Terrestrial Biodiversity

Land Management

The Western Australian Department of Environment and Conservation manages more than 26 million hectares, including more than nine per cent of WA's land area: its national parks, conservation parks, regional parks, nature reserves, State Forest and timber reserves (vested in the Conservation Commission of Western Australia)

Managing WA Forests

Western Australia's public native forests are managed for many diverse values, including nature conservation, tourism and recreation, water catchment protection and timber production

As an agency with integrated responsibilities, DEC manages lands and waters for the conservation of biodiversity at ecosystem, species and genetic levels, including management for the renewable resources they provide, and for the recreation and visitor services they can sustainably support.

In accordance with the Conservation and Land Management Act 1984, DEC prepares management plans for these protected areas on behalf of the Conservation Commission and the Marine Parks and Reserves Authority.

Management plans are prepared in consultation with the community to identify and guide long-term management directions and strategies for protected areas.

Tackling Salinity

Salt has always been present in our landscape. It has been accumulating in the ground over hundreds of thousands of years. Natural salt lakes are important features of Western Australia's landscape and the special plants and animals that live on them contribute to our amazing biodiversity.

The clearing of native vegetation to make way for agricultural crops has meant that more water has soaked into the ground. As a result, the rising groundwater table is bringing the stored salt to the surface where it runs into our streams and spreads across the landscape. Increasing surface salinity affects plants, aquatic life and drinking water. Even our rural towns are suffering with roads and buildings crumbling because of the spreading salt.

Salinity threatens the natural diversity of our south-west agricultural region and is challenging the way we use agricultural land.. Many of our streams and wetlands are becoming saltier, and remnants of native vegetation are declining. Hundreds of native plants and animals living in valleys face extinction.

Tuart Trees

Tuart trees grow along a 400-kilometre band from Jurien Bay, on the northern margin of the Swan Coastal Plain, to the Sabina River, just east of Busselton.

They are generally confined to limey or limestone soils close to the coast. It is

estimated that before Europeans arrived there were more than 111,600 hectares of tuart woodland. Most of these were subsequently cleared for agriculture and urban development and it is estimated that only 35 per cent remains.

Tuart Conservation

Most tuart woodlands are now found at Ludlow, Yanchep and Yalgorup National Parks. Significant tuart woodlands are also conserved in Bold Park and Kings Park, in State Forest at Myalup and McLarty, and in unallocated Crown land and Bush Forever sites at Yanchep, Woodman Point, Port Kennedy and the Harvey Estuary. Smaller remnants of tuart are scattered across its natural range from Jurien to south of Busselton.

About 67 per cent of the existing tuarts are on freehold land.

Tuart's have been reduced by more than 65 per cent due to urban, industrial and agricultural development. Remaining tuart woodlands have been disturbed by grazing, altered fire regimes and past timber harvesting. Some approved clearing of tuart woodlands continues for urban and industrial land uses, road construction and the development of public infrastructure.

The values of tuart woodlands include conserving biodiversity, protecting ecosystem function and providing connectivity between remnant vegetation. Tuart woodlands provide important landscape, cultural, social and economic values. Processes that threaten the integrity of tuart values include habitat loss, fragmentation and alteration caused by changes in natural and human induced vegetation disturbance regimes.

Tuart Health

Since the mid 1990s, there has been a growing community concern about the noticeable decline in the health of tuart trees south of Mandurah. The State Government's Tuart Response Group seeks to establish a partnership with local communities to plan and manage the conservation and protection of tuart trees and ecosystems, and to investigate the causes of their decline, which is linked with heavy infestation by wood-boring and de-foliating insects. Research is underway in the areas of:

- root health;
- soil microbiol communities;
- soil and nutrient supply and uptake;
- water relations;
- and how these have been modified by:
  - forest management, especially the use of pine;
  - accumulation of litter; and
  - change in understorey structure.

Wandoo Trees

Wandoo Trees

Wandoo is often known as White gum; though this is used for several other eucalypt species with similar white coloured bark.

