Carnarvon

Low open woodlands of Mulga and Bowgada over herbfield on red sandy plains of central Carnarvon Bioregion, W.A.
Photo: N. Gibson

Description

Bioregional description and biodiversity values

This bioregion comprises Quarternary alluvial, aeolian and marine sediments overlying Cretaceous strata.

It is a mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, snakewood scrubs on clay flats, and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia stuartii* and *A. bivenosa* shrublands outcrop in the north, where extensive tidal flats in sheltered embayments support extensive mangroves.

The climate is arid, semi-desert to sub-tropical with variable summer and winter rainfall. Cyclonic systems may affect the coast and hinterland annually. The bioregion contains two subregions, Cape Range and Wooramel.

Special values include the islands of Shark Bay, Exmouth Gulf, the Muiron group, the Lowendal group, the Barrow group and the Montebello group. All are important for sea turtle breeding and seabirds. These islands also support populations of endangered mammal species, some of which are no longer found on the mainland.

The karst system of Cape Range has a large troglobitic fauna of international significance, with Bundera Sinkhole having the only known example of Remipede (*Lasionectes exleyi*) community in southern hemisphere, and Camerons Cave supporting a unique assembly of terrestrial and aquatic troglofauna.

Extensive mangroves occur along the southern and eastern coast of Exmouth Gulf.

The extensive and diverse wetland system of Lake MacLeod is rich in aquatic invertebrates and waterbirds. The region is a centre of evolutionary radiation for the lizard genus *Lerista,* and has many locally endemic species.

Overall condition and trend

Most pastoral landscapes in the region are poor or degraded with widespread loss of soil litter layers and mineral A-horizon. Even the main river channels are occluded with sand. The trend is to decline, as goats continue to replace sheep and cattle as the main source of income for the pastoral industry.

Nearly 50 per cent of the region's original non-volant mammal fauna is now extinct. The continental stress class of the bioregion is three (medium). It would be rated worse than this, except for three factors - the loss of native vegetation biomass and soil has not been measured, there are several large reserves in the region, and the extensive areas of sandplain and dunefield are mostly in good condition because they provide poor grazing for stock and feral herbivores.

Conservation priorities

The coverage of the reserve system needs to be improved. The islands need to be protected from disturbances. Feral animal, fire and weed control is a priority across all lands. Management of pastoral lands needs to be re-emphasised towards protecting biodiversity values, including soil profile conservation.

Nationally important wetlands

There are six nationally listed wetlands including subterranean karst systems, brackish to saline lagoons, intertidal flats, marshes and swamps, ephemeral freshwater lakes and swamps, saltpans and beaches.

Five are in good condition and static in their trend but one is in a fair condition and declining rapidly (McNeill Claypan).

Threatening processes are:

- pollution,
- grazing by feral animals (goats),
- increased salinity,
- weeds,
- mining fragmentation,
- inappropriate tourism and
- fishing.

Wetlands of regional significance

There are nine wetlands of regional significance comprising major rivers. Conditions range from poor in the case of wetland sections of the Wooramel, Gascoyne and Minilya Rivers to fair for the subterranean waterways of Barrow Island to good for Yardie Creek, Bay of Rest, Ningaloo Reef and intertidal communities of the Montebellos.

The only subregionally significant wetland in near pristine condition is Mangrove Bay.

Trends for most wetlands are to decline and others are likely to remain static. The rivers are particularly important. They control alluvial processes throughout the region, and their riverine ecosystems act as biological refuges. Threatening processes include:

- changed hydrology from massive sediment loads,
- weeds (buffel grass and Athel pine),
- grazing pressure from cattle and
- feral animals (foxes, cats, rabbits and goats).

Riparian zone

The bioregion includes riparian zones associated with the western (lower) reaches of the Wooramel, Gascoyne, Minilya, and Lyndon Rivers. Their catchments have the same name, but are almost entirely in the Murchison and Gascoyne bioregions, to the east.

All riparian zones are degraded and infested with buffel grass. Permanent and semi-permanent pools are affected by cattle, sheep and goats and are declining in condition. Threatening processes are:

- grazing pressure,
- feral animals (cattle, sheep horse, goats and rabbits) and
- weeds.

Ecosystems at risk

Two threatened ecological communities have been declared as Critically Endangered under WA State legislation (both are cave communities). However, at least 26 other ecosystems are known to be at risk.

These include:

- stygofauna,
- coastal marine,
- ephemeral creeklines,
- permanent soaks,
- plant, invertebrate and reptile assemblages,
- mangrove,
- floodplain and
- samphire.

Most of these degraded ecosystems are declining in condition. The main threatening processes are feral animals (fox, cat, goats and rabbits) and grazing pressure.

