

Regional State of the Environment Report

2008–2009
Comprehensive Report



**For the Councils
of the Greater Central West Region of NSW:**

Bathurst, Blayney, Bogan, Bourke, Cabonne, Coonamble, Cowra, Dubbo, Gilgandra,
Lachlan, Mid-Western, Narromine, Oberon, Orange, Warren, Warrumbungle, Wellington



Acknowledgements



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ABS	Australian Bureau of Statistics
AGO	Australian Greenhouse Office
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Conservation Council
BASIX	Building Sustainability Index
BOD	Bathurst Orange Dubbo Alliance
BOM	Bureau of Meteorology
CAP	Catchment Action Plan
Centroc	Central West Regional Organisation of Councils
CMA	Catchment Management Authority
CPRS	Carbon Pollution Reduction Scheme
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECCW	Department of Environment, Climate Change and Water
DIPNR	Department of Planning and Natural Resources (former)
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EPA	Environmental Protection Authority
ETS	Emissions Trading Scheme
GHG	Greenhouse Gas
GM	Genetically Modified
GPT	Gross Pollutant Trap
ha	Hectares
INFFER	Investment Framework For Environment Resources
km ²	Square kilometres
LBL	Load Based Licensing
LEP	Local Environment Plan
LGA	Local Government Area
LHPA	Livestock Health and Pest Authorities
ML	Megalitres
NAP	National Action Plan
NGERS	National Greenhouse and Energy Reporting System
NRM	Natural Resource Management
NSW	New South Wales
PAS	Priorities Action Statement
PoEO	Protection of the Environment Operations
PVP	Property Vegetation Plan
REC	Roadside Environment Committee
Regional SoE	Regional State of the Environment
RTA	Roads and Traffic Authority
RVMP	Roadside Vegetation Management Plan
SoE	State of the Environment
STP	Sewage Treatment Plant
WTP	Water Treatment Plant

Message from the Chair

Building on the success of last year's Supplementary Regional State of the Environment (SoE) Report, the Central West Catchment Management Authority (CMA) is again pleased to support the Councils of the Greater Central West Region in the preparation of the 2008-09 Comprehensive Regional SoE Report, presented here.



ABOVE Tom Gavel, Chairman, Central West Catchment Management Authority

The Regional SoE Report is an opportunity to detail the work undertaken by the Councils to care for their local environment and, in so doing, support the targets outlined in the Central West CMA's Catchment Action Plan, as we all move towards vibrant communities and healthy landscapes.

This year's Regional SoE Report is seen as something of a transition document, as changes are being made by the Department of Local Government to Councils' planning and reporting structure, including the State of the Environment Report. Consequently, the region's Councils have taken the opportunity in this SoE to identify environmental issues that are likely to affect their communities into the future.

Sustainability and responsible environmental management are two clear objectives across the region and the main themes emerging from the Councils' environmental objectives include:

- Providing and promoting environmental leadership
- Protecting the environment, biodiversity and habitats
- Considering future generations in decision making, planning and resource use
- Sustainable practices within the community and within the council
- Supporting environmental, economic and cultural values
- Contributing to larger regional, national and worldwide environmental issues, as well as local ones
- Preparing for, and ameliorating, the impacts wrought by changes to climate.

More specific objectives include:

- Adopt and enforce strategies to maintain air quality
- Restore riparian corridors
- Reduce the amount of waste going to landfill.

In addition there is great emphasis on building partnerships between the community and the Councils to achieve these objectives.

Currently the Central West CMA and the Department of Environment, Climate Change and Water are providing information to the Councils which will help identify and protect the natural



RIGHT Bald Hill Reserve near Dubbo



ABOVE Cattle at sunset from Central West CMA photograph competition

resources of each Local Government Area through the planning reform process now underway. This process requires Councils to review their Land Use planning and Local Environment Plans, and creates an opportunity to recognise and put in place a greater level of environmental protection.

