

# State of the Environment South Australia

Environment Protection Authority

## Summary



2013



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# Foreword

The Environment Protection Authority acknowledges the responsibility entrusted to it by the parliament and people of South Australia to periodically assess and report on the condition of the state's environment. We hope that, in presenting this sixth state of the environment report for South Australia, we will continue to improve understanding of the key environmental issues we face, and through greater knowledge, reduce the risks to a sustainable South Australia.

The context within which state of the environment reports have been produced since first published about 25 years ago has seen major changes. This, the most recent report on the environment of South Australia, looks back over a period in which the effects of a changing climate became more pronounced, including in the form of unseasonal and extreme weather events. It is a period in which concern about the resilience of our natural environment to the many pressures it faced reached new heights.

The South Australian environment is in a moderate and finely balanced state, and there is much work to do to be able to report even a steady condition in five years' time.

The impacts on the state of our natural assets are mainly the result of the collective decisions and behaviour of people — yet it is we humans who stand to lose most from a degraded and dysfunctional natural environment. Perhaps this disjunction reflects weaknesses in the availability, accessibility and communication of environmental information. For this reason, at the same time as releasing the 2013

state of the environment report, the Environment Protection Authority is also releasing a plan to improve future state of the environment reporting. The plan includes a recommendation for a whole-of-government environmental information plan to fill important gaps in environmental knowledge, and to coordinate, integrate, better use and share the many sources of environmental information available within and outside government.

This report would not have been possible without the contributions of many people in a number of government departments and the input of expert peer reviewers, and we express our thanks and appreciation to all for their valuable effort.

We trust that this report will prove to be a valuable resource for policymakers, natural resource managers, students and all other custodians of our state's natural assets.



Dr Campbell Gemmell  
Chief Executive



Ms Mia Hanshin  
Presiding Member



# Summary

Bushfires, storms, floods and extreme temperatures are tangible and often traumatic events that remind us of the close interrelationship between people and the natural environment. There are also less visible but important changes in the environment that escape attention because they develop over a long time or because they occur in remote areas, under the ground, in water, out in the ocean or up in the atmosphere. Some environmental changes may be overlooked because of inadequate data, and their significance may only become clear with the collection of long-term information.

Because of the strong relationships between the natural environment, human wellbeing and economic progress, it is important to have good information about the health of our natural resources and trends in environmental quality. One important source of environmental information for government, business and the community is the state of the environment report produced by the Environment Protection Authority at least every five years, under the *Environment Protection Act 1993*. These reports assess the condition of South Australian environmental resources, identify significant trends in environmental quality, and review the effects of programs and activities by public authorities to protect, restore and improve the environment.

The 2013 report reveals mixed results in the condition of the state's natural assets and trends in environmental quality over the last five years. There is good news—such as sustained growth in generation of renewable energy, more efficient use of water and electricity, and continued

increases in recycling. There is also cause for concern—such as further decline of already poor biodiversity, increased use of natural resources, increased average temperatures, increased development and industrial activity in sensitive areas such as the coastal zone, increased use of private motor vehicles, reduced water flows for the natural environment from the River Murray, and changes in the acidity, salinity and temperature of the marine environment.

## Reporting approach

The report's assessments have been prepared based on the driving forces, pressures, state, impact, response, outlook (DPSIRO) reporting framework (see Figure 1). In this framework the state of the environment (S) is the result of specific drivers (D) and pressures (P), which impact (I) on the environment. The response (R) represents the policies, programs and projects of government agencies to improve or maintain the state, while the outlook (O) considers what is expected to happen to the environment into the future.

The report examines what is happening overall in South Australia, and in the key themes of people and places, climate change, water, biodiversity, and the coastal and marine environment.

