Regional Park on page 17.



Mushrooms the size of a dinner plate can appear within 48 hours of a fire in the karri forest. Read about forest fungi on page 48.



The Pilbara's numerous islands are rich in history, wildflowers and wildlife, with prolific marine life in the surrounding waters. See page 34.



Many of WA's threatened marsupials can be seen in the south-west for the first time in decades. Read about their return to Dryandra Forest on page 10.

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## C O V E R

Paradoxically, the stinging tentacles of sea anemones—a group of carnivorous invertebrates that sometimes resemble colourful flowers—can also provide a safe haven for many underwater creatures. Anemonefish gain immunity to the stinging cells and live primarily in sea anemone tentacles. Other animals, such as crabs, carry a protective anemone on their backs. Turn to page 28.



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