5
Volume

South Australian Arid Lands Biodiversity Strategy

Volume 5 Sandy Deserts Conservation Priorities

**SOUTH AUSTRALIAN ARID LANDS
NATURAL RESOURCES MANAGEMENT REGION**

A partnership between

**The Department for Environment and Heritage and
South Australian Arid Lands Natural Resources Management Board**

Australian Government

Government of South Australia

www.environment.sa.gov.au

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Cover photo: Bare dune crest - Merty Merty Station

Introduction

*The **South Australian Arid Lands Biodiversity Strategy** has been developed by the South Australian Arid Lands Natural Resources Management Board (SAAL NRM Board) and the South Australian Department for Environment and Heritage (DEH).*

The South Australian Arid Lands Natural Resources Management Region covers over 520,000 km^2, almost 53% of the State. The landscapes and biodiversity of this huge area are diverse and complex. Planning for biodiversity conservation at such large scales requires a landscape-based system of classifying the land. The classification system used for this strategy is the Interim Biogeographic Regionalisation for Australia (IBRA) regions. The IBRA bioregions of the SAAL NRM region are the Stony Plains, Flinders Lofty Block, Broken Hill Complex, Channel Country, Simpson–Strzelecki Dunefields, Finke and Gawler.

The Strategy consists of six documents. Volume one is the South Australian Arid Lands Natural Resources Management Region Biodiversity Strategy: Region-wide Priority Actions. It identifies the region-wide goal for biodiversity conservation and sets resource condition targets that will enable us to measure our success in achieving this goal, and details a comprehensive suite of management action targets and strategies that must be implemented regionally to achieve this goal.

The five bioregional documents are separate volumes, and identify conservation priorities for each of the bioregions in the South Australian Arid Lands. These are:

- *Volume 2 Channel Country Conservation Priorities*
- *Volume 3 Flinders and Olary Ranges Conservation Priorities*
- *Volume 4 Gawler Conservation Priorities*
- *Volume 5 Sandy Deserts Conservation Priorities*
- *Volume 6 Stony Plains Conservation Priorities*

This document, ***South Australian Arid Lands Biodiversity Strategy – Sandy Deserts Conservation Priorities***, has two sections. Section one describes the bioregion's natural attributes, land uses and the major threats to biodiversity. Section two sets out the priority actions for biodiversity conservation for the bioregion in the next five years. This document is one of five bioregional biodiversity strategies that, together, contribute to the South Australian Arid Lands Biodiversity Strategy.

The conservation priorities described here have been identified in the SAAL portion of the Simpson-Strzelecki Dunefields and Finke bioregions. The Simpson-Strzelecki Dunefields bioregion extends from south-eastern Northern Territory, through the north-east of South Australia into Queensland and New South Wales, and the Finke bioregion is shared between the Northern Territory and South Australia.

Photo: Simpson Desert

Bioregional framework

The Interim Biogeographic Regionalisation of Australia (IBRA) establishes a hierarchy of ecosystem classification for which the physical, climatic and biological characteristics are described.

Bioregions:

are continental scale (1:1,000,000) ecosystems that range in size from one to 20 million hectares. They are distinguished from adjacent regions by their broad physical and biological characteristics. They may include more than 30 landforms and 50 vegetation associations. Seven bioregions, or parts thereof, occur in the SAAL NRM Region.

Continental ecosystem:
Simpson–Strzelecki Dunefield IBRA – Extensive linear dunefields and sand plains interspersed with clay pans and drainage lines which flow into a series of large salt lakes, the largest of which is Lake Eyre.

IBRA Bioregion
Continental Ecosystem
1:1,000,000

Subregions:

are sub-continental scale (1:500,000) ecosystems that range in size from 100,000 to seven million hectares. They occur within IBRA bioregions and may include up to 15 landforms and 30 vegetation associations.

Sub-continental ecosystem:
Dieri IBRA subregion – An extensive dunefield interrupted by large claypans grading into a large playa complex of salt lakes with gypsum dunes, and surrounding plain with channels and dunes.

IBRA Subregion
Sub-continental Ecosystem
1:500,000

Landsystems:

are regional scale (1:250,000) ecosystems that range in size from 2,000 to five million hectares. They occur within IBRA subregions and may include up to five landforms and 10 vegetation associations.

Regional ecosystem:
Eyre landsystem – The Lake Eyre lake bed, shores, shoreline dunes and lunettes.

Landsystem
Regional Ecosystem
1:250,000

Vegetation communities:

are local scale (1:100,000) ecosystems that range in size from five to 5,000 hectares and are based on a single landform and vegetation community.

Local ecosystem:
Nitrebush low open shrubland.

Vegetation Community
Local Ecosystem
1:100,000

Who is this strategy for?

This strategy is designed to address the needs of three main stakeholder groups:

- The SAAL NRM Board, Government and other investors
- Scientists, technicians, and NRM support staff
- Land managers

SAAL NRM Board, Government and other investors

The focus audience for this strategy is the SAAL NRM Board, State and Federal Government Departments with responsibility for biodiversity conservation, and other organisations currently investing, or wishing to invest, in conserving the biodiversity of the South Australian Arid Lands. The 20-year targets represent clear statements of intent about biodiversity conservation priorities in the Sandy Deserts and how they will be managed. Monitoring and evaluating progress against the identified performance criteria will contribute to regional reporting on biodiversity conservation efforts.

The five-year actions provide specific direction for targeting investment. In most instances, the actions can be implemented as new projects, or as part of existing projects currently undertaken by the SAAL NRM Board, Government Departments and other stakeholders. Responsibility for delivering each action has not been detailed. Ultimately, the SAAL NRM Board and Government are responsible for the ongoing process of working with other stakeholders to deliver each action.

Scientists, technicians, and NRM support staff

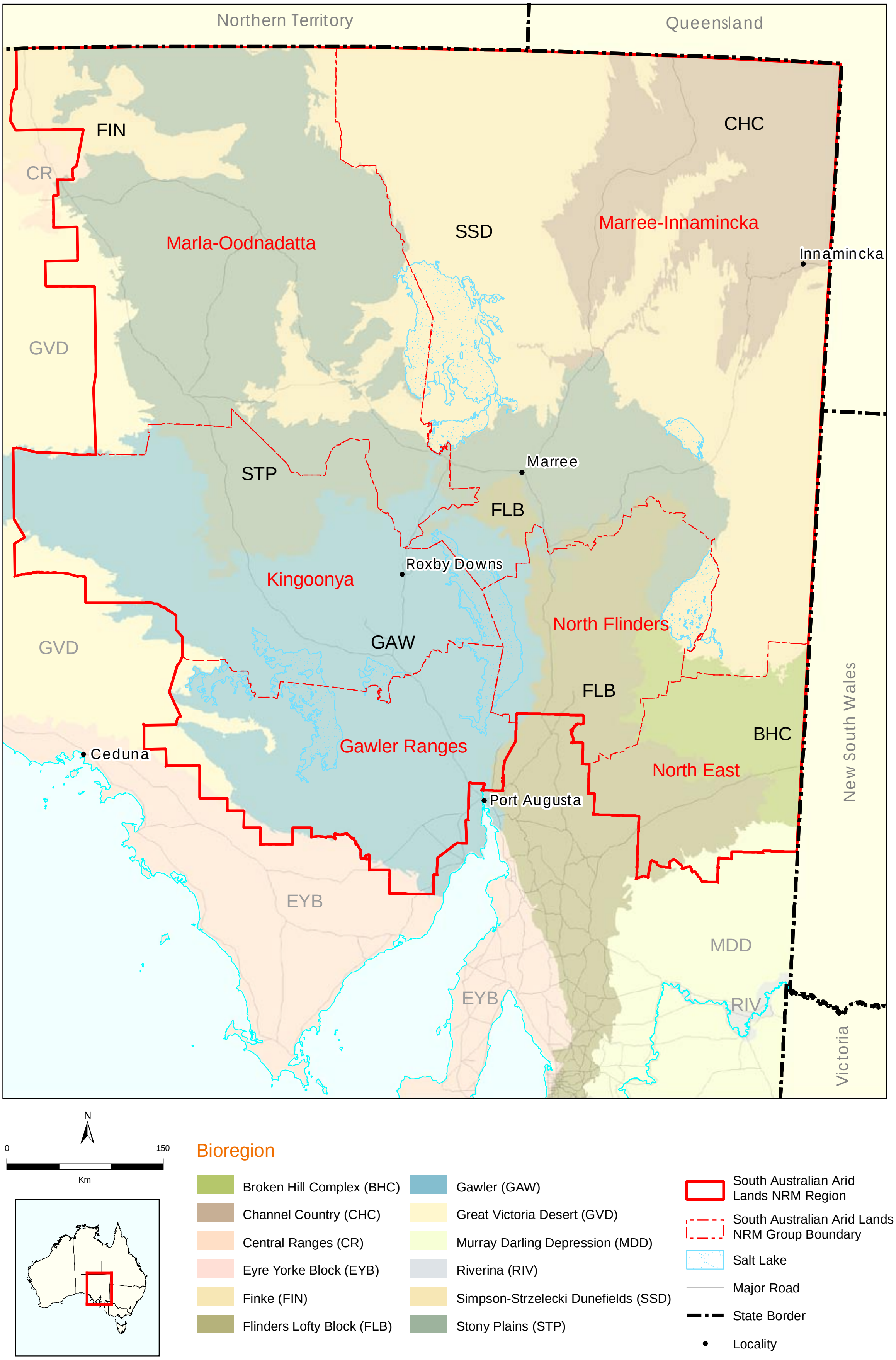
The strategy also has two main uses for biologists, ecologists, NRM support staff and others involved in biodiversity conservation and NRM projects and programs.

1. It provides a set of priorities for biodiversity conservation in the Sandy Deserts. Technical staff can confidently structure existing or new projects to deliver the actions identified for each conservation priority.
2. It identifies practical strategies for direct involvement by land managers. Technical staff can use these strategies to structure and develop engagement and extension programs to build capacity of land managers to achieve effective biodiversity conservation goals.

Land managers

For the land managers of the Sandy Deserts, this document clearly sets out the biodiversity conservation priorities for the bioregion, and describes the activities that need to be undertaken to address these priorities. The document also suggests practical strategies and actions that land managers can undertake as part of their day-to-day operations, to maintain and improve biodiversity.

South Australian Arid Lands – NRM region IBRA bioregions



SECTION 1

SANDY DESERTS DESCRIPTION

IBRA subregions

Major landforms

Major land uses

Threats to biodiversity

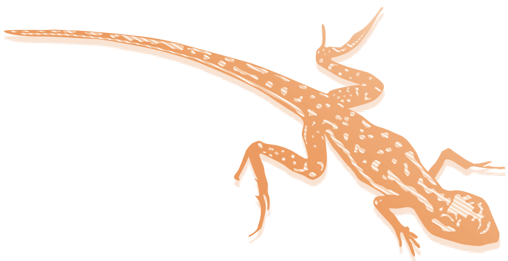


Photo: Bare dune crest

Sandy Deserts description

Covering an area of 149,188 km² of South Australia, the Simpson-Strzelecki Dunefields and Finke bioregions represent 28.67% of the South Australian Arid Lands and 15.21% of the State.*

The Finke bioregion, straddling the Northern Territory and South Australia border is characterised by sand plains and dissected uplands. In the north western corner of the SAAL region, gently undulating plains with some granite inselbergs and silcrete-capped mesas grade into silcrete-capped tablelands in the east. Further south, in the Pedirka Desert, gently undulating plains with parallel dunes are dominant.

The Simpson-Strzelecki Dunefields bioregion is one of the largest linear sand dune environments in the world. The region forms part of a huge complex of linear dunes in central Australia, dunefields that extend well into Queensland, the Northern Territory and north-western New South Wales.

Lake Eyre, in the southern part of the Simpson-Strzelecki bioregion, is the fifth largest terminal lake in the world, with a catchment covering over a million square kilometres, almost one-sixth of Australia. The Cooper, Diamantina and Georgina catchments feed down from Queensland through the Channel Country bioregion and the Neales, Macumba, Anna, Warriner, Margaret, Frome and Clayton Creeks flow in from the west and south.

Stream channels from the Tibooburra and Barrier Ranges in New South Wales flow west toward Lake Callabonna and Lake Frome through the southern Strzelecki Desert, but runoff is insufficient to reach the distant lakes. All creeks and rivers of the region are ephemeral with short periods of flow following rain, and long periods with no flow at all. They change from dry channels with occasional waterholes in dry times to slow moving 'inland seas' many kilometres wide during floods.

Several major watercourses, including the Alberga, Hamilton and Curralulla Creeks, traverse the Finke bioregion and drain south-east towards Lake Eyre.