Wandoo trees (E. wandoo) and their associated understorey have contributed economically towards the State's development while conferring invaluable ecological benefits.

Importance of wandoo (nature conservation and economic)

Wandoo is one of the most important trees for wildlife in WA, with many animal species using hollows in the tree and shed branches on the ground for Habitat. Animals such as the brush-tailed wambenger (or phascogale), several bat species and a variety of birds including the rufous tree creeper, regent parrot, Carnaby's Black-Cockatoo [pictured in tree hollow] and barn owl will inhabit hollows in standing trees. The retention of nest trees is critical to the long-term survival of species such as Carnaby's Cockatoo. Hollow logs on the ground provide homes for wambengers, immature rufous tree creepers, brushtail possums, numbats, chuditch and echidnas, as well as carpet pythons, Gould's monitors, western bearded dragons and other reptiles.

The foliage and bark support a myriad of insects and invertebrates, making it a good habitat for insectivorous birds. Flowers produce abundant nectar, an important source of food for birds and insects. Insects are important in recycling plant matter and nutrients, dispersing seeds and pollinating many plants, forming an integral part of the ecological food web. The tree produces a fine honey that has long been the mainstay for the apiculture industry.

Wandoo is a first class structural timber and has been used extensively for heavy construction purposes such as poles, bridges, railway sleepers, wharves and warehouse flooring. It is still in demand for joinery, flooring, as well as stockyards and fencing.

Wandoo maintains popularity in landcare-oriented plantings, and is attracting re-newed interest for timber production, as a farm forestry species in the medium rainfall areas However, the wandoo forest these days is most valued for watershed protection and recreation. Most of the eastern or high-salinity-risk areas of Perth's forested water supply catchments are dominated by wandoo.

Extensive clearing for agriculture has diminished and thus fragmented the distribution of wandoo, leading to a loss of habitat for wildlife with remaining areas becoming degraded due to salinity, waterlogging, grazing, firewood collection and changes in fire management. Great care needs to be taken to ensure remaining woodlands in the wheatbelt are protected and left standing.

Fauna, Flora, Bugs and Butterflies

Refer to the following website for information on threatened and protected species, management plans, butterfly gardening, species profiles and more...
http://www.naturebase.net/content/view/840/1288/

Feral Animals

Our unusual native animals continue to fascinate visitors from around the world and many are growing in abundance thanks to innovative projects and programs developed to fight against feral predators.

Australia's native plants and animals adapted to life on an isolated continent over millions of years. Since European settlement they have had to compete with a range of introduced animals for habitat, food and shelter. Some have also had to face new predators. These new pressures have also caused a major impact on our country's soil and waterways and on its native plants and animals.

In Australia, feral animals typically have few natural predators or fatal diseases and some have high reproductive rates. As a result, their populations have not naturally diminished and they can multiply rapidly if conditions are favourable.

Feral animals impact on native species by predation, competition for food and shelter, destroying habitat, and by spreading diseases.

The Rabbit-eared Bandicoot or Bilby needs a constant supply of carbohydrate-rich seeds and roots. Feral animals such as rabbits graze or degrade vegetation that provides food and shelter for them and other native animals. If vegetation is destroyed or eaten by feral animals, the Bilby and other native species are placed under greater pressure. Feral cats and foxes hunt and kill native birds, mammals, reptiles and insects. It is known that this behaviour threatens the survival of many threatened species.

Feral animals can cause soil erosion. While managed domestic livestock can be removed from degraded areas until these areas are revegetated, it is much more difficult to keep feral animals out of these same areas.

Feral animals can carry the same common diseases as domestic animals. They are a constant source of reinfection for wildlife and livestock, which works against efforts to control costly diseases such as tuberculosis. Feral animals are also potential carriers of other animal diseases (such as rabies and foot and mouth disease) and parasites (such as the screw worm fly). So far, these do not occur in Australia. An outbreak among Australia's wildlife would have an immediate and widespread effect, and would be disastrous for our environment. In some cases it would also be very difficult to control these diseases and parasites if feral animals carried them.

