



**NORTHERN AND YORKE
REGIONAL NRM PLAN**

**STRATEGIC PLAN
2019-2029**



Government of South Australia



Natural Resources Northern and Yorke



Strategic Plan • 2019-2029

November 2018

This plan has been prepared by the Northern and Yorke Natural Resources Management Board and is not a policy of the South Australian Government.

Acknowledgements

Thank you to the many people and organisations that have assisted with the development of this Strategic Plan. The Northern and Yorke Natural Resources Management Board recognises your valuable contribution and looks forward to continuing conversations and embarking upon the required actions.

The Northern and Yorke Natural Resources Management Board would also like to thank the ongoing efforts of the community, volunteers, landholders and businesses who work together to manage our region's natural resources for all.

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Acknowledgement of Country

The Narungga, Nukunu, Kurna, Ngadjuri, Barngala and Adnyamathanha people are the Traditional custodians of the Northern and Yorke region and have been for thousands of years. The Board acknowledges and respects the Traditional Owners of Northern and Yorke. We acknowledge elders past and present, and we respect the relationship Aboriginal people have to Country.

Aboriginal South Australians are the first peoples of our State and have occupied, enjoyed and managed these lands and waters since the creation. For South Australia's First Peoples, creation ancestors laid down the laws of the Country and bestowed a range of customary rights and obligations to the many Aboriginal Nations across our state.

Aboriginal peoples' oral histories and creation stories traverse the length and breadth of Australia's lands and waters. These stories interconnect lands and waters with complex meaning and values and hold great cultural significance. We recognise and respect Aboriginal people's ownership of their stories and that they hold rights and obligations to care for Country.

The Board is committed to supporting Traditional Owners, Aboriginal people and Aboriginal organisations' involvement in the management of lands, seas and waters. This includes recognising the relationship between Aboriginal culture and natural resources and incorporating Aboriginal knowledge of natural resources into decision-making.





Natural Resources Management Act 2004

Natural Resources Management Plan for the Northern and Yorke Natural Resources Management Region

I, David James Speirs....., Minister for Environment and Water, after taking into account and in accordance with the requirements of section 81 of the *Natural Resources Management Act 2004*, hereby adopt these amendments to the 2019-2029 Strategic Plan for the Northern and Yorke Natural Resources Management Plan.

A handwritten signature in black ink, appearing to read 'David Speirs'.

Hon. David Speirs

MINISTER FOR ENVIRONMENT AND WATER

Date: 27 10 2019



Message from the Presiding Member

On behalf of the Northern and Yorke Natural Resources Management Board (the Board), I am pleased to present the 2019-2029 Regional NRM Plan.

The 2009-2018 Regional NRM Plan was adopted ten years ago, so this review incorporates a comprehensive process to develop a fresh Strategic Plan and Business Plan which combine to form the 2019-2029 Regional NRM Plan.

The Regional NRM Plan review process started in June 2015 with the release of a Concept Statement.

We then spent more than a year engaging with the community at a local scale through a variety of mechanisms, including stakeholder presentations and workshops, surveys, stakeholder interviews, working groups and existing Community Action Planning (CAP) programs.

We have endeavoured to listen to the issues that matter, identifying areas for improvement, the key threats facing the region and what we need to do to ensure our natural resources remain healthy and productive for future generations.

The Strategic and Business Plans we have developed for community and stakeholder review have evolved from years of working with local community members, stakeholders and landowners.

Our vision for the region is for everyone to *work together for a healthy and productive environment*. This means that we, as a community, have a responsibility to protect and improve our natural resources for future generations. We need to work together to have a healthy natural environment, which in turn

will support the lifestyles and livelihoods that we enjoy in our diverse region.

The 2019-2029 Regional NRM Plan guides how we collectively achieve this over the long term.

The programs outlined involve resource assessment and management, planning, on-ground works and capacity building. Many of these programs build on existing work to best maximise return on investment. The Strategic Plan sets the direction for progressing our vision over the next ten years, while the Business Plan outlines the investment in the Board's programs.

Northern and Yorke has sustained an ongoing conversation with the community around what is important. Following the adoption of our first plan in 2008, the Board initiated the Community Action Planning (CAP) process to determine what our community considers to be the most pressing issues, and what needs doing. Quarterly meetings of eight local planning teams has ensured that landholders, the community and relevant stakeholders have led the development of this new plan, through the input of local knowledge and the identification of priorities for the region. The board is proud of its new plan, which is arguably the first community driven NRM plan in Australia. By combining the information gathered through the community planning process, this new plan provides the framework for integrated action, across the region's eight natural resource landscapes. We acknowledge the time and deliberative discussion that individuals, communities and organisations

have given to build this plan. This continued collaborative approach will be vital as we turn to delivery.

There are many challenges in achieving natural resource goals for the region. Our ecosystems are in a declining condition, under stress from weeds and animals, water resources are scarce, and extreme weather events, including fire, flood, drought and storm surges on the coast, are becoming more frequent.

The Strategic Plan identifies ways to respond to these challenges, to achieve healthy environments and sustainable use that will contribute to livelihood and lifestyles.

The Board seeks to work together with all stakeholders to make a positive contribution to the unique natural resources of the region. Successful partnerships will be the basis for achievement and securing future investment in natural resources management.

We thank the many individuals, communities and organisations that work together to manage our region's natural resources for all.

I commend this Strategic Plan to you and urge you to join us and contribute to its successful implementation.

Eric Sommerville

Presiding Member, Northern and Yorke NRM Board



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Acronyms

Acronyms

AAR	Aboriginal Affairs and Reconciliation
ALT	Aboriginal Lands Trust
AMLR	Adelaide and Mount Lofty Ranges
BCM	Bush Condition Monitoring
BMAP	Bushfire Management Action Plan
CAP	Community Action Planning
CEM	Coastal, Estuarine and Marine
CWMS	Community Wastewater Management System
DEW	Department for Environment and Water
DPTI	Department of Planning Transport and Infrastructure
EPA	Environment Protection Authority
EPI	Erosion Protection Index
ESD	Ecologically Sustainable Development
GIS	Geographic Information Systems
GVP	Gross Value Production
IBA	Indigenous Business Australia
ILC	Indigenous Land Corporation
LGA	Local Government Association
MAT	Management Action Target
MNH	Mid North Horizons
MOU	Memorandum of Understanding
N/A	Not applicable
NGOs	Non-governmental organisations
NRM	Natural Resource Management
NY	Northern and Yorke
PIRSA	Department of Primary Industries and Regions, South Australia
PWRA	Prescribed Water Resources Area
RCT	Resource Condition Target
RDA	Regional Development Australia
RDAYMN	Regional Development Australia Yorke and Mid North
SA	South Australia
SANTS	South Australian Native Title Services
SFR	Southern Flinders Ranges
SYP	Southern Yorke Peninsula
TBD	To be determined
WAA	Water Affecting Activities

Units

cm	centimetre
km	kilometre
m	metre
ML	Mega Litre
mm/year	millimetre per year
MW	Mega Watt
pH	potential of Hydrogen (numerical scale of acidity)
ppm	parts per million

Summary

This plan guides the Board, related State Government agencies and other stakeholders in their efforts to maintain and enhance the region’s natural resources. The regional vision highlights the need to progress all three high level goals, *Working Together*, *Healthy Environments* and *Sustainable Use* collectively, now and for the long-term.

These goals have been developed together with the community based on a thorough understanding of the condition of the region’s natural resource assets and values, the pressures that apply to them and the broader landscape context



GOAL 1A Better Ways	Continual improvement of strategic natural resource management planning and delivery
GOAL 1B Aboriginal NRM	Aboriginal people continue to care for Country and share their natural resource knowledge
GOAL 1C Collaboration and Partnerships	Communities and organisations collaborating with a common agenda and achieving sustained natural resource outcomes
GOAL 1D Monitor and Adapt	Manage our natural resources for future viability and optimise outcomes through an adaptive management approach



GOAL 2A Healthy Ranges	Improve existing levels of ecosystem function in the Southern Flinders Ranges and maintain existing levels of ecosystem function in the Mid North Ranges
GOAL 2B Healthy Plains	Reinstate and maintain ecosystem function and services within the Southern Yorke Peninsula to support ecological and community values
GOAL 2C Healthy Coasts	Adaptive management of the physical coastal landscape to support ecological and community values
GOAL 2D Healthy Gulfs	Maintain and improve ecosystem function of Spencer Gulf and Gulf St Vincent



GOAL 3A Agricultural Systems	Agricultural systems are productive and operate within the needs and constraints of natural ecosystems
GOAL 3B Grazing Systems	Grazing systems are productive and operate within the needs and constraints of natural ecosystems
GOAL 3C Water	Water resources are managed within the constraints and needs of natural ecosystems and the community
GOAL 3D Urban and Industry	Urban and industrial development is sustainable and operates within the needs and constraints of natural systems

About the NRM Plan

Purpose of the NRM Plan

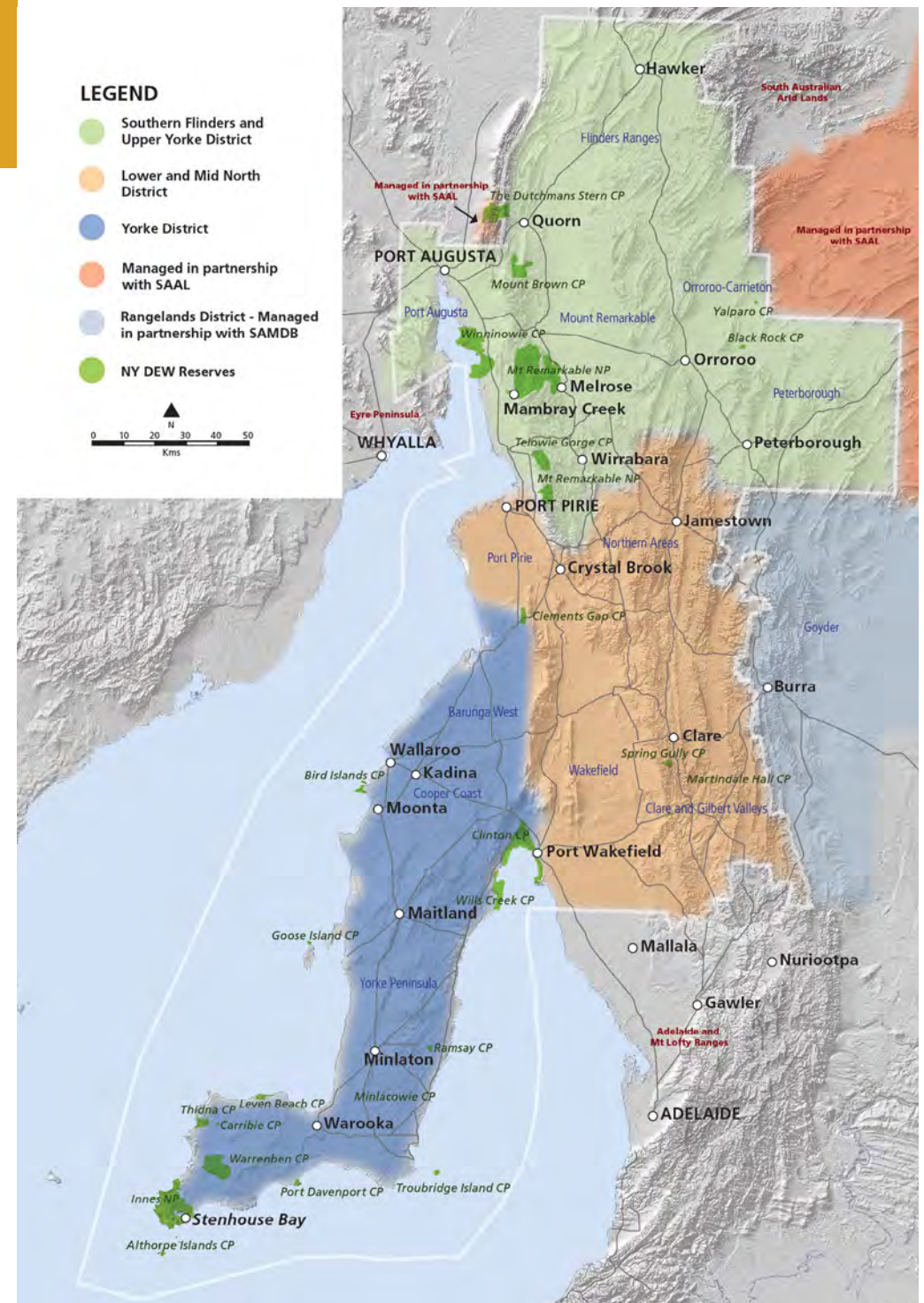
Natural resource management is about how all of us – individuals, communities, industry and government – work together to ensure that resources are used sustainably, and natural systems, like creeks, estuaries and native vegetation, are cared for and remain healthy. How we collectively do this in the long term, and in turn support regional prosperity, is guided by the regional NRM Plan.

The Board has responsibility, under the *Natural Resources Management Act 2004*, to facilitate a NRM Plan for the region. The plan guides the Board, related State Government agencies and other stakeholders in their efforts to maintain and enhance the region's natural resources, and provides the framework to develop synergies and management actions that encompass the broad range of relevant policy and legislation

The plan consists of the following components.

NRM PLAN COMPONENT	PURPOSE	WHERE DO I FIND IT?
Strategic Direction	<ul style="list-style-type: none"> Sets out the vision and goals for NRM in the Northern and Yorke region Objectives for the next 10 years with suggested strategies and possible actions to progress 	<ul style="list-style-type: none"> Northern and Yorke NRM Strategic Plan (this document)
State of the region	<ul style="list-style-type: none"> Assessment of the condition of natural resources in the region and the pressures influencing asset health 	<ul style="list-style-type: none"> Northern and Yorke NRM Strategic Plan – Appendix A (this document)
Board's Investment	<ul style="list-style-type: none"> Board's programs, expenditure and income over the 3 year period and the basis for the NRM levy 	<ul style="list-style-type: none"> Northern and Yorke NRM Board Business Plan
Water Affecting Activities	<ul style="list-style-type: none"> Sets out policies for Water Affecting Activities (WAA) 	<ul style="list-style-type: none"> Northern and Yorke NRM Board Business Plan
Water Allocation Planning (WAP)	<ul style="list-style-type: none"> Sets out arrangements for water sharing between the environment and water licensees 	<ul style="list-style-type: none"> Clare Valley Prescribed Water Resource Area Water Allocation Plan

There is a range of legislation, policy and regional strategies that set out roles and responsibilities, the NRM Plan aligns with these. Refer to [Appendix B](#) of this document for relevant plans and policies.



Regional Snapshot

The Northern and Yorke NRM region extends for 34,500 square kilometres of land area, or more than three million hectares. It is a varied and productive portion of South Australia and includes 1,350 kilometres of coastline and an additional 15,500 square kilometres of adjacent marine areas.

The region encompasses the Yorke Peninsula, Northern Mount Lofty Ranges, Southern Flinders Ranges and significant areas of Spencer Gulf and Gulf St Vincent. The landscapes of the region include plains, hills and rugged ranges, undisturbed bushland and native grasslands, coastal vistas and cliffs, and mangrove forests, wetlands, seagrass beds and reefs.

The Northern and Yorke region has a climate of mild winters and hot summers. Rain falls predominantly in the winter months, but conditions vary over the region, with differences in latitude and altitude. The Clare Valley, central Yorke Peninsula and the Southern Flinders Ranges receive the most rain within the region (average 500-600mm), while the north of the region has lower rainfall (average 250mm).

Over recent years, extreme weather events including heatwaves, coastal storm surges and king tide events, flooding and bushfires, have made a significant mark on the natural resources and communities of the region. Projections of increased extreme weather events in the future, along with an overall shift of drier and hotter climate will be an important factor in natural resource management.

A number of drivers influence the region at a local and broader scale. International markets driving agriculture production, declining ecosystem services, technological advances, changing demographics, decline of some rural towns and services, and trends in community health and wellbeing are all interrelated. The combination of such factors indicates an increasingly uncertain future.

Significant geological assets include evidence of Ediacaran and Cambrian life in the Flinders Ranges, and ancient fossils of soft-bodied biota from Precambrian time. Near Burra, fossil megafauna have been discovered and there are numerous geological assets, such as glacial erratics, at Port Vincent.

The region supports a population of approximately 95,000 people who reside in agricultural, coastal and urban communities. The major urban centres are the cities of Port Pirie and Port Augusta, and the towns of Clare, Kadina, Moonta and Wallaroo. Large numbers of visitors are welcomed each year to destinations that include Innes National Park, the Clare Valley and the Southern Flinders Ranges.

Local government areas: Flinders Ranges Council, Port Augusta City Council, District Council of Mount Remarkable, District Council of Ororoo Carrieton, District Council of Peterborough, Northern Areas Council, Regional Council of Goyder, Port Pirie Regional Council, District Council of Barunga West, Wakefield Regional Council, Clare and Gilbert Valleys Council, Copper Coast Council, Yorke Peninsula Council.

The Northern and Yorke region supports a diverse array of species, ecological communities and ecosystems, many of which are threatened. Biodiversity and the associated ecological processes underpin the health of our environment and its ability to support community needs. This includes basic requirements such as the production of oxygen, creation of soil, pollination and pest management, cycling and purification of water, and breakdown of wastes. It regulates our climate, underpins the production of our food and provides the basis for many popular recreational pursuits.

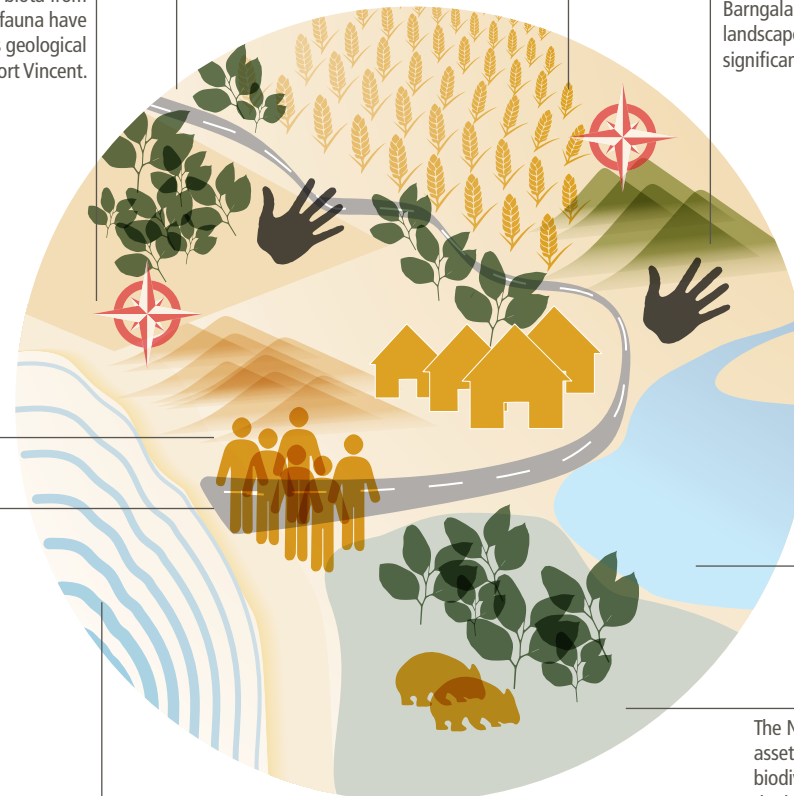
Natural resources underpin a range of industries. Approximately 80% of the region is under agricultural cropping and grazing production, contributing a quarter of South Australia's agricultural earnings. The region embraces the major Clare Valley wine growing area, and supports significant mining and mineral processing activities, fishing, aquaculture, forestry, horticulture and tourism.

The region includes traditional Aboriginal lands of the Narungga, Nukunu, Kaurna, Ngadjuri, Barngala and Adnyamathanha people. Many landscapes and features are of cultural significance to Aboriginal people.

Water is a critical asset for the people and natural biodiversity of the Northern and Yorke region. Both surface and groundwater resources sustain the region's economic production and the environment. The quality of water in many areas is saline enough to limit its suitability for many economic uses and therefore limits the degree of extraction. Most watercourses in the region are intermittent in flow, but many have permanent pools and springs (where groundwater resurfaces), which provide critical refuges for biodiversity.

The Northern and Yorke region's soil is a critical asset to agricultural productivity and natural biodiversity. The characteristics of soil are one of the key factors that determine where different crops may be grown and the natural distribution of native plant species. Additionally, the soil provides habitat for a range of flora and fauna: burrowing mammals, marsupials and reptiles, invertebrates and microbial organisms.

Coasts comprise a variety of environments including high energy cliffed coasts with pocket beaches, low energy gulf shorelines of low cliffs, narrow beaches and extensive saltmarsh and mangrove supratidal plains. Across the Spencer Gulf and Gulf St Vincent, significant habitats include seabeds, algal dominated reefs and sponge gardens.



Developing the Plan

This plan has evolved from years of working with local community members, stakeholders and landowners, and listening to the issues that matter to our region. Together we've identified our natural resource assets, areas for improvement, pressures facing the region and what we need to do as a community to ensure our natural resources remain healthy and productive for future generations.

Over the past 10 years, the Board has actively pursued community input into the development of this new Strategic Plan. The key opportunities for community and stakeholder input into the plan are outlined below. These represent a range of activities at regional, sub-regional and landscape-scale that have captured and analysed a range of community values and knowledge.

The regional NRM plan is built from a base of nine Community Action Plans (CAP) that reflect the region's core NRM assets; soils, water and biodiversity. CAP uses the internationally recognised **Open Standards** planning framework to identify community values and concerns, and to determine priorities for action (refer to Appendix C). The Board delivers on these priorities through three integrated landscape management programs; Living Flinders, Naturally Yorke and Mid North Horizons.

The priorities identified in the CAP plans have been rolled up to a regional level to identify the health of the region's priority assets, the pressures on these assets and where the greatest opportunities are for natural resource outcomes.

The **Collective Impact** framework has been used to assess the opportunities for improved collaboration and long lasting change in our communities. Aligned with the Collective Impact framework, there are five key elements for successful collaboration:

1. All participants have a **common agenda** for change, including a shared understanding of the problem and a joint approach to solving it through agreed upon actions.
2. Collecting data and **measuring results consistently** across all participants ensures shared measurement for alignment and accountability.
3. A plan of action that outlines and coordinates **mutually reinforcing activities** for each participant.
4. Open and **continuous communication** is needed across the many players to build trust, assure mutual objectives, and create common motivation.
5. A **backbone organisation(s)** with staff and specific set of skills to serve the entire initiative and coordinate participating organisations and agencies.



Our Landscapes

The landscape areas considered in the development of the plan recognise the diversity in natural resources and communities across the Northern and Yorke region. The priorities for these eight separate landscapes were identified and captured in a series of Landscape Round-ups for review by the community. These priorities then fed into the regional plan. If you would like more information about the priorities for your landscape, refer to the [Landscape Round-ups](#).

MAMBRAY COAST AND SOUTHERN RANGES

The Mambray Coast and Southern Ranges stretching from the Pirie Plains in the south, up to Wilmington and Winninowie in the north and to the east, connects with the Southern Flinders Ranges. The region is home to 17,000 residents and offers a combination of coastal landscapes, productive agricultural land and towns.

Geographically, the area is characterised by coastal plains of the Spencer Gulf with a series of disconnected creeks, and the Southern Ranges include escarpments, gorges, rocky outcrops and scree slopes.

UPPER YORKE PENINSULA

Stretching from Port Broughton in the north to Maitland in the south – and with the Hummocks Range providing the eastern boundary – the Upper Yorke Peninsula is home to 20,000-plus residents and offers a combination of coastal landscapes, productive agricultural land and towns.

Geographically, the area is characterised by gently undulating plains and low hills, broken up only by the Hummocks Range which stands at 430m above sea level. Sand dunes are a distinctive feature of the landscape, particularly in the low-lying areas at the top of Gulf St Vincent and north of Port Broughton.

SOUTHERN YORKE PENINSULA

Stretching from Innes National Park on the south-western tip of the peninsula and up the coast towards Cape Elizabeth, Southern Yorke Peninsula is home to 8,000 residents and offers a combination of coastal landscapes, productive agricultural land and towns.

Geographically, the area is characterised by semi-saline wetland systems, high-energy rugged coastlines, low-energy cliffs and dunes, and undulating low plains throughout inland areas. No part of the region is more than 20km from the coast.

ARDEN VALE AND 'TOP OF THE GULF'

Stretching from Cultana on the Eyre Peninsula to Port Augusta, and following the range from Wilmington to Hawker in the east, the Arden Vale and 'Top of the Gulf' landscape is home to 16,000 residents and offers a combination of coastal landscapes, productive agricultural land and towns.

Geographically, the area is characterised by parallel ranges and valleys running north-south with steep gorges and rocky outcrops in the east, and a mixture of plains and tablelands at the head of the Spencer Gulf. Elevation varies from 965m at Mt Brown in the south-west to 70m near Lake Torrens in the north-west.

EASTERN PLAINS

Stretching from Willochra in the north-west, through Carrieton and across to Peterborough in the south-east, the Eastern Plains offers productive grazing land and large areas of remnant vegetation.

Geographically, the area is characterised by the extensive Willochra and Walloway plains, low hills and a series of three large ranges – Hungry Ranges, Oladdie Hills and Bendleby Ranges.

CENTRAL

Stretching from Crystal Brook and Jamestown in the south to beyond Orroroo to in the north, the Central landscape is home to 6,700 residents and offers productive agricultural land and towns.

Geographically, the area is characterised as a plateau dissected by a series of ranges and valleys that lie in a north-south direction. Goyder's Line runs along the north of the area.

