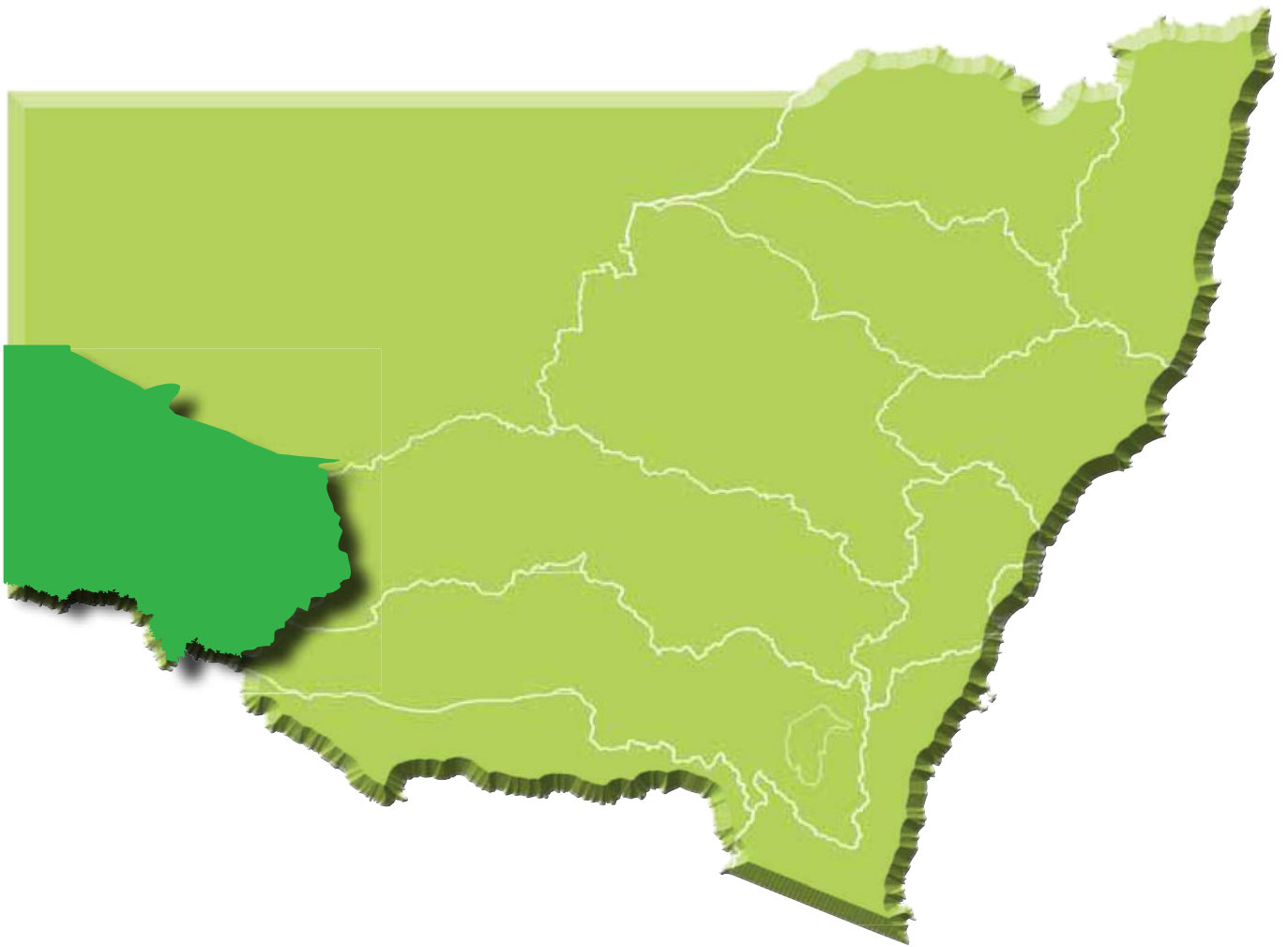


# Overview

## *Lower Murray Darling region*



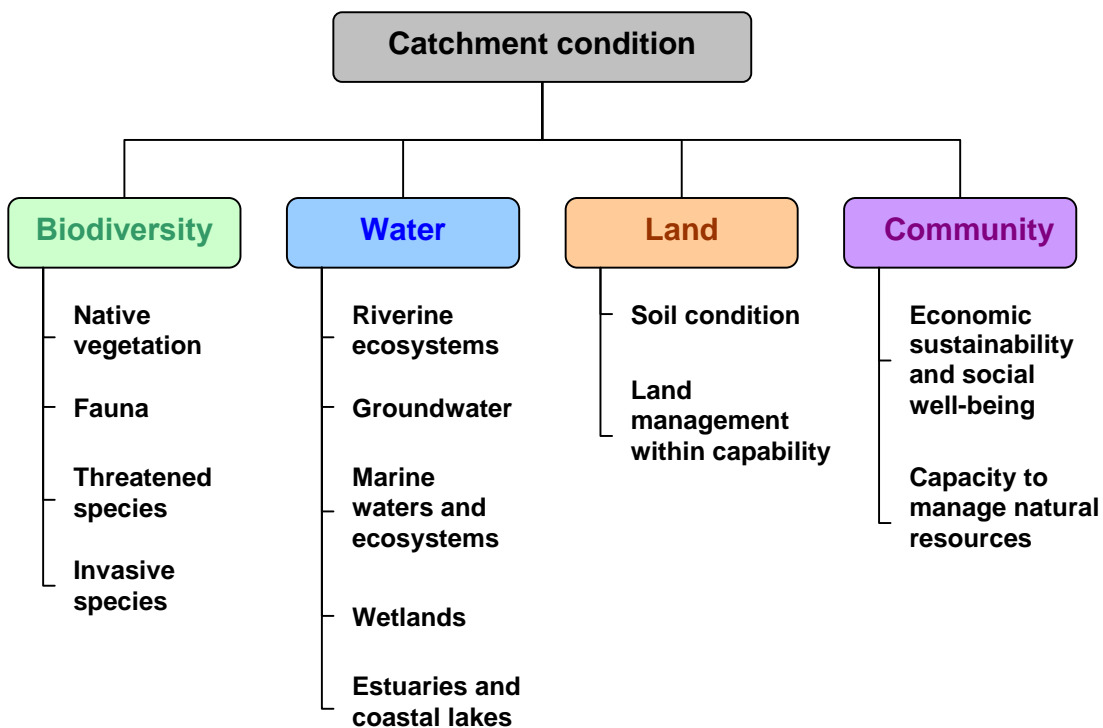
## Background

Under the New South Wales Natural Resources monitoring, evaluation and reporting (MER) strategy (DNR 2006), a regionally based state of the catchments (SOC) report has been prepared. This report aims to provide the broad community and State and local Government with information on natural resource condition and trends within a consistent reporting framework.

Reporting is based on 13 natural resource themes, in accord with the NSW state-wide natural resource management (NRM) targets (NRC 2005), which can be broadly grouped as shown in Figure 1. The targets fall under the Green State priorities and targets in the NSW State Plan 2010.

The MER strategy specifies that SOC reports will:

- provide a preliminary assessment of the condition of natural resources in the catchments of each region
- inform natural resource managers' policy and investment decisions within and between regions
- assess progress towards natural resource condition targets.



**Figure 1 Resource themes categorised by state-wide targets**

Detailed technical reports describe the methods used to derive the information contained in this overview report. At the time of publication of the *State of the catchments (SOC) 2010* reports, the technical reports were being prepared for public release. When complete, they will be available on the DECCW website: [www.environment.nsw.gov.au/publications/reporting.htm](http://www.environment.nsw.gov.au/publications/reporting.htm).

Note: All data on natural resource condition, pressures and management activity included in the SOC reports, as well as the technical reports, was collected up to January 2009.

As there is limited historical data available for trend analysis, this SOC report represents the first baseline of catchment condition across the Lower Murray Darling region. Ongoing data collection will allow assessment of trends in condition for future SOC reporting. The extensive data and information underlying the report will assist to inform policy, planning and investment decisions by natural resource managers.

Each SOC report is based on the geographic extent of the region in NSW managed by each of 13 catchment management authorities (CMAs). While the SOC reports use indicators of condition relevant to state-wide targets, it is recognised that CMAs will have translated these into more specific, locally relevant ‘catchment’ targets. To the extent that the state-wide and catchment targets and indicators align, these reports will aid the reporting by CMAs of progress of CMAs towards catchment targets.