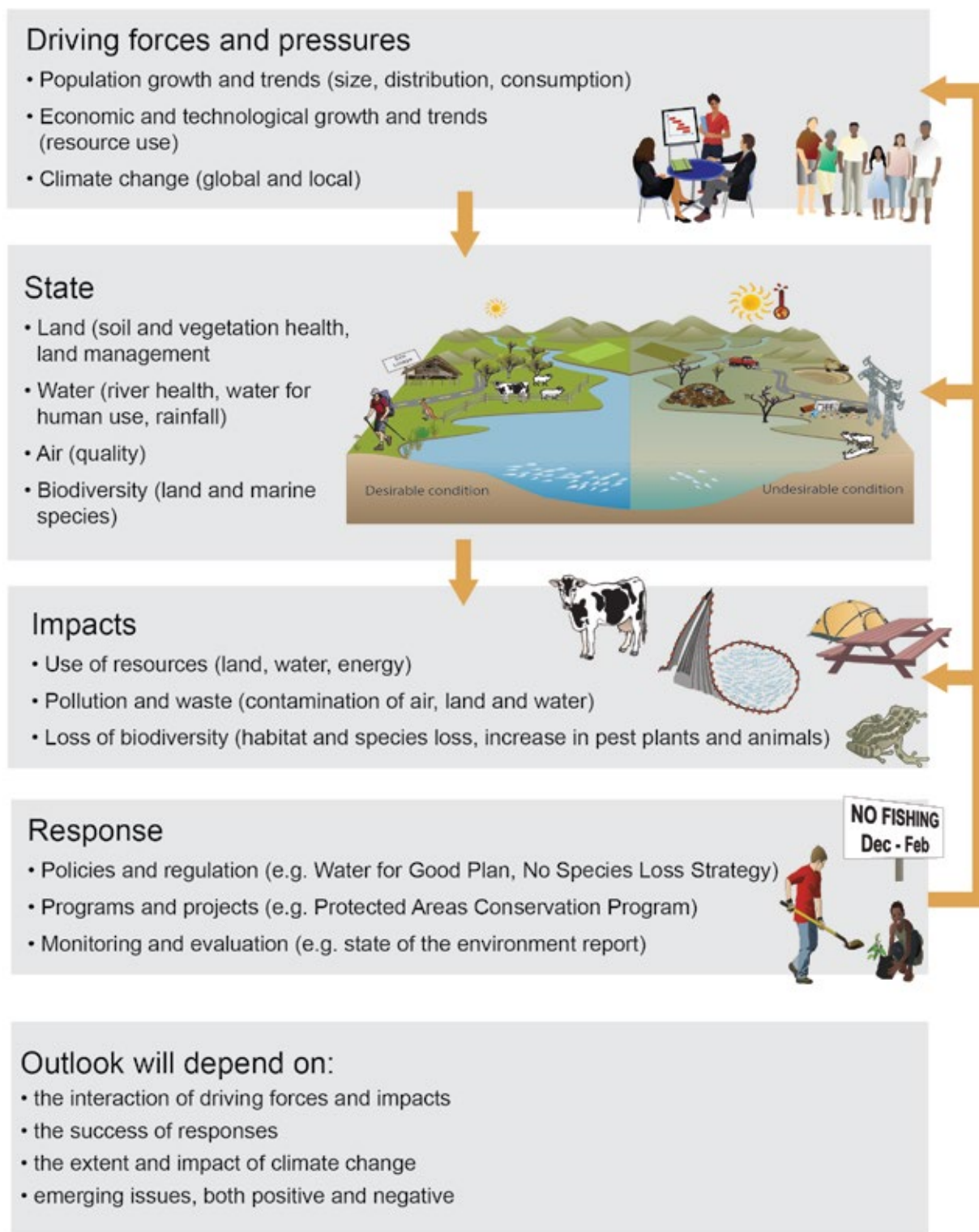


Figure 1 State of the environment reporting framework—driving forces, pressures, state, impact, response, outlook (DPSIRO)



## Driving forces and pressures

Many of the drivers and pressures of environmental change in South Australia are similar to those for other Australian states and territories, and for many other parts of the world, with some variation in scale and intensity. Many significant environmental trends are the result of global socio-economic and environmental drivers and pressures (also called mega-trends), such as:

- a growing and ageing population that is highly urbanised and more affluent and in which the average person consumes more, releases more carbon and wastes more resources than previous generations; on average, Australians consume more than most other peoples in the world
- a global economic system that relies on exponential growth in production and consumption of many products that are reliant on scarce or non-renewable natural resources and that are often produced by industries with large environmental impacts, including high water and energy use, and harmful emissions
- historic and current human activities such as large-scale land clearing, contamination of land and introduction of pest plants and animals
- rapid technological change and innovation with profound effects on production systems and consumerism
- global climate systems (the Southern Oscillation system and related La Niña and El Niño events) and their impact on species, ecosystems and natural cycles
- global climate change; the concentration of carbon dioxide in the atmosphere is higher than it has been for at least 800 000 years (397 parts per million—25% higher than 1960) and the global warming effect is profoundly changing our climate.

All of these mega-trends are well established and are expected to persist for at least the next few decades (Australian Academy of Science 2012), if there are no dramatic interventions or culture changes.

In addition to these global drivers, environmental quality in South Australia is also affected by more local pressures, as discussed in individual chapters in the report. For example, water quality is affected by dryland salinity, loss of riparian vegetation, intensive agricultural practices, soil and stream bank erosion, sedimentation, changes in land use and pollution.

## Impacts

The expected impacts of these forces and pressures include:

- loss of species, ecosystems and biodiversity
- pollution and degradation of air, land and water
- increase in volume and diversity of waste products
- increase in extreme weather events and escalation of damage from floods and bushfires
- pressures on food supply
- unsustainable use of natural resources, including mineral and energy resources, and on waste management and minimisation generally
- pressures on freshwater supplies, including predicted declines in stream flow.

Given the scale and persistence of key drivers and pressures such as a growing population and a growing economy, the only feasible approach for mitigating some of the identified impacts is to ‘decouple’ the drivers from the impacts. For example, the pressures on water supplies can be reduced by increasing water efficiency, especially in agriculture and industry; increased resource use can be offset by recycling; and the carbon production associated with increased energy needs can be reduced through the use of renewable energy sources.

In addition, some pressures will resolve naturally—for example, through depletion of non-renewable resources, including coal, even if at significant impacts and costs.

## State and condition

The following is a summary of the condition of environmental resources and significant trends in environmental quality in South Australia by theme—people and places, climate change, water, biodiversity, and the coastal and marine environment.