CENTRAL

CENTRAL

MID NORTH AND RANGELANDS

SOUTHERN PLAINS

MID NORTH AND RANGELANDS

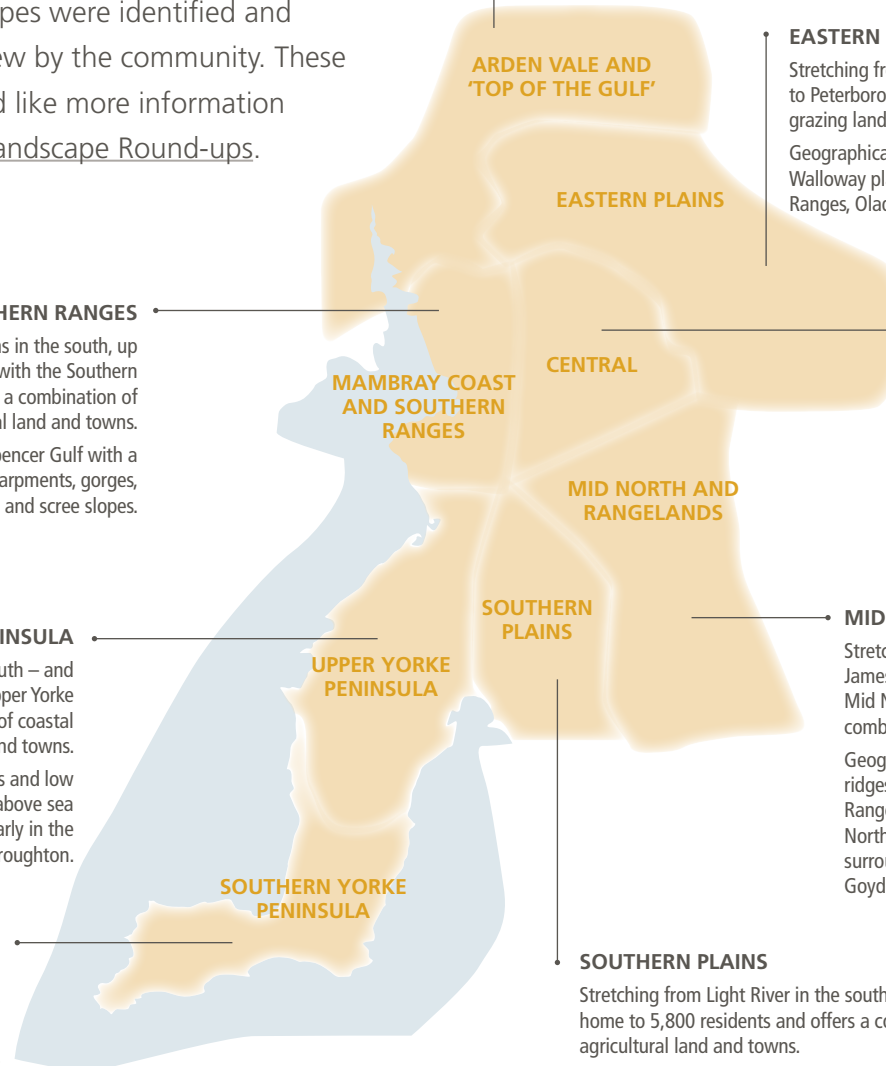
Stretching from Hamley Bridge and Eudunda in the south, up towards Jamestown in the north and the pastoral Rangelands to the east, the Mid North and Rangelands is home to 12,000 residents and offers a combination of productive agricultural land and towns.

Geographically, the area is characterised by a series of north-south ridges, including the Burra Hills, the Bungaree Hills and the Camel Hump Range, interspersed with narrow valleys and forming a portion of the Northern Mount Lofty Ranges. The Clare Valley contrasts greatly with the surrounding area, with steep-sided valleys and gently undulating floors. Goyder's Line runs north-south through Burra.

SOUTHERN PLAINS

Stretching from Light River in the south, to Redhill in the north, the Southern Plains is home to 5,800 residents and offers a combination of coastal landscapes, productive agricultural land and towns.

Geographically, the area is characterised by a narrow north-south range of hills, comprising the Hummocks and Barunga Ranges and the broad, flat open plain to the east known as the Condownie Plains. The land adjoins the top of Gulf St Vincent.



Our Assets

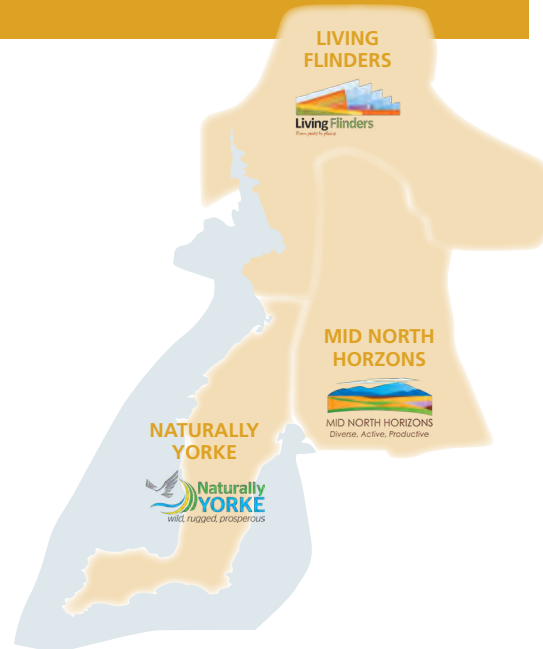
‘Our assets’ are the natural resources that we value in the Northern and Yorke region.

The health of sub-regional assets in Northern and Yorke have been assessed and regularly reviewed over a number of years by the CAP programs using the **Open Standards** methodology (refer to Appendix C). These assessments incorporate knowledge from local landholders and technical specialists, and evaluation of monitoring data. The ten regional assets outlined below were formed by grouping together sub-regional assets that have a common form, function, native plants and animals. Sub-regional health assessments were rolled-up to a regional level (similarly following Open Standards methodology) acknowledging the variability in health across this scale.

The assets typically need different management and have different pressures. Assets that are in good condition require some ongoing maintenance, however those that are in fair condition need careful management to stop further deterioration. Assets that are in poor condition are difficult to recover, and there is significant risk of losing the values they provide; in such cases, significant thought needs to be given to the return on investment in management. In such cases, investment may be targeted to manage specific components of the system (e.g. threatened species), rather than attempting to recover the entire system.

For further information on the assets and health ratings refer to the [State of the Region report](#).

The health of our assets is an important factor in deciding the priorities for management in our region. These priorities are **Ranges, Plains, Coasts** and **Gulfs**, and are included in **Goal 2: Healthy Environments**.



HEALTH RATING	
★★★★	Very Good
★★★	Good
★★	Fair
★	Poor

The type, health and value of assets are shown below.

ASSET	Living Flinders	Mid North Horizons	Naturally Yorke	Overall viability
Temperate plains ecosystems	N/A	★	★★	★
Coastal ecosystems	★★★★	★★	★★	★★
Surface water	★★	★★	N/A	★★
Groundwater	★★★★	★★★★	★★★★	★★★★
Marine ecosystems	★★★★	★★★★	★★★★	★★★★
Arid plains and ranges ecosystems	★★	★★★★	N/A	★★
Temperate ranges ecosystems	★★★★	★★	N/A	★★
Soils – Agriculture	★★★★	★★★★	★★★★	★★★★
Soils – Permanent grazing	★★★★	★★★★	★★★★	★★★★
Saline ecosystems	N/A	★★	★★	★★

Temperate plains ecosystems



Values: Ecosystem services to agriculture; Livestock grazing; Habitat for rare and threatened species; Amenity value of vegetation and scrub



Coastal ecosystems



Values: Habitat for rare and threatened species; Breeding grounds for fish; Residential, tourism and recreational use



Surface water

★★

Values: Habitat for rare and threatened species; Stock and irrigation water; Cultural and amenity values



Groundwater

★★★

Values: Stock, domestic, town and industry water supplies; viticulture and horticulture; Groundwater dependent ecosystems; Cultural and amenity values of waterholes



Marine ecosystems

★★★★

Values: Commercial, cultural and recreational fishing and other activities; Shipping and industry ports; Habitat for rare and threatened species



Arid plains and ranges ecosystems

★★

Values: Habitat for rare and threatened species; Vegetation; Livestock grazing; Tourism and recreational use



Temperate ranges ecosystems

★★

Values: Ecosystem services to agriculture; Livestock grazing; Habitat for rare and threatened species; Amenity value of roadside vegetation, scrub blocks and watercourses



Soils – agriculture

★★★

Values: Agricultural production including cereal, mixed farming and viticulture; Services to natural ecosystems



Soils – permanent grazing

★★★★

Values: Livestock grazing; Services to natural ecosystems



Saline ecosystems

★★

Values: Habitat for rare and threatened species; Recreational activities; Salt harvesting; Livestock grazing



Our Management

Over the years we have made significant improvements in the way natural resources are used and managed. However, it's widely acknowledged that historical actions and ongoing practices have adversely affected the health of our natural resources. With this in mind, the table below identifies what pressures can have the highest actual or potential impact on the natural resources of the region.

There are always a number of contributing factors (economic, cultural, societal or institutional) which drive these pressures. Pressures on our natural resource assets also impact on other economic and social aspects

within our community, so they need to be managed in an integrated and balanced way to support assets to recover and sustain lifestyles and livelihoods.

Pressures are rated based on the combination of scope, severity and irreversibility factors, from Low to Very High. The pressures have been assessed using the **Open Standards** methodology (refer to [Appendix C](#)) and incorporate knowledge from local landholders and technical specialists, and evaluation of monitoring data.

For further information on the pressures, refer to the [State of the Region report](#).

Understanding the pressures our assets face is an important factor in deciding where the greatest opportunities are for sustainable use and management in our region.

These priorities have been grouped into **Agricultural Systems, Grazing Systems, Water** and **Urban and Industry** and are included in [Goal 3: Sustainable Use](#).

PRESSURE RATING
Very high
High
Medium
Low

PRESSURES	TEMPERATE PLAINS ECOSYSTEMS	COASTAL ECOSYSTEMS	SURFACE WATER	GROUNDWATER	MARINE ECOSYSTEMS	ARID PLAINS AND RANGES ECOSYSTEMS	TEMPERATE RANGES ECOSYSTEMS	SOILS – AGRICULTURE	SOILS – PERMANENT GRAZING	SALINE ECOSYSTEMS
Changes to natural systems	Very high	High	Low	Low	Low	Low	Medium	High	Low	High
Climate change	Very high	Very high	High	Very high	Very high	High	Medium	High	Medium	High
Recreational activities	Medium	Very high	Low	Low	Low	Low	Low	Low	Low	Medium
Water use and dams	High	Low	Very high	High	NA	High	Medium	Low	Low	Low
Fishing	Low	Low	NA	NA	High	NA	Low	NA	NA	NA
Residential and industry pollution	Medium	Low	Low	High	High	Low	Low	Low	Medium	Low
Grazing livestock	Very high	Medium	High	High	NA	Very high	Medium	Very high	Very high	High
Introduced pests and overabundant native species	Very high	Very high	Medium	Low	Medium	Very high	High	Very high	High	High
Cropping practices	High	High	Medium	Low	NA	High	Low	Very high	High	Medium
Fire	High	Low	High	Low	NA	Medium	Medium	Very high	High	Low
Extreme weather events	High	Very high	Medium	High	High	High	Medium	Very high	Very high	High
Residential and industry development	Medium	High	Low	Low	High	Low	Low	High	Medium	Medium
Energy production and mining	High	Medium	Low	Low	NA	Medium	Low	Low	Low	Medium
Transportation corridors	High	Low	Low	Low	High	Low	Low	High	Medium	Low

Our Strategic Direction

The following section sets the direction for NRM in the Northern and Yorke region. The vision highlights the need to progress all three high level goals **Working Together, Healthy Environments** and **Sustainable Use** collectively, now and for the long-term.

The overarching goals provide structure for identifying priority areas requiring management and the scope of activities and partnerships necessary to achieve the regional vision.

Adaptive, landscape and collaborative approaches have been fundamental to the development of the plan and have been fostered across the regional goals.

- The goals are based on the best available knowledge at this point in time. An **adaptive approach** should be applied over the life of the plan to utilise new knowledge and condition changes that may occur. Goals and objectives will need to be adjusted accordingly.
- The region is diverse and interconnected. A **landscape approach** will be required to account for local nuances and the complementary nature of goals.

- Achieving the common vision – *Working together for a healthy and productive environment* – will require a **collaborative approach**, partnerships and participation by individuals and groups from across the region.

The strategic direction is outlined in the subsequent pages using the following framework:

- **Goals** are a statement of the desired future status of an asset or practice. These relate to what we want to see delivered. **20+ year timeframe.**
- **Objectives** describe a desired outcome or changes in pressure and other factors that will affect a goal. **<10 year timeframe.**

- **Strategies** describe a set of actions that will achieve an objective.
- **Possible actions** are examples of what could be done (within the life of the Strategic Plan) by any stakeholder that would contribute (in part) to achieving the objective. **<10 year timeframe.**

The goals are aligned with the objects of the *NRM Act 2004* (see [Appendix B](#)). A Monitoring, Evaluation, Reporting and Improvement framework will set out arrangements to assess the success of the regional NRM Plan and detect changes in natural resources.

REGIONAL VISION

*Working together
for a healthy
and productive
environment*

GOAL **1**

WORKING TOGETHER

Working together provides the platform for achieving natural resource outcomes. We need to collaborate to find solutions.

GOAL **2**

HEALTHY ENVIRONMENTS

Healthy environments are central to a healthy region. We need to maintain or improve asset health.

GOAL **3**

SUSTAINABLE USE

Humans are part of the environment. We need to use our natural resources sustainably for our future.

GOAL 1

WORKING TOGETHER

Better Ways
Aboriginal NRM
Collaboration and Partnerships
Monitor and Adapt



GOAL 1A Better Ways

We need to continue looking for innovative and relevant methods for managing NRM issues and delivering projects to ensure the community and NRM have a united front. Kate, Orroroo



Continual improvement of strategic natural resource management planning and delivery

Objectives

- Improve access to, and sharing of, local knowledge, data and scientific information, and use to make informed NRM decisions
- Apply a 'systems approach' to planning and delivery of NRM, by developing integrated NRM programs that deliver at a landscape-scale.
- Manage natural resources across tenures and at the most appropriate scale

As natural resource managers we must always be looking to continually improve the way we plan and deliver activities to achieve sustained change. Community and natural resources are all part of the one system and are not defined by fixed boundaries. In fact, about 87% of the land in the region is managed by private landholders, and social and economic factors are major drivers of change in NRM. Similarly, no one person or organisation has all the knowledge; much of what we know comes from the generational experience of local people. It is therefore important to value and capture knowledge from a range of sources to maximise outcomes and achieve multiple benefits, both across the region and within local communities.

STRATEGIES	POSSIBLE ACTIONS
1A.1 Integrate community and cultural values into NRM planning and delivery	<ul style="list-style-type: none"> • Ongoing program of landscape-scale community action planning (CAP) and management • Identify and understand socio-economic factors associated with NRM • Design and support viable community based projects and programs
1A.2 Support landscape approach to fire management	<ul style="list-style-type: none"> • Support the development of Bushfire Management Area Plans (BMAP) • Include environmental and cultural heritage assets in BMAP • Identify landscape-scale fire regime objectives, including Crown Land
1A.3 Support landscape approach to terrestrial and aquatic pest animal and weed management	<ul style="list-style-type: none"> • Establish and communicate strategic approach to management • Explore collaborative resourcing arrangements
1A.4 Manage cross-boundary natural resources through established relationships and knowledge	<ul style="list-style-type: none"> • Management of Gulf St Vincent and Spencer Gulf • Management of Burra Rangelands
1A.5 Strengthen and support regional based expertise and sharing of information	<ul style="list-style-type: none"> • Support established networks and events • Mentoring of emerging natural resource managers • Support volunteers and groups and ensure future viability • Prioritise use of regional based expertise
1A.6 Increase the accessibility of knowledge (including local knowledge) through state-wide systems	<ul style="list-style-type: none"> • Provide GIS resources and support • Records management • Database of technical experts
1A.7 Establish and implement a collaborative regional based research and innovation program	<ul style="list-style-type: none"> • Support research students • Strengthen networks with research and development organisations • Promote regional research and development needs • Share research and use for decision-making



LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, community groups, grower groups, environmental non-governmental organisations (NGOs), Department for Environment and Water (DEW), Biosecurity SA, Native Vegetation Council, Australian Government, industry, research organisations, Bushfire Management committees, local government

GOAL 1B Aboriginal NRM

Aboriginal people continue to care for Country and share their natural resource knowledge

Objectives

- Increase NRM based sustainable business enterprises and employment opportunities for Aboriginal people
- NRM planning empowers Aboriginal people and influences decision-making at all levels
- Increase awareness and capacity of all people to promote and embed Aboriginal culture into NRM activities
- Support networks to enable Aboriginal people to share knowledge, connect with land and develop skills to care for Country

Aboriginal people have cared for and managed this region for millennia and continue to care for Country today. There is significant potential to further expand Aboriginal involvement and build the capacity of emerging Aboriginal natural resource managers.

As a region we will build on our partnerships with Aboriginal people and communities so they have the opportunity to fully participate in land and sea management, drawing on their significant and unique knowledge, skills and responsibilities.

STRATEGIES

- 1B.1** Support two-way knowledge sharing (e.g. fire management) to better inform and improve land and sea management strategies.
- 1B.2** Build skills and capacity to manage natural resources and operate NRM based business enterprises
- 1B.3** Facilitate the ongoing development of NRM business enterprises and employment opportunities
- 1B.4** Provide opportunities for leadership in NRM planning and decision-making
- 1B.5** Provide opportunities for younger people to spend time on Country and participate in NRM activities
- 1B.6** Establish channels for communication and strategic advice within NRM sector
- 1B.7** Build general community awareness of the importance of Country and cultural sites
- 1B.8** Build cultural awareness, understanding of networks and develop skills to embed into other NRM planning, policy and management activities
- 1B.9** Explore opportunities for shared management of public land

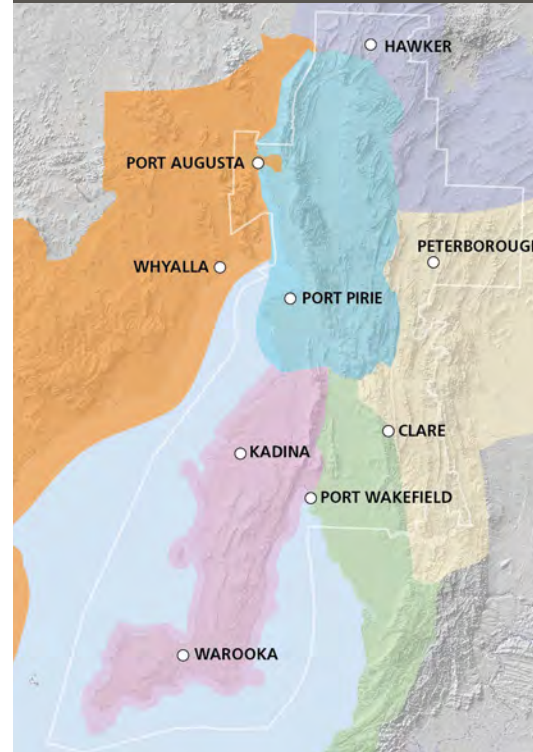
'Possible actions' have not been detailed here. These will be developed with the partners identified. The map only captures those groups who have lodged a Native Title claim and may not represent all Traditional Owners of the region.



By assisting Aboriginal nations to have involvement in NRM further strengthens the economic and social benefits to Aboriginal people in the region by empowering us to further care for our Country and provide significant and unique knowledge of Country.

Aaron, Innes National Park

ABORIGINAL TITLE CLAIMS



LEGEND

- Adnyamathanha No 1
- Barngarla Native Title Claim
- Kaurna Peoples Native Title Claim
- Narungga Nation
- Ngadjuri Nation #2
- Nukunu Native Title Claim

LEAD: Northern and Yorke NRM Board

PARTNERS: Aboriginal communities and organisations, Traditional Owners, Native Title Claimant Groups, South Australian Native Title Services (SANTS), DEW, environmental NGOs, local government, Aboriginal Lands Trust (ALT), Aboriginal Affairs and Reconciliation (AAR), Indigenous Land Corporation (ILC), Indigenous Business Australia (IBA), Regional Development Australia Yorke and Mid North (RDAYMN), Primary Industries and Regions SA (PIRSA), SA Water, landholders, research and development organisations

GOAL 1C Collaboration and Partnerships



Communities and organisations collaborating with a common agenda and achieving sustained natural resource outcomes

Objectives

- Resources secured to support and drive improved Collective Impact for each of the regional goals
- Common agenda of regional goals achieved
- Increase accountability and responsibility of communities and organisations

Successful natural and cultural resources management involves collaboration and partnerships – working together and the active involvement of people at all levels of decision-making in NRM.

Effective collaboration and partnerships are based on:

- Having a common understanding of the problem and developing practical solutions
- Supporting and reinforcing the capacity and activities of individuals and groups
- Communicating consistently and openly
- Taking responsibility and ensuring there are skills and resources available to do the job

Regional communities are renowned for working together to facilitate change. There are many community groups and organisations already established in our region, with high volunteer numbers. We are geographically dispersed and resources are spread thin, so collaboration is essential. By identifying a common agenda, pooling resources, recognising strengths and working together, we can manage our region's natural resources far more effectively.

STRATEGIES	POSSIBLE ACTIONS
1C.1 Strengthen strategic collaboration and identify opportunities for alternative partnerships to raise profile of regional and NRM priorities	<ul style="list-style-type: none"> • Support executive level NRM partner committees • Support strategic regional agencies cooperation • Explore philanthropic opportunities and industry partnerships
1C.2 Ensure skills and resources are available to complete NRM activities	<ul style="list-style-type: none"> • Establish backbone support for regional goals • Leverage funding opportunities
1C.3 Identify and foster a common agenda within regional planning	Northern and Yorke NRM Board participation in: <ul style="list-style-type: none"> • Zone Emergency Management Committee • Regional Climate Change Steering Committee • BMAP • Industry committees
1C.4 Develop and implement communications strategies to support collaborative approaches	<ul style="list-style-type: none"> • Communicate regional and local objectives with stakeholders • Maintain local community contact points • Build community understanding of ecological services, e.g. fire as a management tool
1C.5 Increase accountability of landholders, government agencies, statutory authorities and industry for legislative responsibilities	<ul style="list-style-type: none"> • Build landholder knowledge of their responsibility to manage land, water and declared plants and animals • Provide information and incentives to support activities • Support voluntary remediation activities • Undertake compliance activities in accordance with the <i>NRM Act 2004</i> and regional implementation plans
1C.6 Build capacity and awareness of environmental issues and opportunities	<ul style="list-style-type: none"> • Support school-based environmental education programs • Facilitate youth environmental leadership events and activities • Promote environmental education activities at the Clare NRC • Provide information through appropriate channels • Support capacity building and participation of the community in NRM through the development of collaborative programs with volunteer-based community organisations

Strong partnerships play a key role in developing and achieving integrated outcomes by effectively utilising the wide range of skills, experience and values available. Michael, Crystal Brook



LEAD: Northern and Yorke NRM Board
PARTNERS: All

GOAL 1D Monitor and Adapt

Manage our natural resources for future variability and optimise outcomes through an adaptive management approach

Objectives

- Adaptive decision-making is applied to regional NRM
- Collaborative approach to enable regional climate change adaptation
- Climate change refuge areas are identified and prioritised for management
- Alternative pathways are identified and facilitated for vulnerable natural resource systems and landscapes

The plants and animals, social communities and industries of the Northern and Yorke region have, in recent history, been resilient to variability in weather and other driving factors.

However, with projected longer-term shifts in climate, and the vulnerable nature of the environment, a move to active adaptive approaches across all levels of natural resource management are required.

Northern and Yorke has already experienced increases in average temperatures over recent years, with more frequent hot weather, fewer cold days, shifting rainfall patterns, and rising sea levels.

Climate change projections for this region are summarised in the adjacent table. Monitoring and evaluation will be highly important to plan, take action, learn and respond under climate change. Our people, communities and industries will also need to adapt.

Where possible, we must collaborate to build resilience of biodiversity refuges, landscapes, production systems and communities, and plan for uncertainty.



	Average temperatures will continue to increase in all seasons.
	More hot days and warm spells, and fewer frosts.
	A continuation of the trend of decreasing winter rainfall is projected. A decrease in spring rainfall is also projected. Changes in other seasons unclear.
	Increased intensity of extreme daily rainfall events.
	Mean sea level will continue to rise. Height of extreme sea-level events will also increase.
	A harsher fire-weather climate in the future.
	On annual and decadal basis, natural variability in the climate system can act to either mask or enhance any long-term human induced trend, particularly in the next 20 years and for rainfall.

