6
Volume

South Australian Arid Lands Biodiversity Strategy

Volume 6 Stony Plains 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: Breakaways - Arckaring 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 region 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 in 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 – Stony Plains 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 Stony Plains bioregion. The Stony Plains bioregion stretches south east from the Northern Territory border, through Oodnadatta and Coober Pedy and across to Maree. Lake Frome is the eastern boundary.

Photo: *Goodenia chambersii*

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:
Stony Plains IBRA – Arid stony silcrete tablelands (breakaways) and gibber and gypsum plains crossed by large river floodplains with sparse low chenopod shrublands on duplex soils and calcareous earths.

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:
Oodnadatta IBRA subregion – Undulating plains with some gypsum crusting, low hills with silcrete gibbers and low gypcrete escarpments.

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:
Oodnadatta landsystem– Gently undulating gypcrete plain and wide floodplains with anastomosing channels with low shrubland and low fringing woodland.

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:
Eucalyptus coolabah low woodland along watercourses.

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 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 Stony Plains bioregion 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

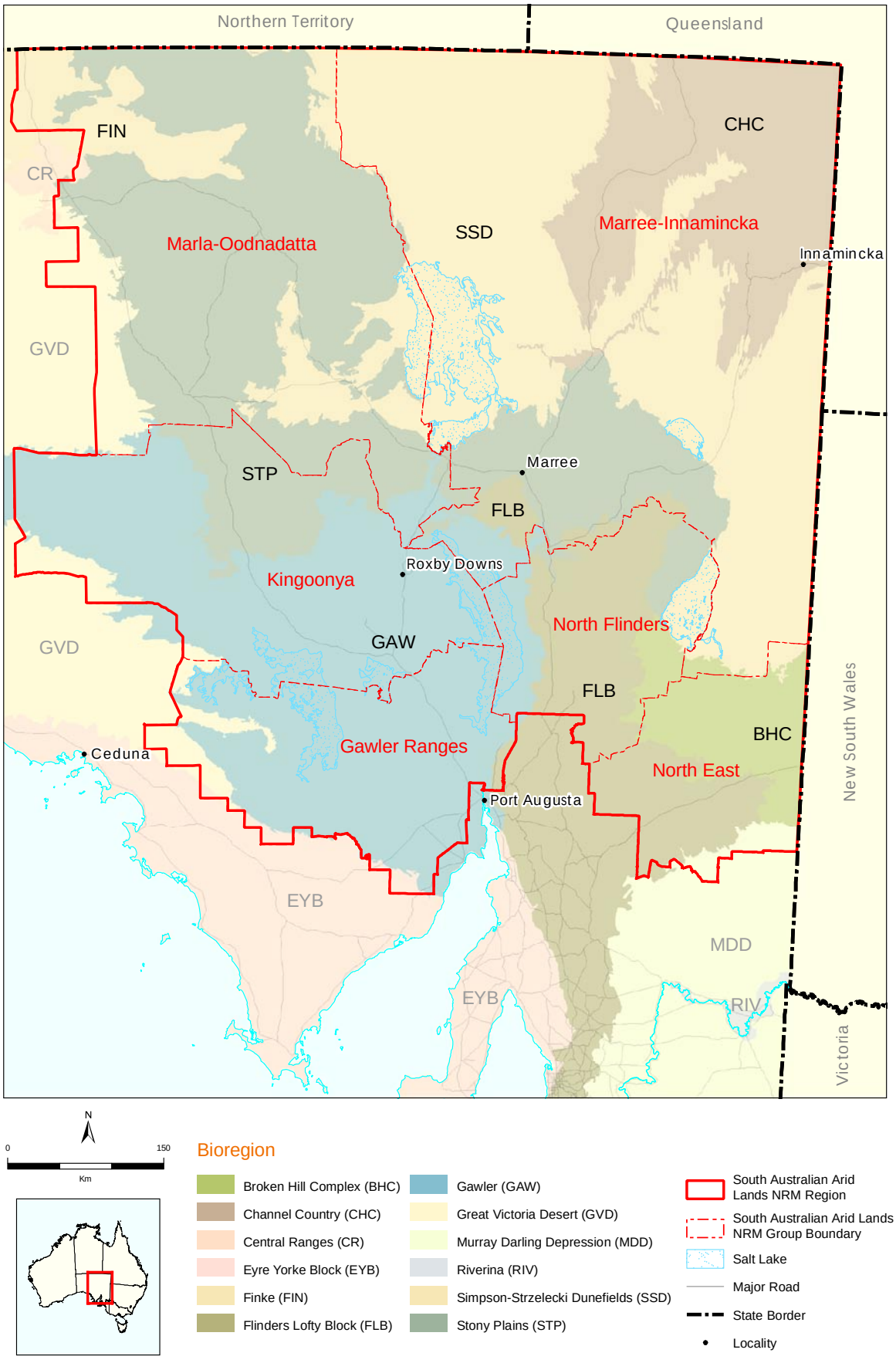
The strategy also has two main uses for biologists, ecologists, NRM support staff and others involved in biodiversity conservation and NRM projects and programs.

1. It provides a set of priorities for biodiversity conservation in the Stony Plains bioregion. 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 Stony Plains, 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

STONY PLAINS DESCRIPTION

IBRA subregions

Major landforms

Major land uses

Threats to biodiversity

Photo: Hermit Hill GAB Springs (T. Gotch, DWLBC)

Stony Plains description

Covering an area of 129,240 km^2 of South Australia, the Stony Plains bioregion represents 24.8% of the South Australian Arid Lands and 13.2% of the state.*

The dominant feature is the vast gently undulating gibber and gypsum plains which seem to stretch forever. Gibber plains, or as the locals say the "hard country", are areas covered in small polished rocks called gibbers. These are polished fragments of the original crusts that capped the plain some 65 million years ago. Fine abrasive material has swept past, wearing them down and rounding them off. Today they protect the underlying soil from wind and water erosion. Saltbush, Bluebush, Samphire, Mitchell Grass or the short-lived Bindyi, Thyme Sea-heath and Bonefruit dominate these plains which are dotted with occasional lakes, claypans, some low hills and the floodplains of ephemeral watercourses that drain toward Lake Eyre.

Where dunefields, swales and sand plains overlay the gibber surface, Sandhill Cane-grass grasslands dominate although areas containing Mulga, Sandhill Wattle, Umbrella Bush, Nitrebush, Sturt's Pigface and Bladder Saltbush are also common. Sandhill Cane-grass is very drought-resistant and a valuable dune stabiliser. In dry times the above-ground parts die right back taking on a blue-grey hue. They become dormant and can remain so for years while the root system survives underground.

The breakaways and stony hills are a unique habitat supporting a number of endemic species such as the Arckaringa Daisy, Barkers Mulla Mulla, Pebble and Ochre Dragons and Bronzeback Legless Lizard that are restricted to or rely heavily upon these areas. In addition to the shrubs found on the plains, Mulga, Emubushes, Wattle and occasionally Silver Needlewood are found in these rocky areas.

Salt pans are usually bare and salt-crusted but often have a halo of tussock grassland or samphire. Samphires, salt-loving succulent shrubs, are widespread across the region. They vary in colour from a rust-pink to green. Claypans fill with water following rains, providing fresh water and good habitat for Swamp Cane-grass, very hardy grass that survives long periods of dry conditions as well as long periods of standing water. Dense stands over large areas provide protection and habitat for many water birds.

Drainage channels in the upper catchment tend to have a denser version of the vegetation of the surrounding hills and breakaways. Gidgee is one of the larger trees lining watercourses in the north, with Coolibah dominant in wetter areas and waterholes. Downstream in floodplains and swamps, Old-man Saltbush, Lignum, Cottonbush and Cane-grass dominate. Occasionally the floodplains and channels have permanent waterholes which attract waterbirds, raptors,

* 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 7 is released in 2009. Monitoring and evaluation on the Stony Plains bioregion will be consistent with national guidelines and fit the national monitoring and evaluation framework.

Photo: Waterhole, Arckaringa Station

pardalotes and honeyeaters. These permanent waterholes are extremely important for protecting remnant populations and providing refuges where animals can survive droughts and from which they can disperse to colonise new areas when environmental conditions allow.

Regionally unique are the numerous artesian springs that flow from weaknesses in the earth's crust along the margin of the Great Artesian Basin (GAB). The pressurised subterranean water percolates up from considerable depth through cracks and fissures and forms permanent wetlands, some with substantial mounds built up of calcareous deposits over many thousands of years.

The Dalhousie Springs complex, protected within Witjira National Park consists of eight active spring groups, representing some of the largest and finest examples of artesian springs in Australia. These springs range in size and composition, the largest pool being 50 metres long and 10 metres deep. The Dalhousie Springs group is home to at least 10 species of snail, 90 different plants and three endemic fishes.

A characteristic feature of this region is the high proportion of ephemeral or short-lived plant species. A few weeks after soaking rain, the region becomes a sea of colourful ephemeral plants which germinate, flower, seed and die within a few weeks. The diversity of habitats in this bioregion is reflected in the abundance of reptiles, with over 100 species recorded.

Native mammals are uncommon, many small and medium-sized mammals having become extinct since European settlement. Dingoes and kangaroos are however quite common, along with the introduced rabbits, feral cats, donkeys, camels and horses.

Photo: Pebble Dragon *Tympanocryptis cephalus*

IBRA Subregions

Seven IBRA subregions occur within the Stony Plains bioregion. Detailed descriptions of the landsystems of the Stony Plains can be found in the District Plans published by the Marla-Oodnadatta, Marree, North Flinders, and Kingoonya Soil Conservation Boards.

Stony Plains bioregion

Breakaways (STP1)

Dissected silcrete tableland and mesas, and extensive gibber covered footslopes on deeply weathered shales.

Total Area: 24,147 km^2.
Landsystems: Breakaway; Buckshot; Coongra; Glendambo; Lookout; Mailgate; Mt Willoughby and Mudla.