Working on a regional basis to identify and address issues in this way allows the Councils to take a proactive approach, which the Central West CMA commends and will continue to support through the Local Government Reference Group and the Salinity & Water Quality Alliance.

These groups continue to successfully develop the capacity of Local Government and their communities to undertake natural resource and water management activities, both on-ground and through the development of policy and the provision of training. In recognition of this, the Salinity & Water Quality Alliance and Central West CMA were recently presented with a Merit Award for Excellence in Stormwater Education by the NSW Stormwater Industry Association.

The environmental achievements detailed within this document once again show the tremendous effort being made by the regional Councils to care for their natural resources. The Central West CMA is proud to partner the Councils in caring for our catchments.

Tom Gavel
Chairman
Central West Catchment Management Authority

Robert Gledhill
Chairman
Lachlan Catchment Management Authority

Rory Treweek
Chairman
Western Catchment Management Authority



Introduction

A State of the Environment (SoE) Report is an important management tool which aims to provide the community and Council with information on the condition of the environment in the local area. It also provides a platform for community action by raising awareness and understanding of key environmental issues which in turn helps people and organisations make informed decisions regarding future management actions to reduce the negative impacts on the environment.

The *Local Government Act 1993* requires that all local councils in NSW produce an annual SoE report on major environmental impacts, related activities and management plans. Under the Act, councils are required to specifically report on:

1. Land
2. Air
3. Water
4. Biodiversity
5. Waste
6. Noise
7. Aboriginal heritage
8. Non-Aboriginal heritage, with particular reference, with regard to each such environmental sector, to:
 - management plans relating to the environment
 - special council projects relating to the environment
 - the environmental impact of council activities.

BELOW Livestock feeding in a drought-affected area

Under the Act, a Council must produce a Comprehensive SoE Report for the year ending after each election of Councillors. As there were Council elections in 2008, the 2008-09 report is a Comprehensive report. A Supplementary report is required in intervening years.

A Comprehensive SoE report differs from a Supplementary in that it establishes environmental indicators and reports on trends in relation to environmental indicators used in the report. It must also provide detailed information on the impact of activities implemented to improve the environment. A Supplementary report updates trends and reports on environmental impacts that have been introduced since the last Comprehensive report.

At the time of writing this report, the *Local Government Act 1993* was in the process of being amended. The amendments will allow for an Integrated Planning and Reporting Framework to guide Council's future strategic planning and reporting.

As part of the Framework, Councils will develop environmental objectives with their communities in relation to local environmental issues. These environmental objectives will form part of each Council's over-arching Community Strategic Plan. The information in the annual SoE Report should be used to inform Council's preparation of the Community Strategic Plan and continue to inform the required reviews of the Community Strategic Plan.

During the development of the new planning and reporting framework, the option to remove the requirement for a separate SoE Report was considered, as environmental reporting is to be integrated into reporting on the implementation of the Community Strategic Plan and Delivery Program. However, given concerns raised during consultation about the option to remove the SoE Report and the heightened importance of environmental management at a time of serious concerns about climate change, a separate SoE Report will continue to be required as the draft legislation currently stands.

This report reflects the transition from previous SoE reporting based on the 'traditional' themes as specified by the *Local Government Act 1993* (Air, Water etc.) to environmental issues and environmental objectives that could be developed by the 17 participating Councils in their Community Strategic Plans.

The Catchment Management Authorities (CMAs), created by the *Catchment Management Authorities Act 2003*, are also required to provide reports on the progress made towards the regional environmental planning framework, the Catchment Action Plan (CAP). This Regional SoE Report provides benchmarks for measuring catchment-scale changes in the environment as measured by the Local Governments, and should be linked into both Local Government and CMA management plans.



Why a Regional SoE Report?

ABOVE Although an Australian native, White Cedar can be invasive outside of its natural range

This is the second Regional SoE report supported by the Central West CMA. It builds upon the first (Supplementary) Regional SoE Report produced for 2007-08. It was created to enable the community and the Councils of the central and western regions to gain a better understanding of the state of the environment in a regional context.

