

LIBRARY

Department of Biodiversity,
Conservation and Attractions

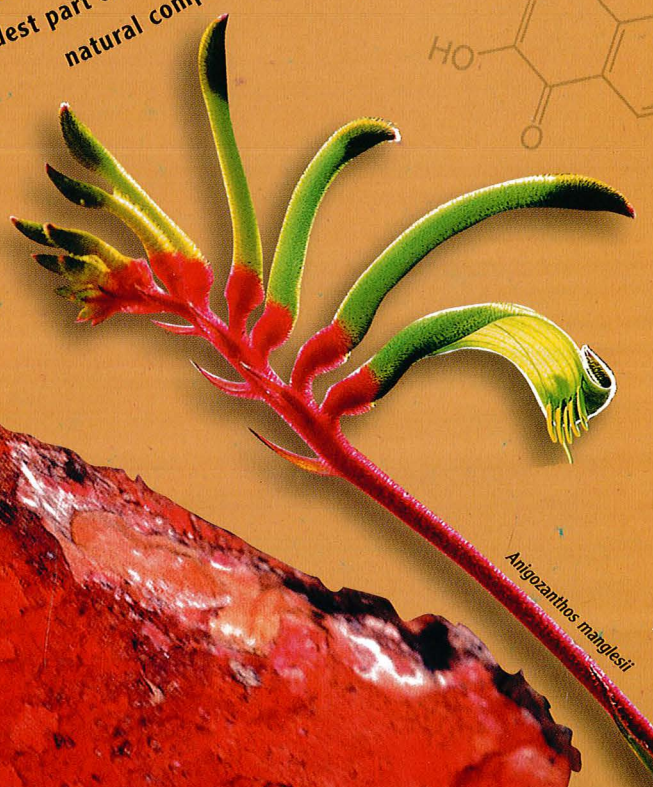
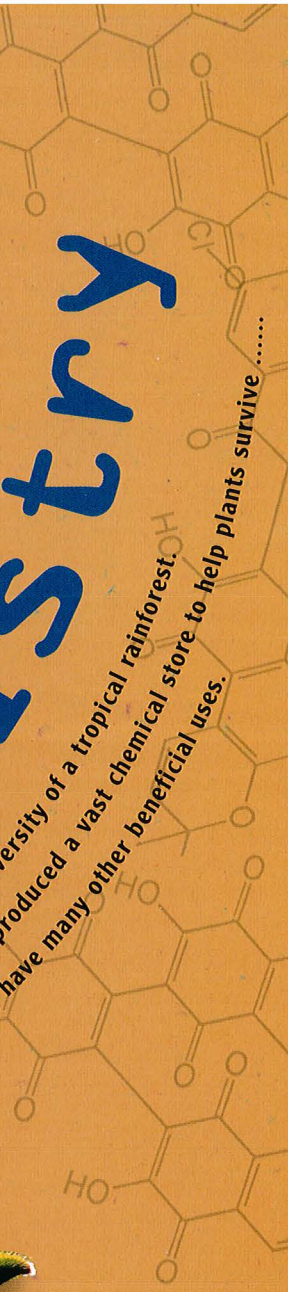
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Verticordia forestii

Outback chemistry

Outback Western Australia has the biodiversity of a tropical rainforest. The flora of the oldest part of the oldest continent has produced a vast chemical store to help plants survive natural compounds which may have many other beneficial uses.



Angoanthis manglesi



Pycnoporus species

WESTERN AUSTRALIA

OUTBACK CHEMISTRY

The flora of Western Australia is renowned for its richness and bizarre shapes and colours, as well as the extraordinarily high number of unique species.

The potential to discover valuable pharmaceutical products in such a rich and varied flora is enormous. One example under investigation is the anti-HIV compound discovered in *Conospermum* species found only in Western Australia.

Western Australia is conservatively estimated to have more than 70,000 species of fungi, 12,000 vascular plants, 5,000 algae and 300 mosses and liverworts. This is the same level of biodiversity found in tropical rainforests. About 9,000 vascular plants are found in the south-west corner of Western Australia and nearly 80 per cent of these plants are found nowhere else in the world.

Western Australia's flora has evolved in virtual isolation from the rich and ancient flora found elsewhere in Australia. Although there are marked relationships with the plants of eastern Australia, the State is unique in the number of species, such as the kangaroo paws, waxflowers and dryandras that are found only in the south-west. A large number of the species of characteristic Australian plants, such as banksias and ti-trees, are found only in Western Australia.