Oodnadatta (STP2)

Undulating plains with some gypsum crusting, low hills with silcrete gibbers and low gypcrete escarpments.

Total Area: 25,928 km^2.
Landsystems: Baltana; Koonchera; Oodnadatta and Paisley.

Murnpeowie (STP3):

A gently undulating gypcrete plain with entrenched drainage, low escarpments and silcrete tablelands. Dunes, occasional lakes and floodplains are found in the centre of the subregion, with a gently sloping gibber plain to the west.

Total Area: 29,014 km^2.
Landsystems: Cooryaninna; Flint; Fome; Kalatinka; Kopi; Mumpie; Oodnadatta; Paradise and Wirringina.

Peake-Dennison Inlier (STP4)

Hills and low ridges on metasediments, and small areas of undulating plain.

Total Area: 1,585 km^2.
Landsystem: Margaret.

Macumba (STP5)

Broad floodplain in the north east, with connecting channels, partly overlain by dunes, and an undulating gibber plain in the south west with dunes, numerous claypans, wide floodplains and some low hills.

Total Area: 6,948 km^2.
Landsystems: Macumba; Simpson and Woolridge.

Witjira (STP6)

Extensive undulating silcrete gibber tablelands with entrenched drainage, escarpments and undulating stony plains. Includes small areas of sand plains, dunes, claypans and GAB springs.

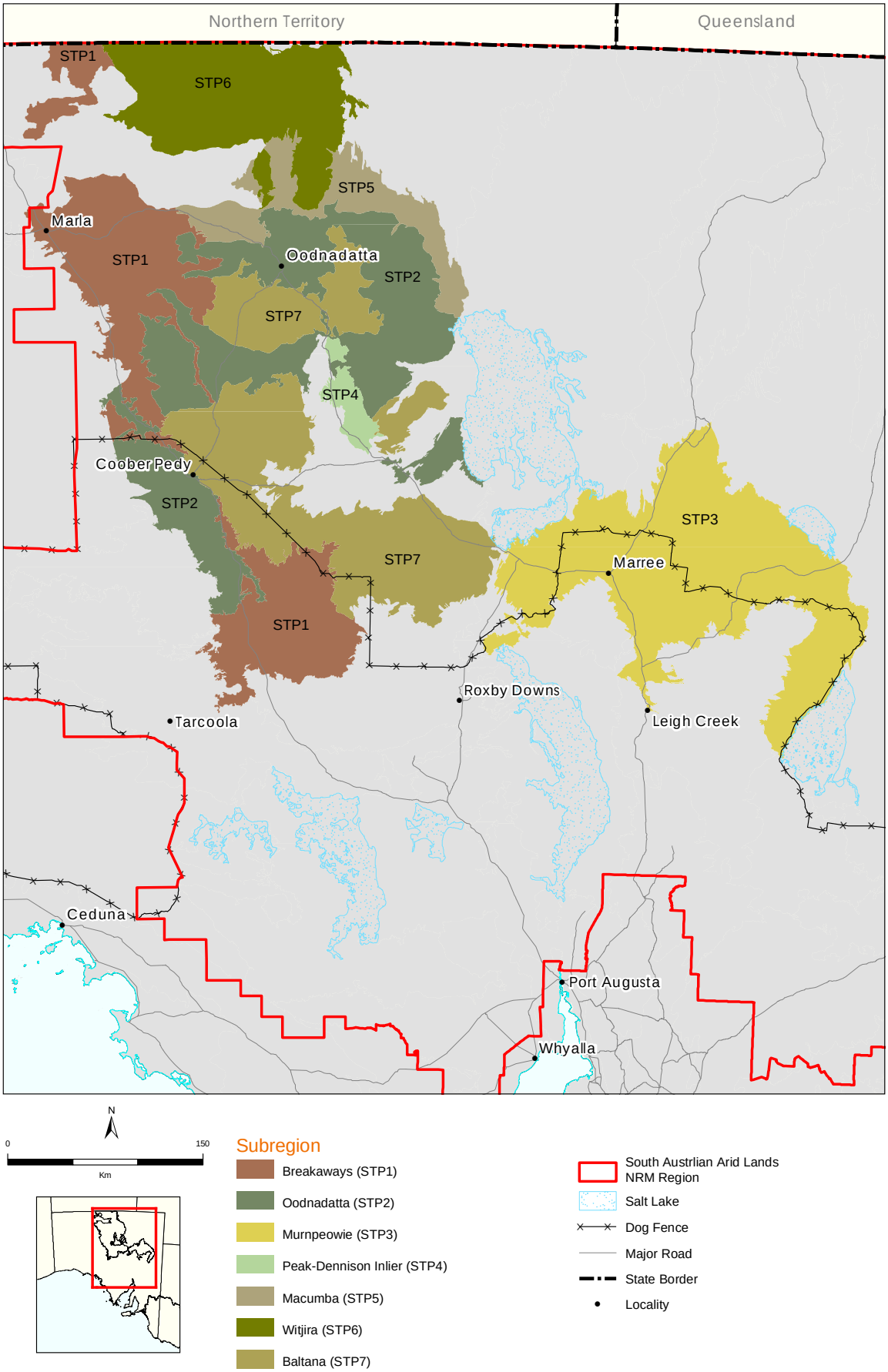
Total Area: 15,044 km^2.
Landsystems: Bagot; Coongra; Crispe; Dalhousie; Federal; Finke; Koonchera and Oodnadatta.

Baltana (STP7)

Silcrete gibber flats, undulating plains and extensive areas of self-mulching clay loams with exposed gypsum.

Total Area: 26,843 km^2.
Landsystems: Baltana; Christie; Coongra; Emu; Margaret; Moon Plain; Oodnadatta; Roxby and Wattiwarriganna.

Stony Plains – IBRA subregions



Major landforms

There are five major landforms in the Stony Plains.

Drainage lines and floodplains

Ephemeral watercourses draining towards Lake Eyre, in places forming major drainage systems featuring broad floodplains.
Subregions: STP1; STP2; STP3; STP4; STP5; STP6 and STP7.

Stony plains and tablelands

Gently sloping gibber plains with a cobble-sized stone cover to gibber pavements characterised by a dense cover of small pebbles.
Subregions: STP1; STP2; STP3; STP4; STP5; STP6 and STP7.

Great Artesian Basin springs

High conservation value wetlands found on the margins of the Great Artesian Basin.
Subregions: STP2; STP3; STP4; STP6 and STP7.

Dunefields and sand plains

Overlaying the gibber surface or surrounding rocky outcrops or hills.
Subregions: STP1; STP2; STP3; STP4; STP5; STP6 and STP7.

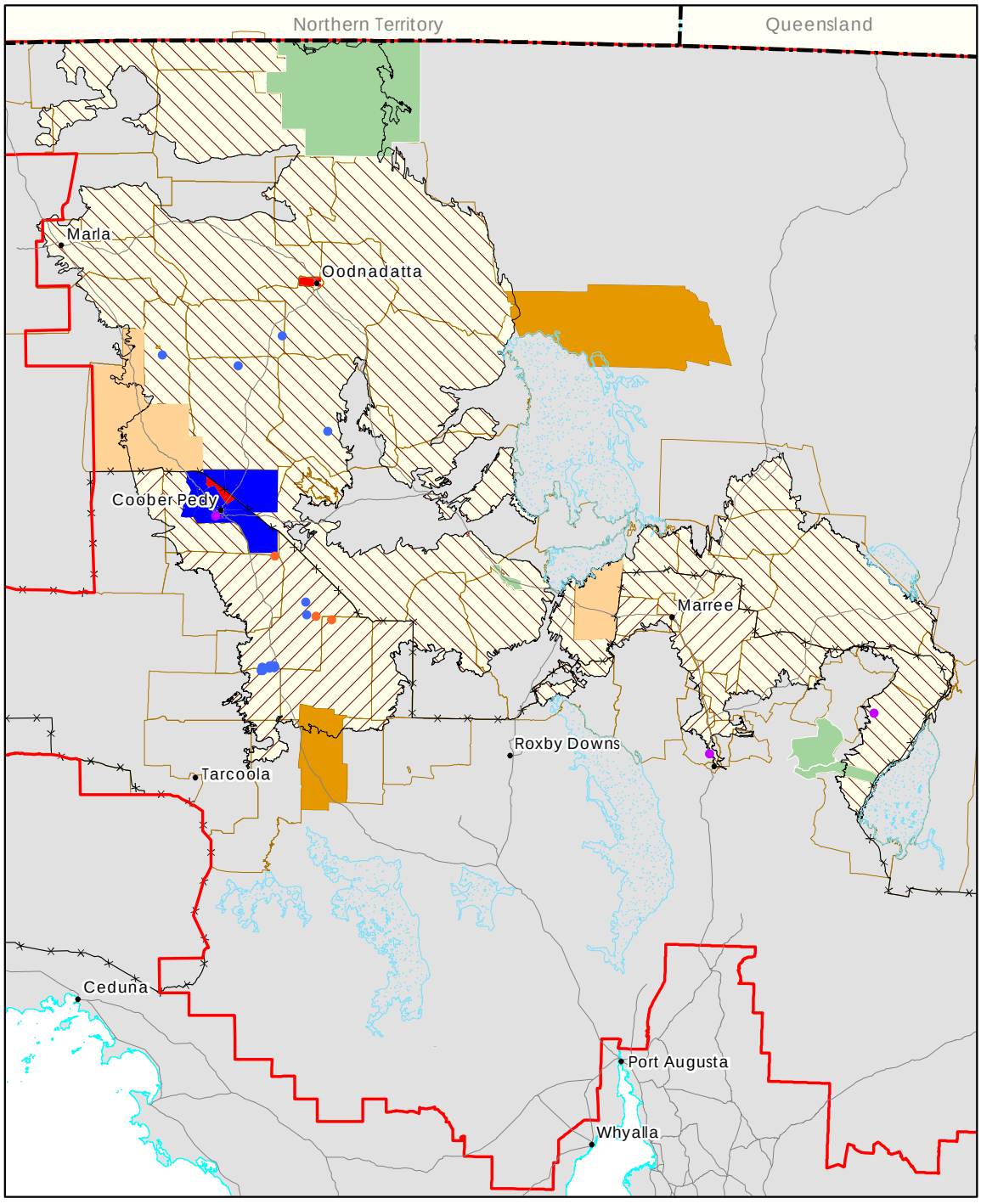
Breakaways and stony hills

Tablelands and other residual habitats forming mesas or tabletops with a capping of silcrete overlaying various shales.
Subregions: STP1 and STP4.