Table: *Climate Change in Australia*
www.climatechangeinaustralia.gov.au



LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, community groups, grower groups, environmental NGOs, RDAYMN, local government, DEW, Biosecurity SA, Native Vegetation Council, Australian Government, industry, research organisations

GOAL 1D Monitor and Adapt *continued*

STRATEGIES	POSSIBLE ACTIONS
1D.1 Establish and implement a monitoring and data collection program to support adaptive planning for all regional natural resources	<ul style="list-style-type: none"> • Baseline and ongoing monitoring of regional assets and pressures • Project based monitoring • Support for review of regional climate change projections • Monitoring of regional climate change indicators and triggers • Species distribution assessment, including terrestrial and aquatic weeds and animals • Sea water inundation assessment • Water resource assessment • Monitoring post-fire ecological processes
1D.2 Communicate, share and support the use of data and information	<ul style="list-style-type: none"> • Regular status reporting of assets, systems and landscapes • Share project learnings with partners to drive incremental improvements to practices • Provide technical support for the use and interpretation of data, projections and modelling • Promote carbon sequestration and low carbon opportunities • Establish local community climate champions and contact points
1D.3 Support regional cross-agency collaboration and regional adaptation actions	<ul style="list-style-type: none"> • Support extreme event preparedness, response and recovery activities • Support for Regional Climate Change Steering Committee • Support for embedding regional strategies and action within regional agency implementation plans • Support natural resources solutions to adaptation across social and economic adaptation
1D.4 Establish and implement an adaptive planning framework across all levels of regional natural resource planning	<ul style="list-style-type: none"> • Cross-linkages between different planning levels and other regional planning • Review and evaluation of regional NRM projects
1D.5 Identify and increase resilience of climate change refuges	<ul style="list-style-type: none"> • Use species distribution modelling, inundation mapping and detailed vulnerability assessment to identify refuge areas • Integrate priorities into local and regional planning
1D.6 Plan adaptation pathways for systems and landscapes vulnerable to climate change	<ul style="list-style-type: none"> • Determine desired functionality, form and ecosystem services of systems and landscapes based on ecological and community values • Develop regional policy relating to assisted migration/novel ecosystems • Identify management pathways and action plans • Monitor trigger points



GOAL

2

HEALTHY ENVIRONMENTS

- Healthy Ranges
- Healthy Plains
- Healthy Coasts
- Healthy Gulfs



GOAL 2A Healthy Ranges

Improve existing levels of ecosystem function in the Southern Flinders Ranges and maintain existing levels of ecosystem function in the Mid North Ranges

Objectives

- Native plants and animals are supported by 211,400 hectares of native vegetation within the Southern Flinders Ranges and by 19,100 hectares of native vegetation within the Mid North Ranges
- Improve conservation status of threatened species
- Desirable native plants and animals within the Ranges have increased in abundance and are able to move through the landscape to maintain ecosystem function

The Ranges have become a significant refuge for native plants and animals in the Northern and Yorke region. Revegetation efforts and improvements in grazing practices have contributed significantly to the maintenance of current levels of ecological integrity.

The Southern Flinders Ranges are a biodiversity hotspot for the region and are considered to be in fair condition, with significant areas of contiguous vegetation and a range of dependent fauna. Current area of remnant vegetation is 357,600 hectares, with 190,000 hectares considered functional. Biodiversity in the Mid North Ranges is currently in fair condition overall, with only small areas of fragmented native vegetation remaining (approximately 40,500 hectares total, with 19,100 hectares considered functional). While remnant vegetation supports many populations of birds and reptiles, these exist in unstable, isolated populations, and many of the more specialised species are locally extinct. The effects of total grazing pressure and feral predators are significant in both Ranges, and

climate change pressures will have increasing impact. There is also increasing interest in recreational use of these areas.

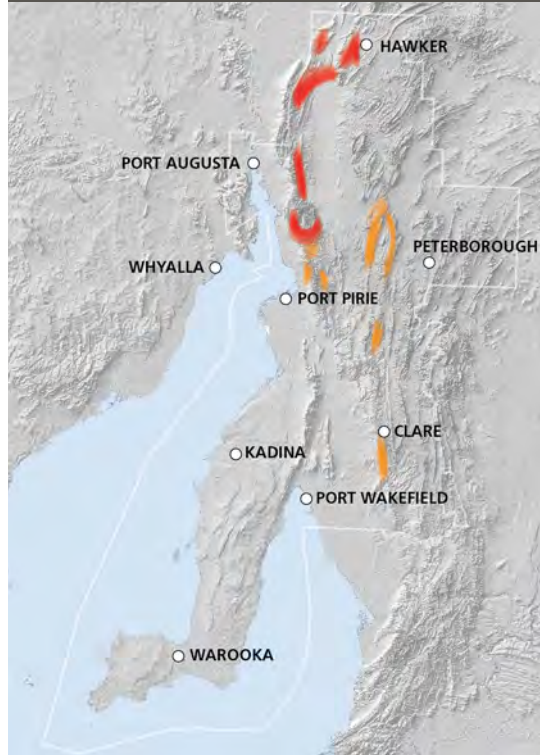
Improving the ecosystem function of the Southern Flinders Ranges landscape is considered viable as many species still remain. This would require an increase in functional area from 190,000 hectares to 268,000 hectares in the long-term (30+ years). An increase to 211,400 hectares is viable within the next ten years.

For the Mid North Ranges, the scope to improve the ecological function is limited and therefore maintaining ecosystems in their current condition in the long-term (19,100 hectares considered functional) is considered the more appropriate pathway. While the Southern Flinders Ranges will take higher priority, activities in both areas will focus on improved vegetation condition, weed management, domestic grazing regimes, minimising the impact of feral herbivores, and reducing the effects of feral predators on wildlife populations and their ability to move through the landscape.



Healthy ranges are vital for healthy catchments as they are the recharge areas for the water, seeds and life that support systems throughout the entire catchment area. Jennifer, Port Pirie

HEALTHY RANGES



LEGEND

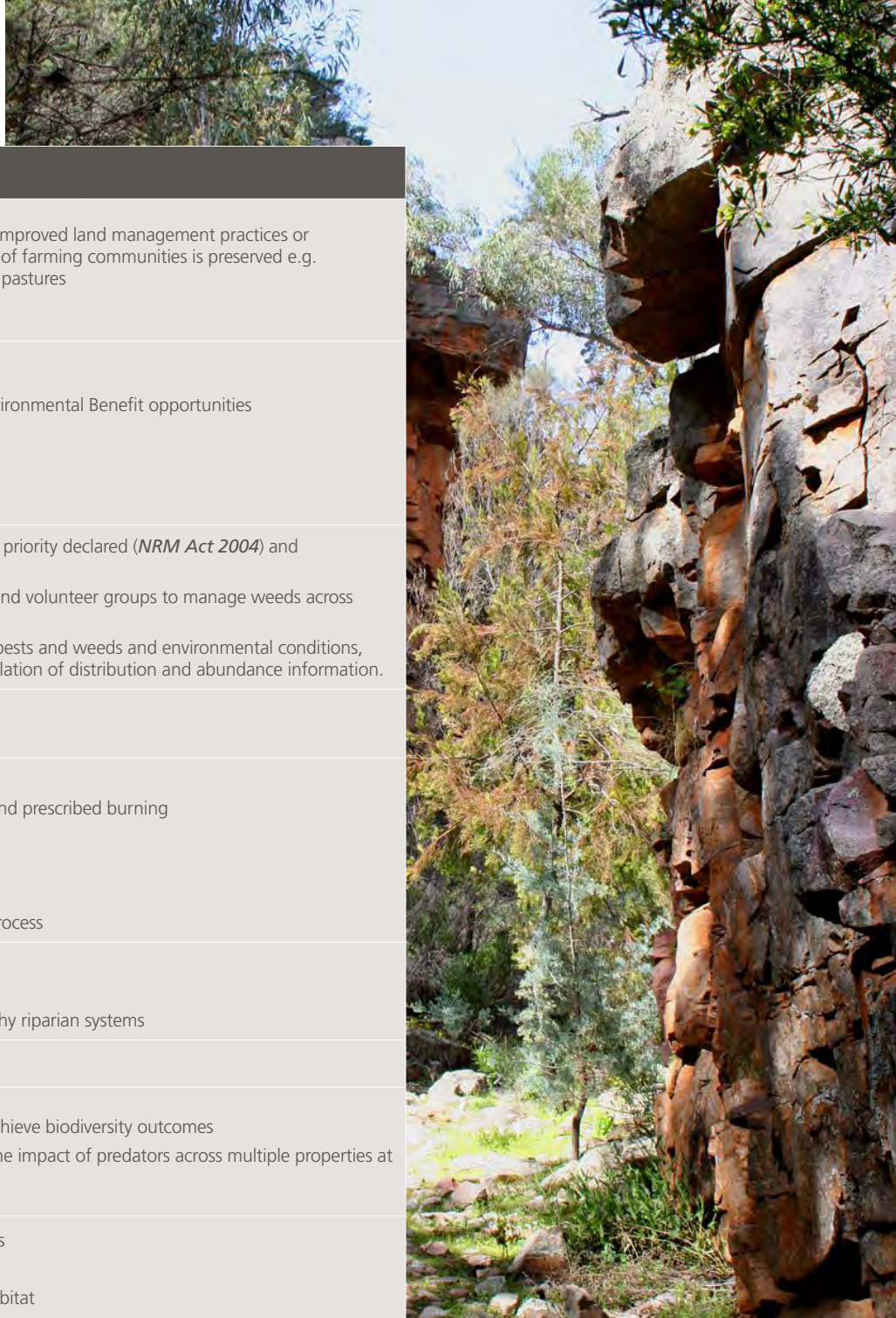
- Priority areas (Southern Flinders ranges)
- Priority areas (Mid North ranges)

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, community groups, producer groups, environmental NGOs, DEW, Native Vegetation Council, Australian Government, PIRSA, Biosecurity SA, local government, industry, research and development organisations

GOAL 2A Healthy Ranges *continued*



STRATEGIES	POSSIBLE ACTIONS
<p>2A.1 Increase the area of native vegetation in ranges managed for conservation/ ecological outcomes</p>	<ul style="list-style-type: none"> • Work with landholders to support (where appropriate) the transition to improved land management practices or enterprises that provide ecosystem outcomes and ensure the livelihoods of farming communities is preserved e.g. stewardship, cultural tourism and improved grazing strategies for native pastures • Promote opportunities for external partners to support landholders
<p>2A.2 Undertake revegetation and support regeneration</p>	<ul style="list-style-type: none"> • Coordinated landscape-scale revegetation programs • Promotion and coordination of carbon sequestration and Significant Environmental Benefit opportunities • Support regional plant nurseries • Provide revegetation/regeneration advice for landholders • Implement paddock tree program
<p>2A.3 Undertake targeted and coordinated control of weeds</p>	<ul style="list-style-type: none"> • Prepare strategic weed management plans at a relevant scale to address priority declared (<i>NRM Act 2004</i>) and environmental weeds • Coordinate a program and support collaboration between landholders and volunteer groups to manage weeds across multiple properties at landscape-scale • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information.
<p>2A.4 Increase active management of total grazing pressure</p>	<ul style="list-style-type: none"> • Refer Goal 3B: Sustainable Use – Grazing Systems
<p>2A.5 Plan and implement cross-tenure fire management for ecological outcomes</p>	<ul style="list-style-type: none"> • Identify landscape-scale fire regime objectives • Engage with landholders to identify mutual benefits for fuel reduction and prescribed burning • Review and adapt ecological fire management guidelines • Review approval processes for prescribed burning on private land • Trial prescribed burning on private land • Support the development of the Bushfire Management Area Planning process
<p>2A.6 Manage land run-off and impacts to watercourse integrity / riparian areas</p>	<ul style="list-style-type: none"> • Make technical expertise more accessible to landholders • Encourage sustainable property management planning • Watercourse revegetation, bank stabilisation and improvements to healthy riparian systems
<p>2A.7 Manage water use</p>	<ul style="list-style-type: none"> • Refer Goal 3C: Sustainable Use – Water
<p>2A.8 Undertake targeted and coordinated control of predators to derive complementary outcomes for biodiversity conservation (<i>Southern Flinders Ranges only</i>)</p>	<ul style="list-style-type: none"> • Prepare predator (pest animal) management plans at relevant scale to achieve biodiversity outcomes • Support landholders and volunteer groups to collaborate and manage the impact of predators across multiple properties at landscape-scale
<p>2A.9 Manage threatened species</p>	<ul style="list-style-type: none"> • Undertake habitat suitability modelling, incorporating climate projections • Develop species translocation plans, and undertake translocations • Where possible, assist species' migration to large areas of contiguous habitat

GOAL 2B Healthy Plains

Reinstate and maintain ecosystem function and services within the Southern Yorke Peninsula to support ecological and community values

Objectives

- Native plants and animals are supported by 52,100 hectares of functional native vegetation within the Southern Yorke Peninsula (SYP)
- Improve conservation status of threatened species
- Desirable native plants and animals within the SYP have increased in abundance and are able to move through the landscape to maintain ecosystem function

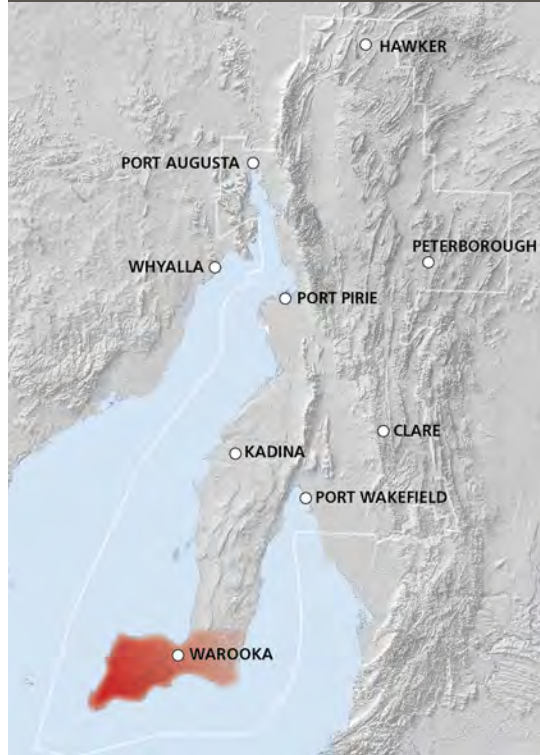
Much of the higher rainfall (temperate) plains area of the region is utilised for high production agriculture, with isolated areas of natural ecosystems remaining along watercourses and transport corridors. These form part of the 'agricultural system' of the region, with remnant bushland providing significant services to production. A few larger areas of remnant and continuous vegetation remain within the temperate plains. A key area where a significant range and area of vegetation types exist is on the 'foot' of the SYP (51,100 hectares). This area is unique, with close connection to coastal systems and potential climate change refuge. For these reasons, this area presents the best opportunity for positive change.

Although the majority of the vegetation on the SYP foot is considered to be in good condition, overall ecosystem health is considered fair due to the local extinction of many fauna species; of the 29 mammal species known to have existed on the Peninsula, 27 are now locally extinct. In the absence of the ecological functions provided by these species (soil generation, pollination and

population regulation) the vegetation of SYP is considered to be in a state of slow decline. Restoration of the Peninsula's temperate plains ecosystems is considered desirable and in the long-term requires 56,000 hectares of functional vegetation with variation in structure and successful regeneration. An increase to 52,100 hectares is viable within the next ten years. Adding support to this course of action is the significant value of tourism and agriculture to the local economy, which could be boosted by ecological restoration activities.



HEALTHY PLAINS



LEGEND

● Southern Yorke Peninsula priority area

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders (farming and lifestyle), community groups, producer groups, environmental NGOs, DEW, Native Vegetation Council, Australian Government, industry bodies, research and development organisations, tourism industry, Traditional Owners

GOAL 2B Healthy Plains *continued*

STRATEGIES	POSSIBLE ACTIONS
2B.1 Increase the area of native vegetation in SYP managed for conservation outcomes	<ul style="list-style-type: none"> • Work with landholders to support (where appropriate) transition to improved land management strategies or enterprises that provide ecosystem outcomes and ensure the livelihoods of farming communities is preserved e.g. stewardship, cultural tourism and improved grazing strategies for native pastures • Promote opportunities for external partners to support landholders
2B.2 Undertake revegetation and support regeneration	<ul style="list-style-type: none"> • Coordinated landscape-scale revegetation programs • Promotion and coordination of carbon sequestration and Significant Environmental Benefit opportunities • Support regional plant nurseries • Provide revegetation/regeneration advice to landholders • Implement paddock tree program
2B.3 Undertake targeted and coordinated control of weed impacts	<ul style="list-style-type: none"> • Prepare strategic weed management plans at a relevant scale to address priority declared (<i>NRM Act 2004</i>) and environmental weeds • Coordinate a program, and support collaboration between landholders and volunteer groups, to manage weeds across multiple properties at landscape-scale • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information
2B.4 Plan and implement cross-tenure fire management for ecological outcomes	<ul style="list-style-type: none"> • Identify landscape-scale fire regime objectives • Engage with landholders to identify mutual benefits for fuel reduction and prescribed burning • Review and adapt ecological fire management guidelines • Review approval processes for prescribed burning on private land • Trial prescribed burning on private land • Support the development of the Bushfire Management Area Planning process
2B.5 Undertake targeted and coordinated control of predators to derive complementary outcomes for biodiversity conservation and agricultural production	<ul style="list-style-type: none"> • Prepare predator (pest animal) management plans at relevant scale • Coordinate a program to support collaboration between landholders and volunteer groups to manage the impact of predators across multiple properties at landscape-scale • Landscape-scale exclusion fencing
2B.6 Reintroduce keystone species to restore functionality	<ul style="list-style-type: none"> • Establish viable populations of native predators • Establish viable populations of native soil engineers • Adaptive management based on ecological and community indicators
2B.7 Increase active management of total grazing pressure	<ul style="list-style-type: none"> • Refer Goal 3B: Sustainable Use – Grazing Systems
2B.8 Manage threatened species	<ul style="list-style-type: none"> • Undertake habitat suitability modelling, incorporating climate projections • Develop species translocation plans, and undertake translocations • Where possible, assist species' migration to large areas of contiguous habitat



GOAL 2C Healthy Coasts

Adaptive management of the physical coastal landscape to support ecological and community values

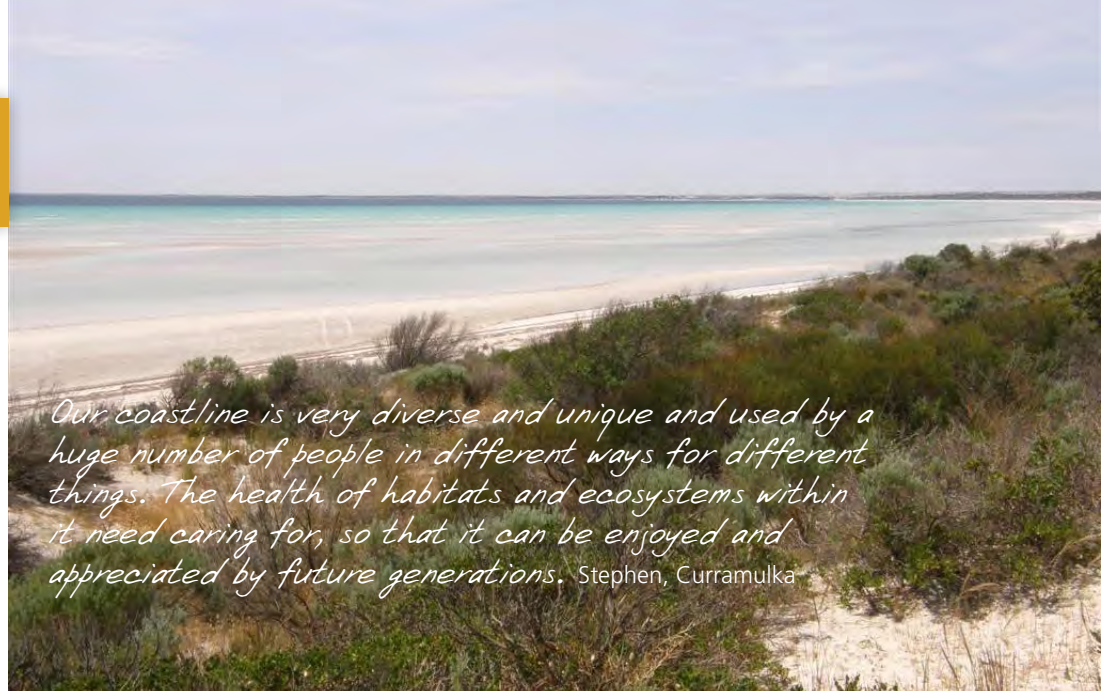
Objectives

- Greater importance is placed on ecological and community values in coastal decision-making and future management minimises impacts to coastal ecosystems
- Improve conservation status of threatened species
- Conservation rating of priority coastal areas are maintained or improved

The 1380 kilometre coast of the Northern and Yorke region is valued for its natural aesthetics and a variety of uses, including recreation. There is a strong commitment by a range of individuals and community groups to improve the health of their local coastal landscapes and associated plants and animals. Many coastal features are of cultural significance to Aboriginal people.

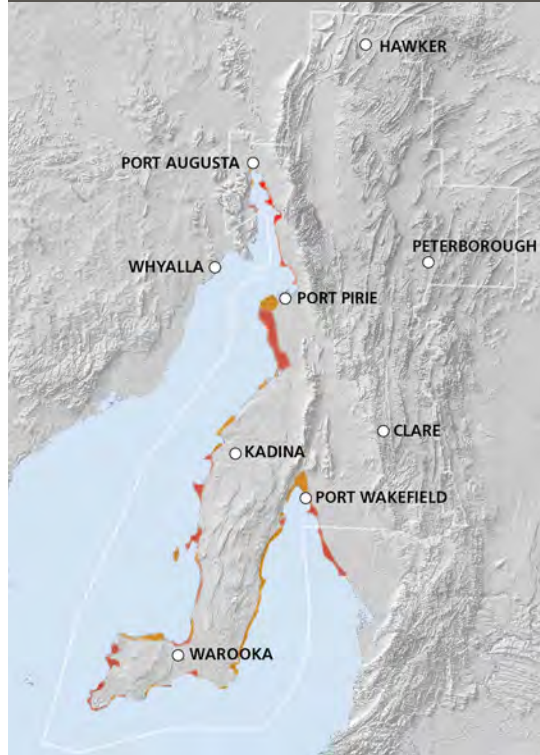
Remnant vegetation makes up 60% of the coastal zone, much of this being mangroves and saltmarsh communities and important bird habitats. However, in many locations, vegetation occurs as a narrow strip bordered by agricultural lands. This geography makes these remnant systems highly susceptible to the degrading influences of weed invasion, adjacent land uses and recreational access. This vulnerability is further increased by the expected rise in sea level and intensity of storm events associated with climate change. The construction of erosion control infrastructure also has the potential to impact natural resources.

Given these pressures, restoration or improvements to ecosystem function is not considered viable across most of the coast. However, strategic investment in the adaptive management of the physical coastal landscape will support ongoing ecological and community values. The greatest focus will be on sections of the coast identified as being of conservation significance and of particular importance to the community.



Our coastline is very diverse and unique and used by a huge number of people in different ways for different things. The health of habitats and ecosystems within it need caring for, so that it can be enjoyed and appreciated by future generations. Stephen, Curramulka

HEALTHY COASTS



LEGEND

- High coastal management priority
- Medium coastal management priority

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, Traditional Owners, community groups, Coast Protection Board, local government, NGOs, DEW, Native Vegetation Council, Australian Government, research and development organisations, industry, Department of Planning, Transport and Infrastructure (DPTI), Adelaide Mt Lofty Ranges NRM Board

GOAL 2C Healthy Coasts *continued*

STRATEGIES	POSSIBLE ACTIONS
<p>2C.1 Encourage incorporation of ecological and community values in coastal planning and prioritised management approach</p>	<ul style="list-style-type: none"> • Incorporate climate change and sea level rise into 'Conservation Assessment of the Northern and Yorke Coast' • Prepare and communicate collaborative plans for priority coastal cells • Strategic assessment of new infrastructure development • Integrate coastal values and priorities into planning policy and decision-making frameworks • Integrate coastal works with management of land-based activities • Promote collaboration in the management of coastal zones in settlements
<p>2C.2 Undertake a targeted community awareness program relating to pressures, recreational use and townships to protect native plants and animals</p>	<ul style="list-style-type: none"> • Promote the state, national and international significance of our coasts • Build partnerships with the tourism industry around coastal ecosystems • Establish local community champions and contact points • Develop and implement a targeted communication strategy, including signage, coordination with community groups and visitor programs
<p>2C.3 Undertake targeted and coordinated control of terrestrial and aquatic pest animal and weed impacts</p>	<ul style="list-style-type: none"> • Prepare strategic weed impact management plans at a relevant scale to address priority declared (<i>NRM Act 2004</i>) and environmental weeds • Support collaboration between landholders and volunteer groups to manage weeds and pests across multiple properties and between landscapes • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information
<p>2C.4 Increase coastal buffer and landscape linkages</p>	<ul style="list-style-type: none"> • Develop policy mechanisms to identify and prioritise land areas for coastal inland migration • Ensure future infrastructure works allow for coastal inland migration and ecological outcomes • Review impacts of existing infrastructure and options for adaptation • Communicate the projected impacts (social, agricultural) of sea level rises to relevant communities
<p>2C.5 Improve decision-making capacity within regional agencies</p>	<ul style="list-style-type: none"> • Refer Goal 3D: Sustainable Use – Urban and Industry



GOAL 2D Healthy Gulfs

Maintain and improve ecosystem function of Spencer Gulf and Gulf St Vincent

Objectives

- Increased collaborative management of marine assets
- Improved sustainability of fishing and aquaculture practices to ensure ongoing viability
- Greater importance placed on ecological and community values in marine decision-making
- Future decision-making minimises impacts on marine ecosystems
- Improved conservation status of threatened species

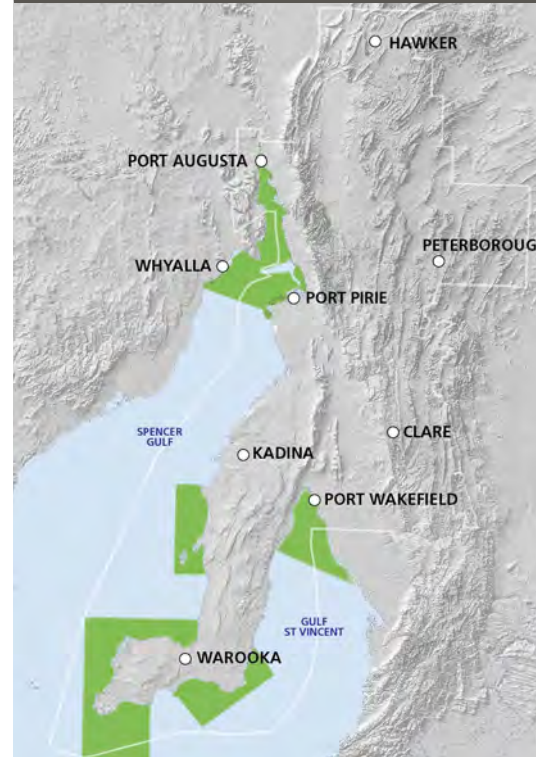
The marine ecosystems of the Spencer Gulf and Gulf St Vincent provide important habitats for unique species, support high-value fisheries and aquaculture industries and are valued by the community as high-use recreation zones. The range of ecosystems in both Gulfs are currently in varying condition, from fair to good, depending on the location.