Lake Eyre, 18 metres below sea level, is the lowest point in Australia. Hundreds of thousands of years ago, central Australia was a vast basin alternately covered by freshwater lakes and the sea. About 40,000 years ago, as the centre of the continent became more arid, the surface sand became mobile and was blown into the Lake Eyre Basin. The continuation of the arid climate allowed the prevailing winds to form the extensive complex of parallel longitudinal dunes that make up the Simpson, Tirari and Strzelecki Deserts.

At a landscape scale, between the dunes are clay and salt pans, sand drifts and sand plains. Some of the higher dunes have active crests, though most are stable. Dune spacing varies, and the swales may expose an underlying stony plain, deep alluvial sands and clays, or calcareous sandy soils. On the mobile sand areas, including dune crests, Sandhill Cane-grass and other grasses and herbs grow. On the more stable sands are Lobed Spinifex, grasses and shrubs, and some Mulga and wattles. Dunefields, sand plains and floodplains all have occasional clay pans and ephemeral lakes.

*Bioregions and subregions are the reporting unit for assessing the status of native ecosystems, their protection in the national reserve system and for use in the monitoring and evaluation framework in the Australian Government's current Natural Resource Management initiatives. The IBRA boundaries presented in this report are provisional and unpublished and will not be officially recognised until IBRA version seven is released in 2009. Monitoring and evaluation in the Sandy Deserts will be consistent with national guidelines and fit the national monitoring and evaluation framework.

Photo: Big Red - Simpson Desert

The region is characterised by extreme climatic variability and that has brought about a huge variety of landscapes and habitats. Distribution and availability of water is a key factor determining what plants and animals can live there. Despite this arid and often harsh and unforgiving landscape, the region is full of plants and wildlife that have adapted remarkably well. Besides the variety of small mammals, such as Hopping Mice, Dunnarts and Mulgaras, Dingoes and Kangaroos are also found. There are numerous reptiles including Military Dragons, Perenties, Australia's largest lizard, Goannas, Western Brown Snakes, Woma Pythons and Banded Skinks, also known as Sand Swimmers because of the way they move over the sand. Of the more than 150 species of birds that inhabit the sandy deserts, there are the rare Eyrean Grasswren and Australian Bustard, and the more common Wedge-tailed Eagles, Brown Falcons, Budgerigars and Zebra Finches. Black Kites, Crested Pigeons and Galahs are also common in the floodplain areas, and a variety of waterbirds, some migratory, can be found, sometimes in huge numbers on the playa lakes when there is water about. The semi-permanent wetlands, rivers and floodplains provide a great variety of habitats due to the variability of flows. Many water and land-based species depend on these refuge areas for survival during dry periods, and they are important breeding areas for many species that forage and hunt in the adjacent dunefields and sand plains.

Much of the plant life has adapted to the extreme and unpredictable seasonal conditions, with short lifecycles enabling opportunistic germination, growth, flowering and setting seed after rain. Following any significant rain, it is a spectacular sight to see flowers blooming profusely in such a harsh arid environment. Changes to vegetation cover, construction of water storages and floodplain levees, and even poorly sited roads, can alter the flow patterns and change river and floodplain ecosystems.

Human involvement in the management of the sandy deserts has introduced a range of environmental influences. There are the introduced feral animals including rabbits, foxes, camels and donkeys. Rabbit impacts before the effects of myxomatosis and Rabbit Haemorrhagic Disease (RHD) were particularly devastating in the sandy country. When camels became redundant for transportation in the 1920s, they were released into the wild. With a population now estimated at over 500,000 roaming the sandy areas of outback Australia, this is the largest free-ranging camel herd in the world. Plants introduced from other regions in Australia as well as from overseas, include Athel Pine, Noogoora Burr, Buffel Grass and Prickly Acacia.

Photo: Woma Python *Aspidites ramsayi*

IBRA subregions

Six IBRA subregions occur within the SAAL component of the Simpson–Strzelecki Dunefields and Finke bioregions. Detailed descriptions of the landsystems of the Simpson–Strzelecki Dunefields and Finke bioregions can be found in the District Plans published by the Marla–Oodnadatta and Marree Soil Conservation Boards.

Simpson–Strzelecki Dunefields bioregion

Simpson Desert (SSD2)

An extensive field of parallel dunes separated by flat interdune corridors.

Total Area: 18,319 km^2.
Landsystems: Simpson.

Dieri (SSD3)

An extensive dunefield interrupted by large claypans grading into a large playa complex of salt lakes with gypsum dunes, and surrounding plain with channels and dunes.

Total Area: 48,475 km^2.
Landsystems: Eyre; Jeljendi; Piarooka and Tirari.

Warriner (SSD4)

A gently sloping plain with extensive dunefields, isolated gypcrete remnants, broad floodplains and large pans.

Total Area: 10,304 km^2.
Landsystems: Piarooka and Wattiwarriganna.

Strzelecki Desert (SSD5)

An extensive dunefield with numerous small claypans, and a chain of inter-connected salt lakes with gypsum dunes along the eastern margins.

Total Area: 59,724 km^2.
Landsystems: Blanche; Eurinilla; Namba and Strzelecki.

Finke bioregion

Tieyon (FIN3)

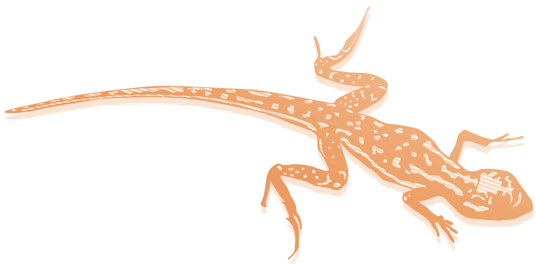
A gently undulating plain with some granite inselbergs and low silcrete capped mesas grading into dissected silcrete-capped tablelands.

Total Area: 4,657 km^2.
Landsystems: Moorilyanna and Wantapella.

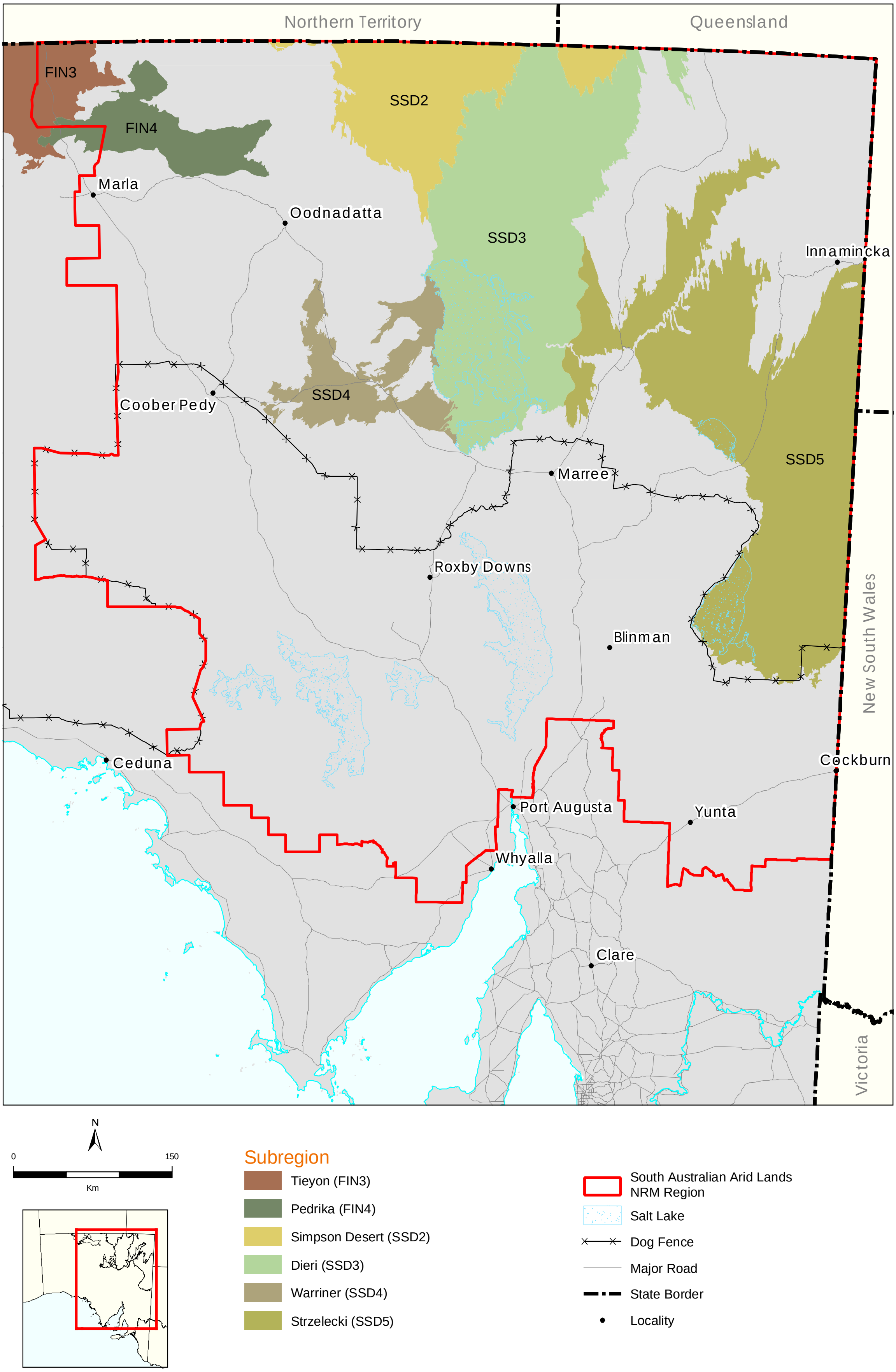
Pedirka (FIN4)

A gently undulating plain with parallel dunes.

Total Area: 9,062 km^2.
Landsystems: Alberga; Pedirka and Tieyon.



Sandy Deserts – IBRA subregions



Major landforms

There are four major landforms in the Sandy Deserts.

Drainage lines and floodplains

Ephemeral watercourses and floodplains draining into six surface water basins: Cooper Creek, Diamantina River, Finke, Georgina River, Hay River and Lake Frome.
Subregions: SSD2; SSD3; SSD4; SSD5; FIN3 and FIN4.

Salt lakes

Salt lakes, shoreline dunes, lunettes and saline deltas.
Subregions: SSD2; SSD3; SSD4 and SSD5.

Great Artesian Basin springs

High conservation value wetlands found on the margins of the Great Artesian Basin.
Subregion: SSD5.

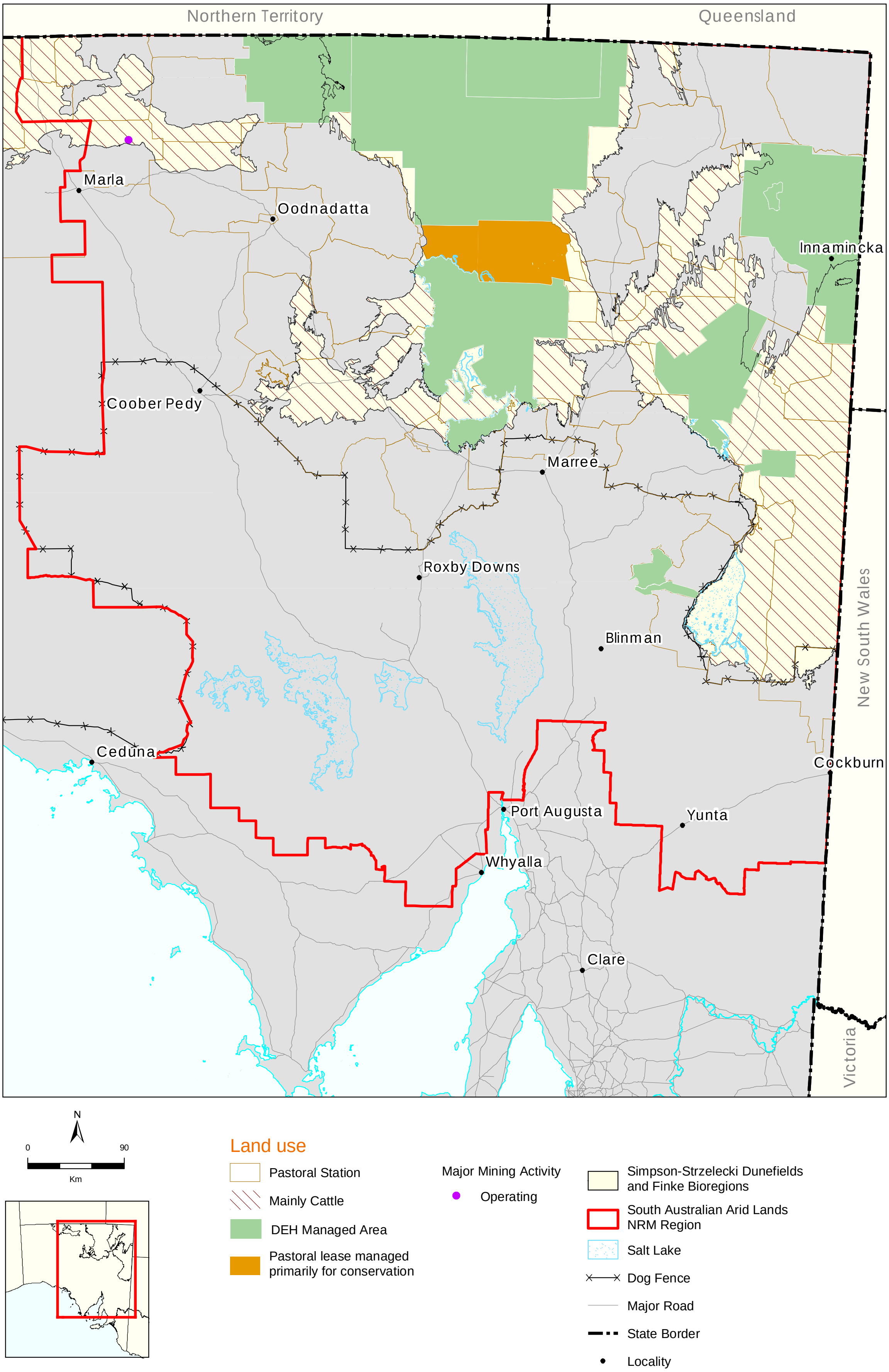
Dunefields and sand plains

Characterised by parallel dunes of varying spacing and sand plains of varying depths over underlying heavier soils which at times may be exposed.
Subregions: SSD2; SSD3; SSD4; SSD5; FIN3 and FIN4.