Conservation priorities have been grouped under each landform.

Photo: Chenopod shrubland

Stony Plains – land use



Major land uses

There are four major land uses in the Stony Plains.

Pastoralism

The main land use in the Stony Plains is pastoralism, with all areas having been used for grazing in the past century. Beef cattle are grazed throughout the north on large pastoral leases with sheep restricted to areas south of the dog fence. One pastoral lease in the Stony Plains currently has approval to trial camels for domestic and export meat markets.

Conservation

Witjira National Park is the largest reserve within the Stony Plains. The major biodiversity value being the Dalhousie Great Artesian Basin (GAB) spring complex, one of the largest complexes of artesian springs in Australia. Wabma Kadarbu Mound Springs Conservation Park was proclaimed in 1996 to conserve a group of important and typical GAB springs. There are two Heritage Agreements in the region, primarily for protection of built heritage values. Mount Willoughby is an Indigenous Protected Area, declared in 2002 for the protection of both cultural and biodiversity values.

Tourism

The Painted Desert, Breakaways and Dalhousie GAB springs are significant tourism attractions within the Stony Plains. Nature tourism, bush walking, wildlife, 4WD experiences, camping and Indigenous tourism are of great appeal throughout the region with heritage, cultural and history sites, key attractions. Tourism occurs across all land tenures.

Mining

Currently the most significant mining activity in the Stony Plains bioregion is opal mining at Coober Pedy, one of three major opal fields in South Australia. Petroleum and mineral exploration occurs across all land tenures in the bioregion, with one large-scale copper-gold mine at Prominent Hill. Geothermal exploration has been initiated in some parts of the region.

Photo: Cattle watering

Threats to biodiversity

There are many threats to biodiversity in the Stony Plains. Some are specific to particular areas, or exist primarily in the Stony Plains, whilst others extend across multiple bioregions or jurisdictions.

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

Excessive total grazing pressure

The combined effects of excessive grazing pressure from domestic stock, 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; erosion and increased spread of weeds and disease.

Reduction in Great Artesian Basin water pressure

Levels of water extraction from the Great Artesian Basin 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.

Photo: Breakaways, Arckaringa Station

Competition for resources by pest plants and animals

Introduced fauna and flora species compete with native species for resources.

Impact: Reduction in recruitment and density of native plants and animals; change in species composition of ecosystems and potential loss of native animal and plant species.

Excessive predation

Hunting and consumption of native animals by introduced carnivores.

Impact: Change in species composition of ecosystems and potential loss of native animals.

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; 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; increased soil erosion.

Pollution

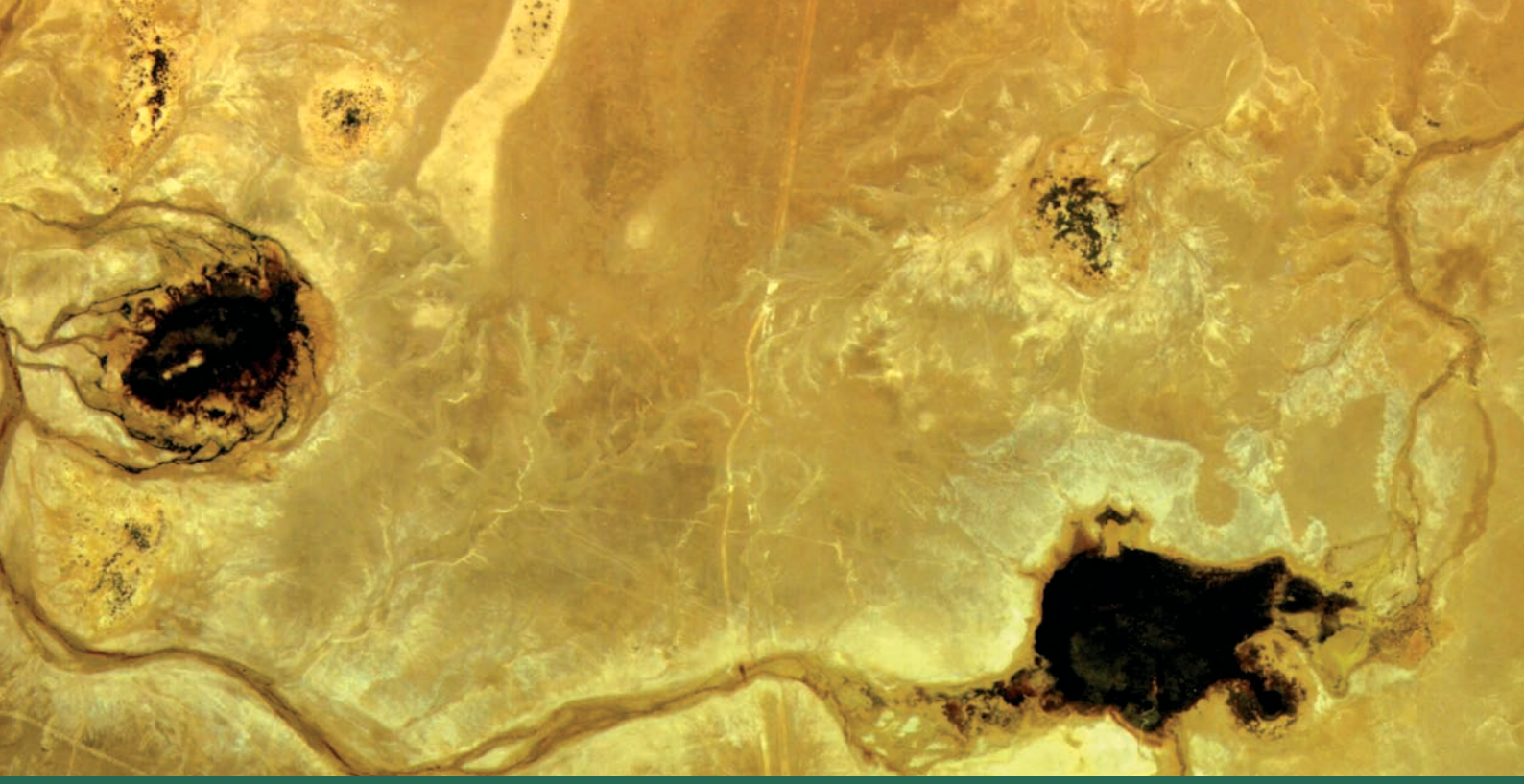
Reduction in quality of ground and/or surface water as a consequence of human activity.

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

Climate change

Changes in rainfall patterns, temperature, and climate variability.

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: Aerial view of Gosse GAB springs

Landform	Conservation priority	
Drainage lines and floodplains	Ecological responses to surface water flows and permanent and semi-permanent waterholes in the landscape	**Significant ecological process** • Ecological responses to surface water
	Threatened ecological communities on floodplains and swamps	**Threatened ecological communities** • 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
Stony plains and tablelands	Endemic species on gypseous clays	**Endemic flora** • Johnston's Slipper-plant (*Embadium johnstoni*) • Haegi's Stemodia (*Stemodia haegii*) **Endemic fauna** • Gibber Dragon (*Ctenophorus gibba*) • Woomera Slider (*Lerista elongata*)
	Significant fauna species on cracking clay plains and stony plains with gilgais	**Nationally threatened flora** • Sea Heath (*Frankenia plicata*) **Nationally threatened fauna** • Thick-billed Grasswren (eastern) (*Amytornis textilis modestus*) • Plains Rat (*Pseudomys australis*)
Great Artesian Basin springs	Habitat diversity of Great Artesian Basin spring complexes	**Threatened ecological community** • All associated with GAB springs **Nationally threatened flora** • Salt Pipewort (*Eriocaulon carsonii*) **Endemic fauna** • Various Hydrobiid snails, Crustaceans, Fishes, Spiders, Mites, Bivalves and obligate symbiotic worms
Dunefields and sand plains	Mulga low woodlands on sand plains	**Threatened ecological community** • Mulga low woodland on sand plains
Breakaways and stony hills	Endemic species on gypseous breakaway slopes	**Endemic fauna** • Ochre Dragon (*Ctenophorus tjantjalka*) **Endemic flora** • Arckaringa Daisy (*Olearia arckaringensis*) • *Goodenia chambersii* • Gypsum Groundsel (*Othonna gypsicola*) • Barker's Mulla Mulla (*Ptilotus barkeri*) • Breakaway Pigface (*Gunniopsis tenuifolius*)
	Northern Myall low woodland and significant fauna species on breakaways	**Threatened ecological community** • Northern Myall low woodland on breakaways **Nationally threatened fauna** • Bronze-back Legless Lizard (*Ophidiocephalus taeniatus*) • Slender-billed Thornbill (*Acanthiza iredalei iredalei* – western ssp.)

Drainage lines and floodplains

Drainage lines and floodplains are characterised by ephemeral watercourses draining mainly towards Lake Eyre, in places forming major drainage systems connecting broad floodplains. Upper catchments support a more productive version of the vegetation surrounding them. Further downstream, vegetation is more distinctly associated with the drainage line than the surrounding area. Watercourses develop from runoff from the surrounding gibber plains, tablelands and breakaway country and can be quite deeply incised.