Environmental issues are not restricted to Council boundaries. Regional SoE reports are used to enable a better understanding of the state of the environment in a regional context and to identify future collaborative pathways. A regional approach to reporting:

- Facilitates a better understanding of the state of the environment across the region
- Encourages collaboration in regards to sharing ideas and resources
- Assists in the management of shared environmental resources
- Forges stronger regional links across participating Councils.

Councils are strongly encouraged to develop their SoE Report in partnership with other councils in their region and Catchment Management Authorities, as environmental monitoring and reporting is usually more useful when done at a regional and/or catchment scale.



Figure 1 Map showing participating Council areas and catchment boundaries

The initiatives presented in this report for each participating Council do not reflect all of the initiatives undertaken by Councils during the reporting period. Furthermore, the format of the Regional SoE does not allow for each Council to identify progress on their environmental management and sustainability plans, which some Councils have previously included in their SoE reports. Councils can append additional information specific to their Council in the back of this report, should they wish.

Who is involved in the Regional SoE Report?

As shown in Figure 1, most of the participating Councils are situated, totally or partly, in the area of the Central West Catchment. Bourke

Shire Council is located wholly in the Western Catchment while Cowra and parts of Blayney, Lachlan, Cabonne, Bathurst and Oberon lie in the Lachlan Catchment.

- The participating Councils are:
- Bathurst Regional Council
 - Blayney Shire Council
 - Bogan Shire Council
 - Bourke Shire Council
 - Cabonne Council
 - Coonamble Shire Council
 - Cowra Shire Council
 - Dubbo City Council
 - Gilgandra Shire Council
 - Lachlan Shire Council
 - Mid-Western Regional Council
 - Narromine Shire Council
 - Oberon Council

- Orange City Council
- Warren Shire Council
- Warrumbungle Shire Council
- Wellington Council

The participating Councils have provided data to be included in the Report, with additional regional information sourced by the Central West CMA.

What are Catchment Management Authorities?

Thirteen Catchment Management Authorities (CMAs) have been established across the State by the NSW Government to ensure that regional communities have a significant say in how natural resources are managed in their catchments.

The CMAs are locally driven organisations with a board that reports directly to the NSW Minister for Environment, Climate Change and Water (DECCW). These statutory bodies coordinate natural resource management (NRM) in each catchment. They are responsible for involving regional communities in management of NRM issues facing their region, and have been the primary means for the delivery of funding from the NSW and Federal Governments to help land managers improve and restore the natural resources of the State (NSW Government, 2005).

A profile of the three CMAs relevant to this report is provided below.

The Central West CMA

The Central West Catchment, located in Central Western NSW, has a diverse range of people and industries. It covers approximately 84,919km² from the central tablelands around Oberon, Bathurst and Rylstone to the western plains around Nyngan, Brewarrina and Coonamble. The catchment supports the major centres of Bathurst, Orange, Mudgee and Dubbo. There are also many other smaller but significant townships including Coonamble, Gulargambone, Nyngan, Warren, Coonabarabran, Gilgandra, Coolah, Trangie, Narromine, Wellington, Gulgong, Peak Hill, Molong and Oberon.

The total population of the Central West Catchment based on the 2006 Census was 183,303 persons incorporating a total Indigenous population of 13,093 persons,

which is 7.1% of the total population of the catchment (ABS, 2009). Major industries in the catchment include agriculture, agribusiness, tourism, mining and viticulture. One of the main reasons that natural resource management issues are so complex within the Central West Catchment is the highly diverse range of agricultural uses. The eastern highlands and western plains are dominated by grazing, the Central West slopes and inner plains support extensive winter cropping, Mudgee, Orange and the Bell River floodplain are places of intense viticulture and horticulture and the Macquarie River floodplain is home to irrigated cotton and other summer crops. The region also supports forestry and mining activities.