Conservation priorities have been grouped under each landform.

Photo: River Red Gum *Eucalyptus camaldulensis*

Sandy Deserts – land use



Major land uses

There are four major land uses in the Sandy Deserts.

Pastoralism

The Simpson–Strzelecki Dunefields bioregion supports the lowest levels of pastoralism within the SAAL region. Covering less than half of the bioregion, much of the Simpson and Strzelecki Deserts support, only opportunistic cattle grazing managed in response to seasonal conditions. In the SAAL portion of the Finke bioregion, pastoralism is the dominant land use. Caltle grazing for beef production is the principal pastoral enterprise.

Conservation

Within the Simpson–Strzelecki Dunefields bioregion, the Simpson Desert Conservation Park, Simpson Desert Regional Reserve, Lake Frome Regional Reserve, Strzelecki Regional Reserve and Lake Eyre National Park occur in their entirety. Kalamurina is a private conservation area managed by the Australian Wildlife Conservancy. Innamincka Regional Reserve is partially within the bioregion. Lake Callabonna Fossil Reserve is dedicated as an area of very high palaeontological significance. There are no conservation reserves in the Finke bioregion

Tourism

Away from the major public access routes (Birdsville and Strzelecki tracks), tourism within the region is restricted primarily to 4WD tours through the Simpson Desert and to Lake Eyre. During wet seasons, flights over Lake Eyre are very popular.

Mining and petroleum

Petroleum activities are focussed on the oil and gas fields of the Cooper Basin, with over 100 oil fields. There is also petroleum exploration outside the basin. Mining in the region is restricted to extraction of material from borrow pits for the development of oil and road infrastructure.

Photo: 4WD tours - Simpson Desert

Threats to biodiversity

There are many threats to biodiversity in the Sandy Deserts. Some are specific to particular areas, or act primarily within the Sandy Deserts, whilst others extend across multiple bioregions or jurisdictions.

The impacts of these threats also vary with time. The main threats to biodiversity in the Sandy Deserts include:

Excessive total grazing pressure

The combined effects of excessive grazing pressure from domestic stock and feral and native herbivores.

Impact: Reduction in recruitment of some native plant species (decreasers); increase in recruitment of some unpalatable native plant species (increasers); loss of native animals due to competition for resources; reduction in habitat quality and increased spread of weeds and disease.

Reduction in Great Artesian Basin water pressure

Levels of water extraction from the Great Artesian Basin (GAB) resulting in a reduction in artesian pressure and flow of water to the surface.

Impact: Reduced availability of water at the springs and likely reduction in area of GAB dependent communities.

Alteration to natural water flows

Restrictions to natural flow and/or flooding regimes of a watercourse due to diversions or the construction of artificial flow barriers and storage areas, including seismic lines, tracks, roads, borrow pits, dams and other infrastructure.

Impact: Change in ecosystem structure, disruption of dispersal mechanisms of aquatic species; loss of refuges and increased soil erosion and salinity.

Competition for resources

Introduced fauna and flora species compete with native species for food, water and shelter.

Impact: Loss of native plant and animal species; reduction in recruitment and density of native plants and animals and change in species composition of ecosystems.

Excessive predation

Hunting and consumption of native animals by introduced forestcast.

Impact: Loss of native animals and change in species composition of ecosystems.

Photo: Boredrain - Muloorina Station (T. Gotch, DWLBC)

Altered fire regimes

Changes to intensity, season and frequency of fire from the previous regime under which the ecosystem evolved.

Impact: Change in ecosystem structure and habitat value and loss of local populations of plants and animals.

Mechanical disturbance

Changes to the vegetation cover as a consequence of human activity that leaves the soil exposed.

Impact: Loss of habitat and reduction in habitat value for native species; increased potential spread of weeds and increaser native species and increased soil erosion.

Pollution

Reduction in quality of ground and/or surface water as a consequence of human activity.

Impact: Loss of native species and decline in habitat value in and surrounding waterholes.

Climate change

Changes in rainfall patterns and increase in temperature.

Impact: Reduction in the geographic range of species; changes in the location, structure and composition of habitats and ecosystems; increased risk of extinction of already vulnerable species and expansion of invasive species.

Section 2

CONSERVATION PRIORITIES

Identifying conservation priorities

Biodiversity exists at three levels - genes, species and ecosystems - and occurs at a variety of scales, from square metres to thousands of square kilometres. At each of these levels, it is necessary to identify thresholds where species, ecosystems or landscapes are recognised as priorities for targeted investment. Conservation priorities addressed by this strategy include:

Threatened species; Identified as Critically Endangered, Endangered or Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Endemic species; Identified as occurring only within a single bioregion.

Threatened ecological communities; Identified as Critically Endangered, Endangered or Vulnerable under the Australian Government's Environment Protection and Biodiversity Conservation Act 1999, or identified in Neagle (2003) An Inventory of the Biological Resources of the Rangelands of South Australia.

Significant ecological processes; Significant ecological processes are those identified as being significant in maintaining the viability of species, communities, ecosystems or landscapes.

Other species or communities considered to be at risk but not currently listed under the Commonwealth Government's Environment Protection and Biodiversity Conservation Act 1999.

Conservation priorities have been presented within this strategy as either significant ecological processes or groupings of species and ecological communities that share a common set of conservation requirements at similar spatial scales. Individual conservation priorities have been grouped under the major landforms in the region.

Mapping conservation priorities at multiple scales

This strategy follows the method of Brandle (1998), and uses broad landform patterns to group vegetation communities and categorise the landscape. Vegetation communities, landsystems, subregions and IBRA bioregions are all categorised by the dominant landform at their respective scales. Whilst the distribution of biodiversity correlates strongly with landforms within bioregions, ecological processes, disturbance regimes and land use influence the distribution of biodiversity within the landscape.

Photo: Waterhole, Mulka Station

Landform	Conservation priority	
Drainage lines and floodplains	Ecological response to water flows in the landscape	**Significant ecological process** • Ecological response to water flows in the Strzelecki Creek wetland system
	Threatened ecological communities on drainage lines, floodplains and swamps	**Threatened ecological community** • Coolibah and River Red Gum woodland on regularly inundated floodplains • Old-man Saltbush on floodplains • Queensland Bluebush shrubland on cracking clay depressions subject to periodic waterlogging • Broughton Willow and Coolibah woodland along drainage lines and on floodplains
Salt lakes	Ecological response to water flows in the landscape	**Significant ecological process** • Significant breeding events on inland lakes
Great Artesian Basin springs	Habitat diversity of the Lake Callabonna–Lake Frome Great Artesian Basin spring complex	**Threatened ecological communities** • All associated with Lake Callabonna–Lake Frome GAB springs complex
Dunefields and sand plains	Dusky Hopping-mouse in the Strzelecki Desert	**Nationally threatened fauna** • Dusky Hopping-mouse (*Notomys fuscus*)
	Marsupial Mole in the Simpson Desert and Finke bioregions	**Nationally threatened fauna** • Marsupial Mole (*Notoryctes typhlops*)
	Threatened ecological communities on low dunes and sand	**Threatened ecological communities** • Mulga low woodland on sand plains • Needle Wattle low woodland on sand plains

Drainage lines and floodplains

Drainage systems of both Simpson–Strzelecki Dunefields and Finke bioregions consist of complexes of waterholes, braided streams, channels, floodplains and ephemeral lakes. The Strzelecki Creek is an overflow of the Cooper Creek and a major feeder stream of Lake Blanche, a shallow ephemeral freshwater lake that increases in salinity as it dries out. The Cooper, Warburton and Strzelecki Creek systems also include fields of parallel sand ridges with interdune areas connected to the main channels which are periodically flooded. There are multiple floodplains and lakes which vary considerably depending on frequency and intensity of flooding.

Coolibah and Broughton Willow (*Acacia salicina*) woodland, often with a tall shrub layer, characterises the major intermittent watercourses and permanent waterholes on the main channels of the Cooper. Waterholes are mostly ephemeral and dry out or become highly saline during dry periods. River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) woodland typically dominates around permanent waterholes. In some areas within the Finke bioregion, drainage lines also support Mulga (*Acacia aneura*). Grasses and ephemeral herbs grow densely after flooding.

Vegetation on swamps and depressions with frequent inundation and long retention times is commonly Swamp Cane-grass (*Eragrostis australasica*), with or without Lignum (*Muehlenbeckia florulenta*). Swamp Cane-grass is replaced by Samphire (*Tecticornia* spp.) in saline depressions. Where retention times are shorter, the usual perennial vegetation is open shrubland of Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*), Cottonbush (*Maireana aphylla*) and Queensland Bluebush (*Chenopodium auricomum*).

Significance of drainage lines and floodplains

In an arid sandy region generally dominated by sparse shrublands, the protection and breeding opportunities provided by the taller vegetation of the drainage areas are critical to the survival of many species that need the adjacent dunes for food, but are unable to breed there. The provision of water to the surrounding landscapes is central to the survival of all living things in this extremely dry environment. What survives and how they survive is determined by the amount, quality and availability of water for their breeding requirements. Species may need permanent fresh water for all or only a part of their lifecycle, or they may rely on the vegetation that grows in places only where water is more available.

Due to the hugely variable flows and inundation times for the floodplains and drainage lines, the range and complexity of available habitats is enormous, and many survival niches are provided for species that are poorly adapted to the dry sandy country.

Birdlife along watercourses is prolific. Many water birds, such as cormorants, herons and egrets, build stick nests next to lakes or wetlands. Often, these nests are built in branches overhanging open water. Hollows, particularly in River Red Gums, are important nesting sites for some ducks as well as raptors, reptiles and small mammals.

There has been one record in the bioregion of the vulnerable Plains Rat (*Pseudomys australis*) in the central Simpson Desert although its preferred habitat is cracking clay plains and gilgais in the Stony Plains bioregion.

Major vegetation communities

Woodland

River Red Gum (*Eucalyptus camaldulensis*) woodland over +/- Inland Paper-bark (*Melaleuca glomerata*) +/- Elegant Wattle (*Acacia victoriae*) +/- Broughton Willow (*Acacia salicina*), Ruby Saltbush (*Enchylaena tomentosa*), and Spiny Saltbush (*Rhagodia spinescens*) and ephemeral herbs along stream channels.

Coolibah (*Eucalyptus coolabah*), River Cooba (*Acacia stenophylla*) +/- Broughton Willow (*Acacia salicina*) +/- River Red Gum (*Eucalyptus camaldulensis*) low woodland over Lignum (*Muehlenbeckia florulenta*) and ephemeral herbs along stream channels.

Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*), Lignum (*Muehlenbeckia florulenta*) low open shrubland with emergent Coolabah (*Eucalyptus coolabah*), River Cooba (*Acacia stenophylla*) over Cottonbush (*Maireana aphylla*), Queensland Bluebush (*Chenopodium auricomum*), and Bindyi (*Sclerolaena* spp.) and ephemeral herbs in minor channels and run-on areas.

Shrubland

Cottonbush (*Maireana aphylla*) +/- Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*) +/-Bladder Saltbush (*Atriplex vesicaria*) low open shrubland over grasses and Bindyi (*Sclerolaena* spp.) on low-lying run-on areas.