The State has approximately half of all the vascular plants described in Australia, of which about two-thirds are unique to Western Australia.

The Western Australian flora has developed its own features in a harsh environment, adapting to the Mediterranean climate with its long dry spells, variable rainfall, nutrient poor soils, grazers and predators, competition and disease.

The root systems, stems and leaf organs of the vascular flora have evolved a vast array of environmental adaptations. One example is the defence mechanisms developed in response to eons of attack by insects and other animals. The number of Western Australian plant species toxic to introduced animals indicates the huge number of anti-feedant chemicals known to exist in the flora.

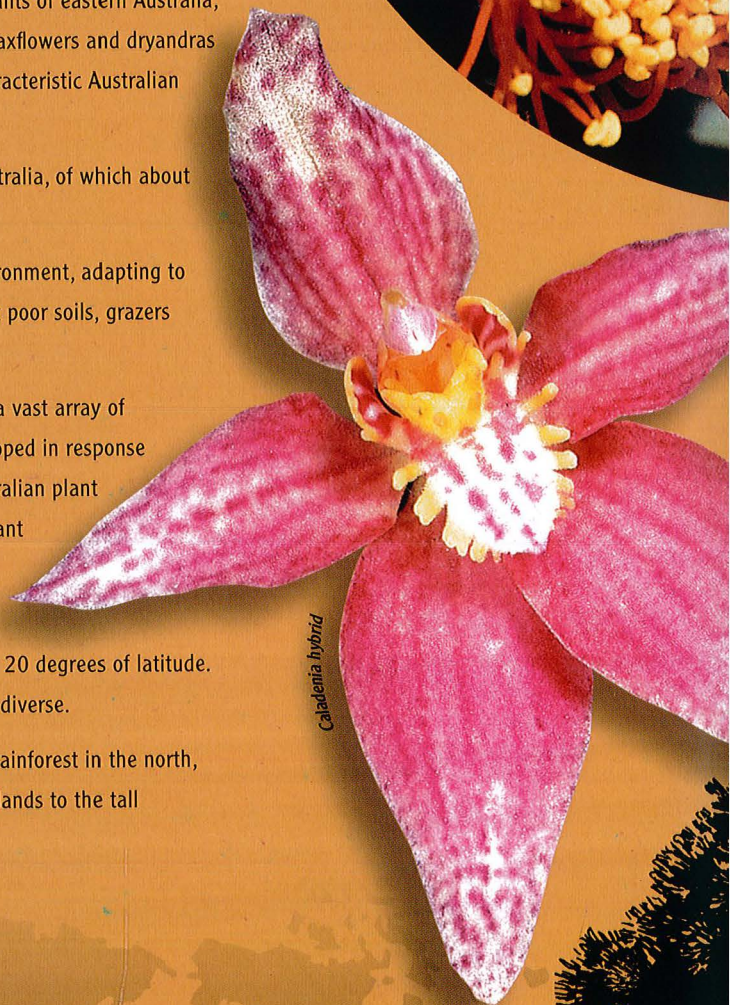
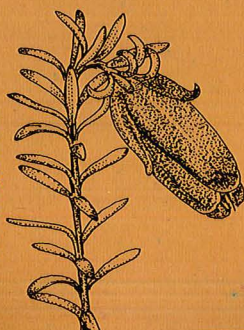
Western Australia covers more than 2.5 million square kilometres (see map below), or one third of the Australian continent, and extends over 20 degrees of latitude. The landscape is ancient and the landforms, soils and climatic patterns are diverse.

The State's plant communities range from small areas of remnant tropical rainforest in the north, through arid hummock grasslands, savanna and extensive shrub and heathlands to the tall forests of the temperate south-west.

More than 800 distinctive flora communities have been recorded in Western Australia.

Three botanical provinces and 21 botanical districts have been identified. The key plant communities in each of the botanical provinces are listed on the following pages.