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# People and places

Population and economic growth have major impacts on the environment, particularly in urban areas. South Australia's population increased by 4.5% (about 70 000 people) between 2006 and 2011—the largest increase since the early 1970s (ABS 2012). The economy also continued to grow, fuelled by exports of food and minerals. Nearly 40% of South Australia's exports are agricultural products reliant on healthy soils and adequate water. Growth (in average annual gross state product between 2002–03 and 2011–12) was highest in agriculture, forestry and fishing (more than 8% in comparison with the average of 2.5%), and third highest in mining (6%) (Government of South Australia 2013a). Mineral exports contribute significantly to greenhouse gas emissions, and mineral extraction and processing rely on large amounts of water.

The historical trend of urban sprawl (typically onto productive land) has been arrested to some degree by an increase in infill development and legislation to protect agricultural land in the Barossa and McLaren Vale regions. This trend is expected to increase with the government's new policy for a more sustainable, compact urban design based on higher density development (Government of South Australia 2010).

The new policy also focuses on efficient transport. Currently, South Australia has low public transport use and high and growing private car use, which contributes to air pollution and noise. It is expected that the government's investment in public transport infrastructure and compact urban design will reduce the

walking distance to schools, work, shops and services. This should see a reduction in private car use and an increase in public transport. The increasing number of people cycling to and from the city is a positive trend which is expected to continue with the assistance of active promotion and improvement of cycling infrastructure, including *Bikedirect* (Government of South Australia 2013b).

The number of households and residential dwellings increased more rapidly than population growth over the past five years, with the trend expected to continue with an ageing population and smaller household size (ABS 2012). These trends affect planning for waste management and other services.

The volume of waste generated has increased per person (up 50% since 2003–04) and in total (up 62% since 2003–04) (EPHC 2010). This has been offset to some degree by increases in recycling; 75% of South Australian waste is now recycled.

In general, air quality has improved, in spite of an increase in emissions reported under the National Pollutant Inventory and an increase in the number of activities of environmental significance licensed under the *Environment Protection Act 1993*. There had been a decreasing trend in significant air pollutants including nitrogen dioxide and particulate matter, with some exceptions in specific locations (EPA 2013).

## In summary

### Aspect and observation

### Assessment grade

### Confidence

Very poor    Poor    Good    Very good    In grade    In trend

#### Population

Between 2006 and 2011 the population of South Australia increased by about 70 000—the largest increase since the early 1970s.

Most population growth has occurred on the northern and southern fringes of the Adelaide Statistical Division, with decline in some regional areas.

The number of residential dwellings increased more rapidly than population growth. This trend is expected to continue as the population ages and household sizes decrease.

There has been an increase of infill residential development and this is expected to accelerate over the long term.



#### Economy

The growth in world demand for food and minerals supported an upward trend in exports.

Nearly 40% of South Australia's exports are agricultural, and these rely on a healthy environment.

Protection of agricultural land has increased, including legislation to better protect the McLaren Vale and Barossa regions from urban sprawl.

An increase in mining exports led to increased greenhouse gas emissions and use of water and energy.



#### Transport

Private car use is high and growing.

The number of cyclists travelling to and from the city increased by more than 50% between 2006 and 2011.

Public transport use is low but increased from 43.8 million to 48.5 million passenger-kilometres, and is expected to increase more rapidly with investment in public transport and new urban design.



Aspect and observation

Assessment grade

Confidence

Very poor    Poor    Good    Very good    In grade    In trend

**Pollution**

Air quality remains good in terms of national standards, with only some exceptions in specific locations.

The quality of water in rivers and streams has generally improved as a result of increased rainfall.

The quality of treated water released into coastal waters has improved.

Knowledge and remediation of site contamination has increased.

The number of licences to handle radioactive substances and operate radioactive apparatus has increased.

Noise complaints increased by about 20% from 2006 to 2011.



**Waste**

Total waste generated has increased by 40% to 3250 kg per person. About 75% of this is recycled.



Recent trend



Improving



Deteriorating



Stable



Unclear

Level of confidence



Evidence and consensus too low to make an assessment



Limited evidence or limited consensus



Adequate high-quality evidence and high level of consensus

Grades



Very poor



Poor



Good



Very good



# Climate change

Atmospheric concentrations of greenhouse gases continued to increase. Australia accounts for about 0.33% of the world's population but produces 1.35% of the world's carbon dioxide emissions—four times the global average. In South Australia, emissions per person and emissions per unit of gross state product have decreased over the reporting period (2006–07 to 2011–12), but remain high in comparison with the world average and other Organisation for Economic Cooperation and Development countries (Garnaut 2008).

Energy production is still the dominant source of state emissions (74%) but renewable energy production and use has increased. Wind energy is now contributing nearly 30% of electricity production in South Australia—on schedule to meet the South Australian Government's target to generate 33% of its electricity needs from renewable sources by 2020 (Government of South Australia 2011).

Wide-ranging effects of climate change are already being seen, and more challenging changes are expected.

Global average temperatures rose by just over 0.7 °C in the 100 years from 1910 to 2009. The reporting period included the warmest year on record, with further increases in average and extreme temperatures expected.

There has been a clear decline in average rainfall in southern Australia since 1970, which has been linked to rising temperatures; this drying trend is likely to persist. We are also seeing increased climate variability, demonstrated by the fact that the reporting period

included the third and fifth wettest years on record, in spite of the long-term declining rainfall trend (BoM 2011). This variability and decline have obvious implications for future water supplies and agriculture. The Adelaide desalination plant will significantly reduce the risks of future variability in water supply.