Grassland

Swamp Cane-grass (*Eragrostis australasica*) +/- Lignum (*Muehlenbeckia florulenta*) tall grassland over annual Saltbushes (*Atriplex* spp.) +/- Bindyi (*Sclerolaena* spp.), and grasses and ephemeral herbs in non-saline swamps.

Photo: River Red Gum *Eucalyptus camaldulensis*

Managing the biodiversity of drainage lines and floodplains – practical ways that land managers can help

The main driver of biological activity in the arid areas is water. When the amount or intensity of rainfall in the Sandy Deserts results in runoff, surface water converges into drainage lines and, eventually, if the flows are large enough, onto floodplains. Flood events must be managed according to the origins of the rainfall. Local rain and subsequent flooding will provide grazing potential different from that of flood events triggered by rainfall away from the drainage lines and in the upper reaches of the catchment.

Drainage lines and floodplains are often the focus for pest plants, camping and grazing pressure from both native and introduced herbivores. These pressures contribute to the suppressed recruitment of perennial shrubs and trees, and have negative impacts on waterhole wildlife through increased pollution and increased water use.

Practical strategies that land managers can use on drainage lines and floodplains to help retain biodiversity include:

- Grazing intensity should be dependent on the type of flooding event. Local floods resulting from local rainfall will trigger a different vegetation response to flood events from rainfall in the upper catchment.
- After heavy rains, reduce total grazing pressure to enable recruiting or emerging shrubs and trees to establish.
- Maximise vegetation cover to help slow water runoff and promote water infiltration after rains. This has other flow-on benefits including:
  - Increased vegetation cover assists water infiltration and nutrient cycling,
  - Greater infiltration of water into the soil increases plant growth and biodiversity,
  - Increased vegetation cover protects the soil from erosion and reduces sediment in runoff water,
  - Lower flows along drainage lines reduces the risk of scouring and eroding banks.
- Control feral herbivores and pest plants, in collaboration with neighbours and the SAAL NRM Board.

Conservation priority

Ecological response to water flows in the landscape

The Strzelecki Creek wetland system is identified as a wetland of national significance. It extends from the Cooper Creek in the Channel Country bioregion 200 km south to Lake Blanche, a shallow fresh water ephemeral lake connected to Lake Gregory in the north-west and Lake Callabonna in the south-east by overflow channels. This system represents an extreme example of ecological processes and adaptations within arid river systems in that it receives flows from the Cooper Creek only under extreme flood conditions.

Surface water flows are essential for many aquatic and terrestrial species to complete their lifecycles and disperse throughout the landscape. The size and duration of the water pulse through these systems determines the initiation, number and size of recruitment events and levels of dispersal. The various phases of flooding and drying allow different types of water birds to feed and breed in the area at different times. When in flood, Lake Blanche, the terminus of the Strzelecki Creek, provides significant habitat for a large number of endemic and migratory water birds.

The Strzelecki Creek wetland system is one of Australia's most important raptor breeding areas, recognised nationally and internationally for its species richness and abundance. Wetlands of the Strzelecki Creek system are rarely but periodically inundated by major flows from the Cooper Creek and localised rainfall which cause the minor drainage systems to flow. The release of Rabbit Haemorrhagic Disease (RHD) enabled significant regeneration along the Strzelecki Creek during the late 1990s. The reduction in rabbit numbers adversely impacted several raptor species, namely the Black Breasted Buzzard (*Hamirostra melanosternon*), Whistling Kite (*Haliastur sphenurus*) and Wedge-tailed Eagle (*Aquila audax*), because rabbits are their most preferred prey. Despite the importance of rabbits as prey for some raptors, rabbits contribute significantly to total grazing pressure and land degradation, which affects the density and abundance of native prey species.

Extraction and diversion of water from this system reduces the natural frequency and quantity of water these areas receive and store. Maintaining water flows is essential to conserving the unique vegetation communities and associated fauna. Conservative stocking strategies and feral animal control programs will significantly improve the resilience of these systems, enabling vegetation and fauna communities to respond better to even minor localised flows.

20-year target

Improvement of the ecological response to water flows in the Strzelecki Creek wetland system.

5-year performance information

- Breeding success and diversity of raptor species.
- Recruitment success of preferred overstorey species.

5-year actions

- Determine the ecological characteristics of the Strzelecki Creek wetland system.
- Map the area, location and persistence of the Strzelecki Creek wetland system.
- Determine the relationship between inundation frequency, prey species and raptor diversity and abundance along the Strzelecki Creek.
- Undertake an audit of infrastructure limiting, and with the potential to limit environmental flows in the Strzelecki Creek system.
- Reduce the impact of infrastructure on flows in the Strzelecki Creek system.
- Improve the ecological productivity of the Strzelecki Creek wetland system and associated fauna through the integrated management of total grazing pressure and feral carnivore predation.

Conservation priority

Threatened ecological communities on drainage lines, floodplains and swamps

Four threatened ecological communities occur on drainage lines, floodplains and swamps of the Simpson–Strzelecki Dunefields and Finke bioregions:

- Coolibah (*Eucalyptus coolabah*) and River Red Gum (*E. camaldulensis*) woodland on regularly inundated floodplains.
- Old-man Saltbush (*Atriplex nummularia* spp. *nummalaria*) on floodplains.
- Queensland Bluebush (*Chenopodium auricomum*) shrubland on cracking clay depressions subject to periodic waterlogging.
- Broughton Willow (*Acacia salicina*) and Coolibah (*Eucalyptus coolabah*) +/- Bauhinia (*Lysiphyllum gilvum*) woodland on drainage lines and floodplains.

Coolibah and River Red Gum woodland are represented in riverine environments in all bioregions of the far north of South Australia. The Old-man Saltbush and Queensland Bluebush shrubland occur in the Stony Plains and Channel Country bioregions, but are absent from the Finke, while the Broughton Willow and Coolibah woodland occurs only in the Simpson–Strzelecki Dunefields and Channel Country bioregions.

The geographic distribution of these ecological communities has not been mapped in the Simpson–Strzelecki Dunefields and Finke bioregions. However, their presence is closely linked to flooding regimes. Woodland communities occur along larger channels and are often associated on the Macumba, Warburton and Cooper Creeks with Queensland Bluebush and Old-man Saltbush shrubland in swamps. Flows are more restricted in the Macumba River and Kallakoopah and Cooper Creeks in the Simpson–Strzelecki Dunefields bioregion, which means that regionally threatened ecosystems are less well-developed than in the more consistently fed Warburton Creek.

Total grazing pressure, particularly historically, has been heavier in these more productive areas and has resulted in greater alteration of the natural environment than in the surrounding higher ground. Alterations to natural water flows have, in some areas, contributed to a reduction in habitat quality, a reduction in recruitment of native species and an altered plant community. The primary threat to these ecological communities is habitat modification associated with total grazing pressure.

20-year target

The maintenance or improvement of the viability of threatened ecological communities on drainage lines, floodplains and swamps in the Sandy Deserts.

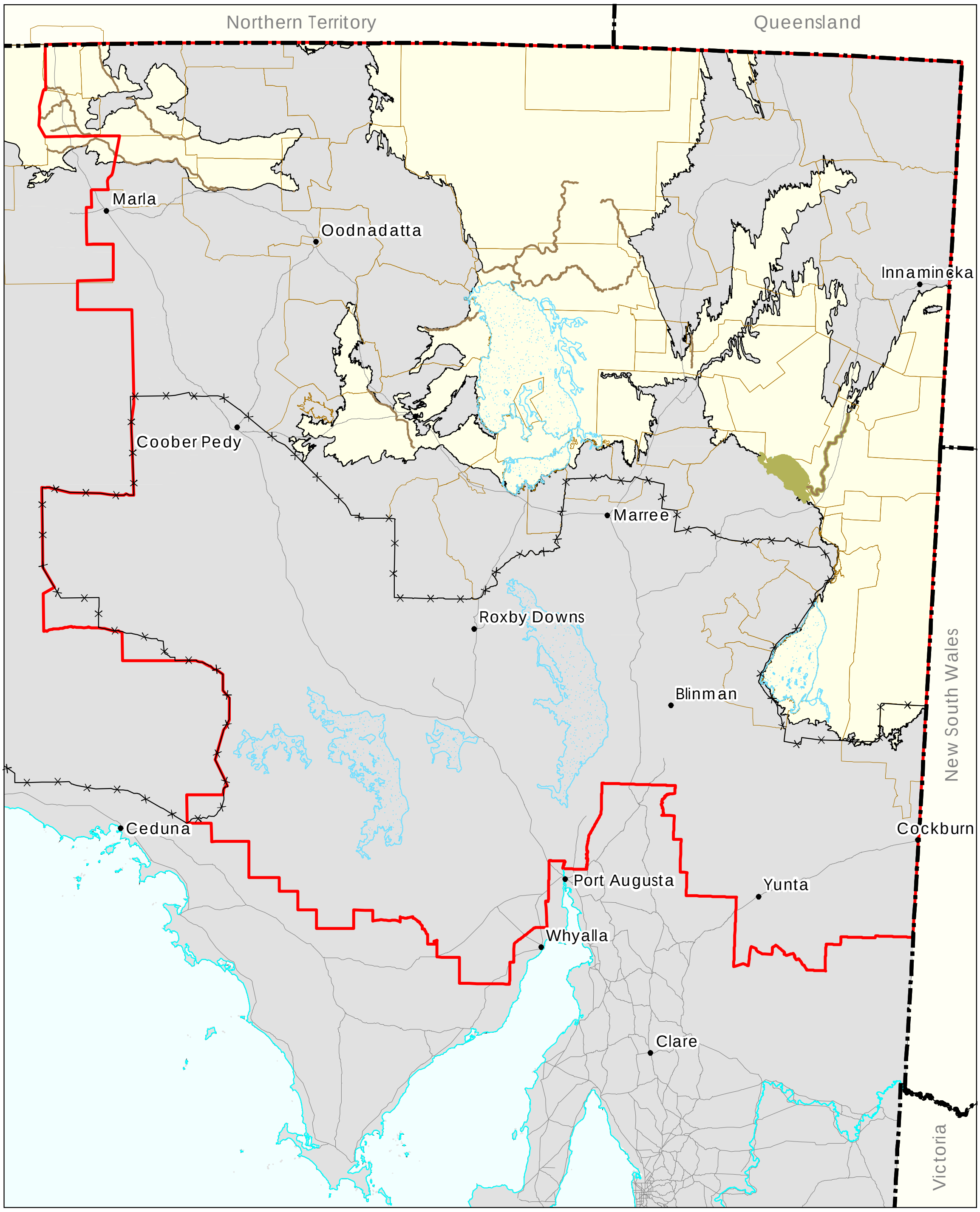
5-year performance information

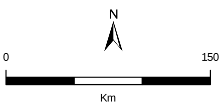
- Percentage of potential area occupied by threatened ecological communities on drainage lines, floodplains and swamps within IBRA subregions.
- Condition of individual occurrences of threatened ecological communities on drainage lines, floodplains and swamps within IBRA subregions.

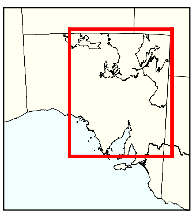
5-year actions

- Determine the current extent and condition of threatened ecological communities on drainage lines, floodplains and swamps, by IBRA subregion.
- Identify the potential area of occupancy of threatened ecological communities on drainage lines, floodplains and swamps, by IBRA subregion.
- Identify and, where possible, quantify the disruption, and sources of disruption, of key ecological processes supporting individual occurrences of threatened ecological communities on drainage lines, floodplains and swamps.
- Rank individual occurrences of threatened ecological communities on drainage lines, floodplains and swamps within IBRA subregions for viability, based on size, condition and landscape context.
- Support land managers to improve threatened ecological communities on drainage lines, floodplains and swamps.

Conservation priorities for drainage lines and floodplains







Conservation priorities

- Threatened ecological communities on drainage lines, floodplains and swamps
- Ecological response to water flows in the landscape

- Simpson-Strzelecki Dunefields and Finke Bioregions
- South Australian Arid Lands NRM Region
- Pastoral Station
- Salt Lake
- Dog Fence
- Major Road
- State Border
- Locality

Mapped conservation priorities provide an indication of the potential distribution

Salt lakes

There are two major salt lake systems in the Simpson–Strzelecki Dunefields bioregion. In the south-east is a series of interconnected salt lakes with channels, gypseous shorelines and plains, with gypsum dunes on their eastern margins, running from Lake Frome to Lake Blanche. In the central south is Lake Eyre.