Darwinia hypericifolia



Caladenia hybrid



Northern Botanical Province

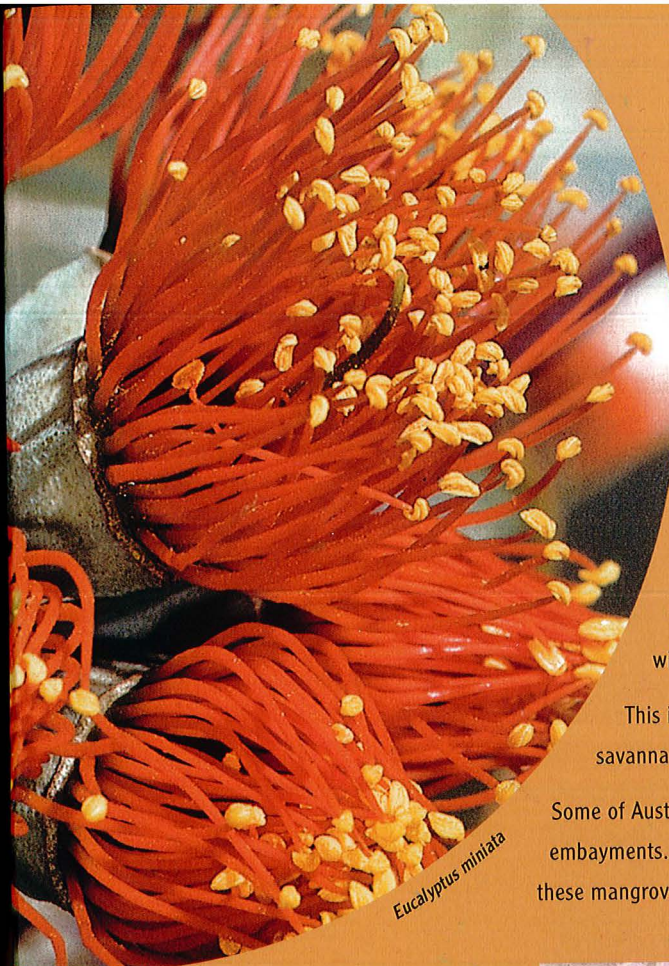
The Northern Botanical Province covers more than 300,000 square kilometres, or 12.6 per cent of Western Australia, and extends across the Kimberley region. Many of the province's plant communities occur across northern Australia.

"Dry" rainforests are found in fire protected areas mainly in the north-west Kimberley, usually in scattered patches of less than 20 hectares. They contain numerous species of flora only found in this habitat and support about 25 per cent of the known species of Kimberley flora. **Rainforest**

The tropical summer rain climate favours grassland. Open grasslands and grasslands with scattered trees are common and widespread plant communities of the Kimberley. **Tropical savanna and savanna woodland**

This is a mosaic of wattle dominated shrublands, containing rainforest, desert and savanna elements, occurring on some sandy soils in the west Kimberley. **Pindan**

Some of Australia's most extensive mangrove areas line the region's estuaries and sheltered embayments. Except for the tiny rainforest patches and narrow riverine fringes, these mangroves are the province's only closed canopy community. **Mangroves**



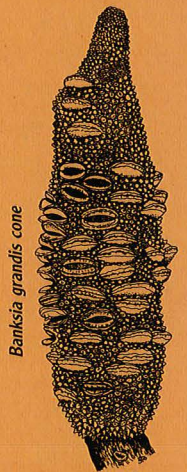
Eucalyptus miniata



Calandrinia species



Drosera pinnata



Banksia grandis cone

Eremaean Botanical Province

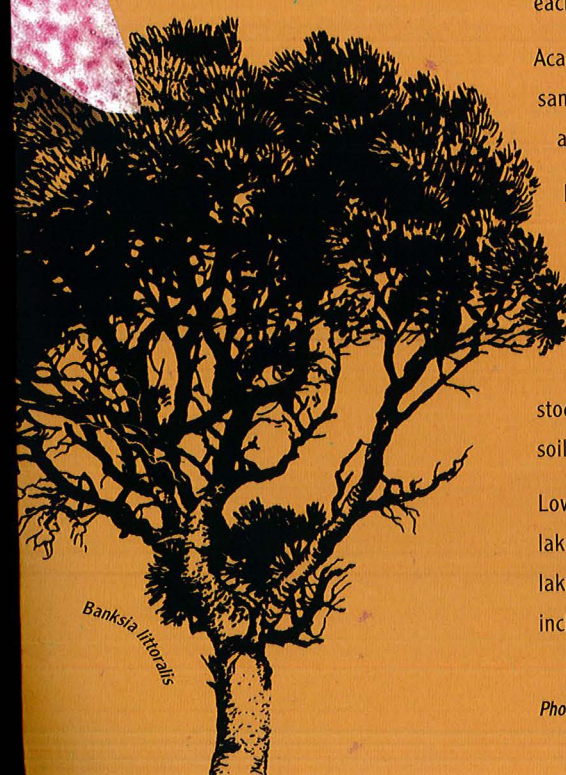
The Eremaean Botanical Province covers 1.8 million square kilometres, or about 70 per cent of the State. The province lies in Australia's arid zone and receives less than 400 millimetres of rainfall each year.