Increased climate variability is also leading to increased frequency and severity of extreme weather events such as heatwaves (BoM 2011). In addition to the effects of high maximum temperatures, high minimum (overnight) temperatures during heatwaves have been found to affect the ability of people and other species to recover from heat stress. Adelaide recorded its hottest night in January 2009 and this was linked to a steep increase in mortality from heart disease.

## In summary

Aspect and observation	Assessment grade				Confidence	
	Very poor	Poor	Good	Very good	In grade	In trend
<p><b>State greenhouse gas emissions</b></p> <p>Per capita emissions and emissions per unit of gross state product have decreased.</p> <p>Per capita emissions are still one of the highest in the world.</p> <p>Atmospheric concentrations of greenhouse gases are increasing.</p> <p>State sources of greenhouse gases are increasing.</p>						
<p><b>Rainfall</b></p> <p>The reporting period includes the third and fifth wettest years on record.</p> <p>The long-term trend is for a decline in rainfall.</p>						
<p><b>Temperature</b></p> <p>The reporting period includes the warmest year on record.</p> <p>The long-term trend is for increases in average (air and sea surface) and extreme temperatures.</p>						
<p><b>Energy</b></p> <p>Energy production is still the dominant source of state emissions (74%).</p> <p>Renewable energy has increased as a proportion of total installed capacity and of the proportion supplied and used.</p>						
<p><b>Sea level</b></p> <p>The global trend is for a rise in sea level, with variances based on local geomorphology, wind direction/strength, etc.</p>						
<p><b>Oceans</b></p> <p>Sea temperature and acidity are increasing; salinity is changing.</p>						
<p><b>Marine and terrestrial biodiversity</b></p> <p>Trends in biodiversity are negative to variable, with changes in gene pools, species ranges, biological patterns and ecosystem dynamics.</p>						



Aspect and observation

Assessment grade

Confidence

Very poor    Poor    Good    Very good    In grade    In trend

**Human health, infrastructure, agriculture and forestry**

Reduced rainfall will affect water supplies and agriculture.

Climate variability has increased, leading to increased frequency and severity of some extreme weather events such as heatwaves.

The increased frequency of extreme events will impact police, emergency services, infrastructure maintenance, volunteers, etc.



Recent trend		Improving		Stable	Level of confidence		Evidence and consensus too low to make an assessment	
		Deteriorating		Unclear			Limited evidence or limited consensus	
							Adequate high-quality evidence and high level of consensus	
Grades		Very poor		Poor		Good		Very good



# Water

South Australia's water resources and trends in water quantity and quality are critical issues for the state's future, particularly given the changes in rainfall expected as climate change progresses.

Since the previous state of the environment report in 2008, total and per person water use decreased with water restrictions and more efficient use. Increase in rainfall together with increased flows in the River Murray made more water available, and groundwater levels increased. Of the state's 67 water management areas, 35 areas were managed within sustainable limits in 2012, 25 areas were partially within sustainable limits and 7 areas were not within sustainable limits (Government of South Australia 2012).

Agriculture remains the largest consumer of the state's water. The diversity of water sources has increased, including wastewater recycling, stormwater reuse and desalination. South Australia has the highest percentage of households with rainwater tanks in Australia (ABS 2010).

Long-term planning and knowledge of water resources have improved with the South Australian Government's Water for Good plan and establishment of the Goyder Institute for Water Research. A program for monitoring and assessing the ecological condition of rivers, lakes and coastal waters was put in place. This program found that the quality of aquatic ecosystems is variable, with 50% of the sites assessed between 2008 and 2011 rated as poor to very poor, only 9% as good or very good, and the remaining 41% as fair (EPA 2012).

Salinity levels in the main channel of the River Murray are stable and those in Lake Albert are lower than were recorded in the previous state of the environment report. Ephemeral water courses and wetlands in agricultural and pastoral areas responded well to above-average rainfall in 2010–11 (EPA 2012). Anecdotal information suggests a number of community supplies in arid regions are becoming increasingly saline, with decreasing levels in some bores.

## In summary

### Aspect and observation

### Assessment grade

### Confidence

Very poor    Poor    Good    Very good    In grade    In trend

#### Water use

Water use generally decreased during the drought, in part due to restrictions. It has subsequently been influenced by factors, including above-average rainfall, that have reduced demand for water.

Long-term planning and knowledge have improved (e.g Goyder Institute for Water Research).

A 2012 assessment of the state's 67 water management areas concluded that, although 35 are managed within sustainable limits, 7 are not managed within sustainable limits and 25 are partially managed within sustainable limits.



#### Water quality

Processes for monitoring and assessing the ecological condition of South Australia's rivers, lakes and coastal waters are in place.

The extent and condition of aquatic ecosystems are variable, with many being in fair to very poor condition and few being in good or very good condition.



#### Water supply

Short-term rainfall has increased.

Water supply diversification, including wastewater recycling and stormwater reuse, has increased.

South Australia has the highest percentage of households with rainwater tanks in Australia.



