



State *of the* Environment

SUMMARY | 2018

FRONT COVER:
MOUNT REMARKABLE
NATIONAL PARK
DEPARTMENT OF
ENVIRONMENT AND WATER

RIGHT:
KANGAROO AND JOEY
MIKE MOORE

[South Australia State of the Environment Report 2018 – Summary](#)

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ANSTEY HILL CONSERVATION PARK

MIKE MOORE

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FORWARD

STURT DESERT PEA, OODNADATTA TRACK
JAMES FIELD

FOREWORD

The Environment Protection Authority is pleased to present the 2018 State of the Environment Report to the government and people of South Australia.

We trust that, in carrying out this important responsibility, we will help improve understanding of the environmental challenges and opportunities we face, and support the collective effort to achieve a sustainable South Australia.

The report provides outstanding examples of the exceptional dedication and accomplishments of the many organisations and individuals who look after our land, water, coast, plants and animals, with the common goal of leaving a clean and healthy environment for the future generations of South Australians.

However, the report also highlights that not all is well. The predicted consequences of a harsher future climate will test our ability, and that of our natural environment, to cope and adapt. Other major challenges, such as the ongoing loss of natural habitat to accommodate a growing economy and increased global demand for food and other resources, will similarly require new, creative and sometimes brave decisions and actions.

It is in this context that the report strives to help inform the choices that will deliver the greatest public value. We sincerely hope that it will prove to be a valuable resource for policymakers, natural resource managers, students and all custodians of our state's natural assets.

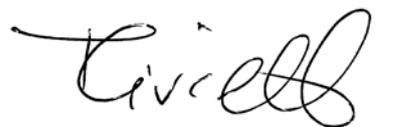
The report would not have been possible without the support of other government agencies, local councils, non-government organisations and experts. We express our thanks and appreciation for their valuable effort, insights and commitment to produce information that can make a difference.

We acknowledge that the report does not explicitly reflect the perspectives of Aboriginal people as the original custodians of the land and who retain a strong cultural and spiritual connection to Country. A report on the state of the environment would be more complete with this perspective, and this will be addressed in the next report.

We encourage you to explore the information and related sources, including the more detailed discussion in our online report.



Catherine Cooper
Presiding Member
Board of the Environment Protection Authority



Tony Circelli
Chief Executive
Environment Protection Authority

INTRODUCTION

Policy makers, natural resource managers and other decision makers need good information for the effective management and protection of our environment.

We need to know the condition of our natural assets and understand how it changes, including the causes and impacts. We also need to evaluate the effectiveness of policy and management responses to those changes for optimal effectiveness – a challenging task considering the complexity of distinguishing between natural variations and human-induced changes.

The statutory State of the Environment Report (SOER), produced every five years under the *Environment Protection Act 1993* (EP Act), is an important contribution to public discourse about the South Australian environment.

The EPA synthesises information from multiple sources to prepare the report. This information is seldom complete or comprehensive, and interpreting it requires judgement informed by consultation with experts, community groups, local councils and various government departments. One of the new features of the SOER is its incorporation of information from the South Australian (SA) Government's 2018 suite of 41 statewide environmental trend and condition report cards.



This year's SOER is the seventh published since 1988 and the fifth prepared in fulfillment of the formal requirements of the EP Act. This history of reporting gives us valuable insight into environmental change over time and related shifts in priorities. It also reminds us of the many successful policies and programs developed in response to emerging environmental challenges, and reveals lessons learnt and the intractable challenges that remain.

Each of the themed sections in the online report provides an overview of actions undertaken over time to protect, restore and enhance the environment. While acknowledging these and many other important actions being undertaken by all levels of government, community organisations and individuals to conserve, protect and improve our invaluable natural environment, some additional opportunities are identified at the end of each of the themes. Many of those are already being progressed, and their implementation will be reviewed as part of the next report.

As reflected in the findings of this year's SOER, the main opportunities to bolster South Australia's sustainability are in building resilience to climate change, restoring and protecting biodiversity and prioritising the available investment in protecting our natural assets based on greatest risk and public value. This requires good information and robust evaluation of the effectiveness of environmental policies and programs. It also relies on strong partnerships.

OVERVIEW OF KEY FINDINGS

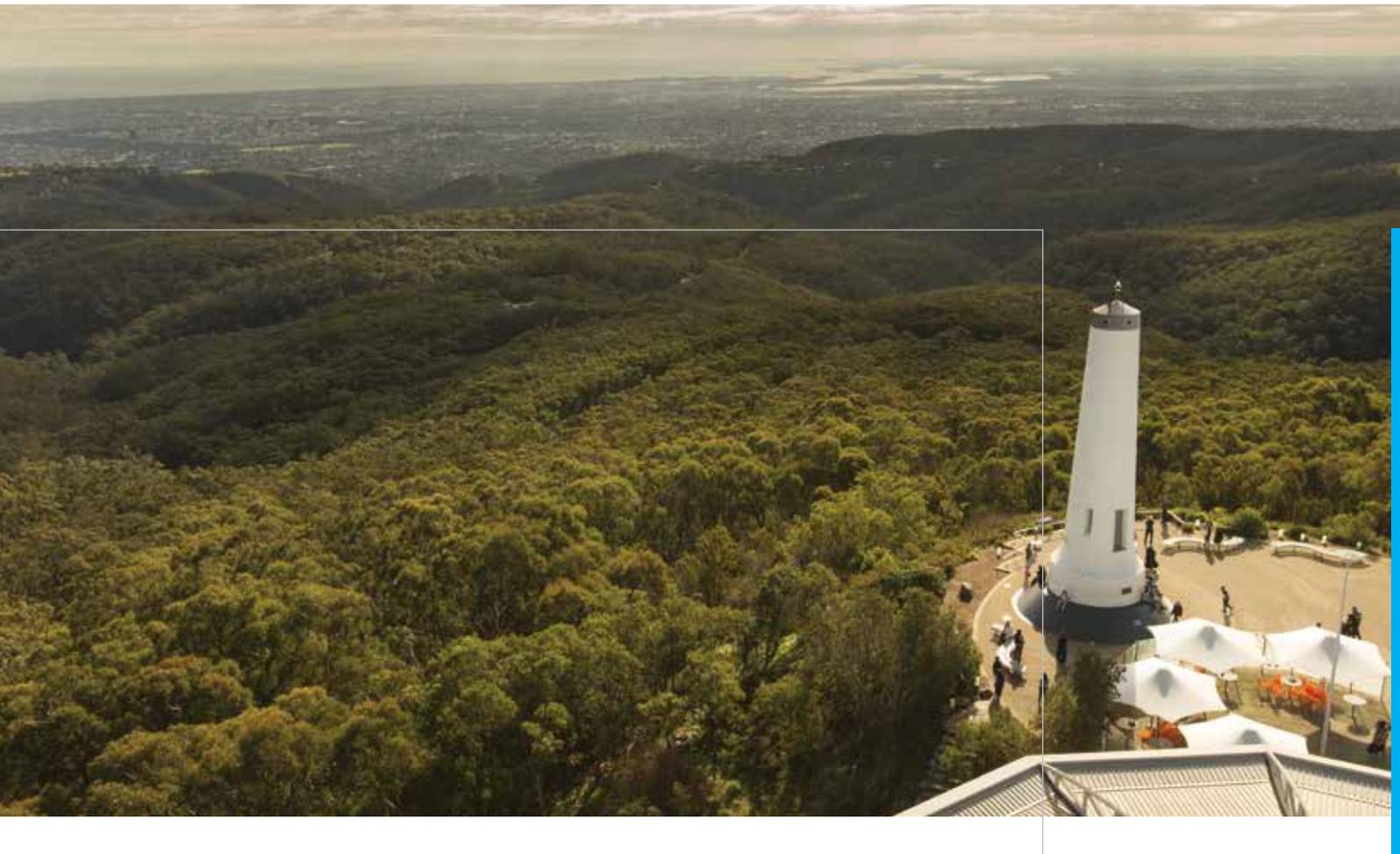
The 2018 South Australian State of the Environment Report reveals mixed results for the condition of the state's natural assets and trends in environmental quality.