Estuaries within the Gulfs play important roles, with land-based environmental flows being particularly important in regulating salinity conditions and determining the suitability of habitats as breeding grounds for many species. Climate change impacts will place significant pressure on marine systems into the future and this increases the importance of managing the existing cumulative pressures.

Active management of the Gulfs is a priority. Appropriate governance structures need to be strengthened and land-based activities need increased management to ensure they do not adversely impact on these important systems.



HEALTHY GULFS



LEGEND

● Marine Parks

LEAD: DEW

PARTNERS: Landholders, community groups, producer groups, environmental NGOs, Northern and Yorke NRM Board, Native Vegetation Council, Australian Government, PIRSA, Biosecurity SA, Adelaide Mt Lofty Ranges NRM Board, local government, industry, research and development organisations

GOAL 2D Healthy Gulfs *continued*

STRATEGIES	POSSIBLE ACTIONS
<p>2D.1 Create and support a platform for collaborative monitoring, Strategic Planning and information sharing</p>	<ul style="list-style-type: none"> • Support collaborative research within the Gulfs • Prepare an annual State of the Gulfs report
<p>2D.2 Build relationships between key marine partners</p>	<ul style="list-style-type: none"> • Establish agreements between relevant NRM Boards • Integrate marine policy with Coast Protection Board and other land-based policies and projects. • Provide an interface between land and marine NRM activities
<p>2D.3 Undertake a targeted community awareness program relating to recreational use and land-based impacts, e.g. townships</p>	<ul style="list-style-type: none"> • Promote the state, national and international significance of marine ecosystems • Build partnerships with tourism industry around marine ecosystems • Establish local community champions and contact points • Develop and implement a targeted communication strategy • Undertake and support local community and industry projects and events, e.g. marine debris clean up days • Support community involvement in marine restoration and management programs
<p>2D.4 Undertake targeted and coordinated control of terrestrial and aquatic pest animal and weed impacts</p>	<ul style="list-style-type: none"> • Prepare strategic weed impact management plans at a relevant scale to address priority declared (<i>NRM Act 2004</i>) and environmental weeds • Support collaboration between stakeholders to manage weeds across the seascape • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information
<p>2D.5 Support sustainable fisheries and aquaculture development</p>	<ul style="list-style-type: none"> • Provide input to fisheries and aquaculture policy to support ecological sustainable development, including consideration of climate change adaptation measures.



GOAL **3**

SUSTAINABLE USE

- Agricultural Systems
- Grazing Systems
- Water
- Urban and Industry



GOAL 3A Agricultural Systems

Agricultural systems are productive and operate within the needs and constraints of natural ecosystems

Objectives

- All soils are of pH > 5.5
- All soils maintain adequate surface cover > 340 days/year
- Improve conservation status of threatened species
- Native plants and animals (including insects and soil biota) are maintained and enhanced to provide ecosystem services, as well as for their intrinsic value

The Northern and Yorke region supports a wide range of highly valued agricultural systems including intensive horticulture, continuous cropping and mixed farming.

The region is one of Australia's most well regarded dry-land farming areas and the soils provide the critical asset on which this production is based.

There are also unique pockets, such as Clare Valley, that enable the production of world class wines. Soils in the region range from calcareous loams to loam over clays, and loamy soils over red clay subsoils.

The uptake of no-till farming practices has contributed significantly to the increase of surface cover year round, reducing susceptibility of soil to erosion, however some issues with this farming system in regard to excessive stubble accumulation and the loss of cultivation as a pest and weed control method are now emerging.

Soil acidification associated with high production and use of ammonium based fertilisers is a significant emerging issue.

Soil salinity can periodically influence production values when water tables rise in response to wetter climatic periods, particularly on Yorke Peninsula.

Remnant vegetation remains in isolated parcels and roadsides, including a range of threatened species that need to be conserved.

It is important to recognise that agricultural systems are part of, and fully operate within, natural systems, and that these natural systems support agriculture.

For example:

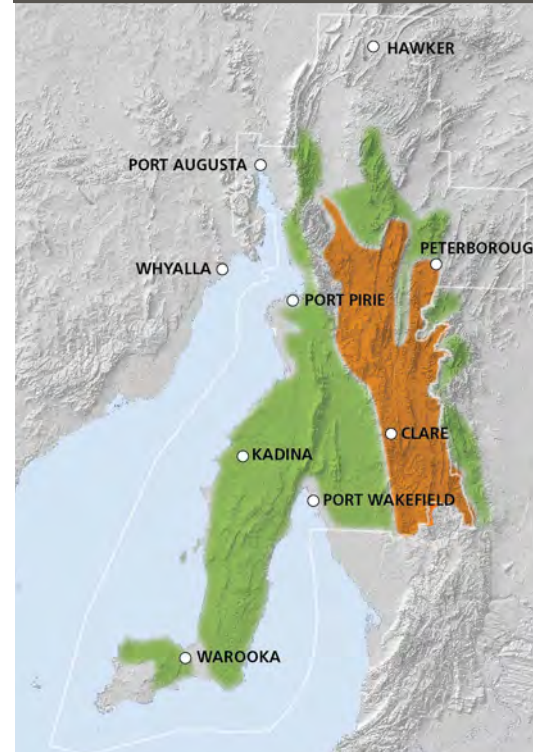
- Insects provide pollination of crops and pest management
- Soil carbon and soil biota influence soil health
- Vegetation influences micro-climates, provides shelter and maintains water quality
- Integrated pest management
- Fire management

The focus of activities aligned with this goal will be the continued pursuit of sustainable agricultural practices to maintain high levels of soil cover and address soil acidity issues.

Handing a resource on to the next generation that is in better condition and is more productive than when they took on its management is a driving force behind the region's farmers. Ruth, Spalding



AGRICULTURAL SYSTEMS



LEGEND

- Agricultural land
- Acid prone soils

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, community groups, producer groups, environmental NGOs, DEW, Native Vegetation Council, Australian Government, PIRSA, Biosecurity SA, local government, industry, research and development organisations

GOAL 3A Agricultural Systems *continued*

STRATEGIES	POSSIBLE ACTIONS
3A.1 Reduce acidification rate through more efficient fertiliser use	<ul style="list-style-type: none"> • Work with advisers, technicians, researchers, agribusiness and farmers to identify, develop, inform, support, demonstrate and implement efficient fertiliser use • Explore the possibilities to utilise biosolids as a soil conditioning agent, to reduce fertiliser use
3A.2 Decrease acidity of soils by applying liming products	<ul style="list-style-type: none"> • Increase awareness of farmers and advisers of the risks associated with soil acidification • Investigate more efficient liming products • Support pH mapping to identify acidic soils • Inform, support, demonstrate and implement spatial application of liming products at appropriate rates
3A.3 Maintain surface cover on annual plant based pastures	<ul style="list-style-type: none"> • Inform, support, demonstrate and implement practices to maintain and improve surface cover, e.g. confinement, supplementary feeding, rotational grazing and feed budgeting
3A.4 Promote alternatives to burning and stubble reduction/cultivation for pest and weed control	<ul style="list-style-type: none"> • Identify, develop, inform, support, demonstrate and implement alternative pest and weed control options
3A.5 Reduce incidence and impact of fire in the agricultural zone	<ul style="list-style-type: none"> • Research and demonstrate fire risk treatments, e.g. application of fire retardants to stubble • Ongoing promotion and review of harvesting codes of practice • Identify, develop, inform, support, demonstrate and implement options to manage fuel loads while maintaining groundcover • Support the development of the Bushfire Management Area Planning process
3A.6 Improve soil stability and infiltration rate (to grow more biomass) where surface cover is inadequate	<ul style="list-style-type: none"> • Identify, develop, inform, support and demonstrate practices with land managers, advisers and NRM organisations to ameliorate problem soils, including: <ul style="list-style-type: none"> - Clay spreading, delving and spading to improve water holding capacity and fertility of sandy soils - Application of gypsum on sodic soils
3A.7 Continuously review 'adequate cover' requirements	<ul style="list-style-type: none"> • Monitoring and analysis of soil cover during and post extreme events
3A.8 Increase knowledge and awareness of native plant and animal services to production and how these can be protected and enhanced	<ul style="list-style-type: none"> • Support locally relevant research activities and increase accessibility of technical expertise/local context: <ul style="list-style-type: none"> - Assessment of pollinator and soil biota needs - Impact of pesticides and fungicides on pollinators and soil biota • Inform and demonstrate practices for: <ul style="list-style-type: none"> - Reduced reliance on the use of pesticides and herbicides - Maintain and increase area/condition of native vegetation - Grazing practices
3A.9 Undertake and support revegetation and regeneration activities for production outcomes	<ul style="list-style-type: none"> • Develop opportunities for strategic on-farm revegetation programs • Promotion and coordination of carbon sequestration and Significant Environmental Benefit opportunities • Support regional plant nurseries • Provide revegetation and regeneration advice to landholders • Implement paddock tree program • Develop management plan for threatened species in agricultural landscapes
3A.10 Manage land run-off and impacts to watercourse integrity and riparian areas	<ul style="list-style-type: none"> • Provide accessible water management technical expertise to landholders • Encourage sustainable property management planning • Watercourse revegetation, bank stabilisation and improvements to healthy riparian systems
3A.11 Manage water use	<ul style="list-style-type: none"> • Refer Goal 3C: Sustainable Use – Water
3A.12 Increase active management of weed and predator impacts	<ul style="list-style-type: none"> • Prepare strategic weed and predator management plans at a relevant scale to address priority declared (NRM Act 2004) and environmental weeds • Support the collaboration of landholders and volunteer groups to manage weeds and predators across multiple properties at a landscape-scale • Increase the awareness of landholders to their management obligations under the NRM Act 2004 • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information

GOAL 3B Grazing Systems

Grazing systems are productive and operate within the needs and constraints of natural ecosystems

Objectives

- All soils maintain adequate surface cover > 340 days/year
- Native vegetation condition within grazing systems is maintained or improved
- Improve conservation status of threatened species and ecological communities
- Grazing systems are managed for water use efficiency and optimal water quality

Over 44% of the Northern and Yorke region is used for grazing by livestock. While factors such as rainfall and/or slope restrict cropping use, good quality pasture and access to water are still necessary for viable grazing production.

Modified pastures occur throughout the region and native vegetation, such as native grasses and shrubs, occur on the northern and eastern fringes. The soils supporting these pastures range from calcareous loams to loam over clays, and loamy soils over red clay subsoils.

Groundwater bores, dams and waterholes are relied upon as sources of water, with mains water available in limited areas. Rainfall infiltration is also vital to maintaining surface cover.

Grazing is a balancing act between stocking rates and maintaining the availability of quality pasture and water. There are also competing pressures such as goats, kangaroos, rabbits and weeds.

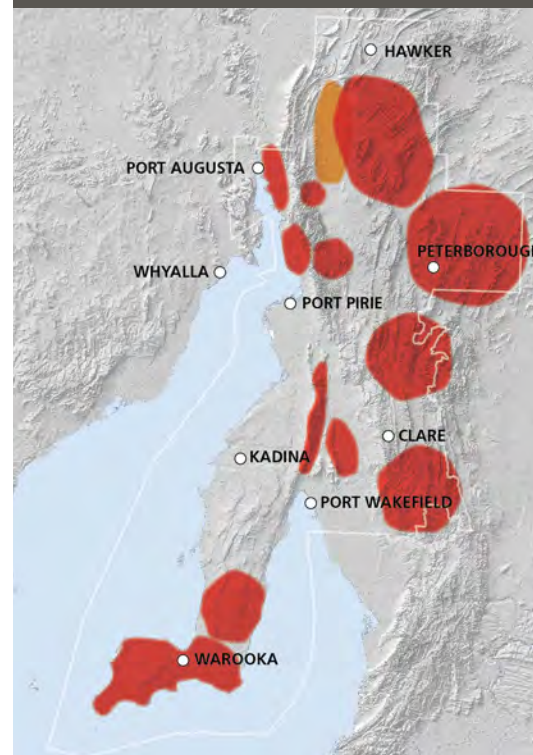
Remnant vegetation remains in isolated parcels and roadsides, including a range of threatened species that need to be conserved. In many places grazing occurs on remnant native grasslands, which are one of Australia's most threatened ecological communities and require careful management.

The focus of activities aligned with this goal will be the continued pursuit of sustainable grazing practices to maintain high levels of soil cover and quality native vegetation.

Improved grazing management improves soil cover, increases water utilisation, increases biodiversity and improves farm productivity. Anne, Wirrabara



GRAZING SYSTEMS



LEGEND

- Priority for biodiversity outcomes
- Priority for surface cover outcomes

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, community groups, producer groups, environmental NGOs, DEW, Native Vegetation Council, Australian Government, PIRSA, Biosecurity SA, local government, industry, research and development organisations

GOAL 3B Grazing Systems *continued*

STRATEGIES	POSSIBLE ACTIONS
3B.1 Improve livestock grazing practices	<ul style="list-style-type: none"> • Build skills and knowledge around grazing systems and practices for managing native species based pastures for livestock • Establish common indicators, e.g. economics, vegetation condition, to monitor and communicate the sustainability of different grazing practices, e.g. emerging technologies, pasture types and diversity, and native grasslands • Identify and increase accessibility of technical expertise, spatial tools and information for sustainable grazing to support knowledge exchange • Establish and support grazing networks and industry linkages
3B.2 Increase active management of total grazing pressure	<ul style="list-style-type: none"> • Develop and implement tools to monitor and communicate the populations and impacts of herbivores, e.g. economic analysis, remote sensing to show long-term degradation and understand trigger points • Improve knowledge of existing and future markets for feral herbivores so that appropriate management strategies and legislative changes can be developed • Inform, support and demonstrate to land managers and advisers effective techniques for managing herbivores, including herbivore pests
3B.3 Support best practice grazing business management and long-term planning	<ul style="list-style-type: none"> • Improve accessibility of technical business management expertise • Encourage sustainable property management planning • Promote agricultural innovations
3B.4 Increase active management of weed and predator impacts	<ul style="list-style-type: none"> • Prepare strategic weed and predator management plans at a relevant scale to address priority declared (<i>NRM Act 2004</i>) and environmental weeds • Support the collaboration of landholders and volunteer groups to manage weeds and predators across multiple properties at a landscape-scale • Increase the awareness of landholders to their management obligations under the <i>NRM Act 2004</i> • Support surveillance and adaptive timely response to new incursions of pests and weeds and environmental conditions, e.g. surveillance reporting systems, promote community surveillance, collation of distribution and abundance information
3B.5 Manage land run-off and impacts to watercourse integrity and riparian areas	<ul style="list-style-type: none"> • Provide accessible technical expertise to landholders • Encourage sustainable property management planning • Watercourse revegetation, bank stabilisation and improvements to healthy riparian systems
3B.6 Manage water use	<ul style="list-style-type: none"> • Refer Goal 3C: Sustainable Use – Water



GOAL 3C Water

Water resources are managed within the constraints and needs of natural ecosystems and the community

Objectives

- Groundwater resources are managed within an acceptable level of risk
- Surface water resources are managed within an acceptable level of risk
- Minimise impacts of future water development on the environment and water dependent ecosystems

Groundwater and surface water resources of the Northern and Yorke region are characterised by a high degree of spatial and temporal variability.

The availability of good quality water has been a key factor in the traditional movement of Aboriginal people, settlement and development and remains a critical asset for the region.

Watercourses and waterholes are also valued for their amenity and recreational uses in both rural and urban areas of the region.

The quality of the water, in particular salinity, limits its suitability for various uses. In addition, in most years only limited run-off or groundwater recharge occurs, with the exception of comparatively more reliable areas such as the Clare Valley. As a result, water resources have been diverted and captured to maintain supplies over extended dry periods and increase productive use of land.

As a community, we need to understand the values of our natural systems that depend on water resources and what level of water use can occur with consideration of the needs and limits of natural systems – this is referred to as ‘acceptable level of risk’. Consultation will need to be undertaken with the community to determine what they deem an ‘acceptable level of risk’.

Today, many of the region’s water resources are thought to be close to sustainable limits and decreases in water availability are projected due to climate change. Water remains a major limiting factor to further economic development of the region.

Changes to the quantity and quality of water affects a diverse array of water-dependent ecosystems in watercourses, wetlands and estuaries (including native plants and animals). The quantity, timing, duration and frequency of flows in watercourses, coupled with the maintenance of springs and waterholes from groundwater, are critical to these ecosystems.

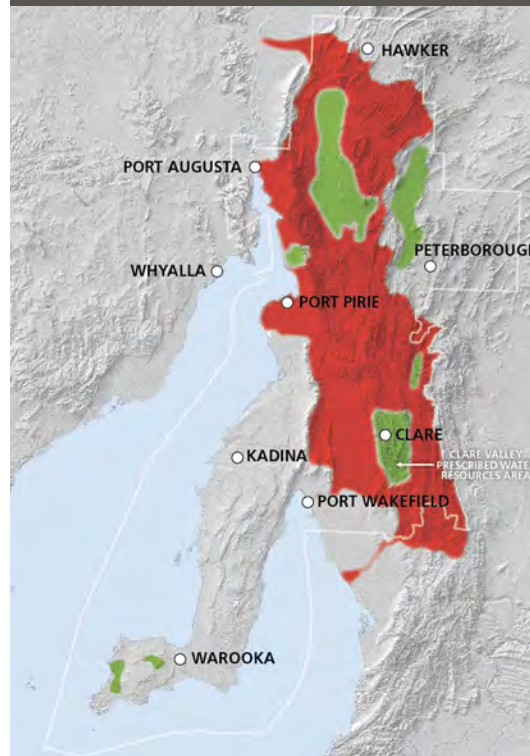
The integrity of watercourses and health of native vegetation within a catchment are critical factors in the management of water resources via hydrological processes of run-off, infiltration and recharge.

Improving our knowledge of water resources and the efficiency of water use will be fundamental to balancing needs of the goal within future climatic variations.

Water is a critical element of life. The health and condition of all life depends on the quality and reliability of water access. Jane, Clare



WATER



LEGEND

● Surface water

● Higher value groundwater

For landscape-scale priorities refer to the relevant Community Action Plan summaries and Catchment Action Plans

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, DEW, PIRSA, Environmental Protection Authority (EPA), SA Water, RDAYMN, local government, Producer groups, water users, Traditional Owners, Adelaide Mt Lofty Ranges NRM Board, research and development organisations, Environment Protection Agency (EPA), Australian Government

GOAL 3C Water continued

STRATEGIES	POSSIBLE ACTIONS
<p>3C.1 Review regions water management framework to reflect current and future needs</p>	<ul style="list-style-type: none"> • Identify current and future sources of risk to water resources • Identify controls for managing risk including application of water take policy • Seek input from Aboriginal groups, stakeholder and industry groups, individual users and the broader community around suitable levels of risk and management controls • Continued support for statewide water reform
<p>3C.2 Ongoing implementation and review of Water Allocation Plan (WAP) for the Clare Valley Prescribed Water Resources Area</p>	<ul style="list-style-type: none"> • Licence and Water Affecting Activities (WAA) administration • Resource and use monitoring • Ecosystem monitoring • Consult with community to review the Clare WAP • Undertake investigations to support review of Clare WAP
<p>3C.3 Improve the efficiency of water use across catchments (for ecosystem and production outcomes and in response to climate change)</p>	<ul style="list-style-type: none"> • Provide information on current water resource status and future climate change projections to inform property level risk management • Provide technical expertise to support property planning • Inform, support and demonstrate to landholders and water users: <ul style="list-style-type: none"> - Water use efficiency options, e.g. capping bores, irrigation methods - Dam management options, e.g. evaporation reduction, dam placement - Alternative supply options, e.g. sheeted catchments, brackish water, technologies • Investigate viability of returning water to the environment to improve ecosystem outcomes for riparian and estuarine systems (options such as removing unused dams, and managed dam and reservoir discharges)
<p>3C.4 Increase community knowledge and participation in water resources and dependent ecosystem monitoring</p>	<ul style="list-style-type: none"> • Regionally delivered citizen science programs • Promote Aboriginal knowledge and values of water • Improve the accessibility of information about current status and projections of water resources
<p>3C.5 Undertake and communicate investigations into resource capacity and quality of less well known resources</p>	<ul style="list-style-type: none"> • Capture local knowledge • Review and prioritise existing monitoring networks for fit-for-purpose outcomes • Undertake groundwater modelling of the Willochra Basin resource to determine sustainable extraction limits • Investigate Mambrey Coast catchment to find potentially usable groundwater resources



GOAL 3

SUSTAINABLE USE

Agricultural Systems
Grazing Systems
Water
Urban and Industry

GOAL 3D Urban and Industry

Urban and industrial development is sustainable and operates within the needs and constraints of natural systems

Objectives

- Increased capacity for sustainable regional development decision-making
- Increased environmental industry contribution to regional economy and lifestyles
- Reduced urban and industry waste impacts on the environment to within sustainable levels

There has been sustained jobs growth across Northern and Yorke in recent years, particularly in mining, construction, tourism and services.

The region's access to national road, rail and sea networks supports this continued growth and diversification of export industries. There are also opportunities for further development of tourism. However, urban and industrial development also place significant pressure on natural resources.

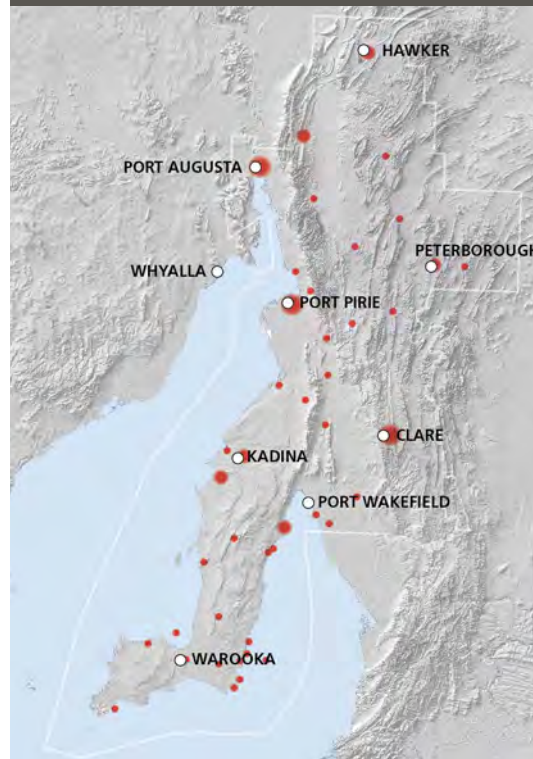
There are numerous opportunities for both the uptake and development of renewable energy sources, while urban and economic development can deliver positive outcomes for the environment.

Future development should recognise the needs and constraints of natural systems, and ensure that the actions of the current generation do not compromise the ability of future generations to meet their needs. The ongoing environmental impact and management of existing and future infrastructure needs to be considered.

Caring for nature and natural systems ensures that we can maintain the region's liveability and economy.



URBAN AND INDUSTRY



LEGEND

● Intensive uses

LEAD: Northern and Yorke NRM Board

PARTNERS: Landholders, DEW, PIRSA, EPA, SA Water, RDAYMN, local government, producer groups, water users, Traditional Owners, research and development organisations, Australian Government, industry

GOAL 3D Urban and Industry *continued*

STRATEGIES	POSSIBLE ACTIONS
3D.1 Improve sustainable decision-making capacity within regional agencies	<ul style="list-style-type: none"> • Provide multi-criteria decision-making tools • Increase accessibility of ecological evidence • Ensure local ecological management expertise on Regional Planning Boards
3D.2 Increase clarity around natural resources and development policy	<ul style="list-style-type: none"> • Integrate the principles and priorities of NRM into planning policy and decision-making frameworks, including the value of nature within urban and industrial landscapes • Encourage alignment of regional agency policy • Advocate for improvements in legislation to clarify and simplify roles and responsibilities throughout governmental processes
3D.3 Partnerships, knowledge and monitoring	<ul style="list-style-type: none"> • Refer Goal 1: Working together
3D.4 Support economic development of the regional 'environmental industry'	<ul style="list-style-type: none"> • Support collaboration across industry sectors and regional agencies to identify joint ventures and bundling opportunities • Promote 'environment' as a legitimate land use and associated employment outcomes • Use regulatory tools to drive change with major industry to improve sustainability and employment outcomes • Advocate for regional 'environmental industry' at a political level • Increase accessibility and utilisation of external expertise to encourage regional innovation • Build a repository of knowledge around regional opportunities for low carbon economy
3D.5 Reduce impact of land-based discharges to the marine environment for natural resource outcomes	<ul style="list-style-type: none"> • Coastal town Community Wastewater Management Scheme (CWMS) upgrades • Flood management / stormwater infrastructure upgrades and inclusion of water sensitive urban design elements • Reuse of stormwater and wastewater • Utilise existing legislative levers
3D.6 Undertake a community awareness and behaviour change program targeting waste management and carbon emissions	<ul style="list-style-type: none"> • School-based education • Establish local community champions and contact points • Demonstrate and provide incentives for sustainable practices • Connect communities and industry



APPENDICES

State of the Region
Asset Summaries
Pressure Summaries
Attribute Summaries
Community Action Planning
Governance



Appendix A. State of the Region

The following State of the Region summary provides the basis for strategic direction. It reflects the process followed in Community Action Planning (CAP), reporting on the condition of the natural resource assets and assessing the pressures they are subject to. The CAP programs identified the key assets, pressures and attributes across the region.