Recent trend	Improving	Stable	Level of confidence	Evidence and consensus too low to make an assessment
	Deteriorating	Unclear		Limited evidence or limited consensus
				Adequate high-quality evidence and high level of consensus

Grades	Very poor	Poor	Good	Very good
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Regional trends			Trend:	Improving	Decreasing
Condition:	Good	Poor		Stable	Unclear
	Fair	Unclear		Variable	
	Variable				

AMLR = Adelaide and Mount Lofty Ranges; AW = Alinytjara Wilurara ; EP = Eyre Peninsula ; KI = Kangaroo Island; NY = Northern and Yorke; SAAI = South Australian Arid Lands ; SAMDB = South Australian Murray–Darling Basin ; SE = South East

## Aspect and observation

## Assessment grade

## Confidence

Very poor   Poor   Good   Very good   In grade   In trend

### Surface water quantity and quality

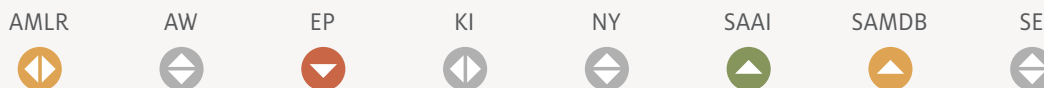
Salinity levels in the main channel of the River Murray are stable, and those in Lake Albert have decreased. Recent high inflows brought floodplain nutrients back into the river, and good flows and flood turbidity suppressed algal blooms. Management of localised sources of pollution improved water quality.

Many of the ephemeral watercourses and wetlands in agricultural and pastoral areas have responded to above-average rainfall in 2010–11.

Main pressures are unsustainable harvesting and extraction in some parts of the state; dryland salinity, loss of riparian vegetation, intensive agriculture practices, and/or soil and streambank erosion in some parts of the state; climate variability and climate change; and changes in land use.



### Regional trends:



### Groundwater quantity and quality

The number of water resource management areas subject to formal management arrangements is increasing.

Groundwater levels that declined during the drought are generally beginning to recover as a result of recent increased rainfall.

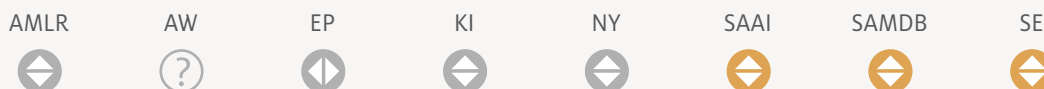
Groundwater-use levels and quality (including contamination in some areas) remain an issue.

There are significant knowledge gaps in relation to trends in groundwater extent and condition in nonprescribed areas.

Main pressures are unsustainable levels of use in some areas, changes in land use and climate variability.



### Regional trends:



AMLR = Adelaide and Mount Lofty Ranges; AW = Alinytjara Wilurara; EP = Eyre Peninsula; KI = Kangaroo Island; NY = Northern and Yorke; SAAI = South Australian Arid Lands; SAMDB = South Australian Murray–Darling Basin; SE = South East

### Aspect and observation

### Assessment grade

### Confidence

Very poor   Poor   Good   Very good   In grade   In trend

#### Water for consumption

Recent high flows in the River Murray and above-average rainfall improved the availability of water for consumptive use across most of the state.

Salinity levels in the main channel of the River Murray are stable, and those in Lake Albert have decreased. In pastoral areas, significant flooding in 2010–11 has recharged aquifers after the drought.

Initiatives through South Australia’s Water for Good strategy are diversifying water sources for consumptive use (including desalination, stormwater and wastewater reuse), and improving the allocation and efficiency of water use.

Consumption generally decreased during the drought. It has been mitigated by increased rainfall, and initiatives to reduce demand and increase the use of alternative water sources, including recycled stormwater and wastewater.

Anecdotal information suggests that a number of community supplies in the arid regions are becoming increasingly saline, with decreasing water levels in some bores.

Main pressures are unsustainable level of use in some areas; and sedimentation, eutrophication and pollution of water sources.