Climate change

South Australia is facing a number of environmental and socio-economic impacts from climate change. Warmer and drier conditions are already evident, sea levels are rising and the surface waters of the ocean are acidifying. Opportunities for improvement are in monitoring and risk assessment to inform planning, investment and management of urban warming, coastal risks, threatened habitats and aquatic ecosystems.

Land and biodiversity

Our native plants and animals are in serious trouble with many in decline and likely to become extinct. Opportunities for improvement are in prioritising and coordinating conservation across the landscape, improved protection of threatened species and ecosystems, and restoration of priority ecosystems.



Waste management

The volume of waste continues to increase at a higher rate than population growth, and is increasing in complexity. Opportunities for improvement are in reducing waste generation through policies and incentives to improve product design and packaging, sharing of resources, more efficient production and behaviour change. There are also gains to be achieved through government leadership in a circular economy, including through green procurement.

Inland waters

Although streamflows are declining across most of the state, water quality is generally stable. Opportunities for improvement are in integrated adaptive management of priority water resources, including planning for climate change and implementation of integrated urban water management.

Coast and marine

The condition of the near-shore marine environment is generally good, with areas in best condition located away from human disturbance and coastal development. Maintaining Adelaide's beaches continues to require significant investment. Opportunities for improvement are in implementation of climate adaptation priorities, further improvements in stormwater and wastewater management, and integrated management of the coastal zone.

Air quality

Air quality is generally good across most of South Australia, most of the time. The main opportunities for further improvement are in reducing emissions from transport and to continue reducing emissions from major industries.

IMPORTANT ISSUES AND RECOMMENDATIONS

Some environmental issues are more important than others based on risk, or because they are large, pervasive, increasing, approaching tipping points, cumulative or irreversible.

Based on the evidence presented in this report, the detailed assessment in the online report and the advice from conservation groups, local councils, experts and other stakeholders, we draw attention to six important crosscutting issues and make related recommendations.

1. CLIMATE CHANGE PLANNING AND ADAPTATION

South Australia's climate is renowned for being dry – it is the driest state in the driest inhabited continent on Earth. Our communities, industries, landscapes and ecosystems have all developed with a tolerance for some climate variation. If the climate changes beyond that range of tolerance, they must adapt, migrate, transform or decline.

In South Australia, our climate has already changed, and further changes are likely as concentrations of greenhouse gases continue to increase. The impacts of a warming climate are more extreme than expected just a decade or two ago, with changing rainfall patterns and intensified extreme weather events putting ecosystems, agriculture, public health and infrastructure at increasing risk.



Understanding the nature of climate trends, as well as the potential risks and impacts associated with a changing climate to South Australia's economic, social and environmental wellbeing, is crucial for planning for climate adaptation.

Recommendation 1

It is recommended that the SA Government review the state's climate change response to ensure that climate risks are adequately embedded into planning and investment by government agencies.

2. BIODIVERSITY DECLINE

Habitat loss, primarily through the widespread historic clearance of native vegetation and drainage of wetlands, continues to threaten native plants and animals. The impact of this habitat loss and fragmentation is exacerbated by changes in grazing pressure (by domestic, native and introduced herbivores), altered fire regimes, invasive plant and animal species, ongoing changes in land use, such as intensification of agriculture, and a changing climate.

A predicted drier and warmer climate, together with the effects of flood, drought and other weather patterns, will progressively change the landscape in terms of species distribution and abundance.

In the southern agricultural regions, the number of native plants and animal species threatened with extinction continues to increase. While widespread clearance of native vegetation has largely ceased, incremental loss of native vegetation continues through legal approvals, illegal activity, and attrition and ageing of vegetation that is not being replaced (for example, scattered trees). Much of this loss is occurring in grasslands and low (non-woody) native vegetation.

Recommendation 2

It is recommended that the SA Government develop a biodiversity action plan to prioritise conservation efforts across the landscape that takes into account climate change and the findings of recent reviews, and is informed by broad public consultation.

IMPORTANT ISSUES AND RECOMMENDATIONS

3. COASTAL PROTECTION IN A CHANGING CLIMATE

More than 80% of South Australians live within Greater Adelaide, a low-lying coastal area exposed to sea-level rise and storm surge. Most of our remaining regional population also lives in close proximity to the coast.

The risks related to this exposure are predicted to increase as sea levels continue to rise and storm events increase in intensity. These risks were illustrated when the largest storm surge since records began hit our shoreline on 9 May 2016, resulting in extensive damage.

In response to the risks, a range of adaptation actions have been identified for management of the coast based on climate modelling, and sea-level rise monitoring and projections. These include a periodic review of coastal management measures, such as the Adelaide's Living Beaches strategy, and guidance to inform coastal development policy and planning instruments.

These are all essential measures, and the following recommendation is intended to support the intent of these commitments.

Recommendation 3

It is recommended that the SA Government review the monitoring of the South Australian coast and sea levels, and assess how it informs policy to ensure planning for development, infrastructure and beach management adequately accounts for risks from climate change.

4. WASTE MANAGEMENT

The average amount of waste generated in South Australia rose from just over 2,000 kg per capita per year in 2003–04 to 3,000 kg in 2016–17, which is an increase of 42%. While we continue to get better at diverting most of this waste away from landfill to resource recovery, the most efficient solution remains that of avoiding generation of the waste in the first place. However, it also remains imperative to keep getting better at reusing recovered resources locally to reduce the risk of reliance on other markets.

The *South Australia's Waste Strategy 2015–2020* sets a target to reduce waste generation per capita by more than 5% by 2020 (from the 2015 baseline). That equates to achieving a reduction of 400 kg (to 2,600 kg) per person per year from the volume generated in 2016–17 by 2020. Given the current upward trend, achieving the target seems unlikely. Current priority actions to meet the target are to promote green purchasing, waste avoidance, collaborative consumption and production, product refurbishment, and behaviour change.

Given strong competing influences on consumer behaviour in the form of marketing, fashion and social norms, a targeted program is needed to encourage production (for example, design, durability and packaging), marketing (for example, labelling) and consumption (for example, product selection) choices that reduce waste generation. There is also a major opportunity for government to take the lead in increasing the strength of a circular economy, including through green procurement.

Recommendation 4

It is recommended that the SA Government advocate for coordinated national action to reduce waste, including through regulation of packaging, providing leadership in the strengthening of the local resource

recovery industry, including through green procurement, and strengthening education and behaviour change initiatives aimed at reducing waste.

5. AQUATIC ECOSYSTEM RESILIENCE

Fresh water is a limited resource in South Australia, with most rivers (excluding the River Murray) having seasonal and highly variable flows. The state also features several unique and important wetland ecosystems. Together, these environments provide habitat for a large range of fauna and flora and essential ecosystem services that contribute to economic productivity.

Predicted declines in rainfall and increases in temperature across much of South Australia will likely reduce streamflows, inundation in wetlands and the recharge of aquifers. These climatic pressures will exacerbate long-standing existing pressures in the form of reduced average flow volumes, increased dry periods, aquifer drawdown, damage by domestic and feral animals, drainage schemes, vegetation clearance and pollution.

To strengthen the natural functioning and resilience of our aquatic ecosystems in a changing climate, it is possible to manage avoidable pressures that are under our control. Nutrient input, grazing and water extraction can be managed at the decadal and catchment scale, as well as rehabilitation of important aquatic ecosystems.

Recommendation 5

It is recommended that the SA Government prioritise water management and onground land stewardship initiatives based on the risks to the sustainability of significant aquatic ecosystems.

6. ENVIRONMENTAL INFORMATION

Since the commencement of the formal requirements for state of the environment reporting, South Australia has adopted a number of other environmental reporting requirements, most of which came into effect after 2000. This includes the *River Murray Act 2003*, *Natural Resources Management Act 2004*, and *Climate Change and Greenhouse Emissions Reduction Act 2007*.