The reports have been prepared by the NSW Government natural resource agencies – the Department of Environment, Climate Change and Water (DECCW), NSW Office of Water (NOW) and Industry & Investment NSW (I&I), in collaboration with CMAs and the NSW Natural Resources Commission (NRC). Report preparation is anticipated to occur on a three-year cycle to coincide with, and provide input to, the NSW state of the environment report.

## Reporting structure

The SOC reporting structure consists of a hierarchy of four information products: catchment overview report (this document), individual theme reports, supporting technical reports and data links. Interested parties can choose to enter any level of the hierarchy and access the information product best suited to their needs and interest. The catchment overview report and the 13 individual theme reports (11 for inland regions) together form the SOC report for a region.

This overview report summarises the condition of the region for each theme, the pressures influencing the condition and the management responses. It is drawn from the condition, pressure and management activity information contained in each theme report.

The *assessment* section (containing *condition* and *pressures*) of each theme report includes the following common elements:

- a statement of the state-wide target
- a brief description of what each indicator means
- a condition rating using a dark green, light green, yellow, orange and red colour scale, representing (respectively) ‘very good’, ‘good’, ‘fair’, ‘poor’ or ‘very poor’ condition. Some themes used different colour ratings to reflect existing published reporting methods (eg the riverine theme uses Sustainable Rivers Audit ratings). Where possible, an indicator condition rating for each spatial reporting unit is given, for example, for each wetland, estuary, soil monitoring unit (SMU) or groundwater system
- a pressure rating using the same green/red colour scale but representing ‘very low’, ‘low’, ‘moderate’, ‘high’ or ‘very high’ pressure – again by spatial reporting unit
- an indication of trend in condition, using arrows for ‘improving’, ‘no change’ or ‘declining’ trend
- an indication of trend in pressure using arrows for ‘decreasing’, ‘no change’ or ‘increasing’ trend
- a data confidence rating for condition and pressure indicators of high, medium or low
- aggregated regional condition, pressure, trend and data confidence ratings, where practical

- a comparison of the condition and pressure in each region with NSW as a whole, by indicator, where available
- maps showing spatial reporting units and ratings, where appropriate.

For some themes, indicators have been aggregated to give an overall index rating by spatial reporting unit and region, of either condition or pressure, for that theme. However, further analysis is required to test the sensitivity of the aggregated indices to differing degrees of catchment (or waterway) disturbance from human activity.

Not all of the elements listed above could be adequately assessed with the data available. Table 1 indicates where some of these data gaps occur.

## Rating scores for indicators and indices

A scoring system for rating the value of a condition indicator or index has been developed for each of the 13 reporting themes. Scores have been based on a five-category system where one is regarded as 'very poor' and five as 'very good'. A 'very good' score generally relates to a resource in near pristine or 'reference' condition, whereas 'very poor' indicates the resource is highly degraded and is unlikely to ever return to reference condition.

Scoring the intervals between the very good and very poor categories represents a particular challenge. Moving down a category should correspond with a measurable biological or ecological threshold in system condition. However, sufficient data and scientific understanding is often not available, thus the adoption of simpler methods of categorisation is required. Methods may include dividing the range of indicator values into five equal groups based on values, other statistical techniques and expert opinion. Each of these methods has been used in the SOC reports, depending on the data.

Similar scoring techniques have been used for assessing pressure indicators and for scoring indicators and indices on a state-wide scale.