Significance of drainage lines and floodplains

Drainage lines and floodplains provide narrow bands of habitat for many terrestrial and aquatic species that would otherwise not occur within the Stony Plains bioregion. Species have adapted to the enormous variability of flow in these rivers, from long periods of little or no flow to extreme floods.

At catchment level, the diversity of habitats results from the huge variability in size, frequency and duration of water flow and storage. More diverse habitat occurs in areas that receive water more often and store it for longer. Permanent and near-permanent waterholes provide refuge for aquatic species, enabling them to survive extended dry periods.

Major vegetation communities

Woodland

Coolibah (*Eucalyptus coolabah*) +/- River Red Gum (*Eucalyptus camaldulensis*), Gidgee (*Acacia cambagei*), Red Mulga (*Acacia cyperophylla*), Mulga (*Acacia aneura*) woodland along drainage lines.

Shrubland

Mixed *Acacia* spp. tall shrubland to low open woodland over chenopod and grasses along minor drainage lines and flood-outs.

Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*), Lignum (*Muehlenbeckia florulenta*) shrubland +/- emergent Coolibah (*Eucalyptus coolabah*), River Cooba (*Acacia stenophylla*), Broughton Willow (*A. salicina*) trees along major drainage lines and associated flood-outs and swamps.

Mixed chenopod (*Atriplex* spp.) shrubland with herbs and grasses on clay flood-out flats without cracking clay and little surface stone, usually associated with major drainage lines.

Cottonbush (*Maireana aphylla*) +/- Saltbush (*Atriplex* spp.) low shrubland +/- emergent trees or tall shrubs along drainage lines, flood-outs and run-on areas.

Samphire (*Tecticornia* spp./*Sclerostegia* spp.) +/- Nitrebush (*Nitraria billardierei*), chenopods (*Atriplex* spp./*Maireana* spp.) low shrubland +/- emergent Broughton Willow (*Acacia salicina*) along saline creek lines and flood-outs.

Claypans and salt lakes with fringing Samphire (*Tecticornia* spp./*Sclerostegia* spp.) low shrubland.

Grassland

Swamp Cane-grass (*Eragrostis australasica*) tall tussock grassland over mixed chenopods on claypans and also often dominating minor drainage depressions on stony clay plains and claypans.

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 over the Stony Plains results in runoff, surface water converges into drainage lines and eventually, if the flows are large enough, onto floodplains. Flood events must be managed with respect to the origins of the rainfall. Local rain and subsequent flooding will provide grazing potential different from flood events triggered by rainfall away from the drainage lines in the upper reaches of the catchment.

Drainage lines and floodplains are often the focus for pest plants, camping and grazing by native and introduced herbivores. These pressures contribute to the suppressed recruitment of perennial shrubs and trees, negative impacts on waterhole wildlife through increased pollution and accelerated water use. Grazing intensity should be dependent on the type of flooding event.

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

- After heavy rains or flooding, manage total grazing pressure to promote recruitment, seed set and enable vegetation to establish.
- Fence to separate productive floodplain areas from adjacent lighter country.
- 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 runoff,
  - Lower flows along drainage lines are less likely to scour and erode banks of watercourses.
- Control feral herbivores and pest plants in collaboration with neighbours and the SAAL NRM Board.

Conservation priority

Ecological responses to surface water flows and permanent and semi-permanent waterholes in the landscape

Surface water flows are essential for many aquatic and terrestrial species to complete their life cycles and disperse throughout the landscape. The size and duration of the water pulse through these extensive drainage systems determines the initiation, number and size of recruitment events and levels of dispersal. Extraction and diversion of water from this system reduces the natural frequency and quantity of water these areas receive and store as environmental flows. Adequate water flow is essential in maintaining the productivity of drainage lines and floodplains for both pastoral production and for the many species that rely on this habitat.

In the drier times, the permanent and semi-permanent waterholes become more important, not only as a pastoral resource but they also provide significant habitat and refuge areas for both terrestrial and aquatic native species. Introduced plants and animal species, and more recently tourism have resulted in a range of threatening processes, including water pollution, predation, excessive total grazing pressure, competition for resources and mechanical disturbance. These processes affect the native species that rely on these habitats. As refuge areas, permanent and semi-permanent waterholes enable many species to survive through extreme drought and enable recolonisation of potential habitats when conditions improve. All major drainage lines contain significant waterholes, although little is known about their individual biodiversity values. Further work is required to identify these values, and to develop management strategies, in conjunction with land managers, to maintain or improve these values.

20-year targets

Environmental flows are maintained at levels sufficient to sustain water dependent ecosystems.

Improved biodiversity values of permanent and semi-permanent waterholes.

5-year performance information

- Extent and duration of floodplains inundation after high and low flow events.
- Number of permanent and semi-permanent water holes managed for biodiversity values.

5-year actions

- Establish criteria to define surface water dependent ecosystems.
- Map the area, location and extent of the water dependent ecosystems in the Stony Plains bioregion.
- Establish criteria for scoring condition of permanent and semi-permanent waterholes.
- Undertake biological surveys to prioritise surface water dependent ecosystems according to biodiversity values.
- Identify extent and intensity of threatening processes reducing biodiversity values of permanent and semi-permanent waterholes.

Photo: Hughes waterhole

Conservation priority

Threatened ecological communities on floodplains and swamps

There are three threatened ecological communities in the floodplains and swamps of the Stony Plains bioregion:

- Coolibah (*Eucalyptus coolabah* ssp. *arida*) and River Red Gum (*E. camaldulensis*) woodland on regularly inundated floodplains.
- Old-man Saltbush (*Atriplex nummularia* ssp. *nummularia*) on floodplains.
- Queensland Bluebush (*Chenopodium auricomum*) shrubland on cracking clay depressions subject to periodic waterlogging.

Coolibah and River Red Gum woodland are represented in riverine environments of all bioregions of the far north of South Australia. The Old-man Saltbush and Queensland Bluebush shrubland also occur in the Simpson-Strzelecki Dunefields and Channel Country bioregions. Floodplains are critical to the viability of pastoral enterprises. 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. The implementation of conservative stocking strategies and feral animal control programs will significantly improve the resilience of these systems, enabling vegetation and fauna to respond better to even minor localised flows.

20-year target

The viability of threatened ecological communities on drainage lines, floodplains and swamps in the Stony Plains are maintained or improved.

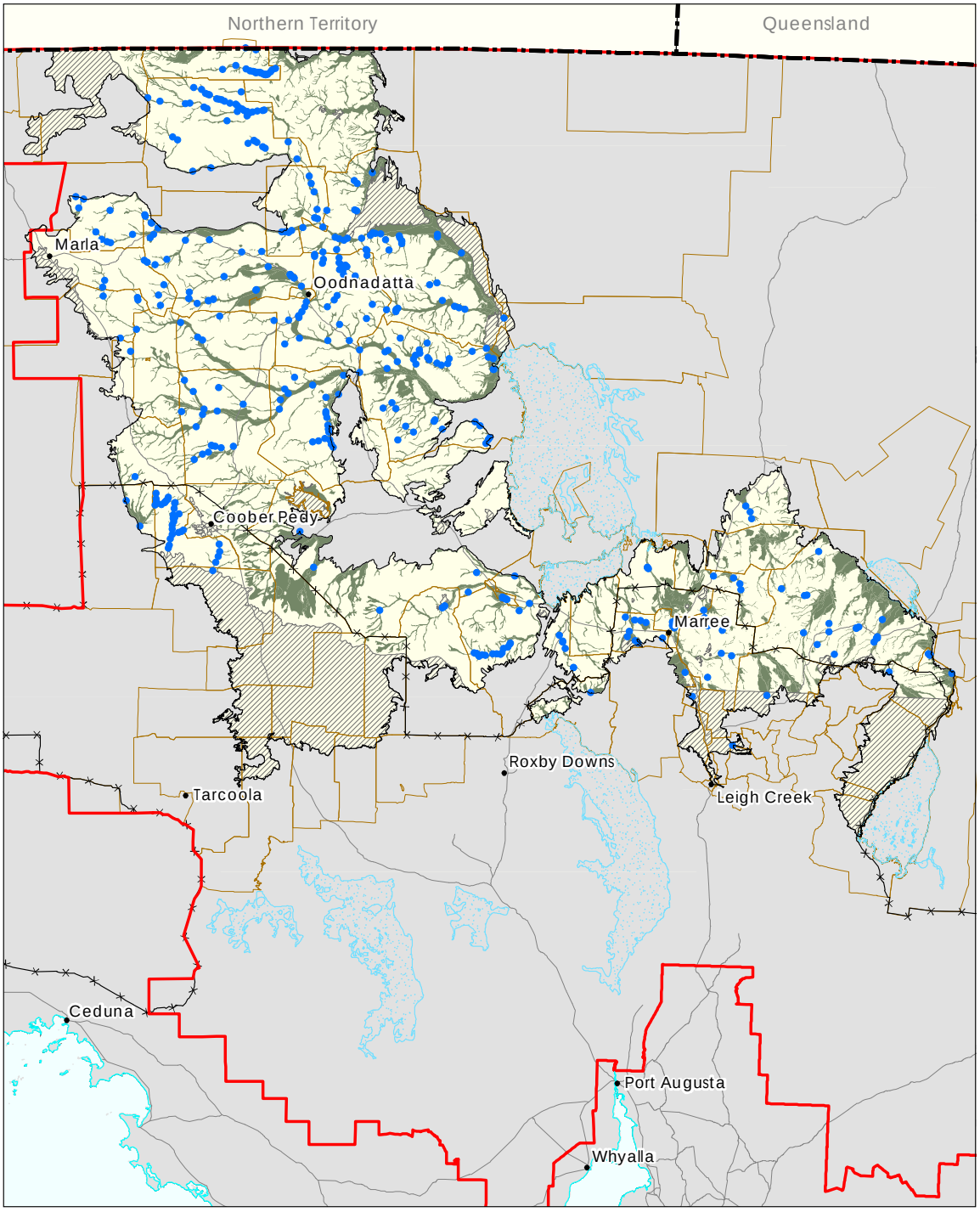
5-year performance information

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

5-year actions

- Determine the current extent and condition of threatened ecological communities on drainage lines, floodplains and swamps within the Stony Plains by IBRA subregion.
- Identify the potential area of occupancy of threatened ecological communities on drainage lines, floodplains and swamps within the Stony Plains 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.
- Develop and implement support mechanisms to assist land managers to improve the condition of threatened ecological communities on drainage lines, floodplains and swamps.