For more information about the CAP process, refer to Appendix C.

Asset Summaries

Asset health is considered at a sub-regional scale to account for variation across the region. These sub-regions relate to the regional landscapes and the Community Action Planning programs. The asset rating indicates viability (ecological integrity) of an asset. It is a measure of: how resistant an asset is to change in its structure and composition in the face of external stresses; and how resilient an asset is (ability to recover upon experiencing occasional severe stress).

Refer to [pages 43-52 for the Asset Summaries](#) which provide a description of the main regional assets including an indication of location and extent, viability rating and relevant attributes and pressures.

Pressure Summaries

A pressure is a human induced action or event that will degrade the health of an asset. They can be a natural phenomena altered by human activities or whose impact is increased by human activities. Pressures can cause a stress on an asset – this is when one of the attributes is not working properly. There are always a number of contributing factors (economic, cultural, societal, or institutional) which drive the pressure. Pressures are rated by asset, accounting for the scope (how much of the asset will be impacted); severity (how badly damaged will the asset be); and irreversibility (can the damage be fixed?).

Refer to [pages 53-59 for the Pressure Summaries](#) which provide a description of the main regional pressures and ratings.

Attribute Summaries

Attributes are the key characteristics that are used to define the viability of the assets. These can be measured by monitoring indicators and defining what would constitute a ‘good’ (or otherwise) status or threshold line. Attributes may incorporate factors such as size, condition and landscape context. Where there is insufficient monitoring, expert and local knowledge is used, acknowledging a level of confidence in the assessment. Refer to [pages 60-68 for the Attribute Summaries](#) which provide a description of the main regional attributes including an indication of current monitoring and knowledge. These attributes form the basis for ongoing regional Monitoring, Evaluation and Reporting framework.

Further Information

These summaries are supported by a range of more detailed CAP summaries, scoping reports, monitoring reports, investigations and regional report cards. Links to some of these information sources are provided within the Summaries.

Sub-regional descriptions

Due to the diversity of natural resources and local nuances across the Northern and Yorke region, planning and collaboration is better done at a scale that relates to community dynamics and practices.

The following program areas are used in the reporting of asset health and pressures.



The Asset Summary ratings are defined as follows:

RATING	STARS	DEFINITION
Very Good	★★★★	Ecologically desirable status; requires little intervention for maintenance
Good	★★★	Within acceptable range of variations; some intervention required for maintenance
Fair	★★	Outside acceptable range of variation; requires human intervention
Poor	★	Restoration increasingly difficult; may result in extirpation

The Pressure Summary ratings are defined as follows:

RATING	POINTS
Very high	●●●●
High	●●●
Medium	●●
Low	●

Description of Asset

Temperate plains and ecosystems occur across the flat, higher rainfall areas of the Northern and Yorke region. These areas are dominated by various types of mallee and open woodlands.

Over the plains and low hills to the west of the Clare Ranges, the mallee is heavily fragmented due to historical clearing. Few large remnant patches remain, with smaller patches occurring on roadsides, railway lines and stock routes, with Clements Gap Conservation Park being the largest protected site.

Sub-coastal mallee is the dominant vegetation type on the south-west of the peninsula, occurring on soils unsuitable for agriculture. Vegetation is low and dense and supports western pygmy possum, malleefowl, western whipbird and the mainland tammar wallaby. Protected areas include Innes National Park and Warrenben Conservation Park. Relictual mallee on the 'leg' of the peninsula comprise of open mallee formations on loamy calcareous soils and shrubby mallee habitats on deep sands.

Open woodlands were once contiguous from Corny Point across the northern part of the 'foot' and up the western 'leg' of the peninsula but are now highly fragmented. The largest areas remain between Innes National Park and Warrenben Conservation Park and near Minlaton, Curramulka and Port Vincent. Open woodlands provide critical habitat for range of birds at risk and nationally threatened orchids and are generally dominated by mallee box and drooping sheoak. They can also occur with dryland tea-tree as a dominant overstorey, particularly on shallow limestone soils.

Values

Ecosystem services to agriculture; Livestock grazing; Habitat for rare and threatened species; Amenity value of vegetation and scrub

Attributes

- Connectivity to adjacent vegetation communities
- Flora diversity and vegetation condition
- Fauna diversity
- Fire regime
- Hydrological regime
- Total area of asset remaining and patch size (Yorke Peninsula)

Key Pressures

- Changes to natural systems
- Climate change
- Grazing livestock
- Introduced pests and overabundant native species



TEMPERATE PLAINS ECOSYSTEMS



LEGEND

● Temperate plains ecosystems

FURTHER INFORMATION

Mid North Horizons CAP
Naturally Yorke CAP

Description of Asset

Extending from Middle Beach on the eastern side of Gulf St Vincent to Two Hummock Point immediately south of Blanche Harbour on the western side of Spencer Gulf, the coastal area includes the head of both gulfs and the entire coast of Yorke Peninsula, a coast of approximately 1380 kilometres, or one third in length of the states' coastline.

The area comprises a variety of coastal environments, including high energy cliffed coasts with pocket beaches, low energy gulf shorelines of low cliffs, narrow beaches and extensive saltmarsh and mangrove supra-tidal plains.

The coastal mangroves and samphire communities within inter-tidal areas of sheltered coastlines between Port Pirie and Port Augusta are exceptionally rich and productive environments, providing important marine habitat for commercial species. The coastal areas of the 'leg' of Yorke Peninsula are dominated by common coastal plants and provide important habitat for shorebirds and reptiles, and roosting habitat for small raptors. The Southern Yorke Peninsula supports a range of migratory shorebirds and marine mammals.

Values

Habitat for rare and threatened species; Breeding grounds for fish; Residential, tourism and recreational use; Nationally threatened temperate saltmarsh communities; Internationally significant shorebird sites, comprising part of the East Asian Australasia flyaway

Attributes

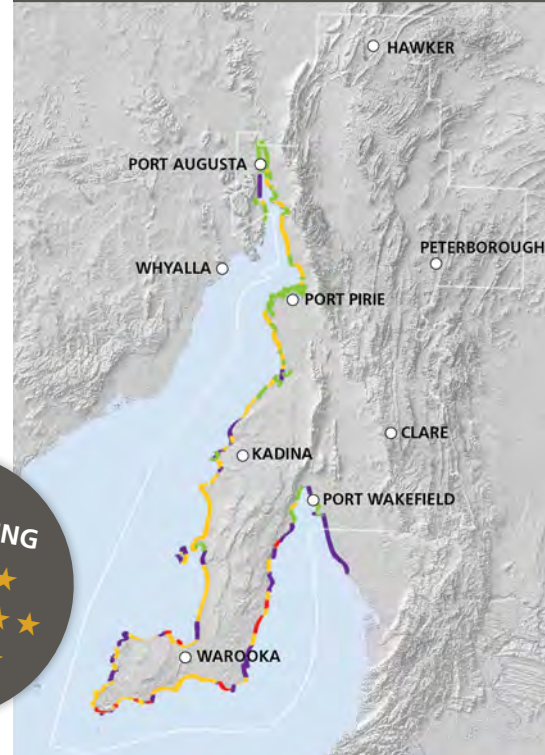
- [Connectivity to adjacent vegetation communities](#)
- [Flora diversity and vegetation condition](#)
- [Fauna diversity](#)
- [Coastal processes](#)
- Total area of asset remaining and patch size

Key Pressures

- [Climate change](#)
- [Extreme weather events](#)
- [Introduced pests and overabundant native species](#)
- [Recreational activities](#)



COASTAL ECOSYSTEMS



LEGEND

- Cliff
- Flats
- Beaches
- Rock

FURTHER INFORMATION

- Living Flinders CAP
- Mid North Horizons CAP
- Naturally Yorke CAP
- Conservation Assessment of the Northern and Yorke Coast

Description of Asset

There are four main river catchments in the Northern and Yorke region: Light, Broughton and Wakefield in the Mid North, and Willochra in the uppermost part of the region.

The Willochra Creek and a number of smaller drainage lines in the Southern Flinders Ranges are ephemeral systems which flow for 3-4 months of the year and are punctuated by periodic floods. These flow north towards Lake Torrens and north-east towards Lake Frome. The Broughton River and ephemeral Mambrey Creek drain into Spencer Gulf, while the Wakefield and Light Rivers flow into Gulf St Vincent. All rivers typically have low base flows which are higher in winter and periodically flood.

Water from the Broughton, Wakefield and Light River catchments is primarily used for stock, with some irrigation and domestic use. Some water is accessed directly from waterways by stock, however much is captured in dams or drawn from permanent pools. There are three large reservoirs (Baroota, Bundaleer and Beetaloo) in the region, which are no longer used for town water supply but are maintained by SA Water and may be utilised in the future for managing environmental flows, recreation or primary production.

Surface water supports an array of water-dependent ecosystems (including native plants and animals) in rivers, wetlands and estuaries. The integrity of the watercourses and health of native vegetation within the catchments are critical factors in the balance of run-off, recharge and maintenance of water quality.

Values

Habitat for rare and threatened species; Stock and irrigation water; Cultural and amenity values

Attributes

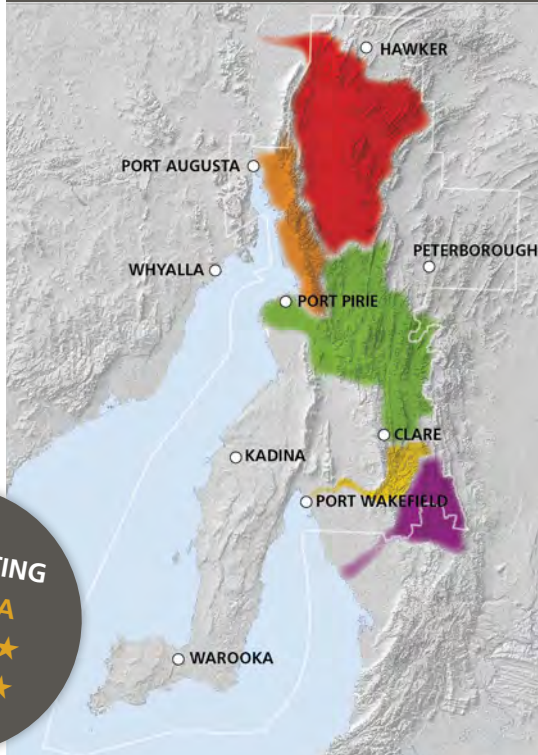
- [Water quality](#)
- [Hydrological regime](#)
- [Connectivity of permanent pools](#)
- [Capacity of water resource](#)
- [Geomorphology](#)

Key Pressures

- [Water use and dams](#)
- [Climate change](#)
- [Grazing livestock](#)



SURFACE WATER



LEGEND

- Willochra Creek
- Mambrey Coast
- Broughton River
- Wakefield River
- Light River

ASSET RATING

N/A

★ ★ ★

FURTHER INFORMATION

Sustainable Water CAP

Description of Asset

In the Northern and Yorke region there are a number of different types of groundwater aquifer systems, both shallow and deep. The shallow groundwater resources are sourced from nine broadly defined basins.

Groundwater supports a number of water dependent ecosystems. All permanent surface water pools in the region are thought to depend on groundwater to persist, highlighting the close interaction between surface and groundwater. Naturally occurring water salinity is a significant limiting factor for domestic and commercial use. Groundwater resources with salinity typically less than 2,000 ppm support town water supplies including Para-Wurlie Basin at the southern end of Yorke Peninsula, and bores primarily situated along the Southern Flinders Ranges. Groundwater resources of moderate quality (2,000 – 7,000 ppm) support irrigation, stock and domestic use.

Values

Stock and domestic water supply; Town water supplies; Industry water supply; Viticulture and horticulture irrigation; Groundwater dependent ecosystems; Cultural and amenity values of waterholes

Attributes

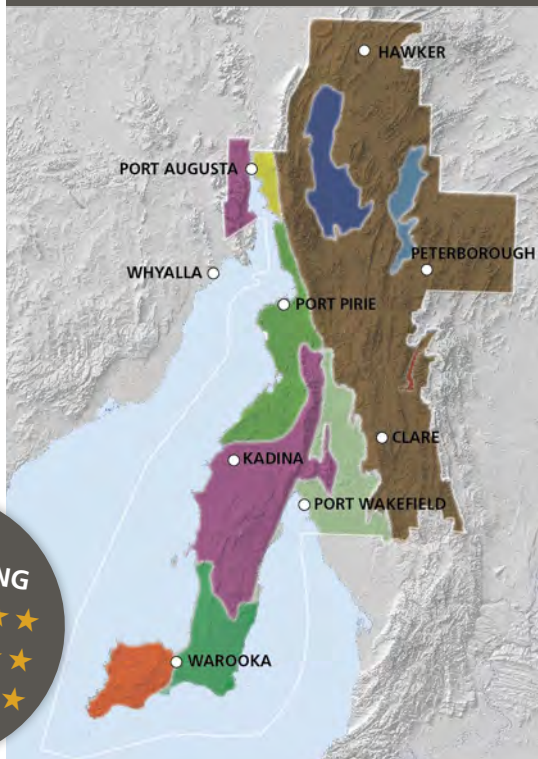
- Salinity
- [Water quality](#)
- [Capacity of water resource](#)

Key Pressures

- [Climate change](#)
- [Water use and dams](#)
- [Extreme weather events](#)
- [Grazing livestock](#)
- [Residential and industry pollution](#)



GROUNDWATER



LEGEND

- | | |
|----------------------|------------------|
| Adelaide Geosyncline | St Vincent Basin |
| Booborowie Valley | Torrens Basin |
| Gawler Craton | Troubridge Basin |
| Para Wurlie Basin | Walloway Basin |
| Pirie Basin | Willochra Basin |

FURTHER INFORMATION

Sustainable Water CAP

Description of Asset

Marine ecosystems of the Northern and Yorke region include parts of Spencer Gulf and Gulf St Vincent.

Spencer Gulf is classified as an inverse estuary. In the north it experiences seasonal extremes in temperature and, due to a lack of freshwater input, high evaporation and relatively poor mixing, the seawater tends to be highly saline. The central portion of Spencer Gulf is a semi-sheltered system with warm temperate waters from the north mixing with an influx of cool seawater from the Southern Ocean. This portion accommodates a diverse range of habitats and biota, from mangrove-lined flats and soft-bottom sedimentary ecosystems of the sheltered waters of the northern parts of the Gulf, to rocky shorelines and reef structures in the more exposed waters.

Gulf St Vincent is also a confined, inverse estuary providing ideal conditions for extensive mangrove forests, together with associated tidal mudflats and saltmarsh communities. These habitats are ecologically important, acting as a nursery for juveniles and feeding grounds for diverse marine fauna. Other significant habitats include seagrass beds, algal-dominated reefs and sponge gardens.

Spencer Gulf is an important economic growth area for South Australia, servicing mineral and energy resource activities across the state and into western New South Wales. Both Gulfs support high-value fisheries and aquaculture industries as well as important recreational areas and zoned Marine Parks.

Values

Commercial fishing; Aquaculture; Cultural fishing; Recreational fishing and other activities; Shipping and industry ports; Habitat for rare and threatened species

Attributes

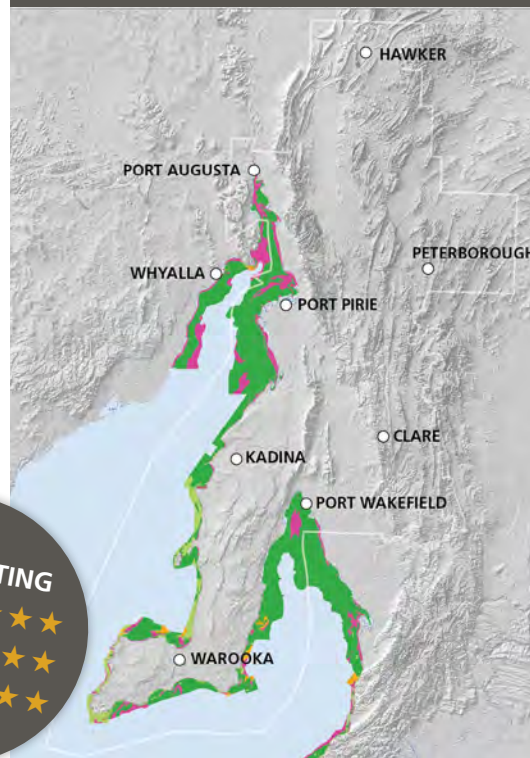
- [Water quality](#)
- Extent and condition of seagrass and reefs
- Species diversity
- [Fish abundance](#)

Key Pressures

- [Climate change](#)
- [Fishing](#)
- [Extreme weather events](#)
- [Fire](#)
- [Residential and industry development](#)
- [Residential and industry pollution](#)
- [Introduced pests and overabundant native species](#)



MARINE ECOSYSTEMS



LEGEND

- Macroalgae communities
- Seagrass communities
- Reef communities
- Saltmarsh/Mangrove communities
- Substrate communities



FURTHER INFORMATION

Yorke Peninsula Marine Assets

Description of Asset

Semi-arid plains and ranges occur across the upper north and eastern edge of the region and correspond closely with pastoral land uses and grazing on native vegetation in the lower rainfall zones.

The plains are flat or gently undulating and are associated with the Willochra catchment. Woodlands occur with overstorey species including black oak, *Myoporum platycarpum*, western myal, northern cypress pine and pockets of mallee. These are critical to a range of bird species at risk and support nationally vulnerable plants such as sandalwood. The plains also have extensive areas of bluebush shrublands and grasslands which are an important resource base for grazing.

The semi-arid ranges are integral to local Aboriginal culture and there are many significant sites. The ranges are a complex of many landscape elements including rocky peaks and outcrops, deep valleys and gorges, low hills and extensive creek networks. The vegetation is a diverse mosaic of shrublands, woodlands, mallee and spinifex. Dominant woodland overstorey species include black oak, bullock bush, northern cypress pine, gum-barked coolibah and mallee species. A key fauna species is the nationally vulnerable yellow-footed rock-wallaby. A number of raptor species also use these areas for hunting and nesting, while rocky outcrops are thought to be important for a range of reptile species. Short-tailed grasswren is a rare species with specific habitat affiliations to the *Triodia* hummock grasslands.

To the east and north-east of Burra, the eastern mallee and transitional country, including highly elevated ranges and expansive arid plains, is characterised by arid vegetation communities including pearl bluebush, low shrublands, woodlands and temperate mallee woodlands.

Values

Habitat for rare and threatened species; Vegetation, shelter and water supports livestock grazing; Tourism and recreational use

Attributes

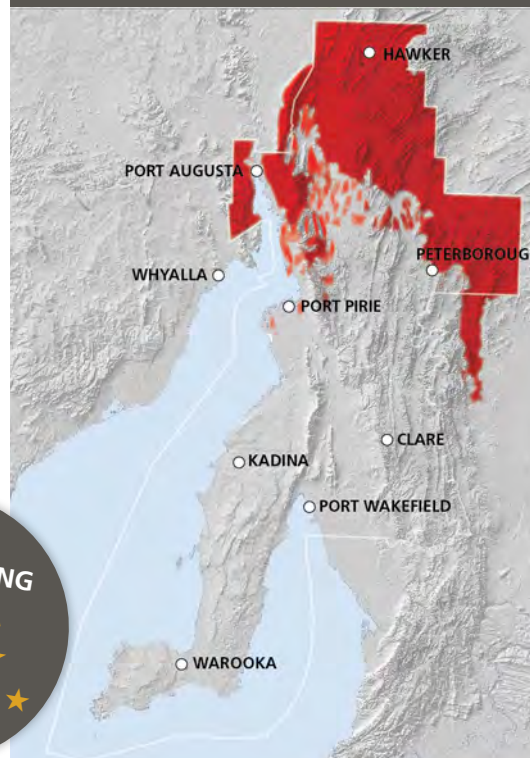
- [Connectivity to adjacent vegetation communities](#)
- [Flora diversity and vegetation condition](#)
- [Fauna diversity](#)
- [Fire regime](#)
- [Hydrological regime](#)
- Total area of asset remaining and patch size

Key Pressures

- [Grazing livestock](#)
- [Introduced pests and overabundant native species](#)
- [Climate change](#)
- [Cropping practices](#)



ARID PLAINS AND RANGES ECOSYSTEMS



LEGEND

- Arid plains and ranges

FURTHER INFORMATION

Living Flinders CAP

Description of Asset

Temperate ranges of the Northern and Yorke region are generally confined to the higher topographic and rainfall (greater than 400 mm/year) areas of the Southern Flinders Ranges and across ranges of the Mid North area.

The main spine of Southern Flinders Ranges, from Crystal Brook in the south to Mount Brown in the north, includes temperate forests and woodlands with shrub dominated understorey on the main range; grassy ecosystems such as the nationally endangered peppermint box and grey box grassy woodlands; and temperate shrublands of yacka and sweet bursaria on rocky ranges and low hills. These areas support important habitat for declining woodland birds, significant yellow-footed rock-wallaby populations and a number of nationally threatened orchids.

In the Mid North, temperate native grasslands were once a dominant vegetation but are now mostly confined to non-arable hills and ranges. These areas support the nationally endangered iron grass grasslands and pygmy blue-tongue lizard. Temperate woodlands occur in ranges of moderate to higher rainfall in the east. Woodland areas support bird species that are at risk.

Values

Ecosystem services to agriculture; Livestock grazing; Habitat for rare and threatened species; Amenity value of roadside vegetation, scrub blocks and watercourses

Attributes

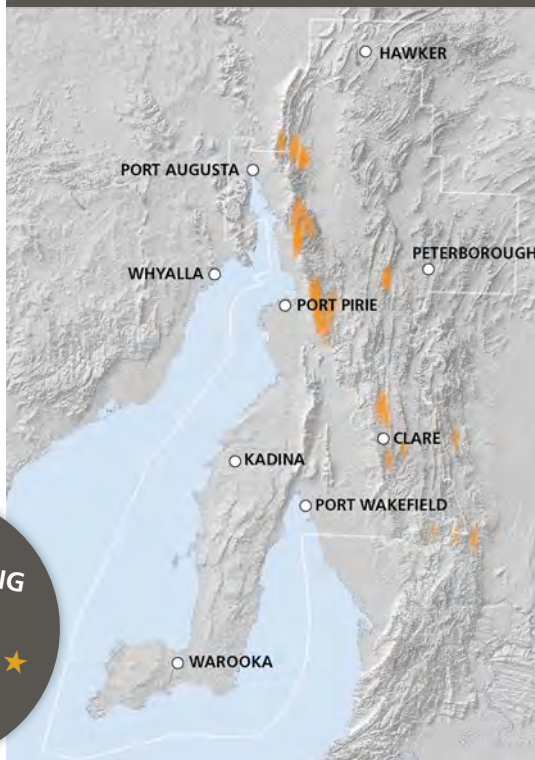
- [Connectivity to adjacent vegetation communities](#)
- [Flora diversity and vegetation condition](#)
- [Fauna diversity](#)
- [Fire regime](#)
- [Hydrological regime](#)
- Total area of asset remaining and patch size

Key Pressures

- [Introduced pests and overabundant native species](#)
- [Grazing livestock](#) (localised areas)



TEMPERATE RANGES ECOSYSTEMS



LEGEND

- Temperate ranges ecosystems

FURTHER INFORMATION

Mid North Biodiversity CAP
Living Flinders CAP

Description of Asset

Calcareous soil is found over much of the northern and central parts of Yorke Peninsula. These soils are usually associated with mallee vegetation; drainage can be very high in deep soils with light textured subsoils. Shallow soil on calcrete or limestone occurs primarily in the southern to central areas. These soils are characterised by a hard carbonate layer or calcrete or limestone within 50 centimetres of the soil surface. Deep sand soils are sandy throughout, resulting from the deposition and reworking of sandy material by wind. These soils manifest in two forms: sand ridges of distinctly varying relief around Port Broughton, Moonta and Balaklava, and the gently undulating topography of Southern Yorke Peninsula.

In the Lower and Mid North, the most common soil type is hard, red-brown, texture-contrast soils, with alkaline sub-soil, found predominantly on the plains and low hills. These soils are firm to hard loamy sands, to clay loam surface soils over red or brown sandy clay loam to clay subsoils. Further to the north, calcareous soils are predominantly found on the plains and low hills. These are well drained, except when overlying clayey subsoils, and infiltration can be excessive in deep soils with light textured subsoils.

Cropped land in the upper north, e.g. north of Peterborough, predominantly lies on calcareous soils and hard red-brown texture contrast soils over alkaline subsoils.

Values

Agricultural production, including cereal, mixed farming and viticulture; Services to natural ecosystems

Attributes

- [Soil pH / Soil acidification rate](#)
- Number of days with adequate surface cover

Key Pressures

- [Cropping practices](#)
- [Grazing livestock](#)
- [Introduced pests and overabundant native species](#)
- [Extreme weather events](#)
- [Fire](#)



SOILS – AGRICULTURE



LEGEND

- Soils – Agriculture



FURTHER INFORMATION

Sustainable Soils CAP

Description of Asset

Soils used predominantly for grazing are generally found in the north, the ranges and more saline parts of the region.

In the north, calcareous soil is found on the plains where cropping is restricted by low rainfall, subsequently land use is overwhelmingly grazing. Hard red-brown texture contrast soils over alkaline subsoils are predominantly found on the plains and low hills. Land north east of Peterborough and west of Hawker is primarily used for grazing. Shallow soils on rock are predominantly found on and near the ranges and are mostly unsuitable for cropping.

The coastal plains extending to the foot of the Southern Flinders Ranges in the west are highly saline. The saltbush and bluebush shrublands which cover much of this asset support grazing by cattle and sheep.

In the Mid North, areas of shallow soil on rock found on or near the ranges are predominately used for grazing.