The EPA made a recommendation in the 2013 State of the Environment Report for the development of an environmental information strategy, to identify and prioritise key environmental information needs. In its response to this report, the government accepted the recommendation and identified several actions to improve access to, and communication of, environmental information.

The government's work has included the development of statewide environmental trend and condition report cards, which have helped to inform the 2018 SOER. The current review of natural resources management legislation offers an opportunity to strengthen the efficiency of environmental reporting, including through streamlining reporting and stronger links between reporting and environmental management.

Recommendation 6

It is recommended that the SA Government review environmental reporting in the state, including the environmental themes and measures that are assessed and reported by the trend and condition report cards, to further improve reporting and strengthen links between reporting and environmental management.



SUMMARY

THEME SUMMARIES

The following themes are not mutually exclusive, and there are overlaps and interactions between them (for example, between climate change and trends for land, water, oceans and air). There are also trends within trends (for example, the increase in vehicle emissions within an overall declining trend for energy emissions).

THEME SUMMARIES

CLIMATE CHANGE

WHY IS IT IMPORTANT?

Our climate is changing more rapidly than it has in the past, with carbon dioxide concentrations in the atmosphere higher today than they have been in 800,000 years. The international community, through the 2015 Paris Agreement, has agreed to collectively limit the increase in the global average temperature to well below 2°C above pre-industrial levels. This is considered the point beyond which the effects of climate change will have dangerous and potentially irreversible impacts for humans and ecosystems. However, current emission levels track close to the highest scenario modelled by the Intergovernmental Panel on Climate Change and, without immediate large reductions, temperature rises of 3°C or 4°C (relative to the pre-industrial period) by as early as 2060–70 are more likely.

WHAT ARE THE PRESSURES AND IMPACTS?

In South Australia, similar to the rest of Australia and the world, energy related emissions account for most of the emissions. In SA, this was 63% in 2015–16. Australia ranks 13th in the world in terms of total emissions, and 7th highest in the world and the highest of all OECD countries in terms of emissions per person.

South Australia contributes 5% of Australia's emissions. The impacts of a warming climate are more extreme than expected just a decade or two ago, with changing rainfall patterns and intensified extreme weather events putting ecosystems, agriculture, public health and infrastructure at increasing risk.



HOW IS IT CHANGING?

While South Australia's climate has always been highly variable, a strong warming trend has been observed since the 1970s. The average annual temperature across the state is now 0.8°C warmer than in the 1970s, and the frequency of days reaching over 40°C in Adelaide in the past 10 years has more than doubled compared with the period 1977–2007. The highest rates of increase in temperature have occurred in the arid northeast of the state and the lowest rates in the cooler southern parts.

In terms of temperature projections, the average daily maximum temperature for South Australia is forecast to rise by between 1 and 2.1°C by 2050 (compared with the average daily maximum temperature in the period 1986–2005). This will lead to higher maximum temperatures and even more days above 40°C.

In terms of rainfall, there has been significant regional variation in rainfall trends across South Australia since 1990. Winter rainfall has decreased in the state's key southern agricultural regions by around 10–40 mm per decade, while tropically induced summer rainfall has increased in the northern pastoral regions by up to 40–60 mm per decade. Although there has been some increase in extreme rainfall events, particularly in the state's north, annual and spring rainfall across South Australia is projected to decline by between 5–15% by 2050 (relative to the baseline period 1986–2005).

THEME SUMMARIES

CLIMATE CHANGE

Sea levels along South Australia's coast have risen by between 1.5 mm and 4 mm per year from 1965 to 2016 (which equates to a total rise of between 70 mm and 200 mm), and the rate of rise is projected to increase in the future.

Total SA energy emissions are declining, but energy emissions from transport have increased. Emissions per capita fell by about 30% between 1990 and 2016 and remain substantially lower than the national average. Similarly, the greenhouse gas intensity of the SA economy, measured in tonnes of CO₂-e (carbon dioxide equivalent) per million dollars of gross state product, has more than halved since 1990.

WHAT ARE WE DOING ABOUT IT?

South Australia has been at the forefront of climate policy since its 1991 Greenhouse Strategy. This included a combination of measures to reduce state greenhouse gas emissions, including through a legislated target to reduce emissions and a supportive renewable energy policy environment. The state's projects include a renewable energy plan, a renewable energy fund and measures to enhance the capture of carbon.

To improve resilience to the projected changes in climatic conditions, a highly participative process for developing vulnerability assessments across SA government regions enabled the identification of a range of adaptation actions. South Australia's Goyder Institute for Water Research has a program to develop methods for industries and resource managers to identify climate-related vulnerabilities and assist in the design and implementation of adaptation measures.

The Bureau of Meteorology (BOM) and other science agencies employ a range of air, land and marine sensors to track climatic trends across Australia. The BOM also maintains an array of monitoring stations that measure sea level around the coastline of Australia to identify long-term changes.

Figure 1: Climate

Aspect	Observation	Trend	Condition	Reliability
Climate Rainfall 	Since 1990, April to October rainfall in the south has decreased and November to March rainfall in the north has increased	 getting worse	 fair	 very good
Climate Projected Rainfall 	Annual and spring rainfall across South Australia is projected to decrease significantly by 2050	 getting worse	 not applicable	 fair
Climate Temperature 	Average annual temperatures have increased across the state in the past 40 years, especially in the arid northeast	 getting worse	 fair	 very good
Climate Projected Temperature 	Higher maximum temperatures and more days above 40°C are projected for South Australia	 getting worse	 not applicable	 fair
Climate Sea Level 	Sea levels along South Australia's coast are rising, and the rate of rise is projected to increase in the future	 getting worse	 fair	 very good

THEME SUMMARIES

LAND AND BIODIVERSITY

WHY IS IT IMPORTANT

South Australia's unique terrestrial landscapes are diverse, ranging from the arid and semi-arid pastoral systems of the north through to low-rainfall wheat and sheep country in the south, and higher rainfall coastal regions with their mix of forests and woodlands.

These landscapes contain a diversity of animals (birds, mammals, reptiles, fish, amphibians and invertebrates), vegetation, soil biology, biogeochemical cycles and micro-organisms that provide a range of essential ecosystem services, such as pollination, soil generation and fertilisation, and climate stabilisation. Much of the state's economy relies on the use of the land and its resources. For example, tourism, pastoralism, forestry and horticulture all benefit from healthy ecosystems.

Our quality of life, our sense of place and our cultural identity are intimately connected to the biodiversity that surrounds us.

WHAT ARE THE PRESSURES AND IMPACTS?

Our land is subject to a range of pressures, the impacts of which vary across the diverse landscapes. Habitat loss, primarily through the widespread historic clearance of native vegetation, continues to threaten native plants and animals.

The impact of habitat loss and fragmentation is exacerbated by changes in grazing pressure (by domestic, native and introduced herbivores), altered fire regimes, invasive plant and animal species, ongoing changes in land use, such as intensification of agriculture, and a changing climate.

A predicted drier and warmer climate is likely to change the distribution and abundance of native and exotic species. Together with the effects of flood, drought and other weather patterns, this will progressively change the landscape in terms of species distributions, shorter growing seasons and more intense bushfires.



HOW IS IT CHANGING?

Changes in the terrestrial landscape vary across South Australia. In the northern arid regions, the extent of native vegetation on which both native biodiversity and agricultural production depend, remains high. While the condition of this vegetation is unknown, the proportion of species that are at risk of extinction remains relatively low. This low risk is also maintained by land continuing to be added to the protected area network.

In the southern agricultural regions, however, different patterns of change are emerging. Across these regions (except Kangaroo Island), the number of native plants and animal species threatened with extinction continues to increase. While widespread clearance of native vegetation has largely ceased, incremental loss of native vegetation continues through legal approvals, illegal activity, and attrition and senescence of vegetation that is not being replaced (for example, scattered trees). Much of this loss is occurring in grasslands and low (non-woody) native vegetation.