Conservation priorities for drainage lines and floodplains



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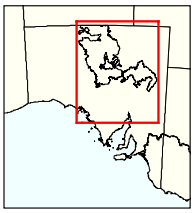


Conservation priorities

- Ecological responses to surface water flows and permanent and semi-permanent waterholes in the landscape
- Threatened ecological communities on floodplains and swamps
- No mapping available

- Stony Plains Bioregion
- 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

Stony plains and tablelands

Stony plains and tablelands are the dominant landform in the Stony Plains bioregion. They include gently sloping gibber plains with cobble-sized stone cover, gibber pavements characterised by a dense cover of small pebbles, and undulating gibber-covered low hills.

These landscapes are typical of the Oodnadatta, Witjira and Murnpeowie subregions and generally support a sparse cover of low chenopod shrublands and tussock grasslands. Small areas of cracking clay gilgais are a significant feature of this landform and represent the most productive and biologically diverse areas in the landscape. Much larger areas of cracking clay, often rich in gypsum, and usually having only a sparse cover of cobbles or pebbles dominate the Baltana subregion.

Significance of stony plains and tablelands

Stony deserts and gibber plains are characterised by a high proportion of ephemeral species. These have short lifecycles, which enable them to exploit irregular rainfall events. The majority of perennial vegetation occurs in gilgais and minor drainage depressions, very productive areas, where even modest rainfall can trigger extensive ephemeral growth. These areas are also notable for the high number of endemic plant species and they provide foci for small ground-dwelling mammals.

Major vegetation communities

Shrubland

Chenopod (*Atriplex* spp./*Maireana* spp.) low open shrubland over sub-shrubs and grasses on stony plains and tablelands.

Chenopod (*Atriplex* spp.), Bindyi (*Sclerolaena* spp./*Dissocarpus* spp.) sub-shrubland +/- herbs and grasses on drainage depressions, flood-out deltas in the north-east and the gypseous cracking clay plains in the west.

Low Bluebush (*Maireana astrotricha*), Bladder Saltbush (*Atriplex vesicaria*) low open shrubland on calcareous rises and plains in the southern parts and west of Lake Eyre.

Grassland

Mitchell-grass (*Astrebla pectinata*), Rat-tail Couch (*Sporobolus actinocladus*) tussock grassland with chenopod (*Atriplex* spp.) and Bindyi (*Sclerolaena* spp./*Dissocarpus* spp.) on gibber plains.

Photo: Low sand mounds on gibber plain

Managing the biodiversity of stony plains and tablelands – practical ways that land managers can help

Stony plains cover a large proportion of the Stony Plains bioregion. These areas including the watercourse and floodplain country have high pastoral value. The gibbers that cover much of the soil surface of the stony plains are extremely important. If this gibber cover is removed, or even slightly disturbed, the exposed soils are very easily eroded and dramatic gully erosion can occur, sometimes metres deep. Once this erosion starts it is very difficult to stop. Erosion gullies redirect water flows from existing drainage lines where there is often a comparatively high level of biological activity and diversity.

The various types of vegetation found on the stony plains provide valuable habitat for a wide range of native animals. Gilgais, drainage lines and sand spreads are particularly important habitat areas.

Excessive total grazing pressure and weed infestations are a significant risk to these habitats. Practical strategies that land managers can use on stony plains to help retain biodiversity include:

- Ensuring wherever possible that the gibber cover is retained by rolling or compacting rather than mechanical disturbance (e.g. grading) when installing tracks, fence lines and other infrastructure.
- Locating stock water points away from slopes to minimise the risk of erosion developing on stock pads.
- Aligning access tracks and fence lines across slopes rather then up and down, or onto less erosion prone soil types.
- Redirecting water off tracks rather than along them. Avoid grading tracks lower than the surrounding soil surface, or grading windrows along tracks. Install water diversion bars across tracks at strategic locations.
- When providing water for stock, particularly dams, only utilise natural water flow rather than grading drains to increase water catchment.
- Ensure borrow pits are rehabilitated to prevent their use as alternative water sources.
- Manage total grazing, in particular avoid over utilisation of gilgais to the point where they lose perennial vegetation and become silted over. High stock numbers and intense trampling on gibber can also lead to increased erosion.
- Avoid installing stock watering points in areas where there are low sand mounds over gibber, as these are important mammal and ground nesting bird-breeding sites and always ensure conservative stocking rates are applied to maintain the integrity of these areas.
- Avoid re-stocking country immediately after good rains to allow recruitment of perennial vegetation.
- Control feral herbivores and pest plants in collaboration with neighbours and the SAAL NRM Board.

Conservation priority

Endemic species on gypseous clays

Four endemic fauna and flora species occur on the gypseous clays of the Moon Plain, Baltana and Oodnadatta landsystems.

These species are:

- Gibber Dragon (*Ctenophorus gibba*)
- Woomera Slider (*Lerista elongata*)
- Johnston's Slipper-plant (*Embadium johnstonii*)
- Haegi's Stemodia (*Stemodia haegii*)

These species are thought to be relatively secure, however due to their restricted distribution, may be susceptible to rapid decline. It is important that they be monitored to ensure any decline is identified and appropriate action taken.

20-year target

The viability of endemic species on gypseous clays in the Stony Plains bioregion maintained or improved.

5-year performance information

- Percentage of potential habitat occupied by endemic species on gypseous clays in the Stony Plains bioregion.
- Number and viability of populations of endemic species on gypseous clays in the Stony Plains bioregion.

5-year actions

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

Photo: Gibber Dragon *Ctenophorus gibba*

Conservation priority

Significant fauna species on cracking clay plains and stony plains with gilgais

The Plains Rat (*Pseudomys australis*) and Thick-billed Grasswren (*Amytornis textilis modestus*) inhabit cracking clay plains and gilgais in Oodnadatta Saltbush low shrubland.

The range of both species has declined significantly since European settlement and is now restricted mainly to the Stony Plains bioregion. Isolated populations of Plains Rat (*Pseudomys australis*) also occur in the Gawler, Finke and Simpson-Stzelecki Dunefields bioregions, while the Thick-Billed Grasswren (*Amytornis textilis modestus*) occurs in the Gawler, Simpson-Stzrelecki Dunefields, Broken Hill Complex bioregions and Flinders and Olary Ranges.

Thick-billed Grasswrens prefer the chenopod shrublands that surround the cracking clay plains and gilgais, particularly those dominated by Saltbush (*Atriplex* spp.) and Bluebush (*Maireana* spp.), whereas the Plains Rats habitat is generally associated with low lying patches of deep cracking clay with minor drainage features and gilgais common in the gibber plains.

The major threat to Thick-Billed Grasswrens is the loss of shrub cover, leading to a reduction in food and safe breeding sites. For Plains Rats, the trampling of burrows and gilgais by stock may be a potential threat. In addition, both species are threatened by predation from cats and foxes.

20-year target

The viability of significant fauna species on cracking clay plains and stony plains with gilgais maintained or improved.