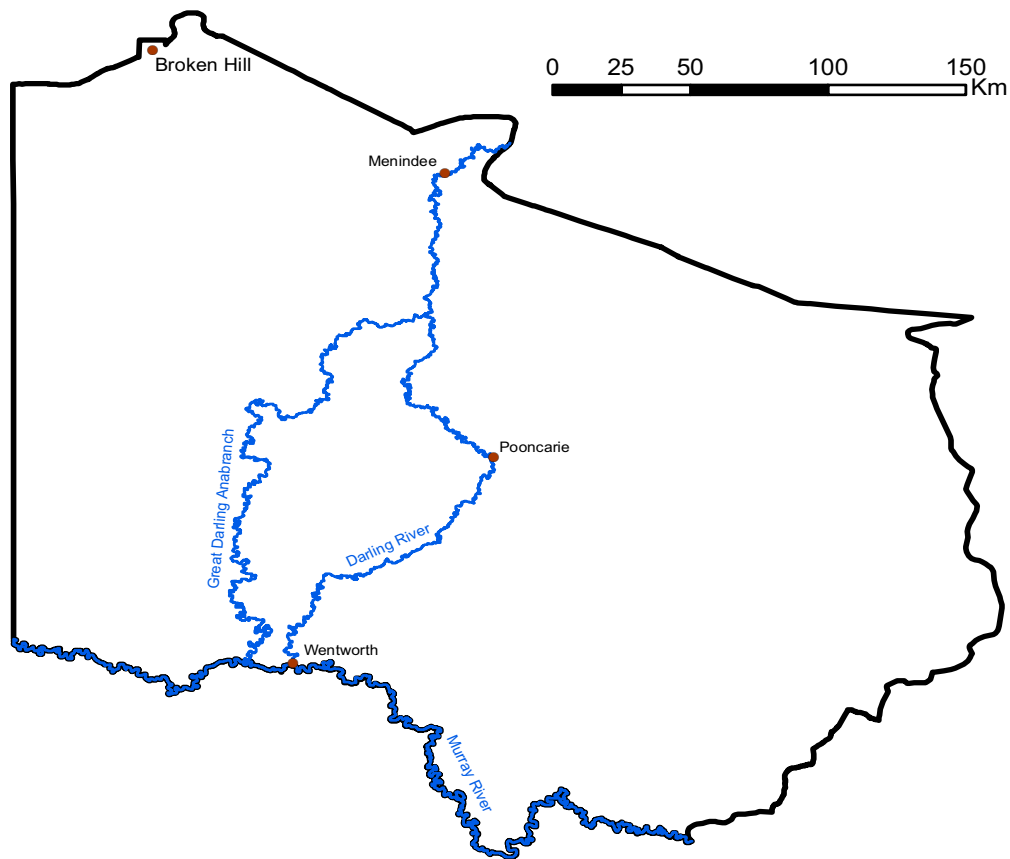
## The Lower Murray Darling region

The Lower Murray Darling region covers an area of approximately 6.3 million hectares, of which approximately five per cent has been cleared for cropping or horticultural purposes.

Remaining native vegetation has been subject to varying degrees of modification (through land-use impacts such as total grazing pressure, fire regimes and management for conservation). The region extends from Broken Hill in the north to the Murray River in the south, and from the Murray/Murrumbidgee junction to the South Australian border in the west.

It is dominated by a semi-arid climate with highly variable winter dominant rainfall. The population of the Lower Murray Darling is estimated at 29,000. The region incorporates the entire local government areas of Wentworth and Broken Hill City, and the majority of the Balranald Shire Council area. The region includes the tribal country of the Barkindji, Mutthi Mutthi and Ngyiampaa peoples and is rich in cultural heritage, including the Willandra Lakes World Heritage Area, Lake Victoria and Menindee Lakes.

Land-use includes irrigated and dryland cropping, horticulture, wool and meat production, water storage (Menindee Lakes and Lake Victoria), mining, tourism, recreational fishing, forestry and nature conservation.



**Lower Murray Darling region**

The Lower Murray Darling CMA is responsible for involving communities in the management of natural resource issues facing the region through partnerships and collaborations. The CMA is also the primary means for delivering outcomes of natural resource funding provided by the NSW and Australian governments.

### Catchment condition for 2008

Table 1 summarises the theme-based ratings for the Lower Murray Darling region. The condition ratings can be compared with those for NSW overall, where the latter rating is available. Ratings for condition and confidence, along with pressure ratings are also shown where data was available. (Note: the table should be read in conjunction with the theme reports which contain more contextual information including, where available, confidence ratings for pressures and the pressure ratings for NSW overall).

