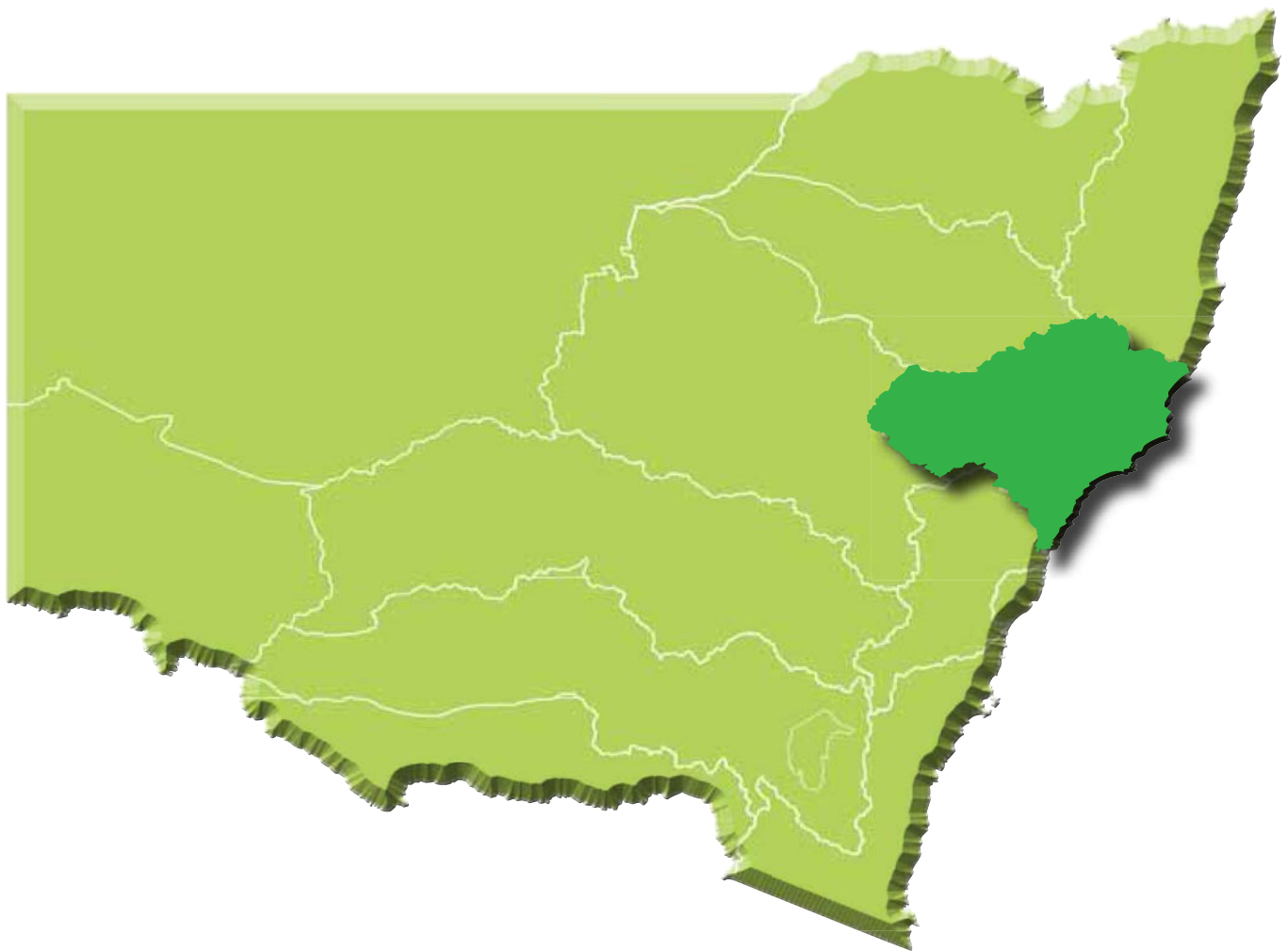


# Overview

## *Hunter–Central Rivers region*



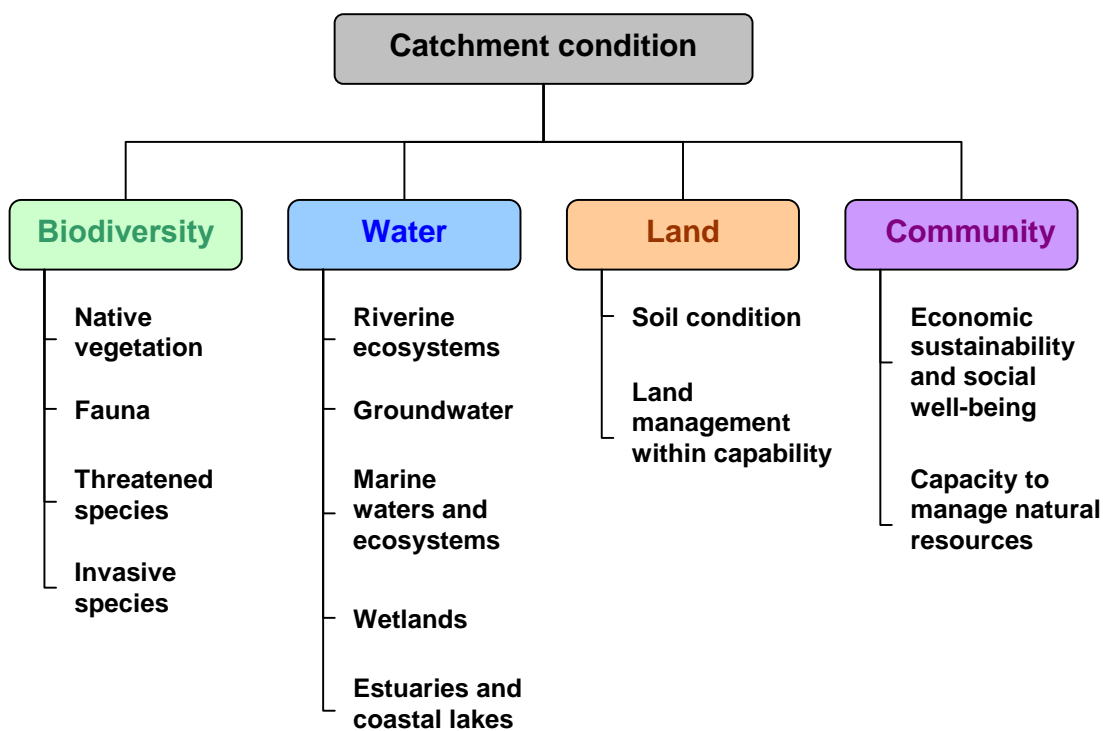
## Background

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 Hunter–Central Rivers 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 towards catchment targets.

The reports have been prepared by the three 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 generally 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.