#### Regional trends:

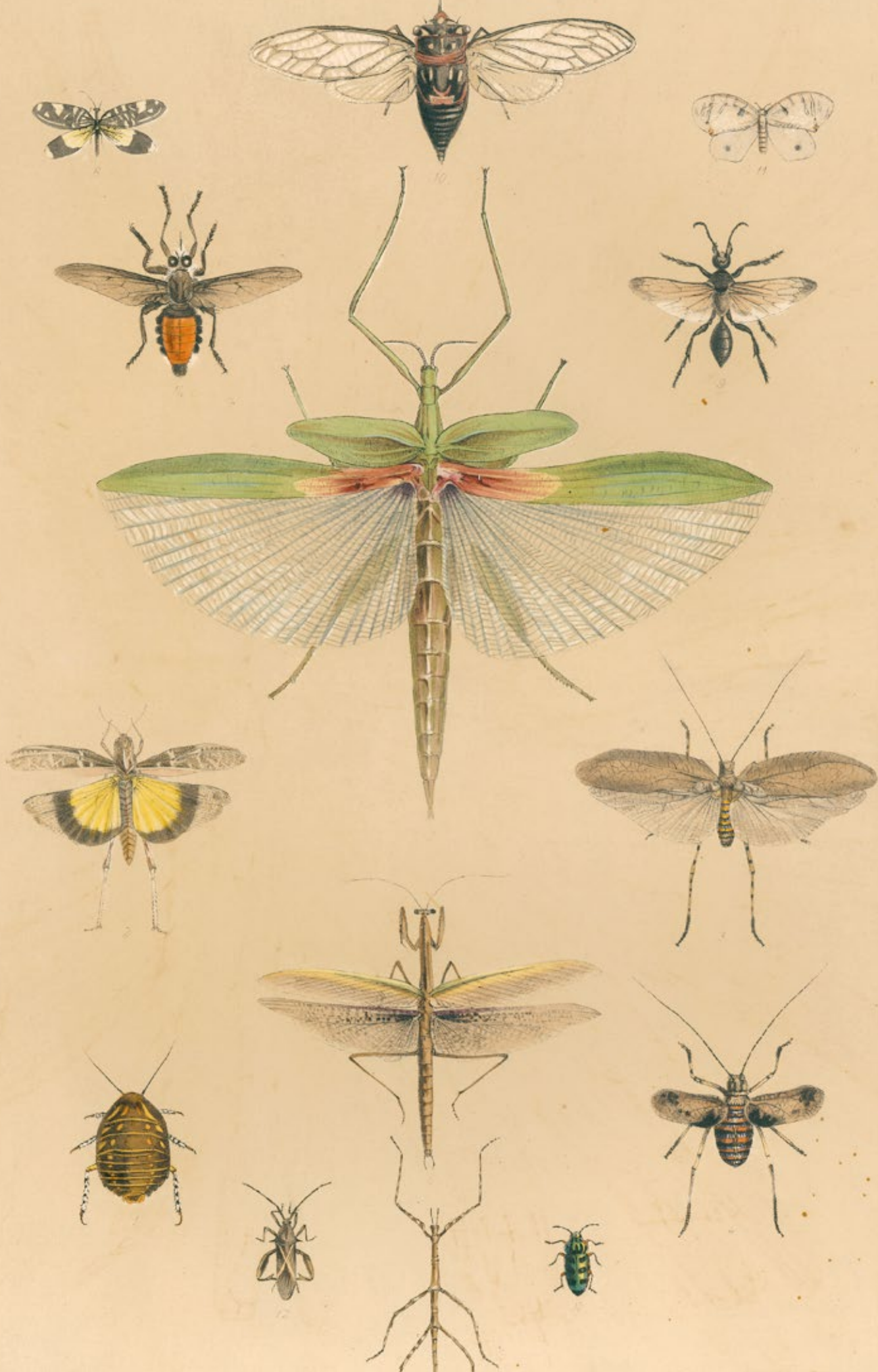


Source: Government of South Australia (2012a)

AMLR = Adelaide and Mount Lofty Ranges; AW = Alinytjara Wilurara ; EP = Eyre Peninsula ; KI = Kangaroo Island; NY = Northern and Yorke; SAAI = South Australian Arid Lands ; SAMDB = South Australian Murray–Darling Basin ; SE = South East



The Ubrae Wetlands  
The Barbara Hardy Institute







# Biodiversity

South Australia has many important and endemic species. Biodiversity is critical to human life, helping to regulate air and water quality, control erosion and pests, pollinate plants, and contribute resources for food, fibre, fuel and medicines.

The state's biodiversity has been greatly altered and affected by historic human activities, including large-scale clearance of vegetation for settlement and farming. Remaining native vegetation is in fair to moderate condition but declining. Less revegetation was undertaken during this reporting period than the previous one and illegal clearing increased. The area of land under some form of formal protection increased about 10%. Soil erosion decreased through improved farming techniques (no-till sowing) and soil condition remained stable except for some increase in soil acidification. Dryland salinity and depth to groundwater is variable, with most trends positive and some negative (DEWNR 2012).

The trend in status of 20 indicator species is variable to positive (SASP Audit Committee 2012) and there has been an increase in the number of recovery plans and actions. However, the status of threatened species and ecological communities remains poor and is declining, with the number of threatened species and ecological communities increasing (EPBC Act 2012). Good progress has been made with trials by the Wentworth Group of Concerned Scientists to develop regionally based environmental accounts in 56 regions across Australia, including one on the Eyre Peninsula in South Australia. The trials include standards for more consistent long-

term measurement of changes in the condition of environmental assets (Wentworth 2008).

There has been an increase in the number, distribution and abundance of most pest plants, animals and diseases, with nine confirmed detections of new weeds and pest animals since 2008 (Biosecurity SA 2013).

The changing climate is impacting biodiversity by affecting gene pools, species ranges, biological patterns and ecosystem dynamics, such as increased acidity and temperature of the ocean and changes in major currents (Hughes et al. 2010). Climate change is likely to magnify the effects of existing pressures on biodiversity—for example, the influence of climate change on newly arrived pests and diseases has the potential to create greater and more widespread problems.

## In summary

### Aspect and observation

### Assessment grade

### Confidence

Very poor   Poor   Good   Very good   In grade   In trend

#### Native vegetation

Native vegetation extent and condition is fair to moderate and declining.

There has been an increase of about 10% in the area under some form of protected status since 2008.

There has been an increase in illegal clearing.

There has been a decrease in the area of revegetation since 2008.



#### Threatened species and ecological communities

There has been an increase in recovery plans and actions.

There is a variable to positive trend in the status of 20 indicator species.