**Table 1 Lower Murray Darling region SOC ratings**

State-wide target	Region condition	Data confidence	NSW condition	Region pressure
Native vegetation	Good	M	Good	Low
Fauna	Poor	L	Good	Low
Threatened species	Poor	L	Good	Low
Invasive species (impact)*	Fair	M	Good	Low
Riverine ecosystems	Good		Good	Low
Groundwater	Good		Good	Low
Wetlands	Fair	L	Good	Fair
Soil condition	Good	L	Good	See LMwC
Land management within capability (LMwC)	Fair	L	Fair	Low
Economic sustainability and social well-being	Good		Good	Low
Capacity to manage natural resources	Fair	L-M	Good	Low

Condition	Rating	Confidence	Pressure	Rating
Very good	Very good	H – High	Very low	Very good
Good	Good	M – Medium	Low	Good
Fair	Fair	L – Low	Moderate	Fair
Poor	Poor		High	Poor
Very poor	Very poor		Very high	Very poor
Not rated			Not rated	

\* Invasive species' impact is a pressure on natural resource condition and is rated on a green/red scale of very low, low, moderate, high and very high.

## Biodiversity

- **Native vegetation** – the overall status of native vegetation (extent and condition) was rated good. Intact native vegetation covers more than 90 per cent of the region. Vegetation condition rated only fair, as most vegetation communities show some degree of modification. The pressures on native vegetation in the region are generally low.
- **Fauna** – the overall sustainability (based on a small number of species that are actively monitored) is rated poor. Within Lower Murray Darling region, 19 of 452 species of terrestrial vertebrates recorded since European settlement have become extinct. A further 10 species (17 per cent) of mammals, 53 species (18 per cent) of birds, three species (23 per cent) of amphibians and 13 species (15 per cent) of reptiles are estimated to have lost at least half of their pre-European distribution under a variety of pressures.
- **Threatened species** – recovery of threatened species in the region rated very poor (based on data available for only three of the 110 threatened species, excluding extinct, within the region). Nineteen fauna species and seven plant species are presumed extinct; two fauna species are

critically endangered; 23 fauna species and 21 flora species are endangered. There are seven endangered ecological communities.

- **Invasive species** – the impact of invasive species in the region is rated moderate. The relative impact of individual invasive species has not been assessed. The percentage of alien fish (averaged over all sites) is around 14 per cent. Emerging invasive species comprise six weed species, one pest animal species and three freshwater pest species.

## Water

- **Riverine ecosystems** – an overall rating for riverine ecosystem condition was not determined. The percentage of samples that exceeded total phosphorus guidelines was very high at the Darling River sites in the upper region and low to moderate in the Murray and Lower Darling sites. The percentage of samples that exceeded turbidity guidelines was moderate at the Darling River sites in the upper region and low in the Murray and Lower Darling sites. The available data record was only sufficient for trend analysis at two sites. All the results showed stable trends, with the exception of a rising electrical conductivity trend in the upper Darling River site. Overall macroinvertebrate, fish and hydrologic condition were rated poor. There is a significant diversion of water in the Lower zone in the Darling River.
- **Groundwater** – the condition of groundwater dependent ecosystems (GDEs) is not monitored directly as they have yet to be fully identified and mapped. The ability of groundwater systems to support GDEs has therefore been determined by assessing the condition of groundwater management areas (GWMAs) against seven indicators. Overall condition has not been rated; however, individual GWMAs are generally in good condition. There is minimal use of groundwater in the Lower Murray Darling CMA, due to the high groundwater salinity. There is a fair to poor ranking for GDE water requirements and land-use impacts. This is due to the regulation of the river system, reducing flood frequency and increasing floodplain salinity, and land-use in the region that is likely to increase groundwater levels. The main pressures are associated with land-use change, such as river regulation, irrigation and vegetation clearing.
- **Wetlands** – overall, wetlands in the Lower Murray Darling region are in poor condition. The confidence in the assessment is low due to the limited data available. The greatest pressure on wetlands in this region is from catchment and hydrological disturbance caused by river regulation, impoundments without fish passage, vegetation clearing/modification in the catchment and point sources.

## Land

- **Soil condition** – the overall soil condition in the 10 SMUs across the Lower Murray Darling region, which cover about 64% of the region, was rated good. Individual SMUs were rated as being in either fair or good condition but with large variation between monitoring sites within SMUs. The lowest scoring indicators within individual SMUs were rated poor and included wind erosion and organic carbon.