Control Methods

It would be desirable to rid Australia of its worst invasive species, but this is not achievable in most cases.

The objective for managing the majority of established feral animals is to reduce the damage caused by pest species in the most cost-effective manner. This may involve localised eradication, periodic reduction of feral numbers, sustained reduction of feral numbers, removal of the most destructive individuals or exclusion of feral animals from an area. The damage caused by feral animals also needs to be considered in context with other factors, such as land use, climate, weeds and grazing pressure from domestic stock.

There are a number of control methods available for feral animals. These methods include conventional control techniques and biological control. Conventional control methods for feral animals include trapping, baiting, fencing and shooting. Biological controls are currently being developed for a number of feral animals including a control that will inhibit cane toad metamorphosis.

During the implementation of any feral animal control program the guidelines for humane treatment and removal, should be applied, as well as adhering to animal welfare requirements that apply in each State or Territory.

Conventional methods of control include fencing, trapping, baiting and shooting.

Biological Control

Biological control is the control of pests by natural predators, parasites, disease-carrying bacteria or viruses. A noted success was the release of myxomatosis in 1950. In the six months following the release, the virus was believed to have killed more than 90% of feral rabbits as it swept through the temperate zone.

In September 1996 Rabbit Calicivirus Disease was accepted as a biological control agent under the Commonwealth *Biological Control Act 1984*.

Stringent tests and controls must be undertaken to ensure that all future biological control agents are effective and will not make the problem worse. An example of biological control gone wrong was the introduction of the cane toad in 1935 to control two insect pests of sugar cane. This biological control effort was a failure as it did not control the insects and the Cane Toad itself became an invasive species. The insect pests were later controlled using insecticides and other more suitable management practices.

Any biological control should be used in conjunction with conventional control techniques to manage the damage caused by feral animals

(For further details on all forms of control, refer to the website below)

Animals of Concern

- Cane toad (*Bufo marinus*)
- European wild rabbit (*Oryctolagus cuniculus*)
- European red fox (*Vulpes vulpes*)
- Feral camel (*Camelus dromedarius*)
- Feral cat (*Felis catus*)
- Feral goat (*Capra hircus*)
- Feral horse (*Equus caballus*) and Feral donkey (*Equus asinus*)

- Feral pig (*Sus scrofa*)
- Feral water buffalo (*Bubalus bubalis*)

(http://www.environment.gov.au/biodiversity/invasive/ferals/)

Threatened Species

A threatened species is an animal whose population is at risk. Conservation measures are often implemented when a species is recognised to be under threat in an attempt to avoid future extinction.

The World Conservation Union (IUCN) publishes a list every year — called the Red List — which includes all species considered Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern or Data Deficient. Species are entered into these categories and reviewed annually based on surviving populations and genetic diversity. The Redlist can be downloaded at www.redlist.org.

A threatened species is one that is considered Critically Endangered, Endangered or Vulnerable. As a general guide, the categories mean:

- Critically Endangered: considered to be facing an extremely high risk of extinction in the wild based on ANY of five categories — population reduction rate in the past decade; extent of occurrence and fragmentation; the current overall population and estimated declining population; and quantitative analysis results indicate the extinction probability within a decade is at least 50%.
- Endangered: considered to be facing a very high risk of extinction in the wild based on similar categories.
- Vulnerable: considered to be facing a high risk of extinction in the wild based on ANY of similar but less extreme categories.

Often animals are labelled 'endangered'. This does not nessesarily mean that they are classed by the IUCN as being endangered but rather that they are a species who is generally threatened.

Perth Zoo exhibits a large number of threatened species from a range of different geographical regions. Some of these include:-

Critically Endangered – Silvery Gibbon, Sumatran Orang-utan, Sumatran Tiger, Western Swamp Tortoise

Endangered – African Painted Dog, Black and White Ruffed Lemur, Carnaby's Cockatoo, Cotton top Tamarin, Dibbler, Nepalese Red Panda, Red tailed Phascogale, Sulawesi Crested Macaque, Woma

Vulnerable – Asian Fishing Cat, Black Flanked Rock-wallaby, Cheetah, Chuditch, Double-wattled Cassowary, Galapagos Tortoise, Ghost Bat, African Lion, Long-nosed Potoroo, Malleefowl, Numbat, Quokka, Western Ringtail Possum.