Cover of woody vegetation remains stable overall, with increases in the Eyre Peninsula, Northern and Yorke, and the SA Murray–Darling Basin. The condition is unknown. Cover of low native vegetation is declining due to clearance and replacement by woody native shrubs. The condition is unknown. The abundance and distribution of native flora and fauna are declining and an estimated 12% are threatened.

Erosion of agricultural land has stabilised and the level of protection is good. Agricultural soil acidity is getting worse and the condition is fair considering that two-thirds of acid-prone soils are in areas at risk of increased acidity.

The abundance and distribution of established invasive plants and animals are increasing. The proportion of landscapes that are adequately protected has increased to 30%. This protection is unevenly distributed, ranging from 81% of landscapes adequately protected in the Alinytjara Wilurara region to just 8% in the Northern and Yorke region.

THEME SUMMARIES

LAND AND BIODIVERSITY

WHAT ARE WE DOING ABOUT IT?

All native vegetation in South Australia is protected by native vegetation legislation. The South Australian protected area network (on both public and private lands) further underpins the conservation of native plants and animals. While protected areas have increased in recent decades, this has not been matched by increasing capacity to manage these areas. Effective partnerships between the SA Government, Australian Government, regional conservation bodies and local communities are critical for protecting our native biodiversity.

Land managers are adopting more sustainable farming practices, while biosecurity programs seek to prevent outbreaks of pests and diseases. These and other land management programs are increasingly delivered through local planning processes that focus on values and pressures which are locally relevant to particular landscapes and communities.

The SA Government is developing a future-focused strategy for nature conservation that aims to identify the changes needed to improve our capacity to conserve our unique plants and animals in such a way that they, and we, are able to adapt to the changes occurring in our environment. What is needed is a mechanism to prioritise investments made in land and biodiversity to ensure that the greatest value is being obtained by those investments, including in the light of climate change.

Figure 2: Land

Aspect	Observation	Trend	Condition	Reliability
Woody native vegetation Percentage cover 	Woody native shrubs are replacing low native vegetation in some areas across South Australia	 stable	 unknown	 excellent
Low native vegetation Percentage cover 	Low native vegetation is transitioning to agricultural land and woody native shrubs in some areas of South Australia	 getting worse	 unknown	 excellent

Aspect	Observation	Trend	Condition	Reliability
Land: protected areas Landscapes that are adequately protected 	In 2017, 30% of landscapes in South Australia were adequately protected	 getting better	 fair	 very good
Agricultural land Days protected from soil erosion 	South Australian agricultural soils are protected from erosion on around 342 days each year	 stable	 good	 excellent
Agricultural land Soil acidity 	Soil acidity is getting worse across South Australia. Lime is needed to help maintain agricultural productivity	 getting worse	 fair	 very good
Land: native fauna Population trends and percentage threatened 	The statewide trend in populations of land native fauna shows a continuous decline, which is due to a range of ongoing pressures	 getting worse	 fair	 fair
Land: native flora Population trends and percentage threatened 	The statewide trend in populations of land native flora shows a continuous decline, which is due to a range of ongoing pressures	 getting worse	 good	 fair
Land: invasive species Abundance and distribution of established invasive species 	The trend in the abundance and distribution of established invasive species shows a continuous increase	 getting worse	 poor	 poor

THEME SUMMARIES

WASTE MANAGEMENT

WHY IS IT IMPORTANT?

Population and economic growth drive increased consumption that, in turn, results in more waste being generated. Waste is considered an inefficiency of the production process and is created in all sectors of the economy and at each point in the production chain. Patterns of waste generation change, as do the types of chemicals and materials used to manufacture the products we buy.

Waste covers a wide spectrum, ranging from food to electrical, industrial, agricultural and construction materials. It could be solid or liquid, and includes anything in size and scale from decommissioned ships, millions of mobile phones to billions of used car tyres.

WHAT ARE THE PRESSURES AND IMPACTS?

The more complex and hazardous the product and its packaging, the greater the challenge for effective waste management. Without effective management, waste can result in considerable health, economic and environmental costs. These include carbon dioxide and methane emissions associated with landfill and transport, contamination of groundwater, generation of dust and litter, loss of valuable resources, disposal costs and competing land uses.

While the amount of waste sent to landfill is decreasing, a range of specialised and problematic waste streams remain a concern due to either their hazardous nature (hence potentially harmful effects on humans and the environment) or lack of commercially viable recycling alternatives.



HOW IS IT CHANGING?

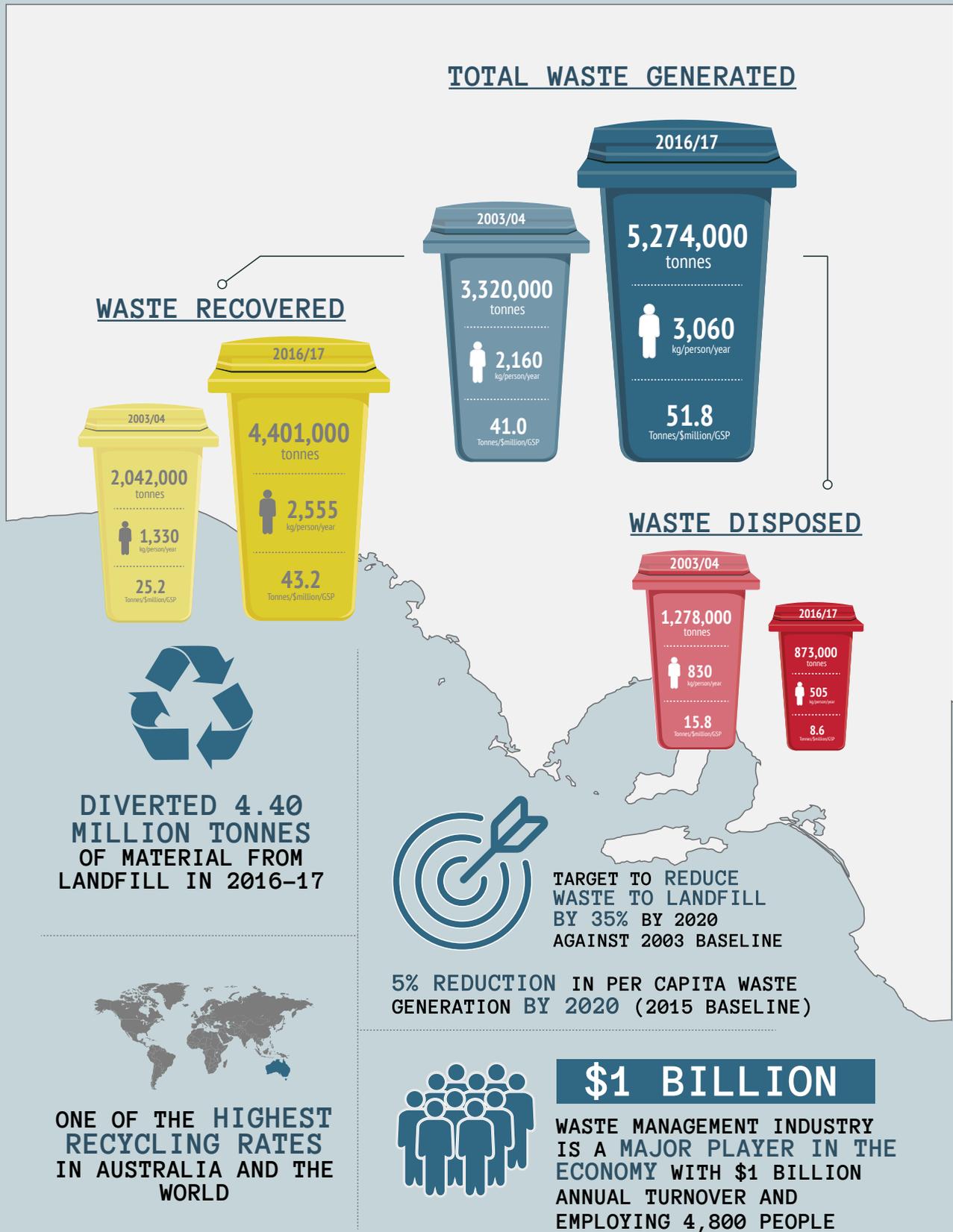
In 2016–17, 5.3 million tonnes of waste was generated in South Australia, an increase of 9.9% from 2015–16 and 59% since 2003–04 (Figure 3). The total volume of waste generated in 2016–17 amounts to an average of 3,060 kg per person, an increase of 8.9% from 2015–16 and 42% since 2003–04. Of this, 2,555 kg were recycled, an increase of 11.6% from 2015–16 and 92% since 2003–04. The remaining 505kg per person went to landfill, a decline of 2.9% from 2015–16 and 39% since 2003–04.