Acacia woodlands are common plant communities throughout the province where the soil is not sandy. Mulga, a low woodland comprised largely of a single species of wattle, *Acacia aneura*, is a version of this community that dominates the pastoral parts of the province. **Acacia woodland (including mulga)**

Low shrublands of bluebush, species of *Maireana*, are essentially confined to the Nullarbor Plain. The Nullarbor stretches over about 200,000 square kilometres, making it one of the largest limestone plains in the world. **Bluebush plains**

Extensive bunch and hummock grasslands of perennial grass species, notably in the genera *Triodia* and *Plectrachne*, occur in parts of the province that are mostly too arid for domestic stock. Grasslands are especially common in the summer rainfall northern parts and in the sandy soils of the winter rainfall areas in the south. **Spinifex grasslands**

Low shrublands of salt-tolerant plants, such as *Halosarcia* species, are associated with the salt lake systems and ancient drainage systems that are now blocked. Features associated with these lakes include aeolian dunes and calcretes with distinctive woodland and heath vegetation that include *Callitris* species. **Samphire shrublands**



Banksia littoralis

South-west Botanical Province and the Interzone

The South-west Botanical Province covers more than 300,000 square kilometres, or 12.3 per cent of Western Australia. The South-western Interzone covers 126,000 square kilometres and is a transitional area between the flora of the South-west and Eremaean provinces.

The level of species richness in the south-west is equivalent to that of south-east Asian tropical rainforests. Biodiversity is particularly high among woody shrub species, especially of the families Myrtaceae (such as eucalypts, paperbarks, bottlebrushes and waxes), Proteaceae (such as banksias, dryandras and hakeas) and Papilionaceae (such as hoveas, daviesias and the pea-flowered poison plants). These families have undergone immense evolutionary development in a relatively short geological period.

Forests The principal forest types are jarrah, *Eucalyptus marginata*, which occurs across a wide range of soil and climate conditions, the more restricted karri, *E. diversicolor*, and tuart, *E. gomphocephala*, which are confined to areas of high rainfall and relatively high soil fertility, and wandoo, which occurs as woodlands and forests on the eastern margin of the jarrah forest.

Woodlands Eucalyptus woodlands of wandoo, salmon gum and York gum fringe the eastern margins of the province's forests in the wheatbelt, but 95 per cent of these woodlands have been cleared for agriculture. Banksia woodlands occupy sandier soils from Kalbarri to Albany and along the coast to Esperance.

Kwongan Also known as sandplain vegetation, the kwongan community occurs on nutrient-poor sandy and gravelly soils and is composed mostly of a large variety of shrub species. These areas, where most of the flora restricted to Western Australia are found, extend from north of Perth to Kalbarri, from the Stirling Range to Esperance and as isolated remnants across the wheatbelt. In the higher rainfall regions, sedges form a major component of this vegetation type.



Tremella mesenterica



Trianthema turgidifolia



Kingia australis

Swainsona formosa



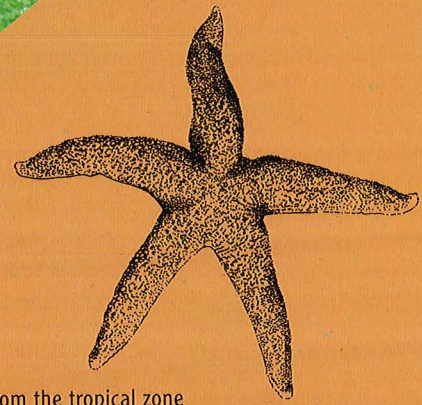
Leptospermum sericeum



Macrozamia riedlei



Ecklonia radiata



Posidonia with epiphytes



Bryopsis species



Marine flora

Western Australia's coastline extends about 12,500 kilometres from the tropical zone in the north to the temperate zone in the south. The marine life found in these waters varies from tropical organisms, such as corals and mangroves off the Kimberley and Pilbara coasts, to temperate seagrasses and algae off the south-western and southern coastlines.

Western Australia has a relatively large number of marine flowering plants, many of which are commonly known as seagrasses. A few, such as the seagrass *Posidonia*, form extensive meadows especially in estuaries and embayments along the south coast, near Perth and at Shark Bay. These meadows are extremely important nurseries for marine organisms and, especially in the northern regions, they form extensive grazing pastures for marine mammals.