Naturally saline coastal and internal draining landforms are too salt affected for most crop types and so agriculture in these areas has an emphasis on grazing on the perennial samphire vegetation and/or planted saltbush. Examples of these conditions include; inland saline lakes between Port Wakefield and Redhill, the coastal plains between Port Broughton and Port Pirie, and the internally drained and ocean connected Peesey Swamp and 'The Drain' on Yorke Peninsula. The soils along non-arable Hummocks Range are mainly loams of calcareous soils, gradational soils with highly calcareous lower subsoil, and hard red-brown texture contrast soils with alkaline subsoil. These areas are not

suitable for cropping due to a number of limiting factors including shallow soils and steep slopes. Remnant perennial native grasslands cover much of this asset, with some grassy woodland in the south, making them very suitable for grazing. Average annual rainfall is around 350mm to 450mm. Carbonate sands on the south western tip of Yorke Peninsula, the coast from Foul Bay, through Inneson and up to Daly Head, is more commonly grazed or reserved for conservation.

Values

Livestock grazing; Services to natural ecosystems

Attributes

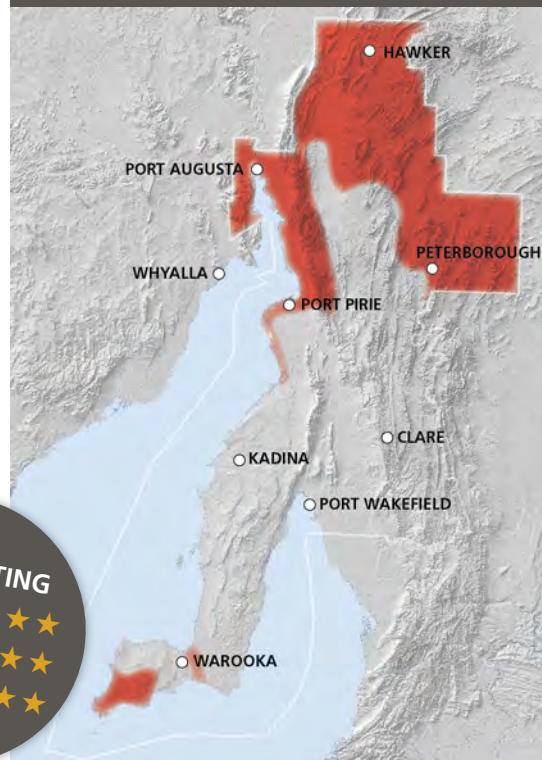
- [Soil pH / Soil acidification rate](#)
- Number of days with adequate surface cover

Key Pressures

- [Extreme weather events](#)
- [Fire](#)
- [Cropping practices](#)
- [Grazing livestock](#)
- [Introduced pests and over abundant native species](#)



SOILS – PERMANENT GRAZING



LEGEND

- Soils – Permanent grazing



FURTHER INFORMATION

Sustainable Soils CAP

Description of Asset

Inland terminal wetlands and saline lakes are found throughout the Northern and Yorke region.

Within the Mid North area, permanently wet saline systems include Bumbunga (internally drained hyper-saline system) and Diamond Lakes (historically freshwater, now hyper-saline), the Boucaut System, Porter Lagoon (predominantly ephemeral lake with small perennial refuge areas), Apoinga and Hiles Lagoons. These wetlands and lakes are important sites for many bird species (resident and migratory) as well as supporting an array of invertebrates. The assemblage of species between any two years and any two areas is highly variable. Fringing vegetation includes low shrublands of samphire, nitre bush and/or chenopods.

Inland wetlands on the Peninsula are generally saline systems separated from the coast. The Peesey Swamp system between Warooka and Yorketown is at or below sea level and maintains some sub-surface tidal connection, as well as a substantial surface drainage system from the eastern side. The Yorketown lakes are a system of numerous crater-like salt lakes which often have local surface drainage and may also be fed by localised aquifers or sub-surface lenses. The vegetation of these systems is generally characterised by low samphire shrublands with occasional salt paperbarks, gahnia filum sedgeland on less salty ground, and open tea-tree and sheoak woodlands in better surrounding soils.

Values

Habitat for rare and threatened birds as well as reptiles and mammals; Recreation; Salt harvesting; Livestock grazing

Attributes

- [Connectivity to adjacent vegetation communities](#)
- [Hydrological regime](#)
- [Fauna diversity](#)
- [Flora diversity and vegetation condition](#)
- Total area of asset remaining and patch size
- [Water quality](#)

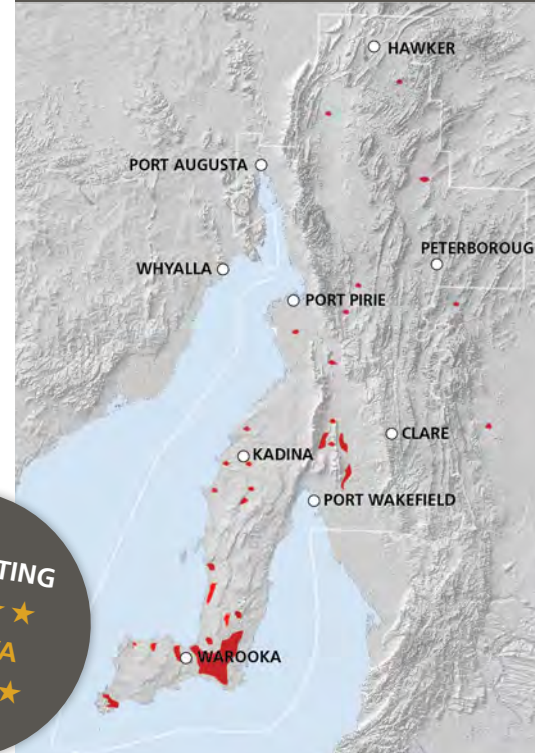
Key Pressures

- [Changes to natural systems](#)
- [Climate change](#) (including sea level rise)
- [Extreme weather events](#)
- [Grazing livestock](#)
- [Introduced pests and over abundant native species](#)

ASSET RATING



SALINE ECOSYSTEMS



LEGEND

- Saline ecosystems

FURTHER INFORMATION

Mid North Biodiversity CAP
Naturally Yorke CAP

**PRESSURE
SUMMARY**

PRESSURE 1 Changes to natural systems

Description of Pressure

Around 80 per cent of the Northern and Yorke region has been significantly modified to some extent for agricultural purposes. However, the long-term effects of historical clearing of native vegetation, changes to natural drainage patterns and other natural systems cause ongoing pressure on natural resources and increases susceptibility to other pressures.

The loss of native fauna due to historical habitat destruction and/or hunting has also disrupted the natural balance and processes of systems. For example, the loss of top order predators has contributed to an imbalance of feral herbivores.

Continuous areas of vegetation have been divided into fragments and isolated by cropland, pasture or towns. This fragmentation reduces the amount and viability of habitats, meaning only small populations can be supported, increasing the chance of extinction, impacting genetic diversity and increasing edge effects from adjacent land use.

Removal of perennial vegetation and formation of drains and diversions has modified surface and groundwater dynamics. While these may have increased the productivity of certain areas, dryland salinity and seepages and loss of flows to water dependent ecosystems may have resulted.

Examples

Historical clearing of native vegetation;
Historical drainage of land

Assets most impacted

Temperate plains ecosystems; Coastal ecosystems; Saline ecosystems; Soils – Agriculture

Further information

- Mid North Biodiversity CAP
- Naturally Yorke CAP

**PRESSURE
RATING**



**PRESSURE
SUMMARY**

PRESSURE 2 Climate change

Description of Pressure

Long-term shifts in climate, including warmer and drier conditions, rising sea levels and acidification of the marine environment, will have a range of impacts on natural resources and a range of other socio-economic aspects of the region. Climate change will influence land use and have a cumulative impact on other pressures.

Semi-arid vegetation communities are likely to encroach into the more temperate regions and communities to the south. Shaded valleys and gorges are expected to provide refuge areas within ranges. Fragmented mallee communities are likely to be highly vulnerable, with species migration impeded by poor landscape connectivity. Conversely, the foot of Yorke Peninsula and ranges communities in the Southern Flinders Ranges may be partially buffered from the impacts due to coastal rainfall influences and will remain an important refuge area.

In agricultural and grazing areas, climate change is expected to reduce the soils capacity to support vegetation and increase the risk of erosion from wind and water. Changes in rainfall patterns may also influence the incursion of new pest and weed species.

Small changes in rainfall, together with increases in evaporation, will lead to considerable changes in surface and groundwater availability due to the interactions between rainfall and recharge. This may impact water salinity and limit productive use.

Increased temperatures and changes to water availability will place more stress on water dependent ecosystems and native fauna.

In coastal areas, loss of vegetation and erosion could result in the destabilisation of dunes. Mangroves and saltmarshes will be affected by sea level rise, particularly where inland migration is impeded.

Decreasing pH in oceans is likely to have a significant impact in the future. Marine species, already at the limit of their temperature tolerance, could move southwards, leading to large shifts in species range and abundance, impacting commercial fishing and temperate reefs in the area. The decreasing pH in oceans is also likely to impact viability of species selected for marine aquaculture.

Examples

Reduction in groundwater recharge; Coastal inundation; Acidification of marine waters

Assets most impacted

Coastal ecosystems; Groundwater; Temperate plains ecosystems; Marine ecosystems

Further information

- Central Local Government Region Integrated Climate Change Vulnerability Assessment- 2030
- Climate Change Vulnerability Assessment for Conservation Action Planning in the Natural Resources Northern and Yorke region
- Southern and South-western Flatlands Climate Change impacts and adaptation information

**PRESSURE
RATING**



PRESSURE SUMMARY

PRESSURE 3 Recreational activities

Description of Pressure

While recreational activities occur across much of the region, the greatest concentration and impacts occur in coastal areas. For Yorke Peninsula alone, visitor expenditure averages \$191 million per year and directly employs 900 people (Tourism Research Australia).

Impacts to natural resources include:

- soil erosion and/or compaction due to motorbikes and four wheel drive vehicles, particularly in coastal areas;
- damage to native vegetation and habitat due to motorbikes, vehicles, foot traffic, camping sites and firewood collection;
- disturbance of fauna and breeding activities due to noise and people walking dogs;
- increased weed infestation due to spread of weeds by vehicles and foot traffic;
- damage to important microphytic crusts in saline ecosystems due to motorbikes and four wheel drive vehicles;
- increases in pest animals due to dumping of household refuse;
- damage to reefs and seabeds by recreational boating;
- alternation of coastal process and species composition due to infrastructure such as boat ramps; and
- impacts to marine animals and birds by marine debris from boating and recreational fishing.

Examples

Wildlife disturbance and breeding activities; Vegetation destruction; Dune erosion

Assets most impacted

Coastal ecosystems

Further information

- CAP Scoping Report # 11 – Management of Coastal Recreational Impacts
- Coastal Motor Vehicle Access Management Strategy
- [Conservation Assessment of the Northern and Yorke Coast](#)
- [Tourism Research Australia](#)

PRESSURE RATING



PRESSURE SUMMARY

PRESSURE 4 Water use and dams

Description of Pressure

Water resources are important for sustaining agriculture, industry, mining and rural townships throughout the region. The region's water resources are captured and extracted through a variety of means, including dams and reservoirs, pumping from permanent pools and wells and diversions.

Over 8,800 dams exist across the region representing total potential storage of around 22,000 ML. Over 90 per cent of dams have an estimated full supply volume of less than 5 ML, however the remaining 8 per cent of dams hold almost 50 per cent of the total storage volume. High farm dam storage density areas are located within, and adjacent to, prescribed areas in the Clare and Barossa Valleys, and in southern Willochra Creek, Rocky River and Upper Light River sub-catchments. In some areas, farm dams are likely to be disrupting natural streamflow regimes, particularly at local scales (Deane 2008).

Resource over-use reduces the quantity of water available to other users, especially water dependent ecosystems, and results in a decline in water quality through concentration of salts and other pollutants. Reduction in surface water run-off may lead to increased siltation of many watercourses. There is anecdotal evidence of a decline in groundwater levels and surface water run-off, with springs and soaks sustained by groundwater discharge reported dry in recent years, and a pattern of declining health of river red gum communities.

The distribution of fish species indicates that the dispersal of biota is being prevented due to changes in stream flow patterns, thereby increasing the potential for localised species extinctions (Scholz et al. 2003). An assessment of the Light River catchment found environmental water requirements were only just being met (VanLaarhoven et al. 2004).

Examples

Loss of in-stream habitat due to channel modification; Over extraction of groundwater; Reduced surface water flows due to capture in dams

Assets most impacted

Surface water; Arid plains and ranges ecosystems; Groundwater; Temperate plains ecosystems

Further Information

- [A River Management Plan for the Light Catchment](#)
- Preliminary Ecological Assessment of Significant Water Dependent Ecosystems of the Willochra Catchment
- [Preliminary Estimates of Farm Dam Development in the Northern and Yorke NRM Region](#)

PRESSURE RATING



Description of Pressure

The Northern and Yorke region has a healthy fishing industry which supports general fishing, crayfish and crab enterprises. During 2014/15, the total volume of production of South Australia's commercial wild fisheries was 49,490 tonnes worth an estimated \$264 million Gross Value Production (GVP). Figures for individual fisheries include:

- SA Blue Crab Fishery (Spencer Gulf and Gulf St Vincent) – GVP of \$8.1 million in 2016/17;
- Spencer Gulf Prawn Fishery – GVP of the order of \$41.9 million in 2016/17; and
- Sardine Fishery (State) – GVP of \$23.8 million in 2016/17.

Species targeted by commercial and recreational fishing play important roles in their marine ecosystems, and overfishing has the potential to reduce biodiversity and impact negatively on ecosystems. Bycatch of commercial fishing must also be managed to minimise the footprint that fishing places on the aquatic environment. Fishing activities can interact with threatened, endangered or protected species and also have the potential to damage habitat and spread aquatic weeds. Potential impacts may result from deployment of illegal artificial reefs, mooring over seagrass beds and damage to reefs from anchors.

All recreational and commercial fisheries in the region follow prescribed management plans and the ongoing assessment of impacts is warranted.

Although it is not physically possible to trawl on reef structures, significant damage can occur if sensitive habitat areas like corals, sponges and seagrass beds are trawled. There are biosecurity risks associated with bait translocation and use.

Examples

Overfishing; Spread of aquatic pests and weeds; Source of marine debris; Disease risks; Pacific Oyster Mortality Syndrome;

Assets most impacted

Marine ecosystems

Further information

- [Economic Indicators for the Commercial Fisheries of South Australia Summary Report](#)
- [Marine Parks Scientific reports](#)
- [Primary Industries and Regions SA's \(PIRSA\) Fisheries and Aquaculture](#)
- [Status of Australian Fish Stocks Reports](#)

PRESSURE RATING



Description of Pressure

Discharges and run-off from towns and industries across the Northern and Yorke region contribute to pollution of surface water, groundwater and marine environments. These include:

- residential stormwater run-off (nutrients and suspended sediment in addition to heavy metals and bacteria);
- Community Wastewater Management System discharges (nutrient, carbon, bacterial) to watercourses and marine environment (Council and SA Water);
- industry discharges (metals and hydrocarbons as key pollutants);
- agricultural run-off (nutrient, sediment, pesticides);
- aquaculture (nutrient);
- solid waste disposal, including other waters such as inland surface water and groundwater (marine debris);
- legacy and site contamination (including metals and hydrocarbons);
- nutrient discharge, urban and agricultural runoff, historical heavy metal pollution;
- shipping (including biofouling and hydrocarbons); and
- plastics (including micro-plastics)

Large nutrient inputs from numerous diffuse sources in the catchment can lead to extensive growth of algae and aquatic weeds. For marine species, entanglement in debris can restrict mobility, leading to starvation. It can also create wounds, infections, and damage to body and limbs, and can facilitate drowning. Ingestion of debris can damage digestive systems, causing physical blockage, internal scarring and injuries

that lead to starvation and death.

Waste management in the Northern and Yorke region has undergone a substantial transformation in recent years, particularly in relation to municipal solid waste and commercial and industrial general waste. Councils have placed an emphasis on resource recovery in the waste streams they are responsible for and have critically reviewed existing landfill operations to meet the new sustainable standards that are being enforced by the EPA. Similarly, evolving policy and initiatives by federal and State Governments on climate change also present challenges to local government in the way it needs to manage community waste (RDA Yorke and Mid North Regional Roadmap, 2014).

Examples

Nutrient discharges causing algal growth; Marine debris entangling marine species; Nutrients discharged by wastewater treatment systems, urban and agricultural runoff and coastal development.

Assets most impacted

Marine ecosystems; Groundwater

PRESSURE RATING



Description of Pressure

Across the Northern and Yorke region, livestock numbers are in the order of 2.6 million sheep and lambs, 83,000 meat cattle and 69,000 pigs. The area of grazing (modified pastures and natural vegetation) is approximately 1.5 million hectares, or 44 per cent of the region. The gross value of livestock slaughtering is approximately \$338 million and livestock products is \$88 million. Sheep and lamb meat and wool make up around 14 per cent of the areas agricultural commodities by value.

The agriculture, forestry and fishing industry group employs 29 per cent of the workforce, making it the highest employing industry group in the region.

Broadacre grazing practices such as rotational grazing and perennial pastures continue to evolve and have significantly improved the sustainable use of grazing systems (soil, native vegetation, native grasslands and water resources) in recent years. The challenges of balancing seasonal conditions and economic drivers however can mean that inappropriate practices may occur at times, which can impact on natural resources and production.

Some of the potential impacts associated with grazing include 'over grazing' by livestock and pest animals which reduces surface cover below adequate levels, making soils susceptible to erosion. Grazing can reduce regeneration and condition of native vegetation species which has flow on effects to native animals. Stock access to creeks and waterholes can trample aquatic vegetation and cause a decline in water quality. Subsequent sediment erosion

and adding excessive nutrients can lead to habitat disturbance, algal growth and aquatic weeds. Poor water quality can negatively impact on stock health. Stock camps and watering points can be susceptible to excess nutrients and erosion and become a source of weed spread. The movement of stock between properties can spread weeds and create biosecurity issues. The intensive livestock industry has increased in the region, including intensive farming of pigs, sheep, cattle, chickens and other smaller industries. Sheep and cattle feedlots occur across the region and are a potential source of pollution if waste products are not carefully managed and increase the risk of localised erosion.

Examples

Soil erosion due to loss of surface cover; Lack of plant regeneration; Contamination of waterholes

Assets most impacted

[Arid plains and ranges ecosystems](#); [Soils – Agriculture](#); [Soils – Permanent grazing](#); [Temperate plains ecosystems](#)

Further information

- [Economic Environmental Indicators for South Australia and its Regions 2006/07](#)
- [RDA Yorke and Mid North Regional Roadmap](#)

PRESSURE RATING



Description of Pressure

A plant or animal may be considered a pest if it exhibits adverse impacts on the environment, primary production or the community. Introduced marine pests can significantly impact our marine environment. The incursion of new pests is an ongoing risk. Impacts may include:

- economic costs such as yield reductions, increased control costs, increased management costs and difficulties, and increased mustering costs;
- stock injuries, illnesses and death from poisonous plants and predatory pest animals;
- loss of biodiversity and ecosystem function through out-competing native plants, competition for moisture and light, and animals preying and grazing native species;
- soil loss through herbivorous animals removing soil cover and disturbing soil structure, and through some weed species providing poor soil cover at critical times;
- fouling of waterholes and physically obstructing watercourses; and
- pest species can act as the vector for numerous diseases affecting humans, livestock and native animals.

Historically, some methods of weed control, such as tillage and broadscale mechanical removal, leave soil susceptible to erosion; however, integrated weed management techniques often prevent or minimise erosion risk. There are also emerging issues of chemical resistance in weed species.

The interaction between pest herbivores such as rabbits, kangaroos, wombats, deer and goats, carnivores such as foxes and wild dogs, and weeds requires a coordinated approach to minimise their

impact to the environment, primary production and the community.

Terrestrial and aquatic species of weeds in watercourses can shade-out native species, alter channel characteristics, contribute excessive organic matter and nutrients, deplete oxygen from decomposing leaves, and host pests and diseases. Introduced fish prey on native aquatic invertebrates and juvenile fish, while European carp disturb sediments and submerged plants. By outcompeting native species for food and space, marine pests can alter ecological processes and significantly degrade marine habitats, resulting in the loss of native species. They can also impact on the value and amenity value of our coastal areas. Marine pests can impact upon aquaculture enterprises and fishing grounds, with flow-on effects to local economies.

Herbivorous pest animals impact native vegetation, crops and pastures, and subsequently fauna and primary producers. Large pest animals also pose road safety hazards to the general public and can be vectors for many livestock diseases.

Examples

Feral carnivores prey on native reptiles and mammals; Weeds out-compete native plants and crops for moisture and light

Assets most impacted

[Arid plains and ranges ecosystems](#); [Coastal ecosystems](#); [Soils – Agriculture](#); [Temperate plains ecosystems](#)

PRESSURE RATING



Description of Pressure

Approximately 1.5 million hectares or 43 per cent of land in the Northern and Yorke region is used for cropping. The gross value of crops in 2015/16 was approx \$786 million. Wheat and barley for grain make up approximately 70 per cent of the areas agricultural commodities by value. The agriculture, forestry and fishing industry group employs 29 per cent of the workforce, making it the highest employing industry group in the region.

Cropping practices such as 'no-till' farming continue to evolve and have significantly improved the sustainable use of soils over recent years. However, the challenges of balancing seasonal conditions and economic drivers can mean that at times some aspects of cropping practices may impact on natural resources. Below are examples of some of the potential impacts associated with cropping.

- Inappropriate use of fertilisers and surface run-off can increase nutrient levels in natural ecosystems causing algal blooms and killing fish in watercourses and marine environments.
- Chemical drift during spraying can damage neighbouring pockets of native vegetation, while some chemicals reduce soil biota.
- The use of cultivation or full stubble burning, or overgrazing on erosion prone soil types can expose soil to the impacts of rainfall or wind. Such practices are no longer widely used, but are sometimes employed to help manage heavy stubbles, weeds, snails or mice.
- Some legacy issues still remain due to past excessive cultivation, causing a reduction of water entering the soil and the amount of water held in the root zone, restricted root growth and reduced seedling emergence, and reduction in the availability of oxygen.

Modern stubble retention and no-till methods have largely restored soil structure.

- The natural rate of soil acidification is increased under agriculture, particularly by high production systems with high nitrogen fertiliser use. On acid prone soils, acidification can have adverse impacts on soil health and production levels, unless it is adequately ameliorated by lime application.
- The widespread removal of native vegetation for agriculture has resulted in rising water tables and driven dryland salinity issues across 30,000 hectares of the region, particularly on upper Yorke Peninsula. Dryland salinity can significantly impact on the growth of crops, limiting both yield and quality.

Examples

Fertiliser use can increase nutrients to natural ecosystems; Cultivation can increase erosion potential; Production can lead to soil acidification

Assets most impacted

Soils – Agriculture; Arid plains and ranges ecosystems; Coastal ecosystems; Soils – Permanent grazing; Temperate plains ecosystems

Further information

- [Economic Environmental Indicators for South Australia and its Regions 2006/07](#)
- [RDA Yorke and Mid North Regional Roadmap](#)
- [Premium food and wine from our clean environment](#)

PRESSURE RATING



Description of Pressure

Australia has experienced bushfires for the last two million years, however our land management practices have changed and the bushfire season is now lengthening as our climate changes with global warming. The behaviour and impacts of bushfires are different across the range of landscapes in the region, from native scrub on inaccessible ranges, to highly modified agricultural areas. Large, intense bushfires can be devastating for the community. It is important to plan and manage our land to reduce the risk of bushfires to people, property and the environment. Furthermore, it is important to enable good post-fire recovery for the protection of vegetation from long-term impacts by managing erosion and weeds and animals. Planned fire is also an important tool for maintaining and improving plant and animal habitats in our landscapes. Different fire regimes are required for different areas of the landscape because the interval between fires affect the growth cycle of plants and animals.

The contemporary fire regime in Northern and Yorke is characterised by infrequent large wildfires which burn intensely in summer. Infrequent large fires can burn whole blocks of vegetation in a single event which has implications for native vegetation composition, habitat diversity and fauna populations. This regime is significantly influenced by post-European settlement fire management which is focussed on the suppression of bushfires in the landscape to protect human life and property.

The DEW Fire program aims to undertake a range of fire management activities that contribute to mitigating the impacts of bushfires on life, property and the environment, while promoting improved ecological and biodiversity outcomes.

Examples

Fire frequency insufficient to support regeneration of native species and/or reduce fuel loads; Large intense fire eliminating habitat for threatened species; Fire in agricultural zone reducing soil cover and increasing erosion potential and subsequent silting of watercourses and negative impacts on human health.

Assets most impacted

Soils – Agriculture; Soils – Permanent grazing; Surface water; Temperate plains ecosystems

Further information

- [The Burning Issue: Climate Change and the Australian Bushfire Threat](#)

PRESSURE RATING



Description of Pressure

Heatwaves, extreme wind, flooding and extended drought have been experienced in the Northern and Yorke region throughout history. With continued climate change, extreme weather events are projected to be more intense and/or more frequent.

Extreme temperatures are projected to increase, with a substantial increase in temperature reached on hot days, the frequency of hot days and the duration. Heatwaves can cause significant stress to flora and fauna and have significant impacts on species already at risk.

Future increase in the intensity of extreme rainfall events is projected. Intense rainfall events can cause erosion and flooding damage to watercourses and vegetation.

More time in drought is projected. Drought places prolonged pressure on flora and fauna and leads to decreases in soil cover, increasing the risk of erosion in agricultural and grazing systems.

There is high confidence that climate change will result in a harsher fire-weather climate in the future.

Intense storm events will have direct physical impacts on the coast, exacerbating coastal erosion. As well as direct physical damage, more intense rainfall events can potentially influence sediment dynamics and quantity and quality of terrestrial run-off.