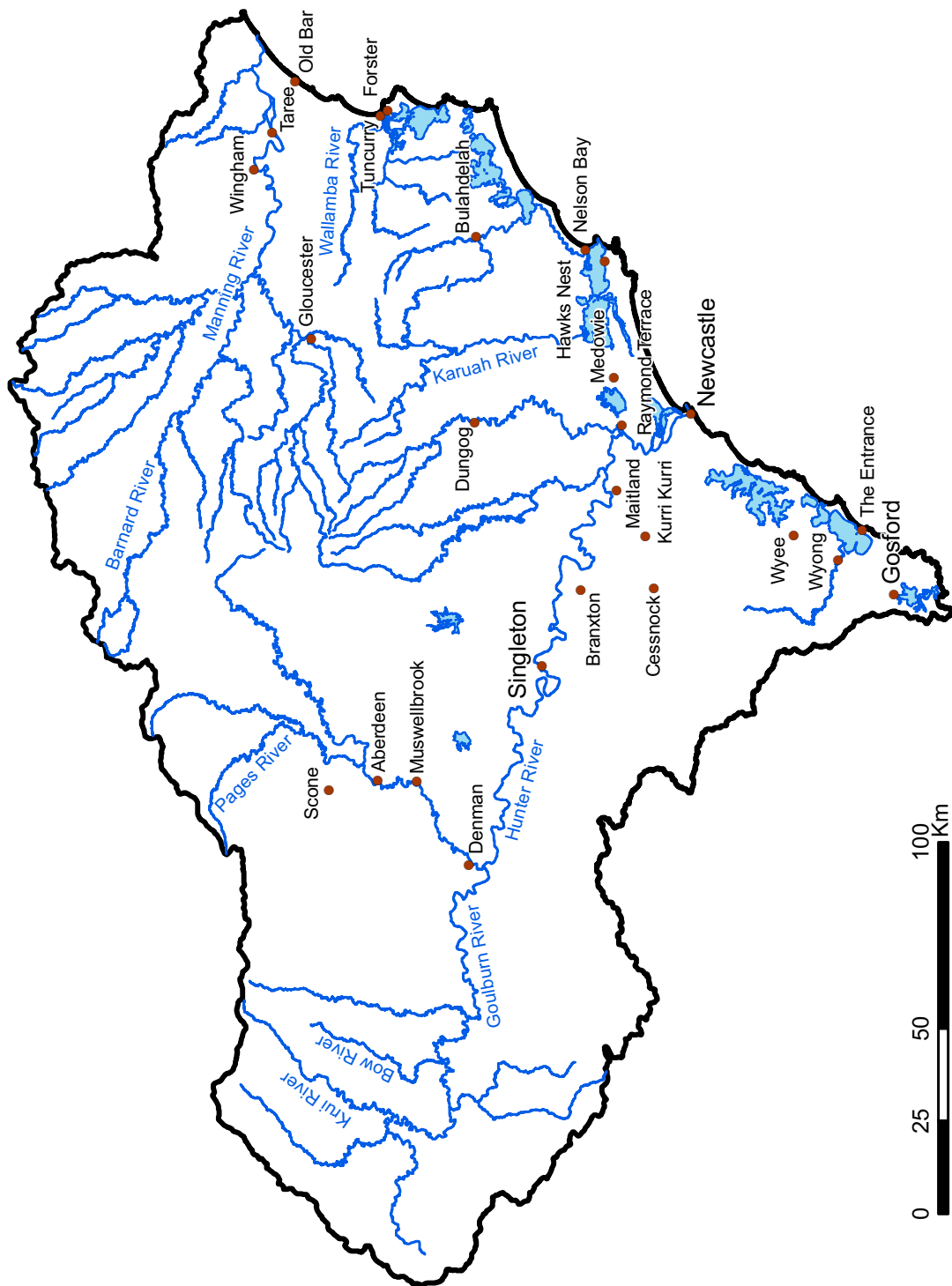
Similar scoring techniques have been used for assessing pressure indicators and for scoring indicators and indices on a state-wide scale.

## The Hunter–Central Rivers region

The Hunter–Central Rivers region is on the east coast of NSW, extending from Newcastle in the east to the Merriwa Plateau and Great Dividing Range in the west; and from Taree in the north to Gosford in the south. The region has a total area of 3.7 million hectares and has highly varied landscapes. It comprises estuarine lakes and mangroves, coastal sands, rich alluvial floodplains and surrounding rural land, woodlands and forests. The region has a subtropical climate, with rainfall highest in coastal areas and the Barrington Tops then decreasing inland. Major waterways are Port Stephens; the Manning, Karuah and Hunter rivers; and the coastal lakes of Wallis Lake, Lake Macquarie, Tuggerah Lake and Brisbane Water.

Land-uses including coal mining, quarrying, power generation, heavy industry, urban development, tourism and recreation, forestry, aquaculture and a wide range of agricultural industries.

Approximately one million people live in the Hunter–Central Rivers region. Major population centres are Newcastle, Maitland, Lake Macquarie, Taree and Gosford. Lake Macquarie is the most populated area with 20 per cent of the region's population. There are 17 state electorates, 10 Federal electorates, 19 local government areas (LGAs), and five regional and 15 local Aboriginal land councils.