An estimated 1,500 species of marine algae occur in Western Australia and many, like the terrestrial flora, are unique to the State.



Western Australian Herbarium

Managed by the Department of Conservation and Land Management, the herbarium has 400,000 plant specimens with an estimated replacement value of \$25 million. There are also regional herbaria in Albany, Manjimup and Karratha, as well as 55 field herbaria in national parks, reserves, regional centres and CALM's regional and district offices.

Specimens from around the State are named and arranged according to a standard classification system that groups related plants, and are kept in vascular and non-vascular collections.

The herbarium underpins CALM's work to conserve species in their natural habitat. The collection is databased and is the repository of information on land management, including vegetation type, associated species, landscape characteristics and soil types, which can be linked with other CALM data on the conservation estate. The native flora data are part of CALM's developing geographic information systems.

Computerisation has allowed information on species distribution to be linked to a variety of biological data on species, from plant longevity and fire response, to the impact of threatening processes.

As well as its conservation role, the herbarium includes voucher specimens of all native plants with economic value, including timber trees and other wood products, species used for tannins, resins and essential oils, poison plants, Aboriginal food plants, species with fodder value and medicinal plants.

The herbarium's advanced specimen vouchering system and its computerised databases are vital to the search for naturally-occurring chemicals with medicinal, insecticidal, cosmetic and other uses.

The herbarium can provide information about the precise location of certain species; their abundance; related plant species and taxonomic affinities.

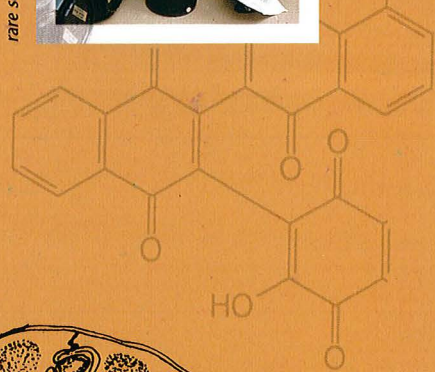
Precise naming is particularly important for recollection and for seeking patent protection for any discovery.



conserving rare species



rare seed storage



identifying voucher specimens



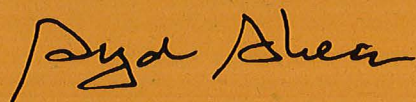
outback chemists

Call for Expressions of Interest in Access to Western Australian Flora for the Purpose of Bioprospecting

Western Australia's flora is internationally recognised for its diversity. Given the high percentage of species found only in Western Australia, many of the natural compounds they contain are unlikely to be found anywhere else in the world.

The State Government has now established a plant extract library and you are invited to submit an Expression of Interest in:

- ❖ screening samples from the extract library for bioactive compounds;
- ❖ commissioning the collection and processing of further extracts;
- ❖ establishing a screening or pharmacological facility in Western Australia and negotiating a mutually satisfactory agreement for the supply of extracts and development of commercial products;
- ❖ establishing a centre to collect, inventory and screen the microflora of Western Australia.



Dr Syd Shea
Executive Director



outback chemistry

CALL FOR EXPRESSIONS OF INTEREST

IN ACCESS TO WESTERN AUSTRALIAN FLORA
FOR THE PURPOSE OF BIOPROSPECTING

WESTERN AUSTRALIA



DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Respondent's name and address:

**Further information regarding this
Call for Expressions of Interest
may be obtained from:**

Technical queries: Dr Neville Marchant
Telephone (618) 9334 0500
Facsimile (618) 9334 0515
Email nevillem@calm.wa.gov.au

General queries: Ms Caris Bailey
Telephone (618) 9442 0306
Facsimile (618) 9386 6399
Email carisb@calm.wa.gov.au

Lodgement of Expressions of Interest

Expressions of Interest must be enclosed in a plain envelope and marked:
TENDER BOX – EOI FLORA

Expressions of interest may be hand delivered or posted to:
Dr Syd Shea, Executive Director
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
Hackett Drive
Crawley
Western Australia 6009

Expressions of Interest may also be lodged by facsimile on: (618) 9386 6399

CLOSING DATE: 1500 WST 30 SEPTEMBER 1997

**Additional documents relevant to this
Call for Expressions of Interest:**

Outback Chemistry, CALM 1997 (enclosed)

INTRODUCTION

The Western Australian Government has established a plant extract library and is seeking Expressions of Interest from organisations working in the field of bio-product development, in:

- ❖ screening samples from the extract library for bioactive compounds;
- ❖ commissioning the collection and processing of further extracts;
- ❖ establishing a screening or pharmacological facility in Western Australia and negotiating a mutually satisfactory agreement for the supply of extracts and development of commercial products;
- ❖ establishing a centre to collect, inventory and screen the microflora of Western Australia.