The major landscape element is the salt lake beds themselves, with shores, shoreline dunes, lunettes, and saline deltas being less dominant. These lakes are unvegetated salinas with salt crusts. Vegetation is limited to the saline and gypseous shores, generally with low open perennial shrubland of Samphires (*Sclerostegia* spp./*Tecticornia* spp.) and Nitrebush (*Nitraria billardierei*). Ephemeral vegetation appears when rainfall is sufficient to leach some salt out of the surface soil and provide moisture for germination.

Fringing dunes are mobile, light-coloured gypseous sands. Where the gypsum content allows, Sandhill Wattle (*Acacia ligulata*) is present with an ephemeral understorey. Elsewhere, herbs and grasses provide temporary, sparse ephemeral cover.

Interdunes and some minor plains with more loamy soils have a sparse chenopod shrubland cover of Low Bluebush (*Maireana astrotricha*) and Bladder Saltbush (*Atriplex vesicaria*). More saline and heavier soils in interdunes may carry Samphire (*Tecticornia* spp./*Sclerostegia* spp.) and Nitrebush (*Nitraria billardierei*), while Lignum (*Muehlenbeckia florulenta*) grows in the poorly-drained run-on areas and pans with grey cracking clays.

Whilst dry, this landscape is extremely limited in its ability to provide shelter, food and nutrition for most wildlife, but when flooded, it becomes the focus for opportunistic breeding of many species and an attractive destination for a variety of migratory birds. Pelicans (*Pelecanus conspicillatus*), Silver Gulls (*Larus novaehollandiae*), Banded Stilts (*Cladorhynchus leucocephalus*) and various desert fishes are known to breed in large numbers during major flood events that can take up to three years to dry out.

Significance of salt lakes

Lake Eyre and the inland saline lakes, including Lakes Callabonna, Frome and Torrens (Gawler bioregion), are recognised as wetlands of national significance, primarily for their importance to water birds. Lake Eyre is also significant in that it is the terminus of the world's largest internal drainage basin that occupies a sixth of Australia and a third of South Australia. The salt lakes are also important for the Lake Eyre Dragon (*Ctenophorus maculosus*), which is restricted to salt lakes in the SAAL region. An ostracod crustacean, *Diacypris* sp. is also thought to be endemic to Lake Eyre. At least 36 species of water birds occupy Lake Eyre and the other inland saline lakes in vast numbers during flooding, and several species breed into huge populations.

Photo: Lake Eyre South

Major vegetation communities

Shrubland

Nitrebush (*Nitraria billardierei*) low open shrubland over Twinleafs (*Zygophyllum* spp.) and ephemeral herbs on sandy, occasionally inundated areas of low salinity.

Nitrebush (*Nitraria billardierei*) +/- Black Bluebush (*Maireana pyramidata*) low open shrubland over Bindyi (*Sclerolaena obliquicuspis*), Wards Weed (*Carrichtera annua*) and Native Spinach (*Tetragonia eremaea/tetragonoides*) on run-on areas of low salinity.

Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*) open shrubland over Samphires (*Sclerostegia* spp./*Tecticornia* spp.), Bindyi (*Sclerolaena* spp.) and grasses with emergent Nitrebush (*Nitraria billardierei)* on minor drainage lines and saline run-on areas.

Samphire (*Tecticornia indica* ssp., *Tecticornia pergranulata* ssp.) and Pop Saltbush (*Atriplex holocarpa*) low open shrubland on saline flats.

Samphire (*Tecticornia* spp./*Sclerostegia* spp.) low open shrubland on saline flats.

Herbland

White Everlasting (*Rhodanthe floribunda*) +/- Soft Billy-buttons (*Pycnosorus pleiocephalus*) +/- grasses and Bindyi (*Sclerolaena* spp.) low ephemeral herbland on slightly saline clay loam plains fringing lakes.

Prehistoric life

There are some important vertebrate fossils in river and lake sediments that have provided some insight into the evolution of the landscapes in the region.

Lake Callabonna is where the first skeletons of the large marsupial Diprotodon, extinct for 15,000 years, were discovered in the late 19th century, and have very high palaeontological significance. *Diprotodon optatum*, which evolved about a million years ago, was quite widespread throughout inland Australia prior to the last glacial peak about 18,000 years ago. Inland Australia was less arid then, and supported extensive grasslands. The last Ice Age brought increasingly dry conditions to the inland, and this may have brought on the extinction of the Diprotodon. Fossils of Diprotodon and other animals are plentiful in the dry inland lakes of South Australia, and may be evidence that the last of the Diprotodons retreated into these lakes as they dried up.

Fossils of Eucalypts dating back to the Miocene epoch, five to 23 million years ago, are preserved in silcrete at Poole Creek and Stuart Creek, south of Lake Eyre. These fossilised plants are evidence that the vegetation was quite different from today's dry sandy desert conditions. Forests with plants now found in the wet subtropical and tropical areas co-existed with Eucalypts and Casuarinas when the Lake Eyre region had plains with large meandering rivers and probably a mosaic of forest and woodland ecosystems.

Managing the biodiversity of salt lakes – practical ways that land managers can help

Salt lakes are fragile ecosystems characterised by high salinities which form at the end of closed drainage systems. All salt lakes in the South Australian arid lands contain water only episodically and have widely variable salinities. The potential biological impact of physical disturbance to dry salt lake beds is unknown, though any activity that affects the free movement of water across lakes can significantly affect their aesthetic appeal. Any activity on or around the fragile salt lake surface should be minimised or avoided. Activities that disturb native vegetation within catchments lead to increased soil erosion, and sediment loads in waters entering salt lakes. Following rainfall, run-off from overgrazed or cleared catchments may increase and has the potential to alter the natural hydrological pattern of salt lakes.

Practical strategies that land managers can use within the catchments to help retain the biodiversity and maintain these unique ecosystems, including:

- Maximise vegetation cover to help slow water runoff and promote water infiltration after rains. This has other flow-on benefits including:
  - Increased vegetation cover assists water infiltration and nutrient cycling,
  - Greater infiltration of water into the soil increases plant growth,
  - Increased vegetation cover protects the soil from erosion and reduces sediment in run-off water,
  - Lower flows along drainage lines are less likely to scour and erode banks,
- Control feral herbivores and pest plants, in collaboration with neighbours and the SAAL NRM Board.

Conservation priority

Ecological response to water flows in the landscape

The inland saline lakes in the Simpson-Strzelecki Dunefields bioregion include Lakes Frome, Callabonna and Eyre. When in flood, these saline lakes provide suitable habitat for over 40 wader species. Lake Frome receives water primarily from the Flinders Ranges, but exceptional flows in the Strzelecki Creek moving through Lakes Blanche and Callabonna may occasionally reach it. Lake Eyre receives water primarily from the Georgina and Diamantina River systems via the Warburton and Kallakoopah Creeks. Water also enters Lake Eyre from the south and west via the Macumba, Neales, Anna, Warriner, Margaret, Frome and Clayton Creeks during exceptional rainfall. During major flood events, the Cooper Creek feeds it from the east.

These lakes are highly dynamic systems that when inundated become very productive and support breeding of over ten species. Species able to take advantage of these temporary wetland conditions include the Silver Gull (*Larus novaehollandiae*), Australian Pelican (*Pelecanus conspicillatus*), Caspian Tern (*Sterna caspia*), Red-necked Avocets (*Recurvirostra novaehollandiae*), Red-capped Plover (*Charadrius ruficapillus*), and Banded Stilt (*Cladorhynchus leucocephalus*).

One of these, the Banded Stilt is endemic to Australia, and generally breeds only on inland salt lakes. Such breeding events occur irregularly and infrequently in response to rains and flooding sufficient to fill these inland lakes.

The Banded Stilt is known to have bred in South Australia only six times in the past 70 years; at Lake Callabonna in 1930, Lake Eyre North in 1984, on Stilt Island in Lake Torrens in 1989, Hughes Island in Lake Eyre North in 1997, Ibis Island in Lake Eyre North in 2000, and in 2006 Banded Stilt bred on the increasingly saline Coorong.

The most recent major water flow into Lake Eyre was in February 2000 following cyclonic rainfall in northern Australia. Water persisted in the lake long enough to facilitate four breeding episodes within six months. During these breeding events, Silver Gulls, another species that responds to available water heavily predated on Banded Stilt eggs and young ultimately causing all nesting to fail. Though Banded Stilts may live for 20 to 25 years, large scale breeding events are driven by the infrequent filling of inland lakes and so, over its lifetime, a Banded Stilt may only have the opportunity to breed two or possibly three times.

The maintenance of a healthy population of Banded Stilts is very much dependent on achieving outstanding breeding success whenever the opportunity arises. The infrequency of reproduction events means that any failed attempts to breed may significantly affect the age structure, eventually resulting in population collapse. The heavy predation by Silver Gulls represents the greatest threat to reproductive success of Banded Stilts.

20-year target

The maintenance or improvement of the success of significant breeding events on inland saline lakes.

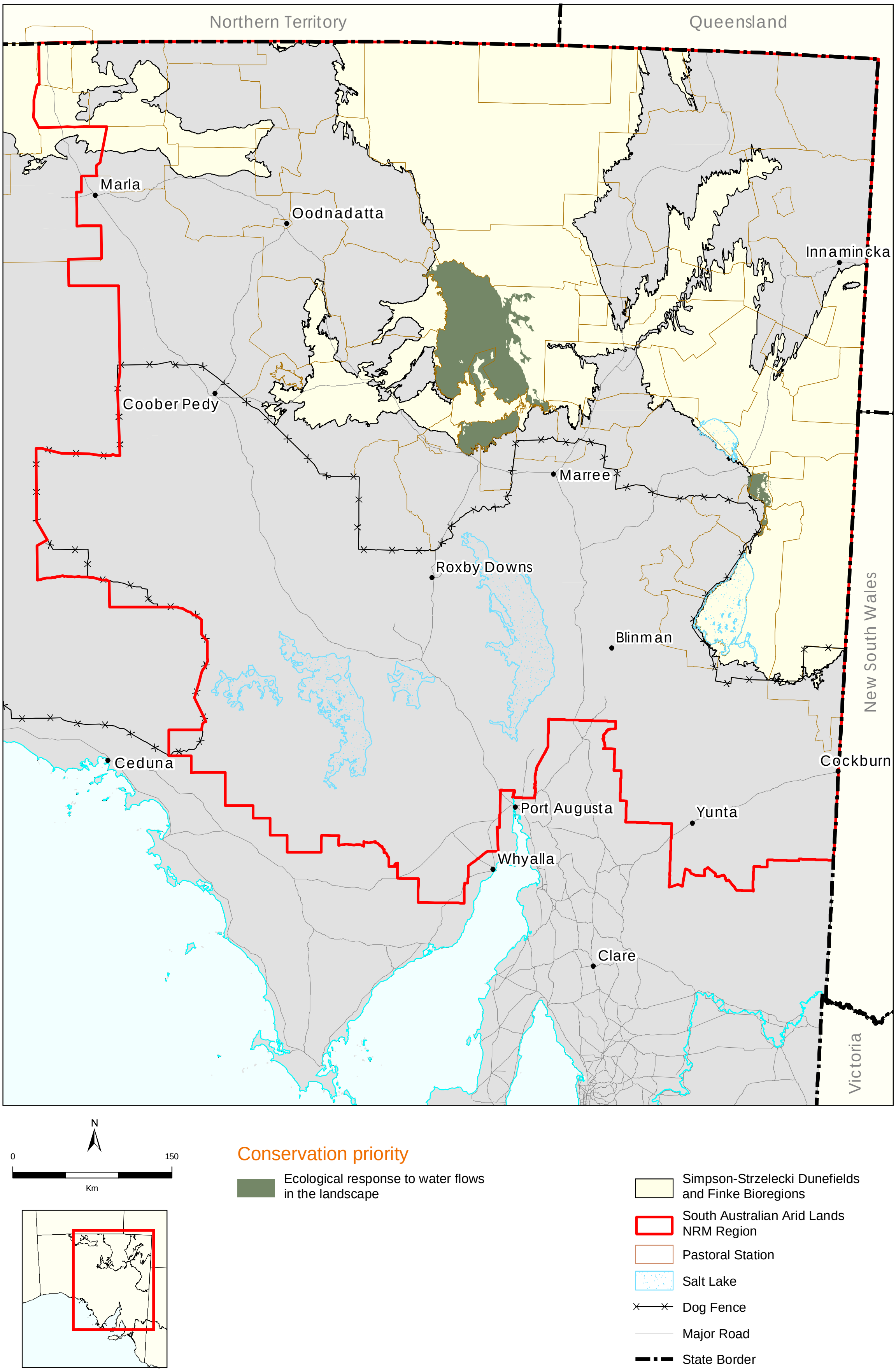
5-year performance information

- Nest abandonment of the Banded Stilt (*Cladorhynchus leucocephalus*) due to Silver Gull interaction during breeding episodes not exceeding 30%.