The status of threatened species and ecological communities is poor and declining.

There has been a net increase in the number of endangered and vulnerable species and ecological communities since 2008.

Climate change has altered fire regimes.



#### Soil and land management

There has been a steady increase in cropping land protected from erosion.

Soil condition in production areas is fair to moderate and stable.

There has been an increase in crop area using no-till sowing methods.

There has been an increase in the area and rate of soil acidification.

There is a variable trend in dryland salinity and depth to groundwater, with most measures declining or stable (positive), and some rising (negative).



## Aspect and observation

## Assessment grade

## Confidence

Very poor    Poor    Good    Very good    In grade    In trend

### Introduced species

There has been an increase in number, distribution and abundance of most pest plants, animals and diseases. Only a few have decreased.



For key established pests and diseases:

- rabbits, feral goats, European fanworm, oriental weatherloach, silverleaf nightshade, *Phytophthora cinnamomi* and sarcoptic mange of wombats have increased in distribution and abundance
- feral deer, European carp, bridal creeper and opuntoid cacti are steady in distribution and abundance
- feral camels, *Caulerpa taxifolia* and gorse are decreasing in distribution and abundance
- chytridiomycosis is unknown in distribution and abundance.

For new pests and diseases:

- the numbers of weeds, marine pests, aquatic pests and native plant diseases are increasing
- the number of terrestrial vertebrate pests is steady
- the number of wildlife diseases is unknown.

There have been six confirmed detections of new vertebrate pest incursions since 2008.

Recent trend		Improving		Stable	Level of confidence		Evidence and consensus too low to make an assessment
		Deteriorating		Unclear			Limited evidence or limited consensus
							Adequate high-quality evidence and high level of consensus

Grades		Very poor		Poor		Good		Very good
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# Coastal and marine environment

The coast, estuaries and adjacent marine waters are a unique part of the South Australian environment. Over 90% of South Australians live within 50 kilometres of the coast (ABS 2002), and many commercial, industrial and recreational activities rely on coastal and marine resources.

The coast and adjacent marine waters are subject to a diverse range of pressures including pollution from wastewater and stormwater, physical development (residential, marinas, ports), commercial and recreational fishing, shipping and aquaculture. The good news is that the quality and reuse of treated wastewater is increasing as is the capture and reuse of stormwater (SA Water 2013). Better regulation and management practices have seen a decrease in impacts arising from aquaculture from nutrients, disturbance and waste, even though the area occupied by aquaculture is increasing.

There is a strong correlation between human disturbance and the ecological health of the coastal zone. An assessment of the six coastal regions found the extent and condition of coastal ecosystems (including foreshore, rocky reefs, seagrass, saltmarsh and mangroves) is highly variable and declining.

As with terrestrial species and ecosystems, climate change is starting to have major impacts on coastal and marine species and ecosystems. This includes an increase in ocean temperature and acidity, changes in ocean salinity and currents, rising sea levels, saline incursion through permeable coastal geologies and the introduction of new pests.

## In summary

Aspect and observation	Assessment grade				Confidence	
	Very poor	Poor	Good	Very good	In grade	In trend
<p><b>Extent and condition of coastal and marine ecosystems</b></p> <p>The extent and condition of coastal ecosystems (including foreshore, rocky reefs, seagrass, saltmarsh and mangroves) are declining.</p>						
<p><b>Disturbance and pollution</b></p> <p>The quality and use of treated wastewater are increasing.</p> <p>The capture and reuse of stormwater are increasing.</p> <p>The area occupied by aquaculture is increasing.</p> <p>Human population in the coastal zone is increasing.</p> <p>The quality of coastal and marine waters is improving.</p>						
<p><b>Threatened species and ecosystems</b></p> <p>Marine protected areas have increased in size and number.</p> <p>New fishery recovery strategies have been implemented.</p> <p>There has been an increase in some species (e.g. New Zealand fur seal and southern right whale).</p> <p>Ocean salinity and currents are changing.</p> <p>Ocean acidity is increasing.</p> <p>Sea level is rising.</p> <p>Coastal and marine ecosystem extent, condition and diversity are variable and declining.</p> <p>There is a decline in some species (e.g. giant cuttlefish and little penguin).</p>						
<p><b>Pest plants and animals</b></p> <p>Port handling and shipping traffic has increased, which increases the risk of pest species incursions.</p>						

Recent trend	Improving	Stable	Level of confidence	Evidence and consensus too low to make an assessment
	Deteriorating	Unclear		Limited evidence or limited consensus
Grades	Very poor	Poor	Good	Very good
				Adequate high-quality evidence and high level of consensus

# Conclusion

## Response

Many individuals, groups and organisations make important contributions to protecting and managing our natural environment. This report focuses on the environmental policies, programs and projects of public agencies in particular, which are discussed in more detail under the section ‘What we are doing about it?’ in each of the theme chapters.

As noted above, some significant drivers of environmental change operate at a global or continental scale and require national and international coordination and cooperation to address. There are more than 250 agreements to support Australia’s participation in international cooperation on the environment.

Within Australia there are a number of mechanisms for national coordination and cooperation such as the 1992 Intergovernmental Agreement on the Environment, and more recent initiatives such as the National Centre for Cooperation on Environment and Development, the National Plan for Environmental Information, the National Waste Policy and the Murray–Darling Basin Plan.