SCOPE OF THIS CALL FOR EXPRESSIONS OF INTEREST

This Call for Expressions of Interest is intended to solicit proposals from Respondents as to the basis for a contract to be entered into between the successful Respondent and the Executive Director of the Department of Conservation and Land Management (CALM).

After the period for Expressions of Interest to be submitted has closed, Respondents will be short-listed against the selection criteria. Restricted tenders from those short-listed Respondents may then be issued. The minimum price in the Expressions of Interest for each Respondent will represent the minimum acceptable price in the tender.

Should offers from only a limited number of Respondents be found suitable, direct negotiations may be conducted with those parties in order to establish a contract/contracts.

In any event CALM will not be obliged to enter into contractual relations with any Respondent and CALM may elect not to proceed further with the Expressions of Interest process after considering the Expressions of Interest.

THE DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

The Department of Conservation and Land Management (CALM) is a statutory agency of the Government of Western Australia. The Department's functions include responsibility for the conservation and protection of flora and fauna throughout the State, as well as promoting the use of flora for scientific and therapeutic purposes. The Conservation and Land Management Act 1984 also gives CALM's Executive Director the power to enter in a wide range of business dealings.

Property in flora on public land in Western Australia is vested in the Crown until it is collected lawfully under licences issued by CALM. The sale of flora from private land is also regulated by licences issued by CALM.

CALM is extensively regionalised and employs a staff of 1200. The Department will spend \$200 million in delivering its core programs for the 1997-98 financial year.

CALM's mission is to conserve and manage Western Australia's wildlife and the lands, waters and resources entrusted to the Department for the benefit of present and future generations. CALM manages more than 20 million hectares excluding the marine reserves – this estate is about 7.5 per cent of the land area of Western Australia, or just over 50 per cent the size of Japan.

CALM has invested significant resources in taxonomy and in cataloguing all flora vouchers with a range of information, including geographic information systems (GIS) locations. This intellectual property is indispensable to an efficient and effective bioprospecting program, ensuring accurate identification of taxa, collection of further samples of the particular taxon and assessment of the biomass available.

The Western Australian Government is keen to pursue value-adding opportunities from its flora, in order to fund further nature conservation projects. As well, further opportunities are sought for Western Australian scientists to add to the intellectual property associated with the State's native biota. CALM's bioprospecting program operates under the following policy guidelines:

- (i) the Western Australian community must receive an equitable share of any commercial benefits derived from the State's biological resources;
- (ii) local scientists and institutions should be involved in any research and development of products derived from the State's biological resources;
- (iii) any development of these resources must be sustainable;
- (iv) Western Australia's biological resources must be protected.

WESTERN AUSTRALIA'S FLORA

Western Australia is conservatively estimated to have 12,000 species of vascular plants and 75,000 non vascular species, including algae, mosses and liverworts (see *Outback chemistry*). The State's south-west is internationally recognised for its biodiversity and more than 75 per cent of the plant taxa present are unique to Western Australia.

Species have had to cope with significant environmental pressures: fire, drought, predation, herbivory, competition and disease. Many plant species have survived by evolving chemical mechanisms as protection against grazing and predation. Given the high percentage of species found only in Western Australia, many of these naturally occurring chemicals are unlikely to be found anywhere else.

The State has a 12,500 kilometre coastline stretching from the tropical zone in the north to the temperate zone in the south. There is a wide diversity of marine species and many are unique to Western Australia.

Western Australia is an enormous potential source for pharmaceuticals derived from plants. One potential medicine currently under investigation as an anti-AIDS treatment is derived from species of *Conospermum* found only in Western Australia.

THE PLANT EXTRACT LIBRARY

CALM has been working with the Chemistry Centre (WA) to produce a plant extract library, so the State's flora can be systematically tested for biologically active compounds.

Scientists from CALM's herbarium have selected plant species which have been collected from around the State for the project and their identification verified through the herbarium's sophisticated voucher-based system.

Plant samples were then milled, extracted with water/ethanol (1:9) and the extracts freeze dried before being stored at minus 20 degrees Centigrade. Where appropriate, some samples were separated into roots, tops, bark and/or flowers.

More than seven thousand coded flora samples have been produced in this way.