5-year actions

- Determine the non-breeding distribution and habitat of the Banded Stilt and evaluate relationship between breeding success and habitat occupancy.
- Identify the source populations of Silver Gulls and work with the relevant jurisdictions to implement gull management strategies.
- During breeding events, monitor interactions between breeding species and Silver Gulls and implement Silver Gull baiting program as required.
- Undertake audit of infrastructure limiting, and with the potential to limit, environmental flows into inland saline lakes.
- Reduce the impact of infrastructure on ecological flows into inland saline lakes.

Conservation priority for salt lakes



Mapped conservation priorities provide an indication of the potential distribution

Great Artesian Basin springs

The Great Artesian Basin springs (GAB springs) are high conservation value wetlands found on the margins of the Great Artesian Basin. There are approximately 1,500 springs in South Australia, ranging in size from a few square centimetres to hundreds of hectares. GAB springs have been active for over 700,000 years, and as a result, contain many examples of relict fauna from when the region was significantly wetter. Due to their isolation, these springs also contain a disproportionate number of endemic and rare flora and fauna species.

Significance of Great Artesian Basin springs

Great Artesian Basin springs are characterised by a high proportion of endemic species. Due to the total dependence on GAB water, all the organisms that live in the springs are threatened with extinction by excessive water extraction. Mechanisms for controlling the potential for reducing GAB pressure are dealt with more comprehensively in the Water Allocation Plan for the Far North Prescribed Wells Area. There are 32 known endemic species in the South Australian GAB springs, however this number is likely to increase as more taxonomic studies are undertaken.

Springs take a variety of geological forms, from large carbonate mounds to sandy seeps. Typical spring structure includes a vent (where water emerges from the ground), a tail (present only if water flow is adequate) which flows from the vent into the wetland around the base of the spring, and saline margins.

Because of their unique nature, all springs and the species they support are listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.

Major vegetation communities

Shrubland

Mixed *Acacia* spp., Native Myrtle (*Myoporum acuminatum*) tall shrubland +/- Nitrebush (*Nitraria billardierei*) +/- Pigface (*Hemichroa mesembryanthemum*) on inactive vents.

Grassland/Sedgeland

Common Reed (*Phragmites australis*) grassland or Bulrush (*Typha domingensis*) +/- Bore-drain Sedge (*Cyperus laevigatus*) +/- Pale Spike-rush (*Eleocharis pallens*) sedgeland +/- emergent Inland Paper-bark (*Melaleuca glomerata*) around active vents and on spring tails.

Bore-drain Sedge (*Cyperus laevigatus*) +/- Pale Spike-rush (*Eleocharis pallens*) +/- Salt Pipewort (Eriocaulon carsonii) or Spiny Flat-sedge (*Cyperus gymnocaulos*) mixed sedgeland around active vents.

Bore-drain Sedge (*Cyperus laevigatus*) sedgeland with occasional Cutting Grass (*Gahnia trifida*), Bare Twig-rush (Baumea juncea), Pale Spike-rush (*Eleocharis pallens*) and Samphires (*Tecticornia* spp.) on spring tails.

Cutting Grass (*Gahnia trifida*) +/- Bare Twig-rush (*Baumea juncea*) sedgeland with Bore-drain Sedge (*Cyperus laevigatus*) around active vents.

Managing the biodiversity of Great Artesian Basin springs – practical ways that land managers can help

In arid areas, water is a vital commodity for all living things. The GAB Springs are oases of naturally occurring, largely permanent wetlands in an arid landscape and are extremely important for regional biodiversity. Scientists working with GAB springs suggest that the key to managing GAB springs for biodiversity is to maintain the diversity of the vegetation within the spring group. The outflow channels and tails of the springs typically contain more significant plant and animal species than the vent itself.

Excessive grazing can result in the vegetation becoming degraded and losing diversity. Excessive grazing can also have other serious negative effects on spring ecology such as pugging, fouling and physical destruction to the spring mounds, outflow channels and tails.

There is, however, some evidence to suggest that occasional, low levels of grazing might help to improve biological diversity. In the 1990s a number of springs were fenced to exclude grazing in an attempt to protect them. Many of these became dominated by one plant, the Common Reed (*Phragmites australis*) choking out other plants and reducing habitat variability. In spring groups that are lightly grazed, the Common Reed is preferentially grazed preventing it from dominating. Weeds such as Bamboo, Date Palm and Athel Pine all have the potential to degrade spring habitat by out competing spring flora, changing the volume and direction of water flows, and altering the physical and chemical properties of spring water and surrounding soil.

Practical strategies that land managers can use on GAB Springs to help retain biodiversity include:

- Avoid using GAB springs as regular livestock watering points.
- Where GAB springs are accessible to stock, manage numbers at low levels, and graze springs irregularly and for short periods to avoid overgrazing of spring vegetation, and to reduce the impacts of pugging and damage to mounds, vents and tails.
- Do not excavate, dam or redirect spring flows.
- Control feral herbivores and pest plants in collaboration with neighbours and the SAAL NRM Board.

Photo: Dalhousie GAB Springs - Witjira NP

Conservation priority

Habitat diversity of the Lake Callabonna – Lake Frome Great Artesian Basin spring complex

Two Great Artesian Basin spring complexes occur in the Simpson–Strzelecki Dunefields bioregion. These two complexes; Lake Callabonna Springs and Lake Frome Springs have been combined into the Lake Callabonna–Lake Frome Great Artesian Basin spring complex. The spring groups in this complex are associated with salt lakes and are considered part of the Lake Frome spring super group.

Very little is known of this spring complex. Further investigation to locate all spring vents and undertake a biological inventory is high priority. By inference from better understood spring complexes, maintaining the diversity of habitats will improve the ability of dependant species to survive the environment. The major threat is reduction in Great Artesian Basin pressure leading to the extinction of springs and loss of habitat diversity. Similarly, overgrazing by feral and domestic stock, colonisation by introduced plant species, localised tourism impacts, and changed fire regimes can reduce habitat and species diversity.

20-year target

The maintenance of habitat diversity through management of the Great Artesian Basin spring complexes.

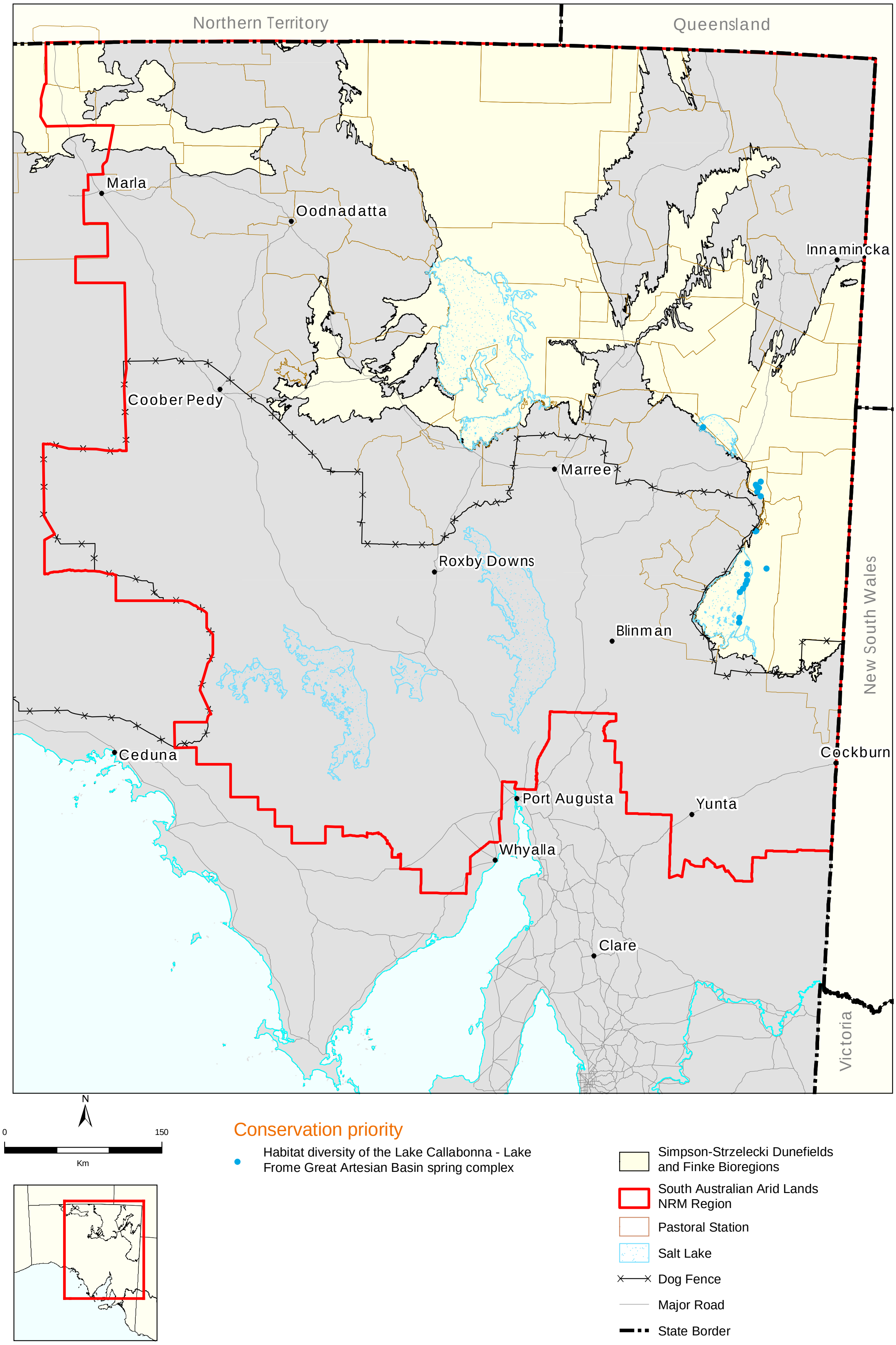
5-year performance information

- Number of Great Artesian Basin spring complexes managed for habitat diversity.

5-year actions

- Incorporate spring data into centralised data management system.
- Locate all spring vents and collect elevation data and baseline biophysical and ecological data.
- Develop risk assessment model for South Australian GAB springs in response to aquifer alterations.
- Undertake spring threat assessment and prioritisation of on-ground threat mitigation works.
- Develop strategies for protection and management of Great Artesian Basin spring complexes, in conjunction with land managers.
- Provide information and support to individuals and organisations undertaking GAB spring-related projects.

Conservation priority for the Great Artesian Basin springs



Mapped conservation priorities provide an indication of the potential distribution

Dunefields and sand plains

The major dunefields of the Simpson, Tirari and Strzelecki Deserts have an alternation of vegetation between the dunes and the interdune areas. Sandhill Wattle or Sandhill Cane-grass are the primary cover of dune crests in all three areas, and of the dune flanks in the Simpson and Tirari Deserts. In the very sparse understorey, herbs and grasses are abundant after rain. Dune flanks often support a very open tall shrubland, with Lobed Spinifex (*Triodia basedowii*) being more common on dune flanks in the Strzelecki Desert.

Further west, the sandy parts of the Finke bioregion (also comprising red parallel dunes and broad interdune corridors) are dominated by sparse Mulga (*Acacia aneura*) woodland over a variety of perennial shrubs, herbs and grasses.

Vegetation of interdune areas varies considerably and depends on the soil texture, which is determined by the dune spacing. Closely spaced dunes have a sand layer covering the underlying heavier soil, and vegetation is similar to that of the dune flanks. Where dunes are widely spaced, gibber soils or floodplain soils may be exposed, and the vegetation is similar to that found elsewhere on those soil types. All variations between these two extremes exist. In low-lying, poorly-drained areas of some interdune areas, where water stands for long periods after rain, Swamp Cane-grass (*Eragrostis australasica*) or Lignum (*Muehlenbeckia florulenta*) swamps develop.

After rain, dunefields are transformed into a colourful garden with the opportunistic germination and flowering of many plants that are dormant during the dry times. The cycles of rainfall, drought and fire bring about a constantly changing community structure and composition in response to the changing environment.

Significance of dunefields and sand plains

Although the dunes themselves do not generally support a high diversity or number of birds, the sandy deserts do have a few important species. The Eyrean Grasswren (*Amytornis goyderi*) occurs in Sandhill Cane-grass on dunes, as well as other birds characteristic of chenopod shrublands. Few exotic birds have been able to colonise these bioregions.

The endangered Dusky Hopping-mouse (*Notomys fuscus*) has been recorded in sand dunes along the Strzelecki Creek. Since the introduction of cats and foxes, many small to medium-sized mammals have become regionally extinct in the sandy deserts. They include the Pig-footed, Western Barred, Golden and Desert Bandicoots, the Lesser and Greater Stick-nest Rats, Brush-tailed and Burrowing Bettongs, the Desert Rat Kangaroo and the Bilby.