WHAT ARE WE DOING ABOUT IT?

Through a combination of a leading regulatory framework, strategic policy approaches, investment in education and infrastructure, and effective incentives, South Australia continues the long-term upward trend in resource recovery that has been occurring since 2003–04, diverting 83.4% of materials from landfill to resource recovery in 2016–17.

A total of 4.4 million tonnes were recovered, a 12.6% increase from 2015–16 and a 116% increase from the 2.04 tonnes recovered in 2003–04. This is the highest diversion rate of any state in Australia.

WASTE



Source: SA's Recycling Activity Survey 2016-17, Green Industries SA

A circular economy

The circular economy concept builds on the 'reduce, reuse, recycle' rungs of the waste hierarchy and is included as a guiding principle in the *Green Industries SA Act 2004*.

In 2017, South Australia became the first Australian jurisdiction to quantify the potential benefits of a circular economy for the state. The study found that a more circular economy could deliver significant job creation (an additional 25,700 jobs) and greenhouse gas reduction (27% of 7.7 million tonnes of CO₂ equivalent) by 2030.

With well-developed recycling and waste management sectors and strong support for investment in renewable energy, many types of circular economy jobs already exist in South Australia and we are in a good position to make the current state economy more circular.

A sustainable circular economy relies on government policy that effectively increases resource recovery and local reprocessing of recyclable materials, supported by procurement of recycled products by national, state and local governments. This could be further underpinned by an accreditation and labelling system for recycled products.

Figure 3:

Totals and per capita of waste generation, recovery and disposal in SA

THEME SUMMARIES

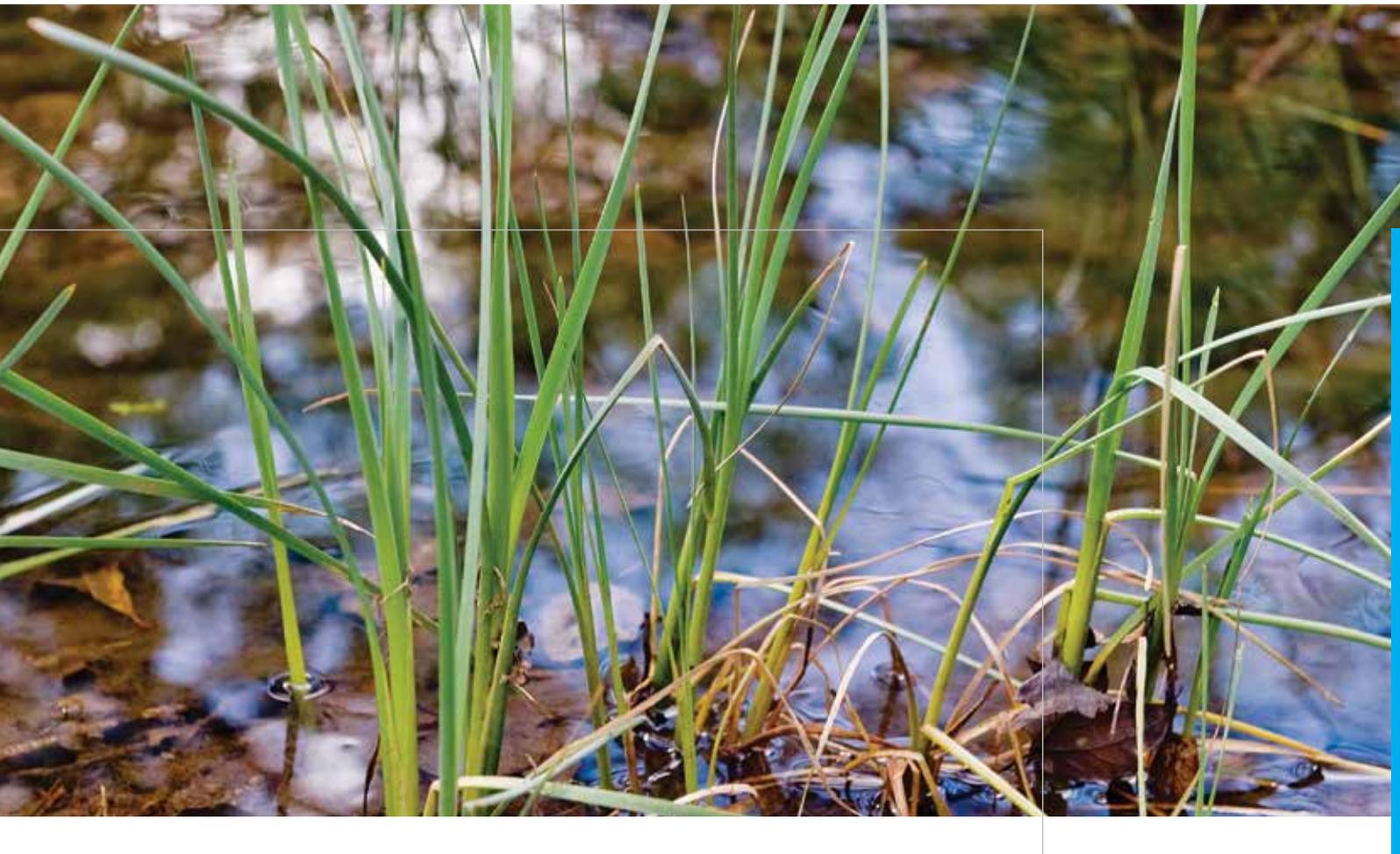
INLAND WATERS

WHY IS IT IMPORTANT?

Water is fundamental to our health, way of life, economy and environment. It is critical to maintaining the health of wetlands, floodplains, rivers, streams, creeks, lakes and estuaries, and the aquatic life they contain, from the arid lands of northern South Australia to the wetter climates of the Mount Lofty Ranges and South East.

The catchments of the Mount Lofty Ranges and the River Murray provide water for metropolitan Adelaide and support irrigated agriculture. Groundwater resources sustain many of the regional economies of the state, supplying towns, stock, agriculture and industries, such as mining.

The River Murray is the state's largest surface water resource and supports internationally significant ecosystems, nationally important economies and local communities. Around 75% of the water taken from the River Murray is used for primary production, and major pipelines supply metropolitan Adelaide and regional communities.



WHAT ARE THE PRESSURES AND IMPACTS?

South Australia's surface water and groundwater resources are under pressure from agriculture, industrial use, a growing population, pollution and climate change. Following early settlement, the various phases of agricultural, urban and resource development, land use and water extraction have significantly impacted on the health of our aquatic ecosystems (Figure 4).

Our water resources are highly variable and strongly influenced by annual and seasonal rainfall. Most inland waters are subject to nutrient enrichment (largely from agriculture and urban land uses) and an accumulation of fine sediments, and have narrow and weedy riparian zones that are often grazed by sheep and cattle. We use about 75% of our fresh water for agriculture.

In the case of the River Murray, dams, weirs and other infrastructure have significantly altered the patterns of flow. The Millennium Drought (2001–09) and a trend towards warmer and dryer conditions is exacerbating the long-term cumulative impacts of regulated flows. This is emphasising the inevitable tensions and trade-offs in sharing available water between environmental and human needs.