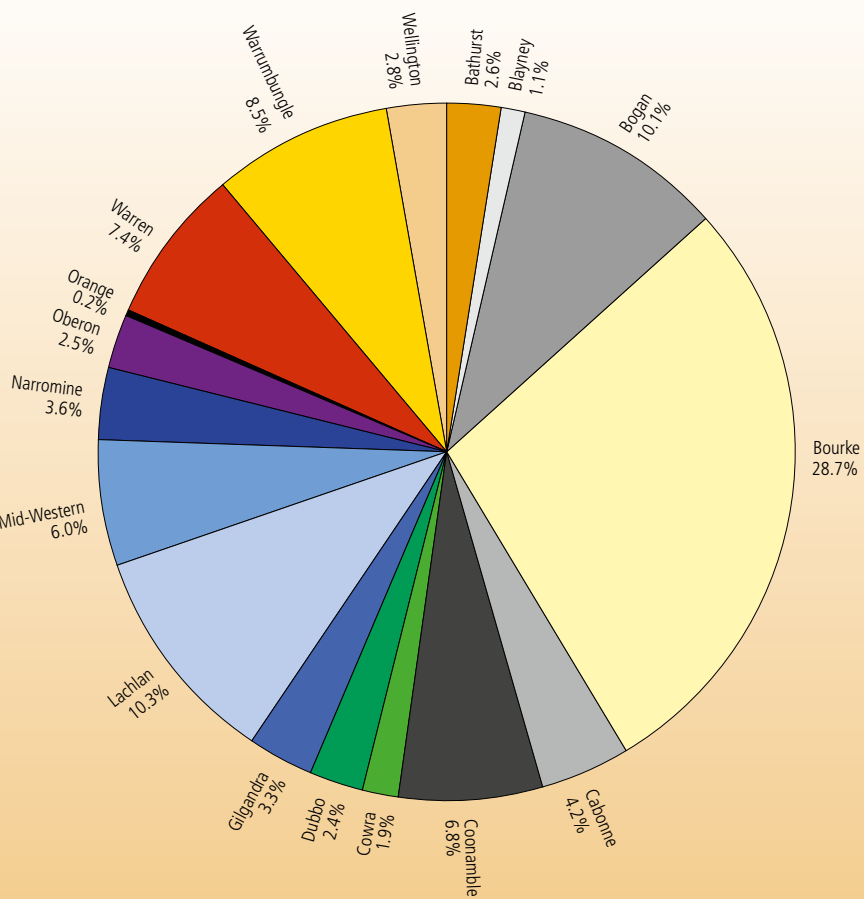
The Central West Catchment includes the Castlereagh, Bogan and Macquarie River valleys. It is flanked by the Barwon-Darling catchment to the west and north-west, the Namoi catchment to the north-east, Lachlan to the south and Hunter and Hawkesbury-Nepean catchments to the east. While the upper reaches of the Bogan and Castlereagh Rivers are largely unregulated, rivers in the Macquarie Valley are highly regulated. Windamere Dam on the Cudgegong River upstream of Mudgee has a capacity of 368,000 ML and the Burrendong Dam located at the junction of the Macquarie and Cudgegong River at Wellington has a capacity of 1,189,000 ML. River regulation and water extraction has had substantial effects on flow regimes, with changes to seasonal flow patterns, reduced variability and changes to flood intensity.

The region possesses a wide diversity of landforms, vegetation species and communities. It incorporates the internationally recognised Macquarie Marshes, the Warrumbungles National Park and important areas of remnant Endangered Ecological Community Box Gum Woodland and grasslands. At the time of European settlement, the Central West Catchment supported a complex mosaic of forests, temperate and semi-arid woodlands, wetlands, shrublands, heaths and grasslands. Clearing and subsequent degradation has reduced this natural vegetation cover to a large number of small, isolated remnants on the less fertile and productive soils, and a smaller number of scattered larger reserved

remnants. For example, the Box and Ironbark woodlands which originally occupied large parts of the slopes and plains have been reduced by as much as 90%, and are now among the most significantly altered plant communities in NSW (Central West CMA, 2008a).