The dunefields also provide immense foraging areas for birds of prey, but few nesting places. Their proximity to major drainage lines that are able to provide this breeding habitat is critical to the survival of some species.

Major vegetation communities

Woodland

Mulga (*Acacia aneura*) low open woodland over Common Bottle washers (*Enneapogon avenaceus*), Buckbush (*Salsola tragus*) and Wild Turnip (*Brassica tournefortii*) on dunes and sandy plains.

Mulga (*Acacia aneura*) low open woodland over Sandhill Wattle (*Acacia ligulata*), Narrow-leaf Hop-bush (*Dodonaea viscosa* ssp. *angustissima*), Spiny Saltbush (*Rhagodia spinescens*), Buckbush (*Salsola targus*) and Lobed Spinifex (*Triodia basedowii*) and grasses on sandy plains and interdunes.

Mulga (*Acacia aneura*) low open woodland over Dead Finish (*Acacia tetragonophylla*), Rock Emubush (*Eremophila freelingii*), Crimson Emubush (*Eremophila latrobei*) and chenopods and grasses on sandy plains and interdunes.

Shrubland

Sandhill Wattle (*Acacia ligulata*), Elegant Wattle (*Acacia victoriae*), Gidgee (*Acacia cambagei*) +/- Narrow-leaf Hop-bush (*Dodonaea viscosa* ssp. *angustissima*) +/- Mulga (*Acacia aneura*) tall open shrubland over Cottonbush (*Maireana aphylla*), Bladder Saltbush (*Atriplex vesicaria*) and grasses and Bindyi (*Sclerolaena* spp.) on dunes.

Sandhill Wattle (*Acacia ligulata*) tall open shrubland over Wild Turnip (*Brassica tournefortii*), Buckbush (*Salsola tragus*) and Poached-egg Daisy (*Polycalymma stuartii*) and annual grasses on dunes.

Low Bluebush (*Maireana astrotricha*) +/- Black Bluebush (*Maireana pyramidata*) +/- Bladder Saltbush (*Atriplex vesicaria*) low open shrubland over Bindyi (*Sclerolaena* spp.) and grasses on swales and interdune flats.

Bladder Saltbush (*Atriplex vesicaria*), Oodnadatta Saltbush (*Atriplex nummularia* ssp. *omissa*), Low Bluebush (*Maireana astrotricha*), Black Bluebush (*Maireana pyramidata*), Spiny Saltbush (*Rhagodia spinescens*) low open shrubland over Bindyi (*Sclerolaena* spp.) and grasses on swales and interdune flats.

Cottonbush (*Maireana aphylla*) +/- Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*) +/- Bladder Saltbush (*Atriplex vesicaria*) low open shrubland over grasses and Bindyi (*Sclerolaena* spp.) on poorly-drained run-on areas.

Bindyi (*Sclerolaena divaricata*), Desert Spinach (*Tetragonia eremaea*) very low open shrubland on swales and interdune flats.

Grassland

Sandhill Cane-grass (*Zygochloa paradoxa*), Desert Rattlepod (*Crotalaria eremaea*) +/- Spiny Saltbush (*Rhagodia spinescens*), +/- Lobed Spinifex (*Triodia basedowii*) tall open grassland with emergent Sandhill Wattle (*Acacia ligulata*) over Poached-egg Daisy (*Polycalymma stuartii*) and grasses on dunes.

Swamp Cane-grass (*Eragrostis australasica*) +/- Lignum (*Muehlenbeckia florulenta*) tall grassland over annual Saltbushes (*Atriplex* spp.) and grasses and Bindyi (*Sclerolaena* spp.) in interdune swamps.

Photo: Sandhill Cane-grass *Zygochloa paradoxa*

Managing the biodiversity of dunefields and sand plains – practical ways that land managers can help

Strategies for managing the biodiversity of the dunefields and sand plains focus largely on total grazing pressure management. Sandy areas are prone to wind erosion and once an area begins to drift the process of re-stabilisation can take considerable time.

Recruitment of palatable perennial plants requires a series of rainfall events at just the right time to allow for germination, seedling establishment, flowering and seed set. These recruitment events occur very infrequently – for many species only once every 30 to 50 years. It is critical to carefully manage grazing pressure on dunefields and sand plains following these events to maximise the likelihood of successful recruitment of perennial plants. The various types of vegetation found in the dunefields and sand plains also provide valuable habitat for a wide range of native animals. Grazing pressure and potential weed infestations are a significant risk to these habitats.

Practical strategies that land managers can use on dunefields and sand plains to help retain biodiversity include:

- Spelling of dune systems in dry times and not restocking immediately following a rainfall event is important to promote the recovery of dune stabilisers such as Sandhill Cane-grass and other perennial grasses.
- Many swales with Queensland Bluebush and Cottonbush swamps also require spelling following prolonged dry periods. Rainfall that fills these swamps promotes recovery and recruitment in these habitats.
- Avoid locating livestock watering points on or near areas that might be prone to drifting such as dune crests. Wide open swales are preferable sites for water points to minimise livestock traffic across dunes and encourage their movement of livestock along the swales.
- Use conservative stocking strategies as part of general management of these areas.
- Regular spelling of these systems following major rainfall events.
- Control feral herbivores and pest plants in collaboration with neighbours and the SAAL NRM Board.

Photo: Sandhill Wattle *Acacia ligulata*,

Conservation priority

Dusky Hopping-mouse in the Strzelecki Desert

The Dusky Hopping-mouse (*Notomys fuscus*) is restricted to the Strzelecki Desert subregion in the Simpson–Strzelecki Dunefields. Although once widespread in sandy areas, this species' range is now patchy in degraded dune and sand plains in the south-eastern Strzelecki Desert. This species has also been recorded from isolated dunes south-east of the Diamantina River in Queensland, and in the Strzelecki Desert in New South Wales. An eight-year study at Montecollina Bore, identified resource limitation as a major regulator of population size. Historical evidence suggests that removal of Sandhill Cane-grass (*Zygochloa paradoxa*) by rabbits and stock and its replacement with short-lived perennial plants has contributed to population decline. There may also be competition with rabbits and mice, the latter being able to respond more quickly to improved food availability than the Dusky Hopping-mouse. Despite this, the Dusky Hopping-mouse has been observed recolonising sites. Further survey effort is required to identify and map suitable areas of habitat and better understand its ecology.

20-year target

The maintenance or improvement of the viability of the Dusky Hopping-mouse in the Strzelecki Desert.

5-year performance information

- Percentage of potential habitat occupied by the Dusky Hopping-mouse in the Strzelecki Desert.
- Number and viability of populations of the Dusky Hopping-mouse in the Strzelecki Desert.

5-year actions

- Determine area of occupancy and relationship between habitat and distribution and abundance of the Dusky Hopping-mouse in the Strzelecki Desert.
- Identify and where possible, quantify the disruption and sources of disruption of key ecological processes supporting individual populations of the Dusky Hopping-mouse in the Strzelecki Desert.
- Identify potential habitats within the Strzelecki Desert for the Dusky Hopping-mouse.
- Rank populations of the Dusky Hopping-mouse within IBRA subregions for viability, based on size, threats and landscape context.
- Support land managers to improve the viability of the Dusky Hopping-mouse in controlling feral animals and overabundant native herbivores, and promoting appropriate grazing practices.

Conservation priority

Marsupial Mole in the Simpson Desert and Finke bioregions

The Marsupial Mole (*Notoryctes typhlops*) is a burrowing mammal that lives underground in sand dunes, interdunal flats and sandy soils on river flats often associated with Spinifex (*Triodia* spp.). Marsupial Moles come to the surface only occasionally, usually following rain. Occurring across the sandy deserts of central Western Australia, south-western Northern Territory and western South Australia, this species has been recorded only in the Gawler, Finke and Simpson–Strzelecki Dunefields bioregions in the SAAL region. In the Simpson–Strzelecki Dunefields bioregion, it has been recorded only in the Simpson Desert subregion. Very little is known of this species. Its ecology, distribution and any threatening processes are poorly understood. Increasing our understanding of the distribution and ecology of this cryptic mammal is a high priority.

20-year target

The maintenance or improvement of the viability of the Marsupial Mole in the Simpson Desert and Finke bioregions.

5-year performance information

- Percentage of potential habitat occupied by the Marsupial Mole in the Simpson Desert and Finke bioregions.
- Number and viability of populations of the Marsupial Mole in the Simpson Desert and Finke bioregions.

5-year actions

- Determine area of occupancy and relationship between habitat and distribution and abundance of the Marsupial Mole in the Simpson Desert and Finke bioregions.
- Identify and where possible, quantify the disruption and sources of disruption of key ecological processes supporting individual populations of the Marsupial Mole in the Simpson Desert and Finke bioregions.
- Review the status of the Marsupial Mole in the Simpson Desert and Finke bioregions against International Union for the Conservation of Nature threatened species criteria.

Photo: Marsupial Mole *Notoryctes typhlops* (H. Ehmann)

Conservation priority

Threatened ecological communities on low dunes and sand plains

Mulga (*Acacia aneura*) low woodland and Needle Wattle (*Acacia carneorum*) low woodland occur on low dunes and sand plains in the southern margins of the Strzelecki Desert subregion. Mulga low woodland also occurs in the Tingana landsystem at the northern extremity of the Strzelecki Desert subregion and on the few areas of sand plains in the Flinders and Olary, Broken Hill Complex, Channel Country, Stony Plains and Finke bioregions. In the Finke bioregion, this community is not considered to be threatened.

The distribution of Needle Wattle low woodland is mainly in the Broken Hill Complex bioregion, with isolated populations in the Olary Spur subregion of the Flinders Lofty Block bioregion, and in New South Wales between Broken Hill and Menindee and north towards Tibooburra. Needle Wattle is nationally vulnerable, and grows primarily on sandy plains or on alluvial soils near watercourses. It reproduces mainly from suckers and grows in colonies of up to a few hundred plants.

Both ecological communities are primarily threatened by inhibited regeneration due to excessive total grazing pressure. Whilst cattle are known to graze mature Mulga, rabbits are the most significant factor as they favour sandy country. Rabbits burrowing in these communities can cause increased soil erosion that may be exacerbated by stock if close to watering points. Anecdotal evidence suggests that the reduction in rabbit numbers from RHD has allowed increased recruitment in these ecological communities. Even though rabbit impact has been less in recent years, much of the Mulga is being severely affected by prolonged dry weather. The long-term effects of both rabbits and drought are not well understood.

20-year target

The maintenance or improvement of the viability of Mulga and Needle Wattle low woodlands on low dunes and sand plains in the Strzelecki Desert.