INLAND WATERS

URBAN

- Stormwater runoff from roads and residential areas (causing sediment transport, increased turbidity and smothering aquatic habitats; various toxic pollutants possibly impacting on sensitive species; eutrophication causing algal blooms).
- Stormwater runoff from highly industrialised locations (with a range of harmful pollutants that can cause toxic impacts).
- Altered flow regimes (minimal base flows and high velocity peak flows)

RURAL

- Cropping and grazing (erosion/sediment transport; fertilizer causing algal blooms; chemical use causing acute and chronic toxicity to sensitive species, soil erosion causing sediment transport, increased turbidity and smothering aquatic habitats; animal waste causing low dissolved oxygen and algal blooms)
- Vegetation clearance causing increase in soil and creek salinity sediment transport, increased turbidity and smothering aquatic habitats; reduced shading in creeks, which increases water temperatures; reduced in-stream habitat diversity).
- Weed invasion along stream banks.
- Wastewater discharges (causing low dissolved oxygen, algal blooms and possible toxicity to sensitive species).

EXCELLENT
Native or natural condition

VERY GOOD
Minimal loss of species; some density changes may occur

GOOD
Some replacement of sensitive rare species; functions fully maintained

FAIR
Some sensitive species maintained; altered distributions; functions largely maintained

POOR
Tolerant species show increasing dominance; sensitive species are rare; functions altered

VERY POOR
Severe alterations of structure and function

ECOLOGICAL CONDITION

INCREASING HUMAN DISTURBANCE

NRM programs

Technical advice

Incentives for land management

Research and applied science

Water allocation plans

Weed control

Pest animal control

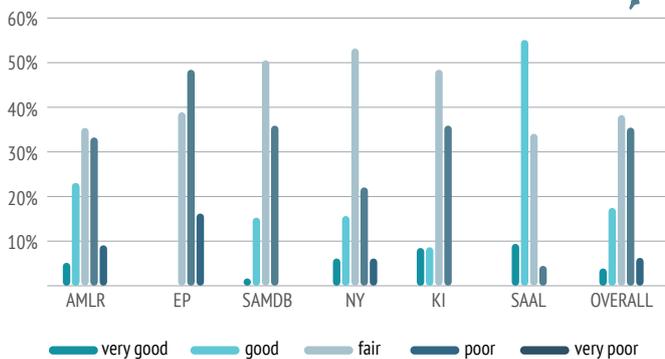
Stormwater quality improvement

Groundwater monitoring

Improved wastewater treatment

RESULTS OF THE ASSESSMENTS BY NRM REGION

Better sites are located in areas of higher rainfall with catchments that still have high percentage of native vegetation.



RESPONSE

HOW IS IT CHANGING?

The condition of our aquatic ecosystems is strongly related to their location in terms of rainfall and extent of intact native vegetation. Overall, aquatic ecosystems are in fair condition and have been improving since the end of the Millennium Drought. We expect flow rates of our streams and the amount of groundwater to reduce due to projected long-term reductions in rainfall.

In the following trend and condition summaries, the condition across several indicators is variable (Figure 5). Water resources and the ecosystems that depend on them are generally rated as fair or good. The management of water resources is rated as good. South Australia has relatively few aquatic weeds and pests, but a lack of data does not allow assessment of trends in new incursions of invasive species. The distribution of invasive fish is large and continues to expand. There were five incursions of declared freshwater pest species in 2017.

The percent cover of wetlands is stable except in three regions where it is declining. Compared with worldwide changes since 1990, the change in wetland cover is considered fair. The rating for surface water quality shows that it is in fair condition, but annual flows for prescribed surface water resource areas are declining. Water salinity varies with streamflow and trends are within natural ranges. The condition of most groundwater resources is good and the trends in levels and salinity have stabilised since 2013.

The trend in populations of inland water fauna shows a continuous decline. Compared with a worldwide benchmark, the proportion of inland water animals considered threatened is fair. The trend in populations of inland water native flora also shows a continuous decline. Compared with a worldwide benchmark, the proportion of inland water plants considered threatened is fair.

The number of actively managed water resource areas with water allocation plans is increasing, with 30 out of 38 (79%) prescribed water resources now having completed plans.

Figure 4:

Key pressures and impacts on inland waters in SA

Figure 5: Inland Waters

Aspect	Observation	Trend	Condition	Reliability
Wetlands Percentage cover 	Wetland cover is stable in South Australia, but has declined in the wetter regions	 stable	 fair	 excellent
Aquatic ecosystem conditions EPA condition assessments 	The condition of South Australia's aquatic ecosystems is fair and improving	 getting better	 fair	 very good
Water management Water allocation planning 	Water allocation planning in South Australia is good and getting better	 getting better	 good	 excellent
Surface water Quantity and quality 	Although streamflows are declining across most of South Australia, water quality is generally stable	 getting worse	 fair	 very good
Groundwater Water level and salinity 	The quality and quantity of South Australian groundwater is generally stable	 stable	 good	 very good



Aspect	Observation	Trend	Condition	Reliability
<p>Inland waters: native fauna</p> <p>Population trends and percentage threatened</p> 	<p>The statewide trend in populations of inland water native fauna shows a continuous decline because of a range of ongoing pressures</p>	 <p>getting worse</p>	 <p>fair</p>	 <p>fair</p>
<p>Inland waters: native flora</p> <p>Population trends and percentage threatened</p> 	<p>The statewide trend in populations of inland water native flora shows a continuous decline because of a range of ongoing pressures</p>	 <p>getting worse</p>	 <p>fair</p>	 <p>fair</p>
<p>Inland waters: invasive fish</p> <p>Established invasive fish abundance and distribution</p> 	<p>Invasive fish have increased in abundance and distribution across South Australia since 2013</p>	 <p>getting worse</p>	 <p>poor</p>	 <p>fair</p>
<p>Inland waters: biosecurity</p> <p>New incursions of invasive species</p> 	<p>There were five new incursions of aquatic invasive species in SA in 2017, but there is insufficient information to determine a trend</p>	 <p>unknown</p>	 <p>fair</p>	 <p>poor</p>

River Murray

Since the end of the Millennium Drought, there have been four years in which South Australia received River Murray flows in excess of 40 GL per day on several occasions compared with the standard maximum regulated flow of 7 GL per day. Since 2012, an additional average of 870 GL of dedicated environmental water per year has also been delivered to South Australia to support environmental outcomes on floodplains, in wetlands and in the Lower Lakes, Coorong and Murray Mouth region.

Better management of the timing and volume of flows to South Australia have led to improvements in native fish populations, and aquatic and shoreline vegetation. The Lower Lakes, Coorong and Murray Mouth region is a priority for environmental water because of the wetlands of national and international significance in the region.

River salinity has been declining and salinity targets are being met. The Murray Mouth has been open more often, but ongoing connectivity with the sea remains largely dependent on dredging.

Although the improved flows have not been sufficient to lead to any noticeable improvement in the health of iconic floodplain trees, such as the River Red Gum, Black Box and River Cooba, their decline in condition has generally stabilised. The exception is the declining condition of the River Cooba, which requires very high flooding flows.

WHAT ARE WE DOING ABOUT IT?

The management of inland waters is made up of four core activities: managing the overall amount of water that can be used (for example, water allocation plans); improving the efficiency of water used (for example, wastewater recycling and stormwater reuse), developing alternative water sources (for example, desalination), and community education and involvement to help protect our water resources.

Water allocation plans are in place for 30 out of 38 actively managed water resources across the state. In addition to regulating the overall water take, water allocation plans also establish water trading to encourage water to be used in the most efficient and productive way. Stormwater and wastewater are increasingly used as alternative sources, with the additional benefit of reducing the detrimental impacts on the coastline.