In many instances, the dominant species of those communities which have been heavily cleared are still relatively common in the landscape. However, remnants often occur as single trees or small groups of mature or senescent trees; these stands typically have little, if any, of the original understorey structure and species diversity, have no regeneration, and have essentially ceased to exist as functional ecosystems. In the case of native grasslands, remnant elements are generally scattered throughout the improved pastures, which dominate much of the region, as well as roadside remnants and travelling stock routes.

Figure 2 Proportional size of each LGA as part of the total reporting area



The Lachlan CMA

The Lachlan Catchment covers an area of approximately 84,700 km² and has a population of 90,831 people, producing 14% of NSW's agricultural production. This includes an Indigenous population of 4,465 which is approximately 5% of the total population (ABS, 2009). The catchment encompasses 24 Local Government Areas.

The Lachlan River rises near Gunning and terminates in the Great Cumbung Swamp near Oxley, 1,450 river kilometres to the west. Major tributaries of the Lachlan include the Abercrombie, Boorowa, Belubula, Crookwell Rivers and Mandagery Creek. The main dam regulating flows in the Lachlan River is Wyangala Dam, which has a capacity of 1,220,000 ML and is located at the junction of the Lachlan and Abercrombie Rivers. The Belubula River is regulated by Carcoar Dam which has a capacity of 36,000 ML and located about 10 kilometres downstream of Blayney.

The geological formations throughout the catchment are quite complex and have a significant impact on salinity. This variability requires effective management for erosion control, nutrient and salinity management (Lachlan CMA, 2008).

The Western CMA

The Western Catchment is the largest catchment in NSW, covering some 230,000 km². It includes the Barwon-Darling, Culgoa, Paroo, Warrego, Narran, Bokhara and Birrie River catchments. It takes in significant portions of the Bourke, Brewarrina, Central Darling, Cobar and Walgett Shires and the Unincorporated Area.

The catchment is predominantly leasehold land, administered under the Western Lands Act 1901 by the Department of Lands. There are more than 630 pastoral and agricultural holdings. The population of the Western Catchment is approximately 36,500 people, with an Indigenous population of 10,278 or 28% of the total population (ABS, 2009).

Predominant land uses in this semi-arid zone are grazing, dryland cropping, irrigated cotton production, mining, tourism and natural conservation. Bourke, Brewarrina, Cobar, Walgett, Lightning Ridge and Broken Hill are the major service centres.

As well as a range of permanent and seasonal river systems, it also includes the largest and most diverse areas of natural rangelands within NSW (Western CMA, 2008).

The CMAs and the Councils at a glance

The 17 local Councils participating in this Regional SoE Report cover a diverse area of Central and Western NSW, totalling approximately 145,169km². The area of each Council and its percentage coverage of the region covered by this report is provided in Figure 2.

Community Profile

In 2008, it was estimated that the population of the region covered by this report was 227,348 (ABS, 2009). This represents an estimated rise in regional population from 2006 of 12,990 (Table 1). It should be noted however, that there was a slight drop in regional population from 2007 compared to 2006 with the 2006-07 SoE report stating a decline of 0.83%. Actual figures for the reporting year may not exactly match current estimates shown by the ABS as these are based on modelling estimates. Anecdotal evidence points towards an ongoing longer term population decline, particularly within smaller centres such as Bourke.

Employment in the Central and Western area is in agriculture, manufacturing, retail, education, property, business services, and health and community services.

Unemployment ranges from 3.7% to 12.2% in the participating LGAs (ABS, 2009). The unemployment rate is slightly higher than the State average at 6.1%; however employment is growing in most of the larger centres (Central West CMA, 2008b).