There are also measures being taken at state, regional and local levels to protect, restore and enhance the environment. These include examples of all five forms of activity (statutory instruments, education and information, land-use planning system, economic instruments, and advice to government and others) recently identified as important for environmental

management (Gemmell and Scott 2013). Some of the most significant policy initiatives during the reporting period include the development and establishment of:

- 2009
  - marine parks
- 2010
  - Water for Good Plan
  - The 30-Year Plan for Greater Adelaide
  - Goyder Institute for Water Research
  - National Waste Policy
  - Environment Protection (Waste to Resources) Policy
- 2011
  - Renewable Energy Plan for South Australia
  - Adelaide Coastal Water Quality Improvement Plan
  - Carbon Farming Initiative
- 2012
  - Climate Change Adaptation Framework for South Australia
  - State Natural Resources Management Plan
  - Water Industry Act.

## Outlook for the environment

The outlook for the South Australian environment is mixed, and is strongly linked to global climate change, ongoing and future patterns of economic activity, and the effectiveness of the range of measures taken by governments, business, industry, the community and individuals to protect and improve the natural environment. Some changes such as climate change and the strain on freshwater supplies are essentially unavoidable, as is the likelihood of further irreversible loss of biodiversity. This highlights the need to improve adaptation and resilience, and to decouple economic activity from environmental impacts.

There are both negative and positive challenges and changes that need to be taken into account in managing the South Australian environment into the future, including:

- increase in population
- continued economic growth, including increase in mining
- changes in land use

- long-term shift from primary and secondary industries towards service industries
- long-term depletion of reserves of fossil fuels and minerals
- new technology and products, including nanotechnology and new chemicals
- transition to new sources of energy, including unconventional gas extraction, non-domestic solar, geothermal and wind
- climate change impacts.

## Outlook for environmental reporting

The most significant challenge for reporting on the state of the environment remains inadequate access to relevant, up-to-date information. A number of recent initiatives promise to improve this, including:

- the NRM state and condition reporting framework developed under the State Natural Resources Management Plan



Painted Dragon  
Angus Kennedy



- a system of environmental–economic accounts and regional environmental accounting model trials by the Wentworth Group of Concerned Scientists
- the National Plan for Environmental Information
- national sustainability indicators
- the Economics of Ecosystems and Biodiversity study
- United Nations Environment Programme Working Group on decoupling natural resource use and environmental impacts from economic growth
- ecosystem services analysis and the analytical backdrop such as the Seventh European Union Environment Action Programme to 2020, resulting in global progress in policy and data deployment
- the fifth report of the Intergovernmental Panel on Climate Change, expected in 2014.

More effective monitoring and evaluation of the state and condition of South Australia’s natural resources are still needed, including the collection of data that allow meaningful analysis of trends in environmental quality over time and the targeting of suitable and resourced interventions. Ideally, this data collection should be consistent, aligned nationally and internationally, and make better use of the multitude of data from individuals, community groups, research organisations and published research. Clearly, over the next five years we can expect crowd-sourcing, citizen science and other trends in open data and public engagement to become even more prominent and significant, as will the need for more and better visualisation of information.

As part of its own commitment to continued improvement of the value and effectiveness of state of the environment reporting, the Board of the Environment Protection Authority have adopted a plan that includes:

- a new reporting model based on a combination of thematic and regional assessments, including significant global trends
- a set of long-term reporting indicators that reflect best practice, adopt environmental accounting standards and concepts, and optimise alignment with other environmental reporting, to be developed in consultation with key stakeholders
- implementation of a system and ongoing program for collecting and maintaining the data required for reporting on the indicators selected, including mechanisms and processes for community participation
- formal agreements with government agencies that have roles related to the reporting topics, for the collection and provision of specified data at specified

intervals to support reporting against the selected indicators

- priority research into key issues to inform state of the environment reporting
- more effective communication of environmental information.

Over the next reporting period, there will ideally be a full integration of the multiple environmental reporting processes, preferably within a whole-of-government environmental information strategy and plan. Additionally, effective sharing and presentation of data needs to be developed to implement web-based, accessible—and more useful and used—state of the environment reporting.

## Conclusion

The 2013 South Australia state of the environment report shows that some progress has been made since the 2008 report to better protect the state’s natural environment. However, the natural resources of the state are declining and environmental quality is variable. This supports the findings reflected in other research and reports.

There are significant challenges in maintaining and protecting our environment. Resolving these will rely on more responsible economic development, more effective implementation of existing environmental measures, and new and innovative solutions to some of the more intractable problems, such as those related to decoupling economic growth from environmental impacts.

The South Australian environment is in a moderate and finely balanced state, and there is much work to do to be able to report even a steady condition in five years’ time. An important aspect of this work is to improve environmental information and knowledge. Good-quality, relevant, up-to-date and accessible information is key to understand the drivers of environmental change and to inform the coordinated response needed to manage the many and diverse impacts on our environmental resources. To deliver the required information as efficiently and effectively as possible, the Environment Protection Authority recommends the development of an environmental information strategy and plan for South Australia. This would identify key environmental information needs; prioritise, coordinate and integrate the collection of environmental data; and improve access and communication of available environmental information.

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