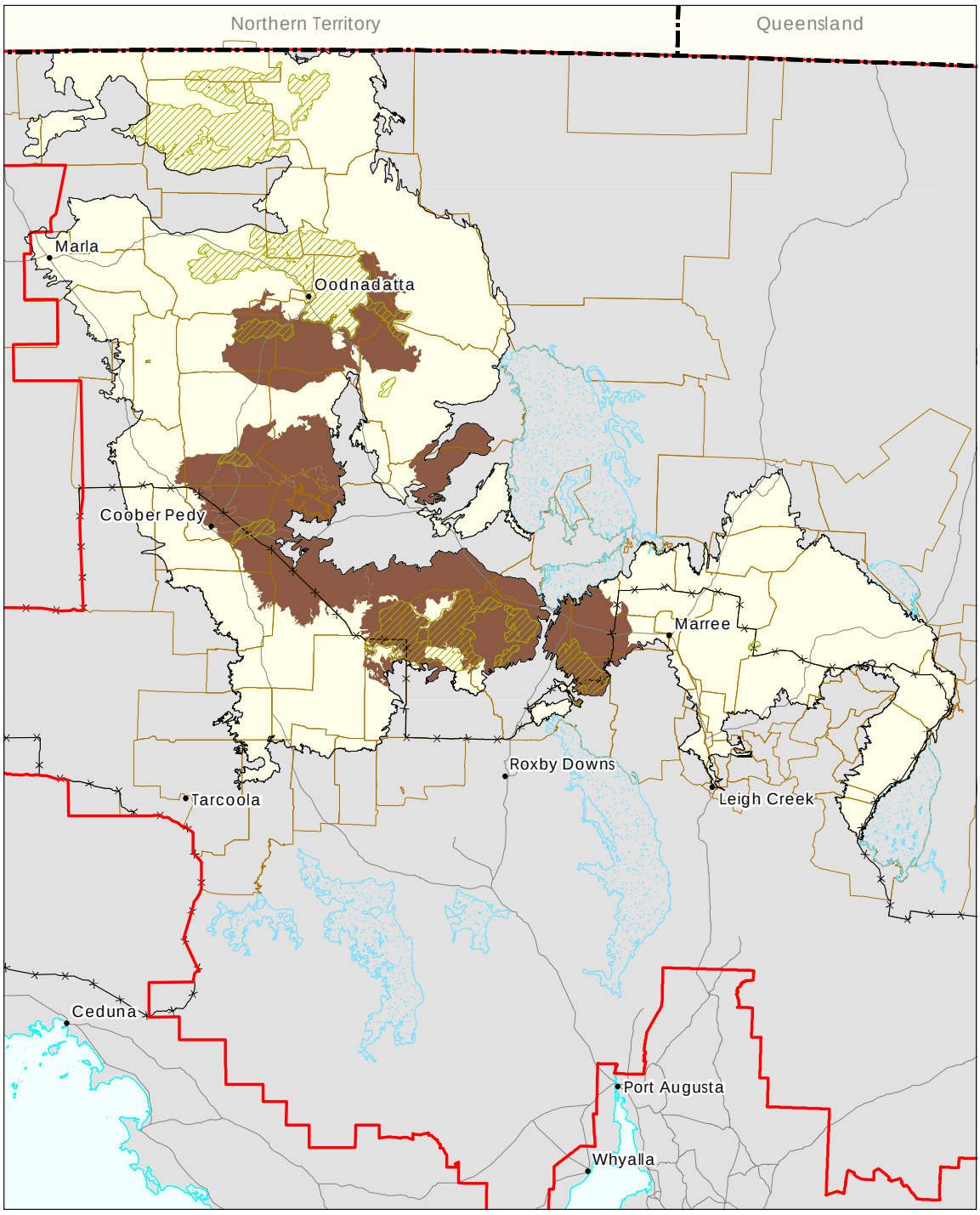
5-year performance information

- Percentage of potential habitat occupied by significant fauna species on cracking clay plains and stony plains with gilgais in the Stony Plains bioregion.
- Number and viability of populations of significant fauna species on cracking clay plains and stony plains with gilgais in the Stony Plains bioregion.

5-year actions

- Determine area of occupancy and relationship between habitat and distribution and abundance of significant fauna species on cracking clay plains and stony plains with gilgais in the Stony Plains bioregion.
- Quantify the disruption and impact of total grazing pressure, soil disturbance, feral predators on key ecological processes supporting individual populations of significant fauna species on cracking clay plains and stony plains with gilgais in the Stony Plains bioregion.
- Identify potential habitats within the Stony Plains bioregion for significant fauna species on cracking clay plains and stony plains with gilgais.
- Rank populations of significant fauna species on cracking clay plains and stony plains with gilgais within IBRA subregions for viability based on size, threats and landscape context.
- Develop and implement support mechanisms to assist land managers to improve the viability of significant fauna species on cracking clay plains and stony plains with gilgais by controlling feral animals and overabundant native herbivores and promoting appropriate grazing practices.

Conservation priorities for stony plains and tablelands



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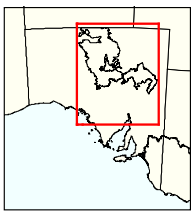


Conservation priorities

- Significant fauna species on cracking clay plains and stony plains with gilgais
- Endemic species on gypseous clays

- Stony Plains Bioregion
- 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

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, many contain 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 by the organisms that live in the springs all are threatened with extinction by excessive water extraction. 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) and 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.

Photo: Blanche Cup GAB spring (T. Gotch, DWLBC)

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 their 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 Palms 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 the 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.

Conservation priority

Habitat diversity of Great Artesian Basin spring complexes

Six Great Artesian Basin Spring complexes occur within the Stony Plains bioregion. These complexes, described at a catchment level, represent the scale at which the movement of species between springs most commonly occurs historically. Maintaining the diversity of habitats in spring complexes will improve the ability of species to survive. The major threat to maintaining habitat diversity is a reduction in GAB pressure resulting in the extinction of springs and loss of habitat diversity. 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. Overgrazing by feral animals and domestic stock, colonisation by introduced plant species, localised tourism impacts, and changed fire regimes can also reduce habitat and species diversity.

20-year target

Great Artesian Basin spring complexes managed to maintain habitat diversity.

5-year performance information

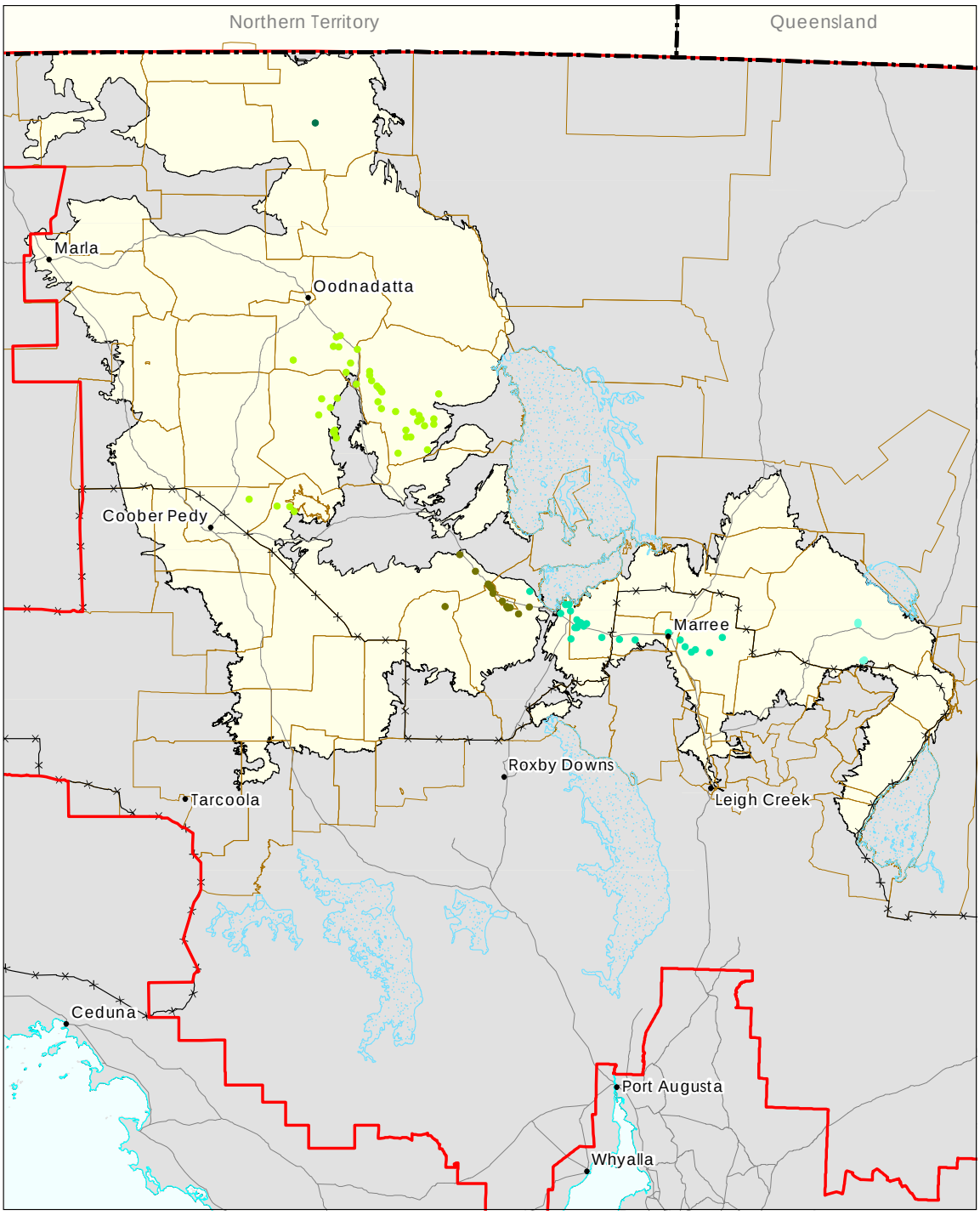
- Number of Great Artesian Basin spring complexes managed for habitat diversity.

5-year actions

- Incorporate spring data into centralised data management system.
- Locate all spring vents and collect elevation data, baseline biophysical data.
- Develop risk assessment model for SA 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 GAB spring complexes in conjunction with land managers.
- Provide information and support to individuals or organisations undertaking GAB springs related projects.

Photo: GAB spring after fire

Conservation priorities for Great Artesian Basin springs



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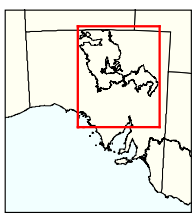


Mapped conservation priorities provide an indication of the potential distribution

Conservation priority

Habitat diversity of Great Artesian Basin spring complexes

- Dalhousie
- Lake Eyre South
- Neales/Peake
- Warriner/Margaret
- Petermorra

- Stony Plains Bioregion
- South Australian Arid Lands NRM Region
- Pastoral Station
- Salt Lake
- Dog Fence
- Major Road
- State Border
- Locality

Dunefields and sand plains

Dunefields and sand plains overlie the gibber surface or surround rocky outcrops or hills throughout the Stony Plains bioregion. This landform occurs predominantly in the Breakaway, Murnpeowie and Macumba subregions and whilst uncommon, can be found within all IBRA subregions.

The sand is mostly of windblown origin and often thinly covers the clay of the region as sand plains or dunefields.

Dune crests are generally dominated by Sandhill Cane-grass and Sandhill Wattle, and swales and sand plains support a variety of shrubs and perennial species depending on the depth of sand.

Significance of dunefields and sand plains

Dunefields and sand plains are restricted in area and support many species that would not otherwise occur in the Stony Plains bioregion. They support a small number of mammals and a diverse range of reptiles. Many generalist birds use this habitat although no species are entirely dependent.

Major vegetation communities

Woodland

Mulga (*Acacia aneura*) low open woodland over shrubs/grasses on sand plain and interdunal areas.

Shrubland

Nitrebush (*Nitraria billardierei*) low open shrubland on shallow dunes and sandy clay plains areas.

Sturt's Pigface (*Gunniopsis quadrifida*) low open shrubland on shallow dunes and sandy clay plains areas.

Grassland

Sandhill Cane-grass (*Zygochloa paradoxa*) hummock grassland +/- Sandhill Wattle (*Acacia ligulata*) tall shrubland on major dunefields.