Examples

Soil erosion due to extreme rainfall and wind events; Coastal erosion due to storm surge

Assets most impacted

Soils – Agriculture; Soils – Permanent grazing; Coastal ecosystems; Groundwater

Further information

- CoastAdapt
- Southern and South-Western Flatlands Cluster Brochure

PRESSURE RATING



Description of Pressure

The Northern and Yorke region is characterised by a number of small towns; population density across most of the region is less than one person per square kilometre. Major towns and cities in the region, such as Port Augusta, Port Pirie, Kadina, Wallaroo, Moonta and Clare, are located in close proximity to coastal areas or significant watercourses. In recent times, the greatest population growth has been in the District Council of Copper Coast. There is a common agenda to secure and grow the regional population.

Industry also tends to be centered around these major towns and key transport hubs such as Bowmans. Future industry development in the region is expected to be linked to agriculture and marine resources. There are valuable extension opportunities associated with these commodities including production of agricultural machinery and equipment, transport equipment and human food and animal food processing.

Development is associated with changes in land use, construction activities, transport and infrastructure corridors and ongoing operations and activities. Further pressures include coastal hardening, encroachment into agricultural land, increasing flood events, sea water flooding and fire risks.

Examples

Marinas; Road construction; Sediment loads and other pollutants that arise from construction activities; Increased surface water runoff and associated impacts to surface water, reduced groundwater recharge and increased pollutants; Increased pressure on Community Wastewater Management Systems and wastewater discharges as a result of increased residential areas.

Assets most impacted

Coastal ecosystems; Soils – Agriculture

PRESSURE RATING



PRESSURE SUMMARY

PRESSURE 13 Energy production and mining

Description of Pressure

Energy production and mining currently occurs in a few isolated locations within the Northern and Yorke region limiting its current scope of pressure. However, this may increase as development continues to occur. Mining activities outside of the region are also a potential pressure due to the use of ports and pipeline corridors within Northern and Yorke. South Australia currently hosts 47 per cent of the nations installed wind capacity. This is equivalent to 868 MW current installed capacity of wind. Around half of this capacity is generated by windfarm developments in the Northern and Yorke region. These developments are expected to double in coming years with several new developments either proposed or under construction in the region. Current locations include Hallett, Snowtown and Clements Gap. Windfarms do not emit greenhouse gases in the generation of electricity, and so wind power is considered a highly desirable form of renewable energy. However, the construction, operation and maintenance of associated infrastructure increases traffic and noise that can contribute to the displacement of native fauna and cause changes in surface drainage, while the loss of raptor species can lead to increased feral animal populations, e.g. rabbits.

Closure of the Port Augusta Power Station in 2016 has reduced thermal discharges to the marine environment, although the management of dust remains a concern.

Mining activities in Northern and Yorke include extraction of limestone, dolomite, brick and road making materials and sand. Mining activities outside of the region are also a potential pressure due to the use of ports and pipeline corridors within Northern and Yorke.

Examples

Construction of infrastructure; Cumulative impacts of wind farms on native species

Assets most impacted

Temperate plains ecosystems

Further information

- [Yorke and Mid North Infrastructure Audit, 2012](#)
- [RDA Yorke and Mid North Regional Roadmap](#)

PRESSURE RATING



PRESSURE SUMMARY

PRESSURE 14 Transportation corridors

Description of Pressure

Transport corridors include road networks, railway and shipping routes. Land-based corridors are barriers to migration of plants and animals, and surface flows, and will be of increasing significance as sea levels continue to rise. Corridors are also associated with the spread and incursion of weeds and animals. Ongoing maintenance, including widening roadways for safe passage of machinery, and construction, also pose a threat to neighbouring natural assets.

Within the upper Spencer Gulf, up to 40 per cent of the immediate landscape around the coastal communities (within 500 metres) is impacted by infrastructure that forms a barrier to inland movement under sea level rise. This infrastructure effect zone is predominantly a result of the existing road network.

Land and sea-based corridors are ideal pathways for weed spread. Vegetation clearance and soil disturbance from construction and maintenance activities create ideal conditions for weed germination and establishment. Vehicles, plant and construction materials such as gravel, sand, rock and fill all provide a means of weed seed introduction. Once introduced, infestations that are not controlled tend to spread very quickly along corridors and into neighbouring properties. Corridor works can also adversely affect native fauna species and fauna habitat either directly (i.e. death of individuals) or indirectly (i.e. removal or disturbance of their habitat). Habitat disturbance can be detrimental to the long-term survival of a range of fauna species according to their rarity (conservation significance) and the extent and nature of the

disturbance.

Similar pressures also exist in the marine environment from shipping corridors. Commercial shipping is one of the most commonly recognised carriers of marine pests. Recent research by Hewitt and Campbell (2010) suggests that vessel biofouling—where organisms attach to the outside of ships—has been a larger contributor (60 per cent) to the translocation of marine pests than commercial shipping ballast water (24 per cent) in Australia, based on those species examined in the study.

Examples

Spread of pests and weeds

Assets most impacted

Soils – Agriculture; Temperate plains ecosystems

PRESSURE RATING



Description of Attribute

Coastal processes include the movement of sand and sediments, tides, accretion and/or erosion of beaches, cliffs and dunes. These processes are influenced by river outflows, wave and weather climate, beach morphology, geology and human activity.

Relevant assets

[Coastal ecosystems](#)

Current monitoring

Coastal processes can be monitored in numerous ways, through shoreline mapping and beach profiling surveys. Since the mid 1970s, a network of beach profiles has been established along the South Australian coast by the Coast Protection Board and Environmental Protection Authority places where beach erosion could cause problems for public property and development. There are 18 profile lines along Yorke Peninsula which are regularly surveyed and evaluated for long-term changes in sand levels.

Aerial photography also provides a valuable tool for measuring coastal change. A comprehensive collection of aerial photography taken at different times allows comparisons to be made between different photos and the differences mapped. The most recent aerial imagery was captured for the western Yorke Peninsula in 2016. Analysis of aerial imagery is on an as needs basis. The Board also has an aerial oblique photography program with each region being flown every five to seven years. Northern and Yorke was last captured in 2014.

Project based assessment of coastal erosion and Digital Elevation Modelling has occurred at settlements on the coast such as Simms Cove and Coobowie.

Further information

- Conservation Assessment of the Northern and Yorke Coast
- [DEW State Report Card – Are the extent and condition of our coastal dunes improving?](#)
- Possible impact of Two Sea Level Rise Scenarios on Salt Marsh Communities at Port Pirie, South Australia
- Yorke Coast Protection District Study Report

Information gaps

While monitoring of beach profiles and aerial photography is being undertaken within Northern and Yorke region, analysis occurs on an ad-hoc basis.

Description of Attribute

Geomorphology is the structure, origin and development of the topographical features. Geomorphologic changes relating to surface water include deepening and widening of watercourse channels, raising of bed levels due to sedimentation and changes in the channel course. These changes have typically been a response to the widespread clearing of vegetation and direct interventions such as channelisation, levee banks, sand and gravel extraction, and the construction of dams and weirs.

Relevant assets

[Surface water](#)

Current monitoring

Watercourse geomorphology in Northern and Yorke was investigated in the early 2000s in the Light, Broughton, Wakefield and Willochra catchments.

Further information

The following management plans document changes in catchment geomorphology:

- [Broughton – River management plan](#)
- [Light – River management plan](#)
- [Wakefield – River management plan](#)
- [Willochra – catchment hydrological and ecological assessment](#)

Description of Attribute

Capacity of a water resource is an assessment of the ability of a water resource to meet community and environmental water needs. For groundwater, the sustainable yield (volume that can be sustainably extracted for use) is generally considered to be a proportion of average annual recharge with an allowance made for environmental water requirements.

Relevant assets

[Surface water](#); [Groundwater](#)

Current monitoring

Numerical modelling is required to determine resource capacity, as average annual flows or levels do not provide a reasonable description due to the high level of inter- and intra-seasonal variation in surface water run-off and groundwater recharge.

Sustainable yield has been determined for the Clare Valley Prescribed Water Resource Area and the Baroota Prescribed Water Resource Area. Sustainable yield of other groundwater basins and surface water catchments are yet to be determined. Modelling inputs include groundwater level monitoring, surface flow measurement, rainfall and extraction volumes. For groundwater monitoring [refer to Groundwater salinity](#). Gauging stations occur throughout the region to measure surface flows.

The spatial distribution and size of dams for the four main catchments in the region was documented in 2008. Licenced water use in the Clare Valley Prescribed Water Resource Area and the Baroota Prescribed Water Resource Areas is currently metered. Water use for town water supplies (SA Water) are also metered.

Further information

- [Demand and supply statement for the region](#)
- [DEW State Report Card – Are our groundwater resources being sustainably used?](#)
- [DEW State Report Card – Are surface water resources being used within their allocated limits?](#)
- [DEW State Report Card – Are the water levels and salinity of our prescribed groundwater resources changing?](#)
- [Preliminary estimates of farm dam development in the Northern and Yorke NRM region](#)
- [Status reports for priority regional groundwater and surface water resources](#)
- [Surface water data](#)

Information gaps

Limited knowledge and monitoring of environmental water requirements occurs across the region.

Sustainable yield of groundwater basins (other than Clare Valley and Baroota) is yet to be determined.

Description of Attribute

Hydrological regime is a description of the duration, volume, timing and connectivity of water up and downstream and across the floodplain. Aquatic (fresh and marine), and many terrestrial flora and fauna, have life history strategies that have evolved in response to natural flow regimes, including ground and surface water. These species are therefore highly susceptible to changes.

Relevant assets

[Arid plains and ranges ecosystems](#); [Surface water](#); [Saline ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#)

Current monitoring

Hydrological regime can be assessed based on data from flow gauging stations which measure stream flow; and observation wells which measure the groundwater depth or pressure. There are 14 surface water monitoring sites across the four main catchments in the region. With the exception of the Clare Valley Prescribed Water Resource Area, there has been limited analysis of these data sources, beyond simple reporting of monitoring levels and volumes due to the temporal and spatial limitations on the monitoring record.

Hydrological regime can also be assessed through monitoring the response of water dependent species. An investigation into die back in river red gum populations in the Northern and Yorke region was commenced in August 2008. In 2016, 35 sites across the Broughton, Wakefield and Willochra catchments were monitored, with an analysis of data and comparison to previous monitoring surveys.

Further information

- [Light – river management plan](#); [Broughton – river management plan](#); [Wakefield – river management plan](#); [Willochra – catchment hydrological and ecological assessment](#)
- [Monitoring of Die Back in River Red Gum \(Eucalyptus camaldulensis\) Communities in the Northern and Yorke region 2008-2016 Willochra Catchment Hydrological and Ecological Assessment](#)
- [Northern and Yorke Natural Resources Management Region Water Monitoring Review](#)
- [Rocky River Catchment Water Resources Assessment](#)

Information gaps

Gauging stations at terminal sites for the Broughton River and Wakefield River are identified as a key monitoring gap.

Description of Attribute

On susceptible soils (i.e. moderate to extreme erosion potential), inadequate soil cover and disturbance can result in erosion of the soil when heavy and prolonged rain or strong winds occur. The most common form of soil disturbance is tillage for weed control and sowing of crops and pastures. Soil cover can be removed or inadequate for a number of reasons including stubble removal practices such as: burning; over-grazing by domestic stock and feral herbivores such as rabbits and goats; and crop failure or poor growth.

Soil groundcover levels are used to indicate the Erosion Protection Index (EPI) of agricultural soils. This gives an average number of days each hectare of soil is adequately protected from erosion on a yearly basis. The Northern and Yorke regional soil protection target of 340 days should be achievable on average with no-till technologies, while allowing for lower groundcover levels in dry seasons.

Relevant assets

[Soils – Agriculture](#); [Soils – Permanent grazing](#)

Current monitoring

Monitoring soil erosion by direct measurement is technically impractical. Instead, the condition of the soil surface in agricultural lands is assessed for relative protection from the risk of wind and water erosion over time. A rapid, roadside field survey method was developed to collect key data related to soil erosion protection across 45 land zones in the agricultural areas of South Australia. DEW

performs field surveys along 14 transects through the zones considered to have significant inherent potential for soil erosion. This covers approximately 8.5 million hectares of the 10.2 million hectares of cleared farming land in South Australia.

In the Northern and Yorke region, 730 paddocks are surveyed from the roadside each year in March, May, at peak sowing time (usually June) and October. This time sequence is used to generate an annual profile of erosion protection, as the amount of ground cover and protection varies according to the seasonal growth cycles of annual crops and pastures. The process involves a simple visual assessment of key groundcover, surface looseness and soil and landscape parameters at each site.

A method of monitoring groundcover levels on agricultural land using satellite imagery has recently been developed by DEW. This will provide an alternative way of monitoring erosion risk at a broad scale across the region.

Further information

- [DEW State Report Card – How much of our agricultural land is protected from erosion?](#)
- [DEW State Report Card – Is water use efficiency improving in our agricultural areas?](#)
- [Erosion protection field surveys](#)

Description of Attribute

Acidic soils occur naturally in the Northern and Yorke region, mainly as sands or sandy loams in high rainfall areas, however the acidification of soils can be significantly accelerated by agricultural practices. Soil acidity becomes a serious problem, affecting agricultural production and the environment, when the level of acidity reaches a pH of 5 or less. The annual soil acidification rates in agricultural regions of South Australia are expressed as tonnes of lime per year needed to balance the acidification process. These are estimated on the basis of agricultural land use intensity and the area of naturally acidic soils.

Relevant assets

[Soils – Agriculture](#)

Current monitoring

Direct monitoring of soil acidity would require soil samples from across the region to be collected and analysed on a regular basis. This is not possible due to the enormous cost and effort that would be required. Instead, soil acidification is monitored by comparing the annual lime use rate in the region (data collected by DEW from lime sellers) with the estimated annual acidification rate as tonnes of lime required on acid prone agricultural soils. This information is supported by pH data from local soil tests and a limited number of monitoring sites. The data is analysed by Hundreds and also by mapping of acidic soils by the State Land and Soil Mapping Program. As there is no control over the selection or sampling of soils, this information is only a semi-quantitative indicator.

Further information

- [DEW State Report Card – Is soil acidity decreasing in our agricultural areas?](#)
- [Soil acidity monitoring](#)

Information gaps

Detailed data on the location and severity of soil acidification on a regional, district and paddock scale.

Description of Attribute

Natural expressions of salinity (known as 'primary salinity') are quite common in the region, and can be seen in the form of salt marshes and salt lakes. Increases in soil salinity due to historic and current land use practices are termed 'secondary salinity', and usually result from alterations to water-balance relationships and groundwater levels across the landscape. When increases in the height of water tables are driven by increased recharge from rainfall, the resultant salinity is termed 'dryland salinity'. Approximately 30,000 hectares of land in the region is affected by secondary dryland salinity, predominantly on Yorke Peninsula. However, the extent and severity of dryland salinity fluctuates over time, depending on seasonal conditions.

Increased levels of soil salinity can be toxic to crops and pastures, and some native vegetation. As salinity increases it becomes more difficult for plants to extract water from the soil, and high levels of toxic ions in foliage can cause leaf burn, dead patches and even defoliation. Poor plant health leads to dramatic reductions in agricultural productivity and shifts in the species composition of pastures and native vegetation, favouring the dominance of salt-tolerant species.

Relevant assets

[Temperate plains ecosystems](#); [Surface water](#); [Groundwater](#); [Arid plains and ranges ecosystems](#); [Soils - Agriculture](#); [Soils – Permanent grazing](#).

Current monitoring

Monitoring can be carried out by:

- Depth to groundwater and groundwater salinity

- Salinity of surface water
- Extent and severity of land salinisation
- Water quality in streams and salt loads
- Impact on biodiversity

Further information

- Central and Southern Yorke Peninsula Salinity Management Plan, June 2007
- Gilbert River Salinity Management Plan, August 2005.
- Lower Broughton River Catchment (Redhill, Pirie and Wandearah Sub-catchments) Salinity Management Plan, March 2004.
- Minlaton-Ramsay Catchments Salinity Management Plan, April 2003.
- Northern Broughton River Salinity Management Plan, June 2006.
- Regional Salinity Management within the Northern and Yorke Agricultural Districts, 2002.
- South East Broughton River Salinity Management Plan, July 2005.
- Upper Light River Salinity Management Plan, November 2003.
- Upper Yorke Catchment (Agery-Weetulta, Cunliffe-Kadina, Paskeville-Wallaroo, Alford, Melton Corridor) Salinity Management Plan, July 2005.
- Wakefield River and Diamond Lake Catchments Salinity Management Plan, March 2006.
- Winulta – Yorke Valley (North Maitland Flat, Winulta Creek, Winulta South and Yorke Valley Sub-catchments) Salinity Management Plan, March 2004.

Description of Attribute

Fire-related variables which have a direct influence on plant and animal survival are the elements of fire regime. Fire regime is defined as the frequency, intensity, season and extent of fire that prevail in an area over long periods of time. It is an integral part of fire ecology, and regeneration for certain types of ecosystems. Altered fire regime is likely to have affected almost all remnant native vegetation in the region. The effects are possibly most severe in small isolated remnants, which are usually unburnt for long periods. When fire does occur, the entire small patch is burnt and the intensity of the fire is far greater (Graham et al. 2001 – Biodiversity plan for the Northern Agricultural Districts).

Relevant assets

[Arid plains and ranges ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#)

Current monitoring

Prescribed burning activity is monitored in the Northern and Yorke region, including pre- and post-burn vegetation surveys, fuel load sampling, mapping of the burn areas and post-burn surveys to determine the plant and animal fire response.

Vegetation surveys can also be used to assess the degree to which fire regimes have been altered based on the life history characteristics of the species that remain.

Further information

- Catering for the needs of fauna in fire management: science or just wishful thinking?
- Fire management for biodiversity conservation: key research questions and our capacity to answer them
- Prescribed burning: how can it work to conserve the things we value?
- [What are the pressures?](#)

Information gaps

There are many uncertainties about how to use fire to meet conservation goals, and existing programs throughout Australia have insufficient data to determine if they are being implemented successfully (Penman et al. 2011). This is the case for both vegetation and wildlife management because the response of a range of species to fire remains poorly understood and documented (Clarke 2008, Driscoll et al. 2010). There is also a lack of understanding about the impacts climate change will have on community composition, which will change our ideas on fire regime.

Description of Attribute

The status of individual flora species (i.e. whether their populations are stable, increasing or decreasing) represents the success or otherwise of managing biodiversity from the site to regional or broader scale, dependent on the needs of each species. Therefore the number, characteristics and status of species deemed under threat are considered an attribute of the condition of the biodiversity resource asset. Species diversity, richness, turnover and identity are indicators of the health of ecological communities.

Vegetation condition more broadly considers components of the structure, function and diversity of native vegetation.

Relevant assets

[Arid plains and ranges ecosystems](#); [Coastal ecosystems](#); [Saline ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#)

Current monitoring

Bushland Condition Monitoring (BCM) sites occur within each of the main asset groups of Northern and Yorke. Benchmark monitoring has been undertaken. Data collected at monitoring sites provides information on components of the structure, function and diversity of native vegetation, and each site is compared against benchmarks derived from expert interpretation of the compendium of survey data collected in the Biological Survey of South Australia. Changes in the measured parameters of vegetation condition are detected in subsequent monitoring surveys at the same locations.

There are approximately 500 BCM sites in Northern and Yorke, but only 20 sites have been resampled. Surveys have been undertaken since 2004.

Other flora and vegetation surveys occur on an ad-hoc or project basis for example:

- local government roadside vegetation surveys; and
- threatened species monitoring.

Further information

- Summary outputs from Biological Survey of South Australia are available through [NatureMaps](#) and the [Atlas of Living Australia](#).
- [DEW State Report Card – Is the condition of our native vegetation improving?](#)
- [DEW State Report Card – How many of our ecological communities are extinct or threatened with extinction?](#)
- [DEW State Report Card – How many of our species are extinct or threatened with extinction?](#)

Information gaps

The frequency required for BCM for each vegetation community is currently not known. BCM outputs are currently only assessed for project outcomes.

Description of Attribute

Biological soil crusts are made up of non-vascular plants (sometimes called cryptogams) and surface soils. The group includes lichens, bryophytes (mosses and liverworts), algae, cyanobacteria, fungi and bacteria. Crusts play important roles in terrestrial and aquatic ecosystems. They protect the soil against erosion, fix nitrogen, phosphorus and carbon and sequestering it in the soil, moderate soil moisture, influence the germination and establishment of vascular plants, and provide habitat for soil animals.

Relevant assets

[Saline ecosystems](#)

Current monitoring

Presence of soil crusts within each vegetation community, as recorded by BCM.

Refer to 'Flora diversity / status'.

Further information

- Refer to 'Flora diversity /status'

Description of Attribute

Permanent pools represent core refuge areas for aquatic biodiversity. They are firstly recognised as being groundwater dependent ecosystems, although surface flows also perform critical ecological roles. Connectivity between pools (maintenance of wetted habitat such as pools, riffles, rock bars and macrophyte beds) is important for the movement of macro-invertebrates, frogs and fish for breeding and recolonisation. The lack of connectivity increases the chance of local extinctions.

Relevant assets

[Surface water](#)

Current monitoring

Baseline mapping and assessment of permanent pools and connectivity in Northern and Yorke has occurred on an ad-hoc project basis.

Relevant projects include:

- Baseline survey of refugia pools in the north-eastern Willochra Creek and western Lake Frome Catchments;
- Four Catchments project; and
- Clare Valley Prescribed Water Resource Area Water Allocation Plan

CFS maps also capture the locations of permanent pools based on local knowledge.

Further information

- [Baseline survey of refugia pools in the north-eastern Willochra Creek and western Lake Frome Catchments](#)
- [Clare Valley Water Allocation Plan](#)
- Refer to 'Hydrological regime' for other related reports

Information gaps

Connectivity of permanent pools needs to be monitored more regularly to understand seasonal and climatic variations and connection to groundwater.

Description of Attribute

Clearance and other modifications to the landscape have caused reduced distribution and fragmentation of native vegetation. This attribute describes the extent of the existing vegetation compared with pre-European extent and considers the size of remaining patches. Smaller extent and patch sizes increase the vulnerability of vegetation to other pressures. In 2007, 90 per cent of patches were less than 20 hectares in size. This attribute also applies to seagrasses.

Relevant assets

[Arid plains and ranges ecosystems](#); [Coastal ecosystems](#); [Saline ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#); [Marine ecosystems](#)

Current monitoring

The current and pre-European terrestrial and coastal native vegetation of the Northern and Yorke region is generally mapped for areas greater than 0.5 hectares. The data from on-ground sampling of vegetation, aerial photography and satellite imagery is studied together to provide an overall picture of the area being mapped. This is not an exact science. Aerial photography and satellite imagery can only successfully capture the overstorey vegetation species. The underlying vegetation species composition and condition may not be as easily identifiable. Also, it can be difficult to differentiate planted vegetation (which should not be mapped) from native vegetation. On-ground field inspections are required for absolute validation. For example, the mapping of grasslands requires on-ground field inspections.

An aerial survey of coastal and marine areas was undertaken in 2004 to map seagrass communities. This has been compared to a 1979/80 aerial survey of the land that covered some marine areas to detect change in the extent of seagrass communities.

Native vegetation maps are continuously updated when additional data, error corrections and new data analysis based on emerging technologies become available. Native Vegetation Mapping Data is available within NatureMaps, DEW's online mapping site.

Further information

- [NatureMaps](#)
- [State of the Region \(Appendix A.\)](#)

Description of Attribute

Water quality (fresh and saline) is critical to maintaining the health of water-dependent ecosystems, agriculture, fisheries and domestic users. Key water quality parameters for surface water are salinity, nutrients, suspended sediments and water temperature. For groundwater, salinity, metal and nutrients are the main parameters of interest as these are key factors in potential use and are indicators of groundwater resource status ([refer to Groundwater salinity](#)). For near shore marine environments key parameters are nutrients, clarity (turbidity) and biological indicators, such as the condition of seagrass and reef habitats.

Relevant assets

[Coastal ecosystems](#); [Saline ecosystems](#); [Surface water](#); [Groundwater](#); [Marine ecosystems](#)

Current monitoring

Prior to 2003, only limited monitoring of surface water quality and quantity was undertaken in the Northern and Yorke region. During 2003, the surface water monitoring network was considerably improved and currently represents an adequate base level of monitoring at the regional scale.

A network of 19 monitoring sites has been established in the region by the EPA with data on macroinvertebrates and water quality. Eleven sites were sampled from the region during autumn and spring 2012 (although only five contained water).

Surface water salinity data has only been recorded at most sites for two years, and the longest available record only extends back to 1995. Grab samples for salinity at all sites extend back to the commencement of surface water monitoring. Waterwatch sites have been monitored in the Broughton Catchment between 1997 and 2009, and also provide water quality data from discrete sampling that may provide complementary information.

Periodic monitoring of eight marine biounits within Northern and Yorke includes sampling for nutrient concentrations and turbidity.

For groundwater [refer to Groundwater salinity](#).

Further information

- Data and ratings of ecological health and water quality (fresh and marine) are available via www.epa.sa.gov.au.
- Marine biounit reports, Lower Spencer Gulf bioregional assessment report 2010 and Gulf St Vincent bioregional assessment report 2010–11 are available [here](#).
- [Northern and Yorke NRM Regional Summary 2012 Aquatic Ecosystem Condition Report](#)
- [EPA Aquatic Ecosystem Monitoring, Evaluation and Reporting](#)

Description of Attribute

Connectivity is the degree to which the landscape facilitates or impedes movement among patches. Native plants and animals that cannot move between patches become more susceptible to local disturbances that threaten their survival. Connectivity may be a measure of the physical connectedness of the vegetation across a landscape but may also be influenced by factors such as barriers and presence of predators.