Hunter–Central Rivers region

The Hunter–Central Rivers 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 Hunter–Central Rivers 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 the 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 Hunter–Central Rivers region SOC ratings**

State-wide target	Region condition	Data confidence	NSW condition	Region pressure
Native vegetation	Green	M	Green	Green
Fauna	Orange	L		
Threatened species	Orange	L		
Invasive species (impact)*	Yellow	M		
Riverine ecosystems				
Groundwater				
Marine waters and ecosystems				
Wetlands	Red	L		Orange
Estuaries and coastal lakes	Green	M	Green	Yellow
Soil condition	Green	L–M	Green	See LMwC
Land management within capability (LMwC)	Yellow	L	Yellow	
Economic sustainability and social well-being				
Capacity to manage natural resources	Yellow	L–M		

Condition	Rating	Confidence	Pressure	Rating
Very good	Green	H – High	Very low	Green
Good	Light Green	M – Medium	Low	Light Green
Fair	Yellow	L – Low	Moderate	Yellow
Poor	Orange		High	Orange
Very poor	Red		Very high	Red
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 (primarily woody) covers over 50 per cent of the region and overall extent is similar to the state average. Around 40 per cent of the region consists of conservation and natural environments. Vegetation condition is rated only fair as most vegetation communities show some degree of modification. Greatest modification, by area, is associated with dryland agriculture and plantations.
- **Fauna** – the overall sustainability (based on a small number of species that are actively monitored) is rated poor. Within the Hunter–Central Rivers region, none of 658 species of terrestrial vertebrates recorded since European settlement has become extinct. However, 12 species (14 per cent) of mammals, 39 species (10 per cent) of birds, four species (seven per cent) of amphibians and 28 species (24 per cent) of reptiles are estimated to have lost at least half their pre-European distribution under a variety of pressures.
- **Threatened species** – recovery of threatened species in the region rated poor (based on data available for only 10 of the 276 threatened species, excluding extinct, within the region). Two flora species are presumed extinct; four fauna species are critically endangered; 36 fauna species and 45 flora species are endangered. There are 24 endangered ecological communities. There are one critically endangered, 24 endangered and one vulnerable ecological communities.
- **Invasive species** – the impact of invasive species in the region is rated moderate. While the relative impact of individual invasive species has not been assessed, the majority of the new and emerging invasive species in the region are weed species. There are one new and five emerging freshwater pests (fish), four emerging marine pests, and two emerging pest animal species (feral horses, and feral and wild deer). Invasive species that are widely distributed in NSW and present in the region are foxes, freshwater pests and wild dogs; and bitou bush along the coast. The proportion of non-native fish species to native species is 27 per cent averaged over all sites.

## Water

- **Riverine ecosystems** – an overall rating for riverine ecosystem condition was not determined. The percentage of samples that exceeded total phosphorus guidelines varied greatly between sites from very low to very high across the region, with the majority of sites having moderate results. The percentages of samples that exceeded turbidity guidelines were all moderate or high at all sites, with one exception in the Manning catchment. Half the sites had stable water temperature, while the remaining sites had a rising trend, with the exception of two sites that had insufficient data for analysis. Just over half the sites had a stable electrical conductivity trend, three sites had a rising trend, one site had a decreasing trend and one site had insufficient data for analysis. All sites on the Hunter River had stable electrical conductivity. All sites recorded an increasing trend in turbidity. Overall macroinvertebrate condition was not assessed as there was insufficient recent data. Overall fish condition was very poor; coastal and lowland reaches had the best condition. Overall hydrologic condition was rated good.
- **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. The poor to very poor condition of the sandstone aquifers is based on the influence of mining on the aquifer system. The declining trend is associated with the continuation and further development of the sandstone aquifers for mining. The major pressure on the alluvial aquifer

systems in the region is land-use changes associated with agriculture, urbanisation, mining and the construction of levee banks reducing the frequency of flood events.