Photo: Dingo *Canis lupus dingo*

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 the 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.
- Avoiding 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: Stony plains with overlying dunes

Conservation priority

Mulga low woodlands on sand plains

Mulga (*Acacia aneura*) low woodland on low dunes and sand plains occurs infrequently throughout the Stony Plains bioregion. This ecological community also occurs in the Channel Country, Finke, Gawler, Simpson-Strzelecki Dunefield bioregions and the Flinders and Olary Ranges. In the Finke bioregion, this community is not considered to be threatened.

Mulga is essentially dormant during drought but revives quickly after rain, producing seed only in relatively wet years. Understorey is variable, often being dominated by perennial grasses and chenopods. A variety of middle level shrubs may be sub-dominant in this community, particularly Sandhill Wattle (*Acacia ligulata*), Desert Senna (*Senna artemisioides*) and Narrow-leaf Hop-bush (*Dodonaea viscosa* ssp. *angustissima*), with a ground layer of tussock grasses and ephemerals.

The role of fire in the natural maintenance of Mulga populations is not well understood. Seedlings proliferate after fire, but almost any fire will kill mature trees that take many years to replace. Fires burning over large areas are usually intense fires carried by the more-than-usual grassy cover from high rainfall seasons. The Mulga woodland ecological community is primarily threatened by inhibited regeneration due to excessive total grazing pressure. The reduction in rabbit numbers by Rabbit Haemorrhagic Disease (RHD) has resulted in an apparent improvement in the condition of Mulga communities. However, the extent and significance of this improvement is unknown.

20-year target

The viability of Mulga low woodlands on low dunes and sand plains in the Stony Plains bioregion maintained or improved.

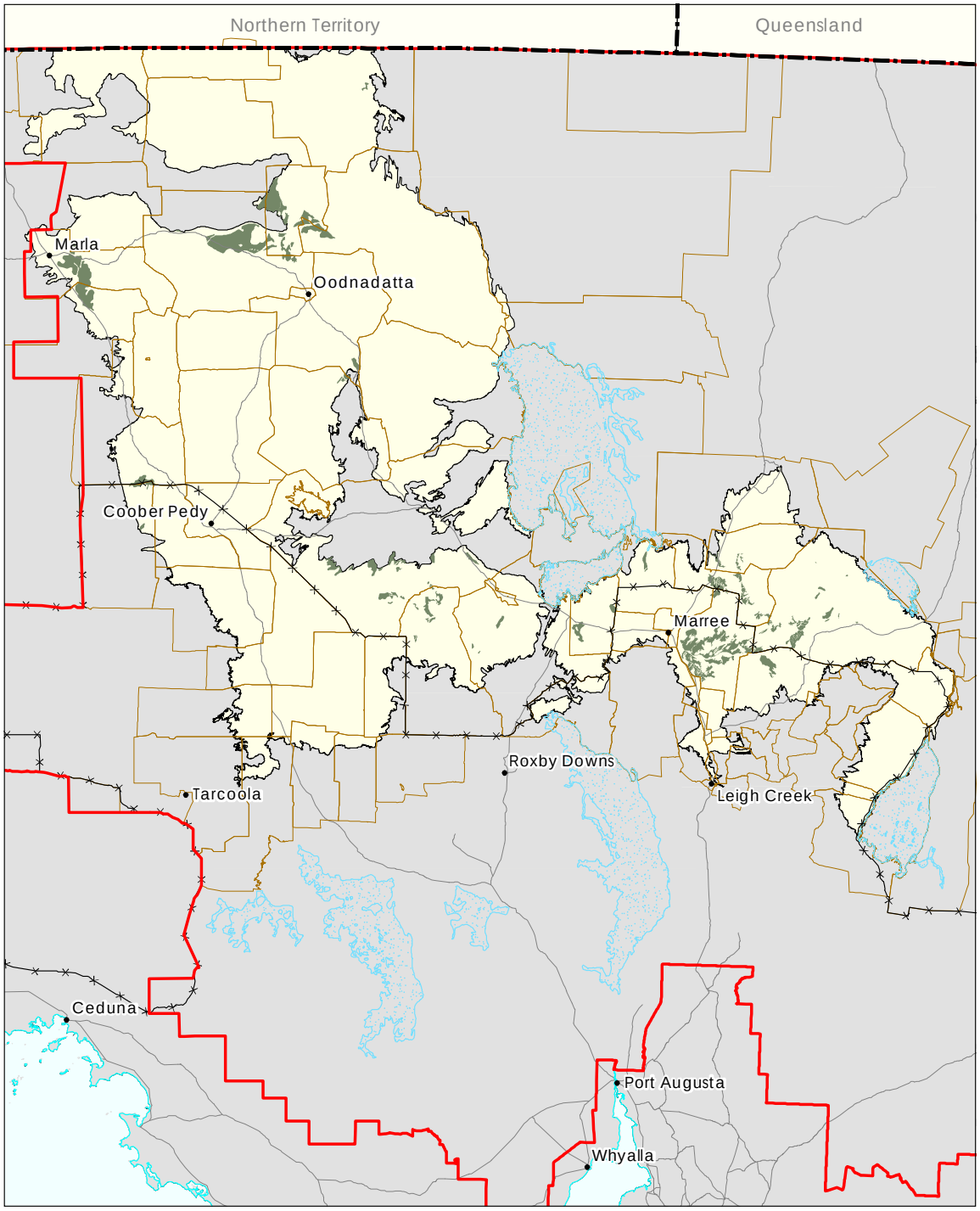
5-year performance information

- Percentage of potential area occupied by Mulga low woodland on low dunes and sand plains in IBRA subregions.
- Condition class of individual occurrences of Mulga low woodland on low dunes and sand plains in IBRA subregions.

5-year actions

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

Conservation priority for dunefields and sand plains



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Conservation priority

Mulga low woodlands on sand plains

Stony Plains Bioregion

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

Breakaways and stony hills

The breakaways are characterised by areas of tableland and mesas with a capping of silcrete overlaying various coloured shales. The silcrete capping often has sharp edges incised by minor drainage lines. The gypsum and shale substrate results in this land type supporting a high diversity of plant life and animal habitat. The Denison and Davenport Ranges is an outlier of ancient metamorphic rock of the Flinders Ranges, with a deeply dissected plateau and many deep gorges. The area supports plant communities similar to the breakaways but also contains areas of *Triodia* hummock grassland more commonly associated with the Flinders Ranges.

Significance of breakaways and stony hills

The breakaways and stony hills form unique habitats in the Stony Plains bioregion, supporting assemblages of species that are restricted to this landform. The breakaways are notable for the high number of endemic species. The Denison and Davenport Ranges contain many populations of species more commonly associated with the ranges of central Australia.

Major vegetation communities

Shrubland

Bastard Mulga (*Acacia stowardii*), Mulga (*Acacia aneura*) tall shrubland over Dead Finish (*Acacia tetragonophylla*) on hills, tablelands and breakaways.

Rock Emubush (*Eremophila freelingii*) shrubland +/- Bladder Saltbush (*Atriplex vesicaria*) on hills, tableland and breakaways.

Bladder Saltbush (*Atriplex vesicaria*) low shrubland with emergent trees and shrubs on tablelands and footslopes.

Silver Mulla Mulla (*Ptilotus obovatus*) with emergent (*Senna artemisioides* ssp.) on breakaway slopes and drainage lines.

Round Leaf Emubush (*Eremophila rotundifolia*) shrubland on footslopes.

Grassland

Spinifex (*Triodia irritans*) hummock grassland on rocky hill slopes in the Davenport Ranges.

Photo: Breakaways, Arckaringa Station

Managing the biodiversity of breakaways and stony hills – practical ways that land managers can help

The breakaways and stony hills are a focal point for tourism in the Stony Plains bioregion. The outwash slopes in the breakaway and stony hills country are easily eroded and dramatic gully erosion can occur. Once this erosion starts it is very difficult to stop. Erosion gullies redirect water flows from existing drainage lines where there is often a comparatively high level of biological activity and diversity.

Practical strategies that land managers can use on stony plains to help retain biodiversity include:

- Redirecting tourist vehicle and foot traffic away from slopes and erodible soils.
- Avoid creating drains, directing water off tracks rather than along them. Avoid grading tracks lower than the surrounding soil surface, or creating windrows. Install water strategic diversion bars across tracks.
- Aligning access tracks and fence lines across slopes rather then up and down, or onto less erosion prone soil types
- Locating stock water points well away from slopes to minimise the risk of erosion developing on stock pads.
- Spell the country after good rains to allow recruitment of perennial vegetation.
- Control feral herbivores and pest plants in collaboration with neighbours and the SAAL NRM Board.

Conservation priority

Endemic species on gypseous breakaway slopes

Six endemic species occur in the breakaway tablelands. These are:

- Arckaringa Daisy (*Olearia arckaringensis*)
- *Goodenia chambersii*
- Gypsum Groundsel (*Othonna gypsicola*)
- Barker's Mulla Mulla (*Ptilotus barkeri*)
- Breakaway Pigface (*Gunniopsis tenuifolius*)
- Ochre Dragon (*Ctenophorus tjantjalka*)

The Ochre Dragon lives on rocky slopes of the breakaway tablelands, while the five plant species all occur on weathered gypseous slopes. The fragile nature of these soils makes them prone to erosion following disturbance and represents the greatest threat to these species.

The restricted distribution and natural rarity of these species has resulted in several being defined as threatened and at risk of extinction. Whilst these species are thought to be relatively secure at the present time, due to their restricted distribution they are susceptible to rapid decline. It is important that they be monitored to ensure any decline is identified and appropriate actions implemented.

20-year target

The viability of endemic species on gypseous breakaway slopes in the Stony Plains bioregion maintained or improved.