Conservation measures undertaken by Perth Zoo include**:**

- Formation of the Native Species Breeding Program which breeds animals for release
- Active Memorandums of Understanding that enable support of numerous conservation action groups that help specific species in the wild

- Captive breeding of Zoo animals for insurance populations
- Pilot programs such as the release of 13 year old captive bred Sumatran Orang-utan Temara into Bukit Tigapuluh National Park in Sumatra.
- Establishment of the Wildlife Conservation Action fundraising foundation that supports species in need.

Western Shield

Western Shield is the Department of Environment and Conservation's leading nature conservation program and is working to bring at least 13 native animal species back from the brink of extinction by controlling introduced predators — the European fox and feral cat. Launched in 1996, it is now the biggest wildlife conservation program ever undertaken in Australia.

Introduced predators have been making a meal of Western Australia's wildlife, contributing to the extinction of 10 species of native mammal, and forcing dozens more to fight for survival.

The main weapon in the fight against the fox and feral cat is use of the naturally occurring poison 1080, found in native plants called gastrolobiums or 'poison peas'. While our native animals have evolved with these plants and have a high tolerance to the poison, introduced animals do not.

Western Shield makes use of this natural advantage.

In the southwest forests, scientific research and monitoring has shown that where baiting has reduced fox numbers, there has been a dramatic increase in native animal numbers. Trap success rates for medium-sized mammals in the jarrah forest of Kingston Block, near Manjimup, reflect a seven-fold increase since baiting began in 1993.

The key to this success is predator control through baiting. Western Shield involves aerial and hand baiting on almost 3.5 million hectares of Department-managed land. Baiting operations take place four times a year throughout the State from as far north as Karratha to Esperance in the south. Smaller nature reserves are baited more frequently.

Project Eden

In the heart of the World Heritage Listed Shark Bay is the ecologically rich Francois Peron National Park. This park is located on the arid 1050 square kilometre Peron Peninsula, which is severed from the mainland at its isthmus by a 3.4 kilometre electric fence.(feral predator proof) Isolated from Australia, it is home to Project Eden the arid scientific conservation component of Western Shield

Control measures such as trapping and baiting have all but eliminated introduced predators. The fox population declined by 95 per cent after Peron Peninsula was aerially baited in April 1995.

Endangered native species are now thriving on the peninsula without the presence of introduced predators such as foxes and feral cats and without introduced foragers such as sheep, goats and rabbits.

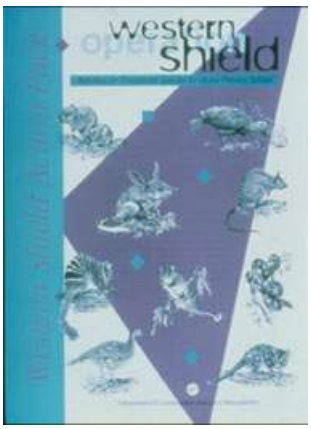
This safe haven is providing a 'Garden of Eden' for nine species of endangered native animals that a few years ago were on the brink of extinction.

Seldom seen species that once roamed the mainland in extensive numbers are resurging in this isolation. Other species that had become locally extinct are reviving as their dwindling numbers are translocated to Peron Peninsula to breed in safety.

The immunity from foxes and feral cats has ushered in a new era of native wildlife - it has been a scientific, botanical and zoological icon. Its success is the renaissance of marsupials and plant life that were once abundant.

Re-appearing native fauna include the brush-tailed bettong (woylie), [pictured] the rufous hare-wallaby, the Western barred bandicoot, the Shark Bay mouse, the Western quoll (chuditch), the mulgara, the banded hare-wallaby, the red-tailed phascogale and the malleefowl.