South Australia is an active participant in interstate management of water resources, including through the Murray–Darling Basin Plan, Border Groundwater Agreement and Lake Eyre Basin Ministerial Forum. The Murray–Darling Basin Plan is the most significant policy reform since the Millennium Drought and provides for a coordinated approach to the management of water resources within the basin.

At the core of the Basin Plan is the requirement for a long-term annual average surface water volume of 2,750 GL to be recovered from consumptive uses to meet the agreed basin-wide sustainable diversion limit of 10,873 GL. A further 450 GL of water is to be delivered through investment in on-farm efficiency measures. The evidence indicates the implementation of the Basin Plan is already having a positive effect in South Australia by boosting flows and helping to reduce salinity levels in the river.

South Australia continues to invest in infrastructure with the aim of:

- reinstating more natural patterns of connectivity between the river and its wetlands and floodplains
- improving the health of wetland and floodplain ecosystems
- assisting fish movements for feeding and breeding
- improving the efficiency of water use, including through diversification to industries that use less water.

Figure 6: River Murray

Aspect	Observation	Trend	Condition	Reliability
<p>River Murray: water Quantity and quality</p> 	<p>The flows of 2016–17 were in the top 25% of flows for the past 40 years and helped maintain healthy salinity levels</p>	 stable	 very good	 excellent
<p>The Murray Mouth Days open</p> 	<p>The number of days the Murray Mouth is open is increasing, but remains heavily reliant on dredging</p>	 getting better	 poor	 excellent
<p>River Murray: fish passage Permanently wet area accessible</p> 	<p>Fish can now move freely throughout most of the permanently wet areas of the River Murray</p>	 getting better	 very good	 excellent
<p>River Murray: floodplain trees Tree condition index</p> 	<p>The condition of the River Red Gum and Black Box is generally stable, but the River Cooba shows signs of declining condition</p>	 stable	 fair	 very good



Aspect	Observation	Trend	Condition	Reliability
<p>River Murray: high value wetlands Achievement of ecological targets</p> 	<p>The achievement of ecological targets for River Murray high-value wetlands is generally stable, but is getting better for the Lower Lakes, Coorong and Murray Mouth region</p>	 stable	 poor	 very good
<p>Coorong and Lower Lakes vegetation Vegetation target success</p> 	<p>More vegetation targets in the Goolwa Channel and temporary wetlands are being met, but the overall trend is stable</p>	 stable	 poor	 excellent

THEME SUMMARIES

COAST AND MARINE



WHY IS IT IMPORTANT?

The coast, estuaries and adjacent marine waters are a unique part of the South Australian environment. Over 90% of South Australians live within 50 km of the coast and many commercial, industrial and recreational activities rely on coastal and marine resources.



South Australia's marine environment is characterised by a variety of habitats, such as mangroves, seagrasses and reefs, which provide a variety of ecosystem services, including carbon storage, and food and shelter for plants and animals.

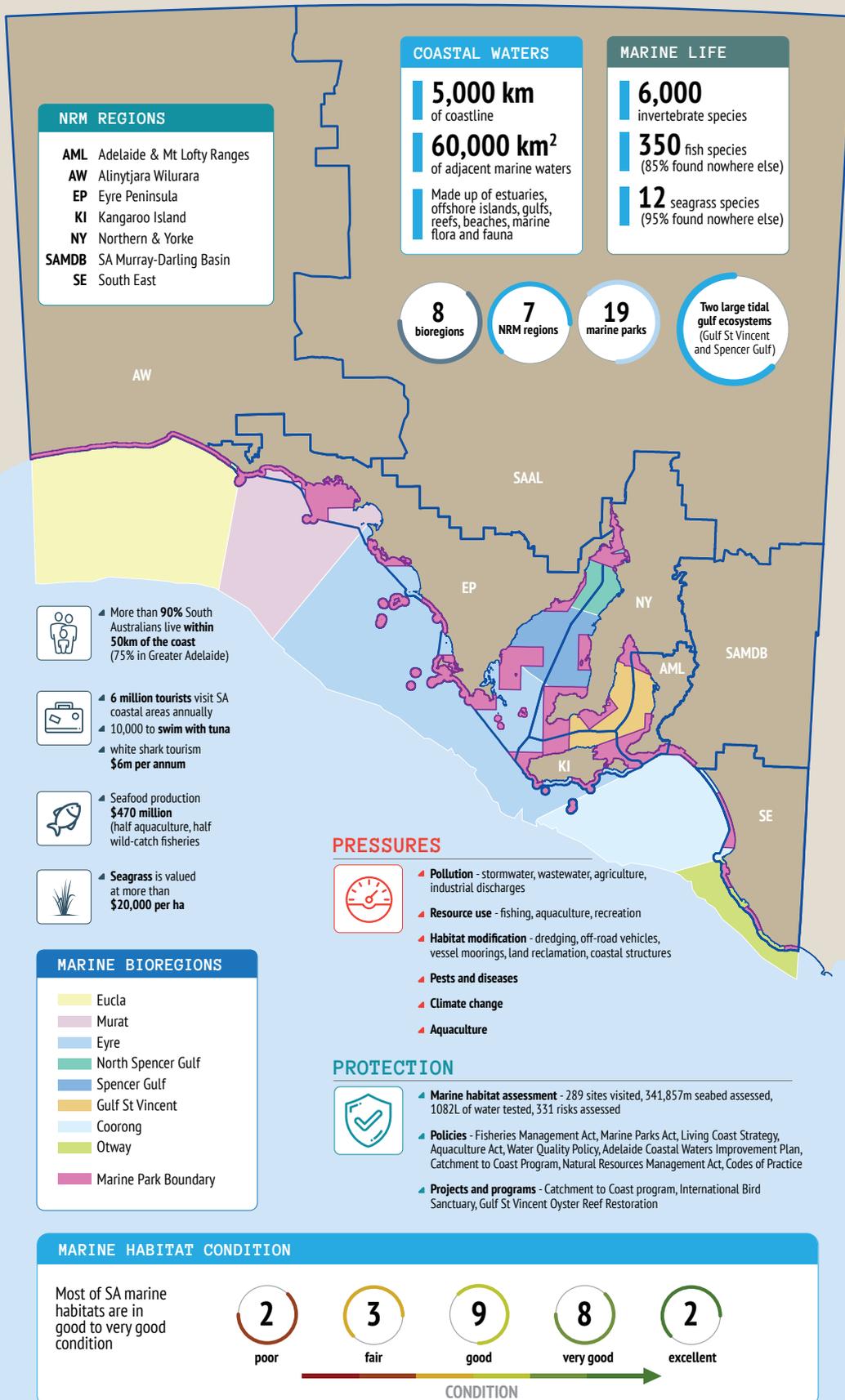
South Australia's marine areas boast iconic species, such as the Southern Right Whale, Bottlenose Dolphin, Leafy Sea Dragon, White Shark, Little Penguin, Australian Sea Lion and Giant Cuttlefish. In addition to their critical role in supporting rich biological diversity, our coastal areas are also of important social and economic value.

WHAT ARE THE PRESSURES AND IMPACTS?

The coastal and marine environment is subject to a diverse range of land- and marine-based human pressures and climate change. Human pressures and impacts include urban development, coastal pollution, resource extraction (including fishing and aquaculture), habitat modification, disturbance of native species and incursions of pests and diseases (Figure 7).

Pollution and nutrient concentrations increase as runoff makes its way to the sea, where the impacts are further amplified by other sources, such as treated wastewater and aquaculture. Climate change impacts, such as a rise in sea level and changes in sea temperature, are expected to result in habitat loss, inundation of fringing coastal habitats and changes in the salinity of estuaries and groundwater.

OUR COAST



HOW IS IT CHANGING?

The condition of South Australia's near-shore ecosystems is generally good, with 83% of areas rated as good to excellent and only 6% rated as poor. Not surprisingly, the areas in best condition are generally located away from human interference and coastal development, where they are least exposed to nutrient enrichment from activities such as sewage discharges, stormwater, aquaculture and dredging. Particularly healthy sites are located throughout the far west coast of South Australia.