5-year performance information

- Percentage of potential habitat occupied by endemic species on gypseous breakaway slopes in the Stony Plains bioregion.
- Number and viability of populations of endemic species on gypseous breakaway slopes in the Stony Plains bioregion.

5-year actions

- Determine area of occupancy and relationship between habitat and distribution and abundance of endemic species on gypseous breakaway slopes in the Stony Plains bioregion.
- Identify, and where possible quantify, the disruption and sources of disruption of key ecological processes supporting individual populations of endemic species on gypseous breakaway slopes in the Stony Plains bioregion.
- Identify potential habitats within the Stony Plains bioregion for endemic species on gypseous breakaway slopes.
- Rank populations of endemic species on gypseous breakaway slopes within IBRA subregions for viability based on size, threats and landscape context.
- Support land managers to improve the viability of endemic species on gypseous clays in controlling feral animals and promoting appropriate grazing practices.

Photo: Ochre Dragon *Ctenophorus tjantjalka*

Conservation priority

Northern Myall low woodland and significant fauna species on breakaways

Northern Myall (*Acacia calcicola*) low woodland occurs in small patches on calcareous red clays on breakaway tablelands and watercourses of the Breakaways subregion. The majority of this ecological community occurs within the Stony Plains bioregion, although there are isolated stands in the Gawler bioregion. Primary threats are camel browsing of adult shrubs and rabbit grazing of seedlings.

The western subspecies of the Slender-billed Thornbill (*Acanthiza iredalei iredalei*) occupies low shrubland adjacent to drainage lines on breakaway tablelands. This subspecies also occurs in the Gawler and Broken Hill Complex bioregions and Flinders and Olary Ranges. The Stony Plains bioregion contains critical habitat for this subspecies due to its significant range reduction. The primary threat is modification of habitat through excessive total grazing pressure.

The Bronzeback Legless Lizard (*Ophidiocephalus taeniatus*) is endemic to the Stony Plains bioregion, occurring in deep leaf litter on drainage lines. It was historically recorded in drainage line habitat in the northern Stony Plains in the 1970s, but now appears to be restricted to the breakaways. The primary threat is modification of habitat through excessive total grazing pressure.

20-year target

The viability of Northern Myall low woodland and significant fauna species on breakaways maintained or improved.

5-year performance information

Northern Myall low woodland

- Percentage of potential area occupied by Northern Myall low woodland on breakaways within IBRA subregions.
- Condition class of individual occurrences of Northern Myall low woodland on breakaways within IBRA subregions.

Significant fauna species

- Percentage of potential habitat occupied by significant fauna species on breakaways.
- Number and viability of populations of significant fauna species on breakaways.

Photo: Northern Myall low woodland

5-year actions

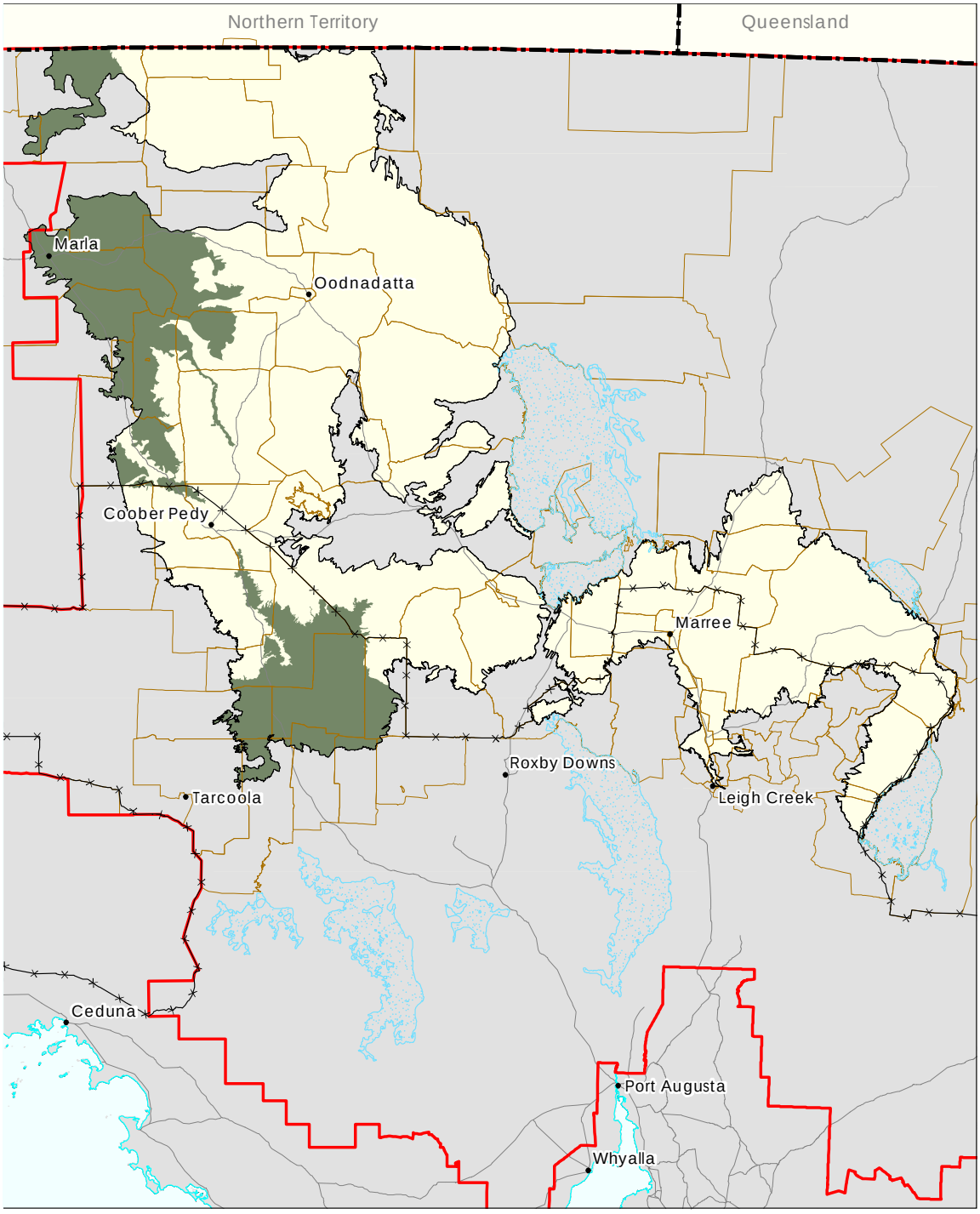
Northern Myall low woodland

- Determine the current extent and condition of Northern Myall low woodland on breakaways in the Stony Plains bioregion.
- Identify the potential area of occupancy of Northern Myall low woodland on breakaways in the Stony Plains bioregion.
- Identify and where possible, quantify the disruption and sources of disruption of key ecological processes supporting individual occurrences of Northern Myall low woodland on breakaways in the Stony Plains bioregion.
- Rank individual populations of Northern Myall low woodland on breakaways within IBRA subregions for viability based on size, condition and landscape context.
- Support land managers to improve Northern Myall low woodland on breakaways in controlling feral animals and promoting appropriate grazing practices.

Significant fauna species

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

Conservation priorities for breakaways and stony hills



Mapped conservation priorities provide an indication of the potential distribution

Monitoring and evaluation

SAAL Biodiversity Strategy Stony Plains Conservation Priorities aim to facilitate conservation actions across the bioregion. 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 SAAL Biodiversity Strategy.

Both the SAAL NRM Board and the Department for Environment and Heritage are jointly responsible for evaluating the effectiveness of this plan 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 responses to water flows within the landscape	Environmental flows maintained at levels sufficient to sustain water dependent ecosystems	• Extent and duration of floodplains inundation after high and low flow events.
	Important permanent and semi-permanent waterholes	Maintain and improve biodiversity values of permanent and semi-permanent waterholes	• Number of permanent and semi-permanent waterholes managed for biodiversity values.
	Threatened ecological communities on floodplains and swamps	Improve the extent and condition of threatened ecological communities on floodplains and swamps.	• Percentage of potential area occupied. • Condition of individual occurrences.
Stony plains and tablelands	Endemic species on gypseous clays	Maintain viable population of endemic species on gypseous clays	• Percentage of potential habitat occupied. • Number and viability of subpopulations.
	Significant fauna species on cracking clay plains and stony plains with gilgais	Viability of significant fauna species on cracking clay plains and stony plains with gilgais improved	• Percentage of potential habitat occupied. • Number and viability of subpopulations.
Great Artesian Basin springs	Habitat diversity of Great Artesian Basin spring complexes	Manage Great Artesian Basin spring complexes for biodiversity values	• Number of Great Artesian Basin spring complexes managed for biodiversity values.
Dunefields and sand plains	Mulga low woodland on sand plains	Viability of Mulga low woodlands on low dunes and sand plains maintained or improved	• Percentage of potencial area occupied. • Condition of individual occurrences.
Breakaways and stony hills	Endemic species on gypseous breakaway slopes	Viability of endemic species on gypseous breakaway slopes maintained or improved	• Percentage of potential habitat occupied. • Number and viability of populations.
	Northern Myall low woodland and significant fauna species on breakaways	Viability of Northern Myall low woodland and significant fauna species on breakaways maintained or improved	Northern Myall low woodland • Percentage of potencial area occupied. • Condition of individual occurrences. Significant fauna species • Percentage of potential habitat occupied. • Number and viability of populations.

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.

Gypcrete: gypsum-cemented crust or hardened layer formed on or in soil. It generally occurs in a hot, arid or semiarid climate in a basin with internal drainage. It usually about 95% gypsum and ranges from a loose, powdery deposit to massive crystalline gypsum and may be up to 4 m thick.

Gypseous: Relating to, or containing Gypsum (Calcium Sulphate).

Gypsum: Hydrated Calcium Sulphate mineral

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 Region: 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.

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 which lack sufficient rainfall for regular crop production. Usually defined as a climate with annual rainfall between 250 mm and 375 mm.

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.

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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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