Expected trend for SMUs, based on the degree to which land management is within capability, is steady. The expected trend across all indicators is stable except for soil structure which is predicted to improve.

Pressures on soil condition depend on land-use and management practices and are reported in 'land management within capability'.



- **Land management within capability** – the overall rating for land management within capability was fair. The ratings for individual SMUs ranged from fair to good but, as for soil condition, with large variation between sites. Land in the region was managed beyond its capability in at least one SMU for each of the hazards except sheet erosion, structure decline and salinity/waterlogging. The degree of land management within capability is tending to be stable for most indicators except wind erosion and structure decline, which are improving.

## Community

- **Economic sustainability and social well-being (ESSW)** – overall condition was not assessed; individual indicators to assess the likely benefit of NRM on maintaining ESSW rated between good and poor. The impact on business and skills was considered positive, while the impact on employment was rated poor. Skills, networking and participation in NRM were rated fair. Trends were either static or improving. Community concerns include low water allocations, low commodity prices, opportunities for Aboriginal communities, declining population and maintenance of infrastructure. Key pressures include population change, market forces and drought/climate change. The region as a whole is experiencing population decline. The decline in agricultural employment in the region over the last decade is more than twice the NSW and national averages.
- **Capacity to manage natural resources** – overall adaptive capacity of land managers in the region was rated poor. Across the Lower Murray Darling region the five capitals (*human, financial, physical, natural and social*) vary substantially. *Human capital* is highest, reflecting high levels of operator and spouse education and self-assessed health. *Physical* and *social* capitals are rated higher than *financial* and *natural* capitals, though all of these are at low levels.

## Key pressures

Effective catchment management relies on monitoring not just the status or condition of the resource, but also the underlying causal factors or pressures (occasionally natural forces but largely human activities) that have the potential to degrade the resource. The monitoring programs for a number of themes involve sampling at locations in catchments that are relatively undisturbed and reference condition, as well as in moderately to highly disturbed systems. By doing this, the sampling is designed to test the effect of different disturbances or pressures on condition, so that effective management responses can be selected.

Examples of high-level pressures on the environment that the reports have identified as applying to the Lower Murray Darling region include:

- mining impacts
- ongoing land-use and land management
- deforestation/removal of riparian vegetation
- invasive species
- water extraction
- water salinity
- barriers to fish passage
- climate change
- social and economic pressures.



The links between high-level pressures and condition are often complex; the high-level pressures ultimately translate into direct system stresses (stressors such as high nutrient levels), which consequently manifest as symptoms of degradation. Land-use and land management are common pressures across nearly all themes. There are also links between themes, where a condition indicator for one theme can be a pressure on an indicator in another theme.

## Data sources

In general, only baseline information is available for this report. Data gathered during 2007–08 by NSW agencies has been the primary source of information, supplemented with existing data where available and of suitable quality. This also applies to the management activities included in each theme report. Data collected subsequent to 2007–08 will be included in future reporting and is available from the respective custodians.

Assessments made about the trends in resource condition refer to different time scales in the various natural resource themes. In many cases no trend information could be obtained because long-term datasets are not available. Assessments of current condition have been made against a defined reference. In many cases this reference condition is defined as ‘pre-European’ but in some themes a shorter-term reference has been used and that is indicated in each of the themes.

There is an ongoing need to improve the data collection and analysis systems that are necessary to support the compilation and reporting process. Information about pressures and trends is also lacking across a significant number of themes for various reasons including lack of existing quantitative data and the time-consuming nature of data collection, quality assurance and analysis. As the intention of the MER strategy is to trial indicators for long-term monitoring, the agencies are in the process of confirming indicator selection. The process of developing the pilot SOC reports is providing agencies and CMAs with information on which to base that selection.

While the primary data source has been NSW agencies, searches were conducted for data from other potential custodians including CMAs, local councils, water authorities and universities. After checking sampling methods and quality assurance procedures, some of this data has been used to complement the state-wide data.

CMAs are required to monitor the effectiveness of management actions implemented under catchment action plans (CAPS). However, methods for incorporating this performance data, without biasing the representative nature of condition reporting at regional and state-wide scales, remain to be developed. Some limited case study data has been incorporated in the pressure or management activity sections of the theme reports to demonstrate the effectiveness of a specific management action at a local scale.