Expressions of Interest are sought from organisations working in the field of bio-product development, in:

- ❖ screening samples from the extract library for bioactive compounds;
- ❖ commissioning the collection and processing of further extracts;
- ❖ establishing a screening or pharmacological facility in Western Australia and negotiating a mutually satisfactory agreement for the supply of extracts and development of commercial products;
- ❖ establishing a centre to collect, inventory and screen the microflora of Western Australia.

A collaborative approach is preferred, so that CALM can meet its policy guidelines for bioprospecting.

CAPACITY TO SUPPLY

The CALM bioprospecting team, working with the Chemistry Centre (WA), has a current capacity to collect and process 5,000 new plant extract samples per annum.

The Minister for the Environment and CALM's Executive Director have the power to grant exclusive rights to flora.

PROCESS FOR PURCHASING PLANT SAMPLES

Given the number of plant species in Western Australia, it is envisaged that more than one Respondent may be successful in securing a contract for access to part of the flora. Contracts may cover access to different numbers of samples, or samples from different genera or different geographic locations.

Access will be provided on negotiated terms to allow the identification and evaluation of new products from Western Australia's natural resources.

CALM will consider favourably proposals which give Western Australian scientists the chance to participate in the development of new products and/or include the establishment of pharmaceutical research and development infrastructure in Western Australia.

Access may also be sought to future collections of plant extracts.

SPECIFICATIONS

Respondents should indicate the:

- ❖ number of samples in which they are interested;
- ❖ stage to which they would like the samples processed, eg removal of tannins;
- ❖ species, or groups of species, in which they are interested;
- ❖ purpose for which the extracts will be used (eg screening for anti-viral activity, etc);
- ❖ period and extent of exclusivity required.

Respondents should indicate the royalty share available for existing intellectual property and for any future improvements developed by Western Australian scientists.

PRICING

Respondents should indicate the price per sample they would be prepared to pay for samples from CALM's plant extract library, which currently holds more than seven thousand samples. A sliding scale is anticipated, depending on the number of samples in which the Respondent is interested and the royalty share offered.

Freight charges will be added to the sample price.

The decision to award the tender will not be based solely on price, but will take into account any collaborative research opportunities, establishment of facilities in Western Australia, etc.

PAYMENT TERMS

An initial payment is sought, with the balance to be paid on delivery of the samples. CALM reserves the right to negotiate the method of payment with the successful Respondent(s).

CONFIDENTIALITY

The nature of this project is such that Respondents and all personnel working on the project shall be required to treat aspects of the project relating to price and sample identification as confidential.

A breach of confidentiality shall be considered as a breach of the contract negotiated for access to Western Australian flora samples.

KEY SELECTION CRITERIA

Respondents will need to provide evidence of their previous performance in screening and identifying biologically active compounds from plant extracts; researching and developing new products; and bringing new products to market.

Criteria listed below are not in any particular order and are not necessarily exhaustive or to be given equal weight:

- ❖ capacity to undertake relevant projects, eg in the pharmaceutical industry or in the development of industrial or agricultural chemicals;
- ❖ number of years of operation in a relevant industry;
- ❖ compliance with contractual conditions;
- ❖ demonstrated experience in managing intellectual property and patents in an area directly relevant to bioprospecting.

CONDITIONS OF TENDERING

1 Delivery method

Expressions of interest (EOI) may be delivered by hand to the tender box (by the Respondent or the Respondent's private agent) or sent through the mail or telecommunications media as a postal article or facsimile transmission for placement in the tender box.

The attention of the Respondent is drawn to clause 3.3 in respect of the transmission of EOIs by facsimile.

2 Late EOIs

2.1 Any EOI lodged in the tender box nominated in the EOI after the closing time on the day nominated in the EOI is a late EOI.

2.2 Late EOIs will be excluded from consideration unless the Respondent provides explicit and conclusive evidence of mishandling by the Department of Conservation and Land Management (CALM) by an official postal or telecommunication service. EOIs sent by other means will not be considered under the late EOI policy. The official postal and telecommunication services in Australia are Australia Post and Telstra.

3 Criteria for admittance of late EOIs to evaluation

3.1 Late EOIs shall be admitted to evaluation if it can be shown, by reference to the criteria set out in paragraph 3.2 below, that they were mishandled by CALM or by an official postal or telecommunications service. Mishandling is defined as:

(a) Mishandling by CALM:

A late EOI shall be deemed to have been mishandled by CALM if it was received and endorsed prior to the EOI closing time at the office's registry or facsimile facility but not transferred to the tender box by closing time.