Relevant assets

[Arid plains and ranges ecosystems](#); [Coastal ecosystems](#); [Saline ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#); [Marine ecosystems](#)

Current monitoring

While the location and patch sizes of vegetation communities can be mapped ([refer Total area of vegetation asset remaining and patch size](#)) a scientific analysis of connectivity has not been undertaken for these assets. Community knowledge is currently used to make an intuitive assessment.

Further information

- [DEW State Report Card – Are the extent and connectivity of our native vegetation improving?](#)

Description of Attribute

The status of individual fauna species (i.e. whether their populations are stable, increasing or decreasing) represents the success or otherwise of managing biodiversity from the site to regional or broader scale, dependent on the needs of each species. Therefore the number, characteristics and status of species deemed under threat are considered an attribute of the condition of the biodiversity resource asset. Species diversity, richness, turnover and identity are indicators of the health of ecological communities.

Relevant assets

[Arid plains and ranges ecosystems](#); [Coastal ecosystems](#); [Saline ecosystems](#); [Temperate plains ecosystems](#); [Temperate ranges ecosystems](#)

Current monitoring

No structured ongoing monitoring of fauna diversity, richness, turnover and identity currently occurs in Northern and Yorke.

The Biological Survey of South Australia has been systematically surveying South Australia since 1971 to determine the distribution of terrestrial vertebrate species throughout the state. The data collected sits within the Biological Databases of South Australia.

Terrestrial fauna surveys have occurred in the past on an ad-hoc or project basis for example:

- yellow-footed rock-wallaby surveys;
- woodland bird surveys;
- fish surveys; and
- [FrogWatch SA](#)

For a complete list and summary of findings refer to 'Overview of Biodiversity Monitoring in the Northern and Yorke Natural Resources Management Region'.

Further information

- [DEW State Report Card – How many of our ecological communities are extinct or threatened with extinction?](#)
- [DEW State Report Card – How many of our species are extinct or threatened with extinction?](#)
- Overview of Biodiversity Monitoring in the Northern and Yorke Natural Resources Management Region: A Report to the Northern and Yorke Natural Resources Management Board
- Summary outputs from Biological Databases of South Australia are available through [NatureMaps](#) and the [Atlas of Living Australia](#).

Description of Attribute

As groundwater salinity is controlled by a combination of climatic conditions, geology and changes in land use, this attribute relates largely to resource use and condition. Increases in groundwater salinity often results from reduced recharge due to prolonged periods of below average rainfall, leached salts in drainage caused by poor irrigation practices or evaporative concentration when shallow watertables are within about two metres of the surface.

Relevant assets

[Groundwater](#)

Current monitoring

Groundwater monitoring has been undertaken in the region since the 1970s by DEW, which currently maintains a number of observation networks for both water level and salinity. These networks are focussed on high value resources such as Clare and Baroota where risk is also the highest. Annual status reports are prepared for these resources. In areas of lower demand and risk, reporting and monitoring is less comprehensive.

Further information

- [Individual well data in the State Government of SA, Drillhole Enquiry System](#)
- [Status reports for priority regional groundwater resources \(groundwater level and salinity\)](#)

Description of Attribute

Stock status considers a group of individuals of a species occupying a well-defined spatial range independent of other groups of the same species, which can be regarded as an entity for management or assessment purposes. Stock status takes into account factors such as abundance, distribution and age structure, and is used to support the management of the species or fishery.

The definitions for stock status are consistent with the national stock status reporting framework (Flood et al. 2014).

Relevant assets

[Marine ecosystems](#)

Current monitoring

Stock status has most recently been reported in the The Status of South Australian Fisheries Report, 2015. Performance indicators and reference points are used in the assessment of stock status and reported against a set of standard classifications.

The report presents transparent information based on scientifically robust stock assessments undertaken for 17 key species and 45 individual stocks/management units. The report covers:

- marine fish;
- estuarine and freshwater fish;
- crustaceans; and
- shellfish.

This information provides a clear assessment, highlighting areas that require further effort for management, industry and researchers as we work together to ensure the ecologically sustainable development of South Australia's fisheries resources.

Further information

- [DEW State Report Card – Are our recreational and commercial marine fish stocks being used sustainably?](#)
- [Marine Parks Scientific reports](#)
- [Primary Industries and Regions SA's \(PIRSA\) Fisheries and Aquaculture](#)
- [Status of Australian Fish Stocks Reports](#)
- [The Status of South Australian Fisheries Report](#) – Released December 2015

Description of Attribute

Reefs are formed from rocky outcrops and provide habitat for invertebrates, algae and fish. Reef condition is assessed based on a combination of reef health indicators.

Relevant assets

[Marine ecosystems](#)

Current monitoring

Subtidal reef condition monitoring is done by scientific and community based Reef Watch studies. Data has been collected since 2005 and tends to be done on an annual basis. Indicators may include:

- percentage cover of canopy forming macroalgae, turfing macroalgae, mussel mats and bare substrate;
- size and abundance of blue throated wrasse;
- abundance of site attached fish and mobile invertebrate predators;
- presence of invasive taxa;
- sedimentation; and
- species richness (macroalgae) and species richness (mobile invertebrates).

Further description of monitoring is available from [Reef Watch](#)

Further information

- [Biodiversity of Yorke Peninsula Rocky Reefs](#)
- [Examining the health of subtidal reef environments in South Australia, Part 2: Status of selected South Australian Reefs based on the results of the 2005 surveys](#)
- [Examining the health of subtidal reef environments in South Australia, Part 4: Assessment of community reef monitoring and status of selected South Australian reefs based on the results of the 2007 surveys](#)
- Reef Watch South Australia: The first decade of community reef monitoring
- [EPA Aquatic Ecosystem Monitoring, Evaluation and Reporting](#)

Appendix B. Governance

Strategic Alignment

This Strategic Plan has been prepared to meet the requirements of Section 75 of the *NRM Act 2004*. The goals are consistent with the objects of the *NRM Act 2004*, the State NRM Plan and relevant legislation.

Various national, state, regional and local plans and policies are relevant and have been considered in the development of this plan. These also outline the roles and responsibilities of the Minister, Northern and Yorke NRM Board, Natural Resources Northern Yorke and other affiliated stakeholders.

National

Australian Government's Agricultural Competitiveness White Paper
Australian Government's Threatened Species Strategy
Australia's Biodiversity Strategy 2010-2030
Australia's Native Vegetation Framework – A national framework to guide the ecologically sustainable management of Australia's native vegetation
Australian Pest Animal Strategy
Australian Weeds Strategy
Biosecurity Act 2015
Cleaner Environment Plan
Environment Protection and Biodiversity Conservation Act 1999
Intergovernmental Agreement on Biosecurity
National Bushfire Management Policy
National Food Plan
National Landcare Programme (Caring for our Country and Landcare)
National Objectives and Targets for Biodiversity Conservation 2001-2005
National Principles for the Provision of Water for Ecosystems
National species action plans and conservation overviews
National threat abatement plans
National Water Initiative
National Water Quality Management Strategy/ Revision of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
National Weed Spread Prevention Action Plan
National Wildlife Corridors Plan
Native Title Act 1993
Weeds of National Significance—update 2008

State

Aboriginal Heritage Act 1988
Aquaculture Act 2001
Coast Protection Act 1992
Conserving Nature: A strategy for establishing a system of protected areas in South Australia
Development Act 1993
Environment Protection Act 1993
Environment Protection (Water Quality) Policy 2015
Fisheries Management Act 2007
Harbours and Navigation Act 1993
LGA SA Climate Change Adaptation Guidelines
Living Coast Strategy for South Australia 2004
Marine Parks Act 2007
National Parks and Wildlife Act 1972
Native Vegetation Act 1991
Natural Resources Management Act 2004
Natural Resources Management (Review) Amendment Act 2013
Natural Resource Management State and Condition Reporting Framework South Australia
NatureLinks
No-Species Loss – A Biodiversity Strategy for South Australia 2007
Overallocation policy and Decision Support Framework
Prospering in a Changing Climate – A Climate Change Framework for South Australia August 2012
Risk Management Framework for Water Planning and Management
River Murray Act 2003
SA Biosecurity Policy 2013-2016
SA Water Strategic Plan 2012-2016
South Australia's Climate Change Strategy 2015-2050 – Towards a low carbon economy
South Australian Dryland Salinity Strategy
South Australian Food Strategy
South Australia's Strategic Plan
State Biosecurity Policy
State Natural Resources Management Investment Strategy 2016

State NRM Plan 2012-2017
Soil Conservation and Land Management; Directions for the Agricultural Lands of South Australia 2005 (the report of the former Soil Conservation Council)
Tackling Climate Change: South Australia's Greenhouse Challenge 2007-2020
Water For Good
Wetlands Strategy for South Australia 2003

Regional

Adelaide and Mount Lofty Ranges NRM Plan
Central Local Government Region Integrated Climate Change Vulnerability Assessment – 2030
Eyre Peninsula NRM Plan
Ecological Fire Management Guidelines
IPA Management Plans/Healthy Country Plans
Local Government Development Plans (various)
Local Government Strategic Plans (various)
Marine Park Management Plans (various)
Northern and Yorke Biodiversity Plan
Park Management Plans for National and Conservation Parks and Wilderness Protection Areas (various)
Regional Development Australia Yorke and Mid North (2012) Strategic Plan 2011-2015
Regional Development Australia Far North Strategic Plan
Regional Development Australia Whyalla and Eyre Peninsula Strategic Plan
Salinity Management Plans (various)
South Australian Arid Lands NRM Plan
South Australian Murray Darling Basin NRM Plan
Threatened Species Recovery Plans (various)
Yorke and Mid North Planning Strategy
Yorke and Mid North Regional Roadmap
Yorke and Mid North Regional Climate Change Action Plan
Water Allocation Plan for Clare Valley Prescribed Water Resources Area
Water Supply and Demand Statement

Appendix C. Community Action Planning

Community Action Planning in Northern and Yorke region: an application of the Open Standards for the Practice of Conservation methodology across natural resource assets

Over the past 10 years, the Northern and Yorke region has incrementally applied the **Open Standards for the Practice of Conservation** methodology (OS) to prioritise its actions and develop integrated natural resource management programs. Based on the principles of adaptive management, OS follows a standardised multi-step process to:

- (i) identify the priority assets within a landscape;
- (ii) assess the viability of the asset, based on its condition, size and landscape context;
- (iii) determine and prioritise the threats to the asset, based on the scope, severity and irreversibility of the threat;
- (iv) build a conceptual model of the system (social, political, economic, cultural, and environmental factors) to identify both the underlying cause of the threat and opportunities for intervention;
- (v) develop and test management strategies and actions;
- (vi) build SMART targets to improve condition or reduce threats;
- (vii) formulate monitoring protocols and plans; and
- (viii) iteratively monitor and evaluate the success of the actions.

Although initially developed as a tool for biodiversity management, the approach has been adapted to enable its application within the region's soil and water resource management programs, allowing the region to compare and prioritise its programs across NRM assets.

The application of the OS in the Northern and Yorke region is delivered under the brand **Community Action Planning (CAP)**.

Based on socio-ecological-production landscapes, the region has developed three Biodiversity CAP plans, three Soil CAP plans, one regional Water CAP plan, one regional Marine Biodiversity CAP plan, and will soon be initiating **Healthy Country Planning** across the region; a variant of OS that focusses on the aspirations and priorities of Aboriginal communities.

One of the significant benefits of the OS/CAP approach is that it proactively seeks the participation of stakeholders and the community in the planning process, aligning it with the goals of the **International Association for Public Participation (IAP2)**.

The ongoing inclusion of all interested parties at the discussion table provides for a significant level of ownership by all participants, an across-the-board agreement on the priority issues and actions, and a high level of transparency in the allocation of resources.

OS/CAP is delivered in the region through a series of ongoing planning and project development workshops, attended by stakeholders, technical experts, and key members of the community. Following preliminary project development, the broader public within the project footprint are actively engaged in the process, to incorporate local perspectives and gauge the viability and appetite for the project. The CAP planning teams also provide the structure on which the region's investment delivery mechanism is based, with funding spread across partner groups and working under distinct program brands – Living Flinders, Naturally Yorke and Mid North Horizons.

With all planning processes built on a common OS/CAP framework, the region can concurrently compare and prioritise its actions across all natural resource assets, providing direction for investment at multiple scales (local, landscape, regional).

This foundation of OS/CAP plans has also enabled the aggregation of similar assets into higher-level resource groupings at a regional scale, providing the basis for Australia's first community-driven Regional NRM Plan, constructed collaboratively from the bottom-up.





Appendix D. Glossary

Acid sulphate soils: soils that either contain sulphuric acid, or have the potential to form sulphuric acid, when exposed to oxygen in the air.

Adaptive Management: a management approach, often used in NRM, where there is limited information, a lot of complexity, or both, and there is a need to implement some management changes sooner rather than later. It is an approach that involves learning from management actions, and using that learning to improve the next stage of management.

Agricultural zone: generally, the areas south of the 250mm isohyet (or Goyder's line).

Aquaculture: the farming of aquatic organisms for the purposes of trade, business or research.

Aquatic ecosystems: an ecosystem located in a water body. The two main types are marine and freshwater ecosystems.

Aquatic pest: An exotic (non-native) aquatic species that causes, or is likely to cause, unacceptable impacts to the environment, economy, human health or social values when present in an area.

Aquifers: porous, water-bearing layers of sand, gravel, and rock below the earth's surface; reservoirs for groundwater.

Asset-based approach: an approach that provides a basis for the protection, rehabilitation and management of natural resources that the community believes to be important. Under this approach, NRM planning focuses on protecting the identified asset by addressing threats to it at a regional level.

Assets — see Natural resources.

Average Recurrence Interval: the average value of the periods between exceedances of a

given flow or rainfall event.

Baseline information: the known data, measured trends and the assessed status of a natural resource (e.g. water quality in a river) or of a social condition relevant to natural resources management (e.g. community knowledge of a threatened species and the required actions for its protection). Baseline information provides a 'benchmark' by which the success or failure of our management actions can be assessed.

Biodiversity: the variety of life forms represented by plants, animals and other organisms and micro-organisms, the genes that they contain, and the ecosystems and ecosystem processes of which they form a part.

Biota: all living organisms in a given area, including fungi, bacteria and algae.

Broad-hectare Agricultural Production: generally, commercial-scale cereal or grazing enterprises that are mostly reliant on rainfall (rather than irrigation) for plant production.

Catchment: extent of land where water from rain drains into a body of water, such as a river, lake, reservoir, estuary, wetland, sea or ocean

Coastal ecosystems: an ecosystem that is located in a coastal environment, bounded by the coastal land margin and the continental shelf. A coastal ecosystem may include dunes, sandy beaches, limestone cliffs, rocky shores, estuaries and lakes. Off shore it may include reefs, seagrass beds, upwellings and bare substrate.

Connectivity: the extent to which patches of similar or complementary ecosystems are connected for the purpose of animal movement, for plant and animal reproduction, and for

supporting ecosystem resilience.

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

Conservation status: the listing of a taxon on state, Australian or international conservation lists according to the threat to its viability.

Contaminants: include, but are not limited to, nutrients, sediments and chemicals.

Desalination/reverse osmosis: a process that converts seawater or brackish water to fresh or more usable water through removal of dissolved solids.

Detention basin: a pond or basin constructed for the temporary detention of water to provide time for suspended sediments and other heavy pollutants to settle before discharge into a watercourse, lake, or other water storage.

Drainage path: the path that surface water naturally flows along over land.

Dryland agriculture: rain-fed agriculture, practised in areas where crop/pasture production is limited to that part of the year when rain falls.

Dryland salinity: the process whereby salts stored below the surface of the ground are brought close to the surface by a rising watertable. The accumulation of salt degrades the upper soil profile, with impacts on agriculture, infrastructure and the environment.

Ecological processes: dynamic interactions among and between biotic and abiotic components of the biosphere.

Ecologically sustainable: the use, conservation, development and enhancement of natural resources in a way, and at a rate, that will enable

people and communities to provide for their economic, social and physical wellbeing while: sustaining the potential of natural resources to meet the reasonably foreseeable needs of future generations.

Ecosystem: a dynamic complex of plant, animal, fungal and microorganism communities and the associated non-living environment interacting as an ecological unit

Ecosystem services: the full suite of benefits that human populations gain from a particular type of ecosystem, such as maintenance of climates; provision of clean water and air; pollination of crops and native vegetation; fulfilment of people's cultural, recreational, spiritual and intellectual needs; and provision of options for the future (e.g. by maintaining biodiversity).

Endemic flora and fauna: plant and animal species that are restricted to a specified region or site.

Environmental flow: the share of water provided and managed for the environment to protect river health.

Environmental values: the uses of the environment that are recognised as being of value to the community. For water quality environmental values this might include: protection of aquatic ecosystems; recreational water use and aesthetics; potable water for drinking; agricultural and aquaculture use; and industrial use. They are not the same as ecological values, which concern the elements and functions of ecosystems.

Environmental water requirements: the water regime needed to sustain the ecological values of water-dependent ecosystems, including their

Appendix D. Glossary continued

processes and biological diversity, at a low level of risk.

Ephemeral flows: stream flows that only endure for a short time following a heavy rainfall event.

Estuary: a partially enclosed coastal body of water that is permanently, periodically, intermittently or occasionally open to the sea within which there is a measurable variation in salinity due to the mixture of seawater with water derived from or under the land.

Exotic aquatic species: A species that is not known to be native to South Australia

Feral: a species that has escaped the management and control of people and is living and reproducing in the wild.

Floodplain: any area of land adjacent to a watercourse, lake or estuary that is periodically inundated with water and includes any other area designated as a floodplain by an NRM plan; or by a Development Plan under the *Development Act 1993*.

Fragmentation: the division or separation of natural areas by the clearance of native vegetation for human land uses, isolating remnants and species and affecting genetic flow.

Geomorphic characteristics / Geomorphology: features of a landform or landscape including, but not limited to, bed and banks of a watercourse, floodplain of a watercourse or lake, cliffs, soils, rocks and other mineral forms.

Groundwater: water occurring naturally below ground level; or water pumped, diverted or released into a well for storage underground.

Groundwater base flow: usually, the amount of streamflow that is due to groundwater discharge. In periods of low or zero rainfall, streamflow may be comprised solely of base flows.

Groundwater recharge: the process whereby water below the land surface is replenished by either direct infiltration of rainfall or by leakage from surface water bodies like streams or lakes.

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

Heritage agreement: a contract between a landholder and the State Government for the protection in perpetuity of a particular area of native vegetation.

Horticulture: the art, industry and science of plant cultivation.

Hydrogeology: the study of groundwater, which includes its occurrence, recharge and discharge processes, and the properties of aquifers; see also Hydrology.

Hydrological flow regime: the flow regime applicable to a particular watercourse or aquatic ecosystem as it varies by seasonal and more episodic climatic events (e.g. periodic severe flooding or drought). It may be a natural regime or man-managed (e.g. by weir pool manipulation). It also includes the water quality dimensions associated with particular flow periods (e.g. high salinity during periods of low flows and high turbidity due to erosion during high flows).

Hydrology: the science that describes and analyses the occurrence of water in nature, and its circulation near the surface of the earth.

Indicators: a measure against which some aspects of performance can be assessed.

Indigenous Land Use Agreement (ILUA): a voluntary agreement between a native title group and others about the use and management of land and waters.

Intensive farming: a method of keeping animals in the course of carrying on the business of primary production in which the animals are usually confined to a small space or area and usually fed by hand or by a mechanical means.

Introduced aquatic species: a species found in Australia as a result of human activity, whether by accidental or intentional release, escape, dissemination or placement.

Introduced species: a species occurring in an area outside its historically known natural range as a result of intentional or accidental dispersal by human activities.

Keystone aquatic plants: those species whose loss from a system leads to the loss of other species. Keystone aquatic plants form the architecture for the wetland habitats; without them the ecosystem cannot function as it should.

Lake: a natural lake, pond, lagoon, wetland or spring (whether modified or not) and includes part of a lake, or a body of water designated as a lake by an NRM plan; or by a Development Plan under the *Development Act 1993*.

Landscape: a heterogeneous area of local ecosystems and land uses that is of sufficient size to achieve long-term outcomes in the maintenance and recovery of species or ecological communities, or in the protection and enhancement of ecological and evolutionary processes.

Landscape-scale management / Landscape approach: strategic approaches to manage natural resource management values and threats at a landscape-scale, being of a sufficient size to sample all landforms of the landscape (i.e. from the top of the hill to the bottom of the valley).

Macroinvertebrates: invertebrate animals (animals without a backbone) large enough to be seen without magnification.

Mangroves: salt-tolerant trees or shrubs that have their lower trunk and roots in sea water at high tide.

Market-based instruments: schemes that use market-like approaches to encourage 'good behaviour', changing management actions to improve natural resource management outcomes.

Micro-organism: small or microscopic forms of life, including bacteria, yeasts, fungi, and moulds.

Native animal: a protected animal within the meaning of the *National Parks and Wildlife Act 1972* and any species included in Schedule 10 of that Act, not including a dingo or any other animal of a class excluded from the ambit of this definition by the regulations.

Native Species: a plant or animal species which occurs naturally in South Australia

Natural resource assets — see Natural resources.

Natural resources: include soil; water resources; geological features and landscapes; native vegetation, native animals and other native organisms; and ecosystems.

Natural Resources Management (NRM): an approach to managing our environment that strives to achieve a balance between our collective need for resources and the needs of our environment.

Pastoral zone: generally, the area north the 250 mm isohyet (or Goyders line). Also referred to as the rangelands.

Pest species: any introduced plant or animal that can adversely affect native species and ecosystems.

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

Appendix D. Glossary continued

through legal or other effective means.

Rare species: a category for threatened fauna and flora under the *National Parks and Wildlife Act 1972 (South Australia)*.

Recharge area: the area of land from which water from the surface (rainfall, streamflow, irrigation, etc.) infiltrates into an aquifer.

Recovery plans: documents that detail management and research actions necessary to stop and reverse the decline of listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long term survival in the wild of a threatened species or ecological community.

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

Resilience: the ability of an ecosystem to withstand and recover from environmental stresses and disturbances.

Restoration: ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed.

Riparian vegetation: vegetation that is associated with streams, rivers, floodplains and lakes.

Riparian zones / areas: that part of the landscape adjacent to a water body that influences and is influenced by watercourse processes.

Runoff: water flowing over land or in a natural or man-made drain, after having fallen as rain or hail or having precipitated in any other manner.

Saline discharge: the process whereby excess groundwater containing dissolved salts rises close to the land surface, resulting in dryland salinity problems. Saline discharge occurs into waterways when saline groundwaters enter the river channel.

Salinisation: the process whereby land or water resources become adversely affected by high levels of salt (usually sodium chloride) that inhibit normal ecosystem functioning (including crop production).

Seascape: a heterogeneous area of local ecosystems and sea uses that is of sufficient size to achieve long term outcomes in the maintenance and recovery of species or ecological communities, or in the protection and enhancement of ecological and evolutionary processes.

Species: a taxon comprising one or more populations of individuals capable of interbreeding to produce fertile offspring.

Stock / domestic dam: a dam for the purpose of the storage of water for domestic purposes or use by livestock, with a capacity of up to 5 megalitres or wall height of up to 3 m from the natural ground level.

Sub-catchment: the area of land determined by topographical features within which rainfall will contribute to runoff at a particular point.

Subspecies: set of populations within a distinct geographical range that are recognisably different from the rest of the populations that make up the species.

Surface water: water flowing over land (except in a watercourse), after having fallen as rain or hail or having precipitated in any another manner, or after rising to the surface naturally from underground. Also, water of either kind that has been collected in a dam or reservoir.

Sustainable use of biodiversity: 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

Terrestrial: pertaining to the land (contrast with

aquatic and marine).

Threatened species and/or ecological communities: species (at national and State levels) or ecological communities (at a national level) classified as being threatened by extinction and listed as either – Vulnerable, Endangered, Critically Endangered or Presumed Extinct.

Threatened species: plants or animals that are listed as rare, vulnerable, endangered or critically endangered or extinct in the wild as per the *National Parks and Wildlife Act 1972 (South Australia)* or *Environment Protection and Biodiversity Conservation Act 1999*.

Threatening Process: processes that threaten or may threaten the survival, abundance or evolutionary development of components of native biodiversity

Turbidity: the cloudiness or haziness of water (or other fluid) caused by individual particles that are too small to be seen without magnification, thus being much like smoke in air.

Underground water — see Groundwater.

Vulnerable species: a category for threatened fauna and flora under the *National Parks and Wildlife Act 1972 (South Australia)* or *Environment Protection and Biodiversity Conservation Act 1999*.

Water Affecting Activities (WAA): activities that can have adverse impacts on the health and condition of water resources, on other water users and on the ecosystems that depend on water resources. These water resources include watercourses, lakes or dams, floodplains, groundwater, springs, wetlands, waterholes and catchment landscapes, among others.

Water Erosion Risk Index: an indicator of the level of water erosion risk expressed as the average number of days each hectare of

susceptible soil is at risk of erosion on a yearly basis.

Water Protection Area (WPA): An area that is protected from pollution, contamination or unsustainable use; proposed development may be excluded from a WPA area when it is liable to impact the water resource or aquifer recharge.

Water resource: a watercourse or lake, surface water, underground water, stormwater and effluent.

Water Use Efficiency (WUE): a measure of crop production per unit of water applied. The focus is usually on increasing WUE to make better use of scarce rainfall or irrigation waters.

Watercourse: a river, creek or other natural watercourse (whether modified or not) in which water is contained or flows, whether permanently or from time, to time and includes a dam or reservoir that collects water flowing in a watercourse.

Wetland: an area that comprises land that is permanently or periodically inundated with water (whether through a natural or artificial process) where the water may be static or flowing and may range from fresh water to saline water and where the inundation with water influences the biota or ecological processes.

Wind Erosion Protection Index: an indicator of the level of wind erosion risk expressed as the average number of days each hectare of susceptible soil is at risk of erosion on a yearly basis.



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