## Data limitations

The state-wide monitoring programs have been designed to report at state and regional scales. Because of the extent and complexity of natural resource assets in NSW and the variability between them, monitoring programs by necessity often sample at a number of discrete points. If sufficient points are sampled at appropriate locations and frequency, assessments can be confidently made of condition and trend. However not all natural resource systems will be sampled for SOC reporting and there will be a need to develop models with the capacity to predict condition in those systems for which funding is not available. These models can then assist CMAs, state agencies, local councils and other natural resource managers to conduct risk assessments and assign priorities for investment accordingly.

Data gaps affect the ability to score some indicators and an index may score higher or lower depending on which component indicator data is available. If insufficient indicator data is available to rate the index, the index has been left unscored. There are opportunities for standard monitoring designs and sampling protocols to be developed for a number of indicators. Data collected by natural resource managers wishing to understand the condition of a particular system can then be of an appropriate standard and can complement the state-wide monitoring program.

Gaps in data coverage are evident in this report and these will need to be addressed through a forward development program of new data collection. As with all monitoring, the cost of resourcing data collection will need to be balanced against the inferential strength required from the program.

## Management responses

Determining priorities for action often involves a risk assessment where tradeoffs are made between the condition of a natural resource, the severity of the pressure being exerted by human activity, the inherent capacity of the resource to sustain that pressure without adverse effect, the values ascribed to the resource by the community and the benefits and costs of action. Responses can be designed to target either the socio-economic drivers of landholder and manager decision-making, the human activity causing the pressure, a reduction in environmental stressors affecting the condition or else the degraded condition of the resource itself.

State and local government, CMAs, industry and the community respond to the pressures and threats posed to environmental health at a range of levels, from state-wide regulatory action to conserve natural resources, policy and strategy initiatives, public opinion and consumer preference campaigns, research and environmental information programs, land-use planning and economic instruments, through regional planning and investment, to local planning, education, capacity building, best management practice and on-ground protection and rehabilitation works.

The State Plan NRM targets are being addressed through state, regional and local partnerships. The CAPs and the published investment strategies that support them are the key documents that coordinate and drive the effort to improve natural resources across NSW. The CAPs describe the whole-of-Government approach to address each of the state-wide targets at the regional scale. The Lower Murray Darling CAP can be found at:  
[www.lmd.cma.nsw.gov.au/catchment\\_plan/targets.shtml](http://www.lmd.cma.nsw.gov.au/catchment_plan/targets.shtml).

Management responses of the Lower Murray Darling CMA for the Lower Murray Darling region are captured in 20 management targets comprising:

- land (11 targets)
- rivers (six targets)
- biodiversity (three targets).

Implementation costs are included in the CMA investment strategy.

NSW Government agencies' theme specific management actions to support the achievement of the state-wide and CAP targets, along with specific regional actions by the CMA and various local activities, are described in the 'management activity' section of the relevant SOC report. The actions listed will be amended and refined as part of the adaptive management process.

## Statutory planning

Statutory planning often addresses multiple aspects of natural resource condition and environmental pressures, on a range of scales. The planning process creates a strategic framework to identify, assess and prioritise land-uses and to assist in strategic investment for the revitalisation/management of natural resource values.

Land-use planning in the region is primarily conducted through local environmental plans (LEPs). All LEPs in NSW are currently being reviewed by local government in consultation with NSW Government agencies and the local community. The plans aim to ensure that appropriate development occurs in the landscape with consideration of future population demands, economic issues and the protection of natural resources and environmental assets in the area. LEPs are statutory controls against which development proposals are assessed.

A number of state environmental planning policies (SEPPs) provide further protection for specific areas (eg koala habitat, rural lands). In addition, the Department of Planning has prepared a series of regional strategies to guide sustainable growth while strongly protecting valuable natural and cultural assets.

## Further reading

DNR 2006 *NSW Natural Resources monitoring, evaluation and reporting strategy*, NSW Natural Resources and Environment CEO Cluster Group 2006, Department of Natural Resources, Sydney.

NRC 2005, *Recommendations – State-wide standard and targets*, Natural Resources Commission, NSW Government, Sydney.

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