(b) Mishandling by official postal or telecommunications service:

A late EOI shall be deemed to have been mishandled by an official postal or telecommunications service if it was accepted by the service by the times specified below for delivery or transmission to the nominated tender box but not delivered to the tender box by the closing time and date;

- (i) postal deliveries from Australia: At least 48 hours prior to the deadline for lodgement of offers;

- (ii) postal deliveries from overseas countries including New Zealand: At least 96 hours prior to the deadline for lodgement of offers;
- (iii) facsimile transmission: At least 1 hour prior to the deadline for the lodgement of offers.

3.2 Evidence

In determining a late EOI case, CALM shall rely only on the following evidence:

(a) Mishandling by CALM:

The date/time imprint impressed on the EOI documents by CALM telecommunications equipment or the personal endorsement of the officer taking receipt of the offer;

(b) Mishandling by official postal or telecommunications service:

In the first instance, the official stamps or marks affixed to or impressed on the EOI documents or the envelope or container enclosing the EOI documents. Should this be inconclusive, the Respondent will be requested to provide supporting evidence in the form of receipts or certifications issued by the official postal or telecommunication service. No other marks or documents will be accepted as evidence. Where an EOI fails the criteria of mishandling detailed above, the EOI will be excluded from further consideration.

3.3 Electronic transmission of EOIs

3.3.1 Facsimile EOIs must be received in full prior to the closing time.

3.3.2 Facsimile EOIs must include all price details, including settlement discounts, essential for establishing a bona fide offer capable of meaningful comparison with other EOIs. In particular such facsimile EOIs must include price detail against individual items.

3.3.3 EOIs submitted in this manner are to be confirmed in writing and endorsed "Confirming EOI", referenced to the original EOI, and lodged within two (2) working days of the closing date (close of business) at the lodgement address stipulated on the EOI.

3.3.4 Where there is any discrepancy between the contents of the facsimile and a written confirmation, (if received), the contents of the facsimile shall prevail unless it can be conclusively shown by the Respondent that an error occurred in transmission of the facsimile.

3.3.5 All reasonable care is taken to ensure the confidentiality and security of EOIs but it should be noted, in respect of those transmitted by facsimile that:-

- (a) facsimile transmission is not a reliable method of EOI lodgement due to the possibility of equipment breakdown and delays due to heavy traffic; and
- (b) the confidentiality of EOIs lodged by facsimile cannot be assured to the same extent as EOIs lodged through the mail.

3.4 Validity

All EOIs shall remain valid for a minimum period of three (3) months from the closing date of this Call for Expressions of Interest.

3.5 Price basis

The prices tendered shall remain firm for the duration of the contract.

3.6 Respondents to inform themselves

Respondents shall be deemed to have:

- (a) examined the Call for Expressions of Interest document and any other information available in writing to Respondents for the purpose of submitting an EOI;



- (b) examined all further information relevant to the risks, contingencies, and other circumstances having an effect on their EOI which is obtainable by the making of reasonable enquires; and
- (c) satisfied themselves as to the correctness and sufficiency of their EOIs including tendered prices which shall be deemed to cover the cost of complying with all the conditions of tender and of all matters and things necessary for the due and proper performance and completion of the work described therein.

3.7 The Respondent

The identity of the Respondent and the Contractor is fundamental to CALM. The Respondent shall be the person, persons, corporation or corporations named as the Respondent in the EOI. Upon acceptance of the EOI, the Respondent shall become the Contractor.

3.8 No assignment

This Call for Expressions of Interest is personal and not assignable or transferable by the Respondent or the legal personal representative of the Respondent without CALM's prior written consent.

3.9 No withdrawal

This EOI shall not be withdrawn by the Respondent without CALM's prior written consent.

3.10 No masquerades

If the Respondent is acting as agent or trustee for or jointly with another person, persons, corporation or corporations this must be fully disclosed by the Respondent in the EOI. If the Respondent fails to fully disclose the identity of all participants and the nature of his relationship to those participants, the EOI shall be null and void at CALM's option.

3.11 Ownership of EOI responses

All documents, materials, articles and information submitted by the Respondent as part of, or in support of an EOI shall become upon submission the absolute property of the Crown in right of the State of Western Australia and will not be returned to the Respondent at the conclusion of the EOI process. PROVIDED that the Respondent shall be entitled to retain copyright and other intellectual property rights therein, unless otherwise provided in the Contract.