Species at risk

Under State legislation, 20 invertebrates are listed as endangered, including arachnids, crustaceans and millipedes – all of which are cave dwellers or stygofauna.

Most populations are in good condition but the trend for all species is unknown. Seven mammals, two birds, five reptiles and two fish are listed as endangered. Further, one mammal, one bird and two reptiles are listed as vulnerable.

Those mammal species still persisting on the mainland, as well as the bird species, are at risk from feral predators, fragmentation of habitat and grazing pressure.

Most listed mammals are restricted to islands off the coast of the mainland. These island populations are not subject to current threatening processes but would be susceptible to the introduction of disease, feral predators or a loss of genetic diversity.

The main threatening process for invertebrate species is pollution. Only one species of Declared Rare Flora is recorded for the bioregion (*Thryptomene wittweri* which is vulnerable). Its population is only in fair condition (see Glossary) and declining. It is at risk from grazing by feral goats.

Management responses

Reserve system

Regional conservation lands include:

- three national parks (Cape Range, Francois Peron and Kennedy Ranges),
- one marine park (Ningaloo),
- two conservation parks (Bundegi and Jurabi),
- four large nature reserves (Toolonga, Bernier Island, Dorre Island and Barrow Island) and
- many smaller island nature reserves (Gulf islands, Muiron Island, and Lowendal, Barrow and Montebellos groups).

The 762,866 hectares of conservation estate occupies 8.3 per cent of the bioregion with 46 of the 100 vegetation associations reserved.

The management of reserves is ranked as fair because, although foxes are baited effectively on one national park, there is usually poor access for management vehicles.

Only a minimal goat control program exists, even though grazing by both goats and rabbits is widespread. Virtually no fire management occurs and there is considerable public use of islands and coastal reserves. Significant conservation work is being undertaken on some islands.

Fifty-eight vegetation units, including 18 ecosystems at risk, have a high priority for acquisition.

They include:

- mosaic grassland,
- sedgeland with low trees,
- hummock grasslands,
- hummock grasslands with shrubs and low trees,
- shrublands,
- mosaic shrublands,
- woodlands,
- succulent steppe,
- mangroves and
- bare areas (mud flats, claypans and salt lakes).

There are constraints in terms of the cost of land and in terms of implementing management. Competing land uses include prospective mining interests (limestone and oil) over karst, and pastoral production. Inappropriate recreation developments (marina resorts) are also proposed.

Off-reserve conservation for species and ecosystem recovery

The main recovery actions for species include:

- monitoring populations,
- controlling feral animals (including goats),
- translocation efforts,
- habitat protection and retention, and
- protecting turtles from human activities.

The main recovery actions required for ecosystems at risk include habitat retention, weed control on islands, fencing of sensitive areas where there are heavy goat numbers, feral animal control and fire management. A significant off-reserve effort is needed for the bioregion. However there are resource constraints and limited community capacity.

Integrated Natural Resource Management (NRM)

Institutional reform through the Gascoyne Murchison Strategy represents major initiatives to purchase pastoral leases for conservation estate.

Threat abatement planning as part of NRM includes:

- the limited management of feral animals on the pastoral estate,
- vegetation management plans and
- pest management.

The mining (and oil) industry has various codes of practice. Integration with property management planning, catchment planning and Landcare through Landcare District Committees are delivering conservation biodiversity benefits.

Further opportunities for NRM include:

- tighter legislative control over pastoral management to control feral animals;
- structural reform of the grazing industry on State lands so that a range of natural resource benefits are emphasised, including the protection of biodiversity, noting that some pastoral areas are already attempting to implement ecologically sustainable practices through processes developed by the Rangelands Environmental Management Program of the Gascoyne-Murchison Strategy;
- specific management of islands including the control of goat, fox and weeds; and
- the Code of Practice for the oil industry including specific measures to protect troglofauna and sea turtles (lighting).

Constraints include the Land Administration Act and operations of the Pastoral Land Board which both require Pastoral Leases to operate in ways that may be inconsistent with conservation. There is a need to increase awareness of conservation values through education of major industries (mining, agricultural) and the public in general.

Major data gaps and research priorities

There is an urgent need for substrate mapping at better than 1:250,000 scale. Quadrat-based biodiversity survey data is sparse and confined to Wooramel and Cape Range. As a result, there is little data to provide a regional context on population trends for ecologically significant species.

These species include:

- mammals,
- spinifex reptile communities,
- ants and termites, and
- weeds such as buffel grass, kapok bush and ruby dock.

Detailed data is required on species' ecological requirements, life histories and effect of disturbing processes. This applies to virtually all invertebrate species (including troglobitic species), plants, persisting critical weight range mammals, uncommon vertebrate and plant species, and even to ecologically dominant plant communities such as hummock grasslands.

The Montebellos.
Photo: P. Kendrick