The extent of mangrove vegetation and coastal saltmarsh is increasing in the Eyre Peninsula and Northern and Yorke regions, and stable in the other regions (Figure 8). Seagrass cover within sampling sites was estimated at 45% and increasing. The condition of sampled seagrass was fair. The condition of subtidal reefs is largely unknown because of limited monitoring. Populations of coast and marine flora and fauna are declining and the proportion threatened is considered fair based on a worldwide benchmark.

The proportion of fish stocks that are classified as sustainable has remained stable at 76% since 2012. Seven fish stocks are classified as depleting, and two finfish stocks and one mollusc stock are overfished. The number of incursions of marine diseases and invasive species is stable. There were two naturally occurring shellfish diseases detected in 2017. Marine parks cover 44% of SA coastal waters, which is considered good. There have been no changes in protection since implementation of the 19 marine parks in 2014.

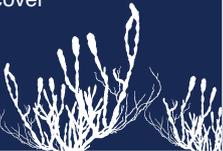
WHAT ARE WE DOING ABOUT IT?

Key measures to protect South Australia's coast and marine species and ecosystems include monitoring and management of 19 marine parks, implementation of the Adelaide Coastal Water Quality Improvement Plan, enforcement of native vegetation legislation, regulation of fisheries and aquaculture and regulation of pollution. Future actions include deployment of coast-specific rangers, an increase in investment in sand replenishment and retention, restoration of seagrass meadows, reduction of harmful stormwater runoff and creation of artificial reefs.

Figure 7:

Pressures, protection and condition for coastal waters and marine life in SA

Figure 8: Coast and marine

Aspect	Observation	Trend	Condition	Reliability
Mangrove vegetation Percentage cover 	Mangrove cover along South Australia's coastline has increased since 1990	 getting better	 unknown	 excellent
Coastal saltmarsh Percentage cover 	The areas covered by coastal saltmarsh are generally stable, but have increased in two regions since 1990	 stable	 unknown	 very good
Marine protected areas Marine parks network 	South Australia's marine park protection is stable, with 44% of our waters protected, including 6% highly protected	 stable	 good	 excellent
Seagrass Cover within sampling sites 	Seagrass cover across South Australia's coast is improving after historical losses	 getting better	 fair	 excellent
Subtidal reefs Reef condition 	The condition of reefs in South Australia is largely unknown, but is recorded as good in some areas	 unknown	 unknown	 good



Aspect	Observation	Trend	Condition	Reliability
<p>Coastal and marine: native fauna</p> <p>Population trends and percentage threatened</p> 	<p>Populations of coastal and marine native fauna are continuing to decline in parts of the state with the highest population and development</p>	 <p>getting worse</p>	 <p>fair</p>	 <p>fair</p>
<p>Coastal and marine: native flora</p> <p>Population trends and percentage threatened</p> 	<p>Populations of coastal and marine native flora are continuing to decline in parts of the state with the highest population and development</p>	 <p>getting worse</p>	 <p>good</p>	 <p>good</p>
<p>Fish stocks</p> <p>Proportion of stocks sustainable</p> 	<p>In South Australia, 76% of fishery stocks are classified as sustainable and three stocks are overfished</p>	 <p>stable</p>	 <p>good</p>	 <p>excellent</p>
<p>Coastal and marine: biosecurity</p> <p>Number of incursions</p> 	<p>Biosecurity in South Australia's coastal and marine environment is stable, with no new diseases or invasive species detected in 2017</p>	 <p>stable</p>	 <p>good</p>	 <p>very good</p>

THEME SUMMARIES

AIR QUALITY

WHY IS IT IMPORTANT?

We all rely on clean air to breathe. For many air pollutants, harm can occur at low concentrations. Although air quality in South Australia is generally good when compared with national and international standards, pollution still results in measurable health impacts and associated economic costs.

WHAT ARE THE PRESSURES AND IMPACTS?

Air pollution occurs when concentrations of airborne gases and particles become high enough and persist for long and often enough to cause adverse effects on people, plants, animals and property. Human activities are the main causes of air pollution, but it can also come from natural sources, such as wildfires. Common sources of air emissions are motor vehicles, industry, wood heaters, open burning and dust from mining and other activities (see Figure 9).

HOW IS IT CHANGING?

Adelaide and South Australia's air quality is generally good and improving. However, motor vehicles, industrial sources, domestic wood heaters and climate change continue to affect our air quality. We expect the health risks from air quality to worsen as the proportion of vulnerable, elderly people and the urban population generally, continue to increase. We also expect that the decline in rainfall and increase in temperatures resulting from climate change will intensify pollution.



Airborne lead is not an issue in South Australia, except in Port Pirie where annual average levels have been variable, but still below the national standard (Figure 10). Sulfur dioxide (SO₂) is not a concern for most of South Australia, except in Port Pirie, where the annual average is less than the national standard, but there were multiple exceedences of the shorter-term standards.

Ambient concentrations of particles (PM₁₀) in South Australia are generally good and annual average levels have declined at key monitoring sites since 2005. Ambient concentrations of nitrogen dioxide (NO₂) across South Australia have been stable since 2005 and below the national standard.

WHAT ARE WE DOING ABOUT IT?

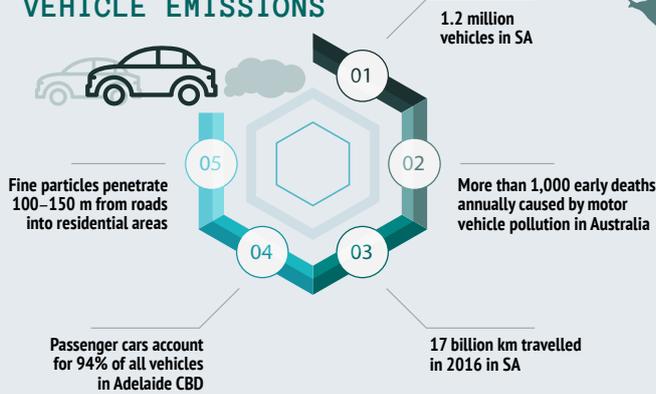
South Australia supports nationally coordinated actions under the National Clean Air Agreement to improve air quality, such as the strengthening of standards. The *Environment Protection Act 1993* is the legislative foundation for regulating South Australia's air quality. The Act requires that all reasonable and practicable steps be taken to prevent environmental harm and has enabled development of specific environmental protection policies, such as the *Environment Protection (Air Quality) Policy 2016*. This provides the basis for imposing conditions on business and industries to reduce emissions through licensing and on new developments to minimise their impacts on air quality.

AIR QUALITY



1,000 air quality related incidents and 500 enquires per year received by EPA

VEHICLE EMISSIONS



Globally 1 in 9 deaths is attributable to air pollution (6.5 million)

DOMESTIC SOLID FUEL HEATERS



SULFUR/NITROGEN OXIDES EMISSIONS

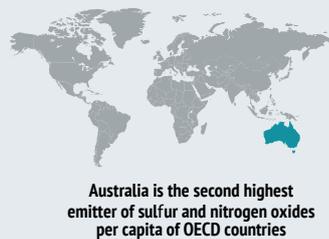


Figure 10: Air Quality

Aspect	Observation	Trend	Condition	Reliability
Air quality Particles (PM ₁₀) 	Annual average PM ₁₀ concentrations have decreased since 2005 and remain below the national standard	 getting better	 good	 very good
Air quality Lead (Pb) 	Levels of airborne lead in Port Pirie are below the national standard and are expected to reduce in the future	 stable	 very good	 very good
Air quality Sulfur dioxide (SO ₂) 	SO ₂ levels in Adelaide are stable and well-below the national standard, and levels in Port Pirie are increasing, but below the national standard	 stable	 very good	 very good
Air quality Nitrogen dioxide (NO ₂) 	Annual average levels of NO ₂ in South Australia are low and below the national standard	 stable	 very good	 very good

Figure 9:
Key pressures and impacts on air quality in South Australia



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