- **Marine waters and ecosystems** – overall condition was not determined. Forty-two per cent of the region's marine waters are in the Port Stephens-Great Lakes Marine Parks. Individual indicators rated good or very good, including Beachwatch bacterial indicators. Abalone rated very poor and below that for NSW as a whole. The threat of disease posed by abalone viral ganglioneuritis is a potential pressure on the abalone industry.
- **Wetlands** – overall, wetlands in the Hunter-Central Rivers region are in very poor condition. Confidence in the assessment is low due to the limited data available. The greatest pressure on wetlands in this region is from habitat disturbance caused by feral animals, recreational facilities in the wetlands and fringing zones, and roads crossing or adjoining the wetland.
- **Estuaries and coastal lakes** – the overall condition of estuaries and coastal lakes is good (13 of the 20 estuaries were rated with the remaining seven having limited or no data). Overall ratings for individual indicators were: chlorophyll a – good; macroalgae – not rated; turbidity – fair; seagrass – fair (but with significant variability from very good to very poor); mangroves – not rated; saltmarsh – very good; and fish – fair. Overall pressure was rated moderate. The pressures on Hunter-Central Rivers estuaries are spread evenly along the coastline with a slight increase in the more developed and populated Central Coast area.

## Land

- **Soil condition** – the overall soil condition in the 10 SMUs across the Hunter-Central Rivers region, which cover about 28% 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 indicator within individual SMUs was sheet erosion which rated as very poor while soil salinity rated as poor.

Expected trend for SMUs, based on the degree to which land management is within capability, is steady except for the Chichester Hills SMU, which is predicted to show a decline in condition and the Hunter Floodplains SMU which is predicted to show an improvement. The expected trend across indicators is stable except for wind erosion 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 were poor 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 for wind erosion and acid sulfate soils. The degree of land management within capability is tending to be stable for acidification, organic carbon decline, structure decline and salinity/waterlogging and improve for sheet erosion, gully erosion, wind erosion and acid sulfate soils.

## Community

- **Economic sustainability and social well-being (ESSW)** – overall condition was not assessed, but trends are stable or improving. Individual indicators to assess the likely benefit of NRM decisions on maintaining ESSW rated either fair or poor. The impact of employment, skills,



networking, participation in NRM, and the effectiveness of NRM decision-making on ESSW was rated as good, while the impact of business rated only fair. ESSW is variable across the catchment. People are concerned about the rapid growth and development in the east, leading to major environmental and community pressures. Key pressures include population change, market forces and drought/climate change

- **Capacity to manage natural resources** – overall adaptive capacity of land managers in the region was rated fair. Assessment of the five capitals (*human, financial, physical, natural* and *social*) indicated key differences between large- and small-scale land managers. The large-scale group had relatively low levels of *social, natural, physical* and *financial* capitals that limited their capacity for NRM. *Human* capital was relatively high. The small-scale landholders had relatively high levels of all capitals, except *human* capital, which was moderate. For large-scale landholders, the primary constraints to NRM were the low profitability of farming, aspects of groundwater management (particularly in relation to the impacts of mining on aquifers) and concerns about the level of engagement with landholders by government in NRM decision-making. For small-scale landholders, key constraints to NRM action related to a lack of enthusiasm, interest and engagement in NRM by their community. Off-farm income, largely through employment in the mining sector, was seen as strongly supporting NRM on small holdings. Both landholder groups believed that, within their communities, the experience and ability in farm management of many landholders effectively supported NRM.

## 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 in 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 Hunter–Central Rivers region include:

- rapid development in coastal urban and peri-urban areas
- mining impacts
- ongoing land-use and land management
- deforestation/removal of riparian vegetation
- invasive species
- water extraction
- drought/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 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 involves 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 response 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 Hunter–Central Rivers CAP can be found at:  
[www.hcr.cma.nsw.gov.au/articles/news.asp?news\\_id=15](http://www.hcr.cma.nsw.gov.au/articles/news.asp?news_id=15).

Management responses of the Hunter–Central Rivers CMA for the Hunter–Central Rivers region are captured in 31 management targets comprising:

- planning (one target)
- conservation action (four targets)
- best management practice (nine targets)
- resource rehabilitation (17 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, Department of Natural Resources, Sydney.

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

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