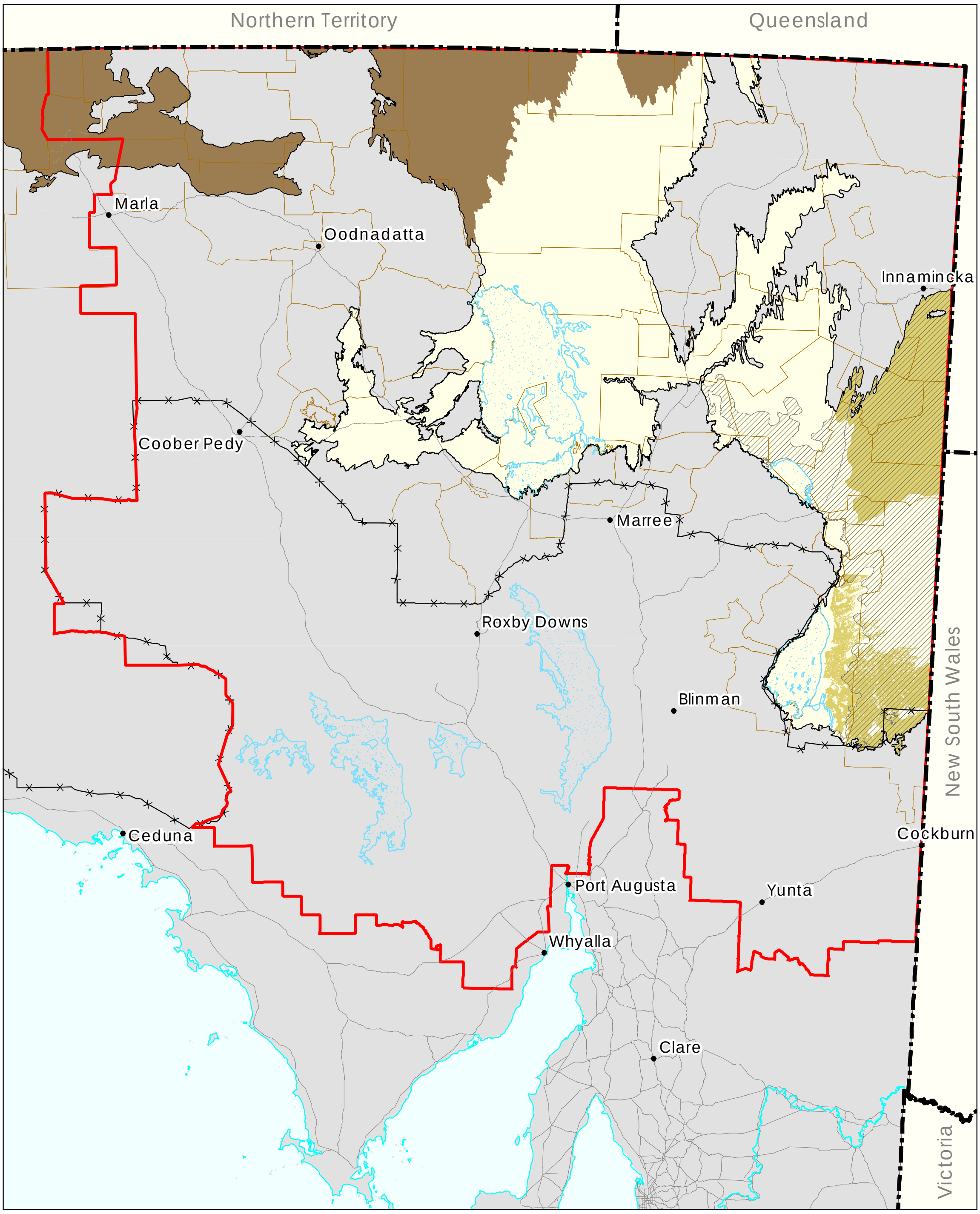
5-year performance information

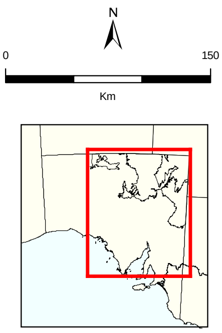
- Percentage of potential area occupied by Mulga and Needle Wattle low woodlands on low dunes and sand plains within IBRA subregions.
- Condition of individual occurrences of Mulga and Needle Wattle low woodlands on low dunes and sand plains within IBRA subregions.

5-year actions

- Determine the current extent and condition of Mulga and Needle Wattle low woodlands on low dunes and sand plains in the Strzelecki Desert.
- Identify the potential area of occupancy of Mulga and Needle Wattle low woodlands on low dunes and sand plains in the Strzelecki Desert.
- Identify and where possible, quantify the disruption and sources of disruption of key ecological processes supporting individual occurrences of Mulga and Needle Wattle low woodlands on low dunes and sand plains.
- Rank individual occurrences of Mulga and Needle Wattle low woodlands on low dunes and sand plains within IBRA subregions for viability, based on size, condition and landscape context.
- Support land managers to improve Mulga and Needle Wattle low woodlands on low dunes and sand plains.

Conservation priorities for dunefields and sand plains





Conservation priorities

- Dusky Hopping-mouse in the Strzelecki Desert
- Threatened ecological communities on low dunes and sand plains
- Marsupial Mole in the Simpson Desert and the Finke bioregions
- Simpson Strzelecki Dunefields and Finke bioregions
- South Australian Arid Lands NRM Region
- Pastoral Station
- Salt Lake
- Dog Fence
- Major Road
- State Border
- Locality

Mapped conservation priorities provide an indication of the potential distribution

Monitoring and evaluation

The Sandy Deserts Conservation Priorities aim to facilitate conservation actions across both the Simpson-Strzelecki Dunefields and Finke bioregions. The SAAL NRM Board and support partners will coordinate and support the delivery of these actions, guided by statutory mechanisms. The SAAL NRM Board will monitor and report on the implementation of the Sandy Deserts Conservation Priorities.

Both the SAAL NRM Board and the Department for Environment and Heritage are jointly responsible for evaluating the effectiveness of this, which contributes to the SAAL NRM Plan and *No Species Loss – A Nature Conservation Strategy for South Australia.*

DEH will produce a public report on overall progress towards the conservation priorities as part of the five year review and evaluation of the South Australian Arid Lands Biodiversity Strategy in 2014.

Monitoring and reporting information

Landform	Priority	Targets	Performance information
Drainage lines and floodplains	Ecological response to water flows in the landscape	Improvement of the ecological response to water flows within the Strzelecki Creek wetland system	• Breeding success and diversity of raptor species. • Recruitment success of preferred overstorey species.
	Threatened ecological communities on drainage lines, floodplains and swamps	The maintenance or improvement of the viability of threatened ecological communities on drainage lines, floodplains and swamps within the Sandy Deserts	• Percentage of potential area occupied by threatened ecological communities on drainage lines, floodplains and swamps within IBRA subregions. • Condition of individual occurrences of threatened ecological communities on drainage lines, floodplains and swamps within IBRA subregions.
Salt lakes	Ecological response to water flows in the landscape	The maintenance or improvement of the success of significant breeding events on inland saline lakes	• Nest abandonment of the Banded Stilt (*Cladorhynchus leucocephalus*) due to Silver Gull interaction during breeding episodes not exceeding 30%.
Great Artesian Basin springs	Habitat diversity of the Lake Callabonna–Lake Frome Great Artesian Basin spring complex	The maintenance of habitat diversity through management of the Great Artesian Basin spring complexes	• Number of Great Artesian Basin spring complexes managed for habitat diversity.

Landform	Priority	Targets	Performance information
Dunefields and sand plains	Dusky Hopping-mouse in the Strzelecki Desert	The maintenance or improvement of the viability of the Dusky Hopping-mouse in the Strzelecki Desert	• Percentage of potential habitat occupied by the Dusky Hopping-mouse in the Strzelecki Desert. • Number and viability of populations of the Dusky Hopping-mouse in the Strzelecki Desert.
	Marsupial Mole in the Simpson Desert and Finke bioregions	The maintenance or improvement of the viability of the Marsupial Mole in the Simpson Desert and Finke bioregions	• Percentage of potential habitat occupied by the Marsupial Mole in the Simpson Desert and Finke bioregions. • Number and viability of populations of the Marsupial Mole in the Simpson Desert and Finke bioregions.
	Threatened ecological communities on low dunes and sand plains	The maintenance or improvement of the viability of Mulga and Needle Wattle low woodlands on low dunes and sand plains within the Strzelecki Desert	• Percentage of potential area occupied by Mulga and Needle Wattle low woodlands on low dunes and sand plains within IBRA subregions. • Condition of individual occurrences of Mulga and Needle Wattle low woodlands on low dunes and sand plains within IBRA subregions.

Glossary

Alluvial Plain: An extensive stream-laid deposit that may include gravel, sand, silt and clay; typically forming floodplains that develop alluvial soils. The alluvial deposit of a stream generated from a gorge upon a plain or of a tributary stream at its junction with the main stream.

Arid: Refers to climates or regions that lack sufficient crop production or extensive sown pastures. Usually defined as a climate with annual average rainfall less than 250 mm (10 inches).

Biodiversity: The variety of life forms: the different plants, animals and micro-organisms; the genes they contain; and the ecosystems they form.

Bioregion: Extensive (continental scale) regions distinguished from adjacent regions by their broad physical and biological characteristics.

Conservation: The protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment.

Decreaser Species: A species that decreases in abundance in areas of high grazing pressure, generally in proximity to water.

Degradation: Degradation of land is the decline in the quality of the natural resources of the land resulting from human activities.

Dispersal: The movement of organisms between locations, especially relating to the movement from birth site or breeding sites.

Ecological Community: A characteristic suite of interacting species adapted to particular conditions of soil, topography, water availability and climate.

Ecological Processes: Dynamic interactions that occur among and between biotic (living) and abiotic (non-living) components of the environment.

Ecosystem: A dynamic complex of plant, animal, fungal and micro-organism communities and the associated non-living environment interacting as an ecological unit.

Endemic: Exclusively native to a specified region or site.

Feral: A domesticated species that has escaped the ownership, management and control of people and is living and reproducing in the wild.

Fire Regime: The intensity, frequency and extent of fire.

Gene: The functional unit of heredity; the part of the DNA molecule that encodes a single enzyme or structural protein unit.

Genetic Diversity: The variability in the genetic makeup among individuals and populations within a single species.

Gilgai: A natural soil formation occurring extensively in inland Australia, characterised by a an undulating surface sometimes with mounds or depressions caused by the swelling and cracking of clays during alternating wet and dry seasons.

Gypsum: Mineral consisting of hydrated Calcium Sulphate.

Habitat Diversity: The number of different types of habitats within a given area.

Habitat: The physical place or type of site where an organism, species or population naturally occurs together with the characteristics and conditions, which render it suitable to meet the lifecycle, needs of that organism, species or population.

IBRA bioregion: Interim Biogeographic Regionalisation for Australia regions.

IBRA subregion: A subdivision of a bioregion based on broad physical and biological characteristics; a system of related and interconnected landsystems within an IBRA region.

Increaser Species: A species that increases in abundance in areas of high grazing pressure, generally in proximity to water.

Indicator: A measure against which some aspects of performance can be assessed.

Invasive Species: Any animal pest, plant or disease that can adversely affect native species and ecosystems.

Inselberg: An isolated rock hill, knob, or small mountain that rises abruptly from a gently sloping or virtually level surrounding plain.

Landform: Any of the numerous features that make up the surface of the earth, such as plain, plateau and canyon.

Landscape: A heterogeneous area of land or sea that is of sufficient size to achieve positive results in the recovery of species or ecological communities, or in the protection and enhancement of ecological and evolutionary processes.

Landsystem: A group of local ecological communities derived from a landscape pattern of related and interconnected local ecosystems within a subregion.

Native Species: A plant or animal species that occurs naturally in South Australia.

Protected Area: An area of land and/or sea specifically dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Refuge: A region, or habitat, where organisms are able to persist during a period in which most of the original geographic range becomes uninhabitable.

Remnant: Areas (generally small) of native plant communities that are found in otherwise cleared landscapes.

Restoration: Assisting the recovery of ecological systems to a state in which the viability of species and ecological communities, and ecosystem function, are improved.

Riparian: on, or relating to the banks of a natural course of water.

Runoff: The portion of precipitation not absorbed into or detained upon the soil and which becomes surface flow.

Semi-arid: Refers to climates or regions with insufficient rainfall for regular crop production. Usually defined as a climate with annual rainfall between 250 mm and 375 mm.

Silcrete: A hard resistant crust formed when silica is dissolved and resolidifies as a cement, often forming the resistant cap rock on features like breakaways.

Species Diversity: Variability (richness and abundance) of biota in an area. An index of community diversity that takes into account both species richness and the relative abundance of species.

Species: A group of organisms capable of interbreeding with each other but not with members of other species.

Subspecies: Distinct geographical ranges of interbreeding natural populations of species that are reproductively isolated and possess distinguishing characteristics from other populations of the same species.

Sustainable Use: The use of components of biological diversity in a way and at a rate that does not lead to the long term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Sustainable: The use of resources or components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Tableland: An elevated and generally level region of considerable extent.

Terrestrial: Land-based biodiversity including inland aquatic ecosystems such as rivers, streams, lakes, wetlands, springs, groundwater and groundwater dependent ecosystems, and the native inland aquatic species in these areas.

Threat Abatement: Eliminating or reducing a threat.

Threatened Species or Ecological Communities: A species or ecological community that is vulnerable or endangered.

Threatening Processes: The dominant limiting factors and constraints to the ongoing conservation of biodiversity.

Vegetation Association: A stable plant community of definite composition presenting a uniform appearance and growing in more or less uniform habitat conditions.

Viability: The likelihood of long-term survival of the example/population of a particular ecosystem or species.

Abbreviations

DEH	South Australian Department for Environment and Heritage
DWLBC	South Australian Department for Water Land and Biodiversity Conservation
EPBC	Environment Protection and Biodiversity Conservation Act 1999
ESD	Ecologically Sustainable Development
GAB	Great Artesian Basin
IBRA	Interim Biogeographic Regionalisation of Australia
NPW	National Parks and Wildlife
NRM	Natural Resources Management
PIRSA	Primary Industries and Resources South Australia
SAAL	South Australian Arid Lands

Further reading

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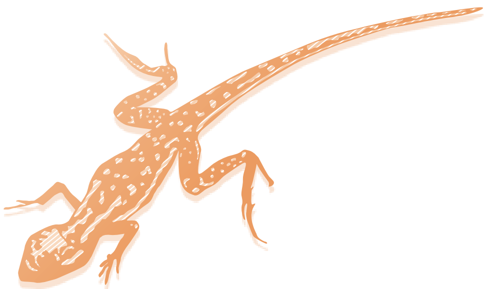

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South Australian Arid Lands NRM Board,
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