In 1997 DEC (Formerly CALM) began to reintroduce animals first the malleefowl, followed by woylies and greater bilbies.
It is hoped to translocate the burrowing bettong (boodie), pale field rat, chuditch, greater sticknest rat and phascogale to the area.
Feral cats presented the biggest challenge for Department scientists. They did not readily take the dried meat baits that worked so well on the fox. A special cat bait was developed and tested and is now working well.
Project Eden is the Noah's Ark of native fauna and flora, turning its energies to a series of diverse and inventive techniques to rid the area of feral herbivores and predators that destroyed native Habitat and wildlife in a 150-year period of European pastoral settlement.
It aspires to turn the tide of extinction and destruction on a small slice of mainland Australia, rejuvenating 105,000 hectares in the continent's biggest and most exciting arid-zone recovery.



All Western Australian schools can be involved in Western Shield schools program.
Since 1996 more than 40,000 students and teachers have been made aware of Western Shield and the importance of saving threatened species.
The Department's EcoEducation Section provides field nature conservation experiences at different sites around the State.(details at the end of this section)
Camps have been run for students and teachers at Batalling Forest near Collie, Perup Forest Ecology Centre, Dryandra Woodland Ecology Centre, the Wellington Discovery Forest and The Hills Forest. Excursions and camps are run at The Wellington Discovery Forest, Hills Forest and Dryandra.
Go the website (http://www.naturebase.net/pdf/plants_animals/western_shield/ws_action_pack.pdf) to download Western Shield Action Pack - a unit of work on threatened species for middle school students.
For information or a brochure on saving the ringtailed possum in the Busselton Dunsborough area, contact
Busselton-Dunsborough Environment Centre

PO Box 291, Busselton WA 6280
Phone/Fax: 9754 2049
Website: http://bdec.mysouthwest.com.au/
Email: bdec@westnet.com.au

Captive Breeding

The majority of modern zoos world wide, focus heavily on conservation work and education. Perth Zoo has developed an international reputation for its conservation work - in particular its breeding-for-release programs for threatened native species.

What is a 'breeding program'?

Species identified by the World Conservation Union (IUCN) as threatened are targeted by regional Zoological associations which coordinate activities across zoological facilities in the region and around the world with the aim of creating a genetically diverse captive population of that species. A regional Species Co-ordinator is assigned to coordinate the breeding programs for that species throughout the region.

When a breeding program is initiated and an animal sought from another facility as a breeding partner, the species co-ordinator works with governing Zoological authorities to determine which individual animals are genetically best suited — in view of their pedigree, traits, health and history.

A complicated formula is applied to a number of hypothetical pairings and the best possible match is identified. The lower the relatedness of two animals, the higher their value in breeding terms. If there are no obvious impediments to the matching (physical distance between animals, illness of either animal, political unrest or disease threat in either location) the breeding program can commence. This often involves the physical movement of one animal.

Perth Zoo may send its animals out or receive animals from other zoos as part of these breeding activities. Some artificial insemination programs also occur with endangered species. The zoo is subject to the recommendations and authority of a central Australasian body (ARAZPA) which is, in turn, subject to the guidelines of the Conservation Breeding Specialist Group, an arm of the global organisation, the World Conservation Union (IUCN).

The zoo actively contributes to regional captive breeding programs which preserve genetically diverse collections of threatened species for reintroduction back into natural environments when it is possible, as well as breeding threatened native species which are released back into the wild in areas that have been cleared of feral predators (cats, foxes etc).

Examples of animals involved in Perth Zoo’s captive breeding program:

Native animals:

- Dibbler
- Numbat
- Western Swamp Tortoise
- Rough-scaled Python
- Short Beaked echidna
- Sandhill Dunnart
- Sunset Frog

Exotic animals

- Sumatran Orang-utan
- Rothschild Giraffe
- Nepalese Red Panda
- Sun Bear
- Silvery Gibbon
- White-cheeked Gibbon
- Sumatran Tiger