There are some differences in age between the region and the Australian average (Table 2); generally this is reflected by fewer people in the middle age groups and therefore higher numbers of youth and aged people (ABS, 2006).

In the Central West and North West statistical regions, there are significantly more people living in regional or remote areas compared to the State average of 72% of people living in major cities (Table 3). This has a significant impact on the provision of services and also the environmental impacts caused by

Table 1 Comparison of regional population 2006-08

LGA	Population		Percentage of 2008 reporting area total population
	2006–Census	2008 – estimated	
Bathurst Region	35,845	38,326	16.9
Blayney Shire	6,593	6,985	3.1
Bogan Shire	2,883	2,989	1.3
Bourke Shire	3,095	3,091	1.4
Cabonne	12,396	12,994	5.7
Coonamble Shire	4,208	4,287	1.9
Cowra Shire	12,475	12,835	5.6
Dubbo City	37,843	40,306	17.7
Gilgandra Shire	4,522	4,564	2.0
Lachlan Shire	6,669	6,838	3.0
Mid-Western Region	21,086	22,359	9.8
Narromine Shire	6,508	6,785	3.0
Oberon	5,030	5,291	2.3
Orange City	35,338	37,991	16.7
Warren Shire	2,750	2,799	1.2
Warrumbungle Shire	9,808	10,197	4.5
Wellington	8,120	8,711	3.8
Total	215,169	227,348	

Source: 2008 ABS data and 2006 Census Data

Table 2 Percentage of age groups compared to Australia

Age group	Total Number	Percentage	Australia percentage
0-4 years	14,825	6.8	6.3
5-14 years	32,925	15.3	13.5
15-24 years	27,761	12.9	13.6
25-54 years	82,199	38.2	42.2
55-64 years	25,395	11.8	11
64+ years	32,066	14.9	13.3

Source: ABS, 2006

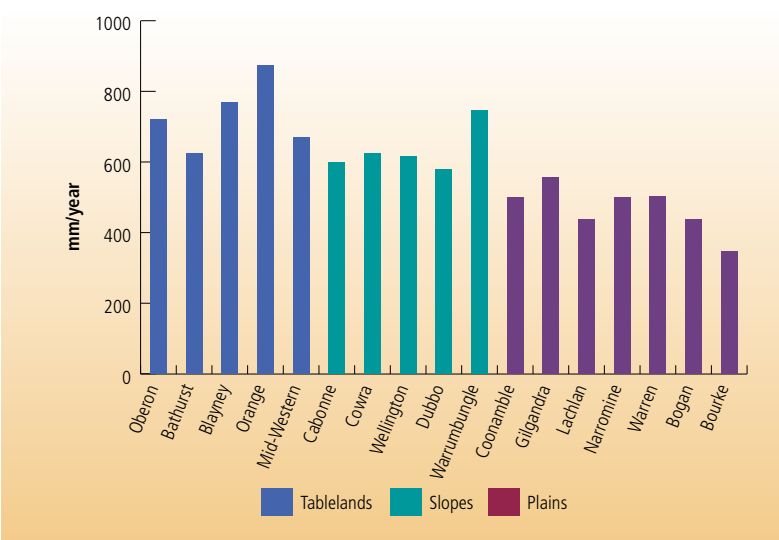
Table 3 Spatial distribution of population in the reporting region

Place of residence	NSW Average	Central West and North West statistical subdivisions
Major city	72.6	0
Inner regional	20.3	59.9
Outer regional	6.5	30.5
Remote	0.5	8.8
Very remote	0.1	0.8

Source: ABS, 2009 (2006 Census Data)

N.B. The Australian Bureau of Statistics utilises statistical subdivisions to collate data from the census. The Central West and North West subdivisions capture the majority of the reporting area however may not reflect the boundaries of the 17 Councils exactly.

human settlement with a high proportion of people living in the reporting area within the inner regional centres. Studies have shown there are often significant differences between these places of residence in terms of population characteristics such as income, Aboriginality



Source: BOM, 2009

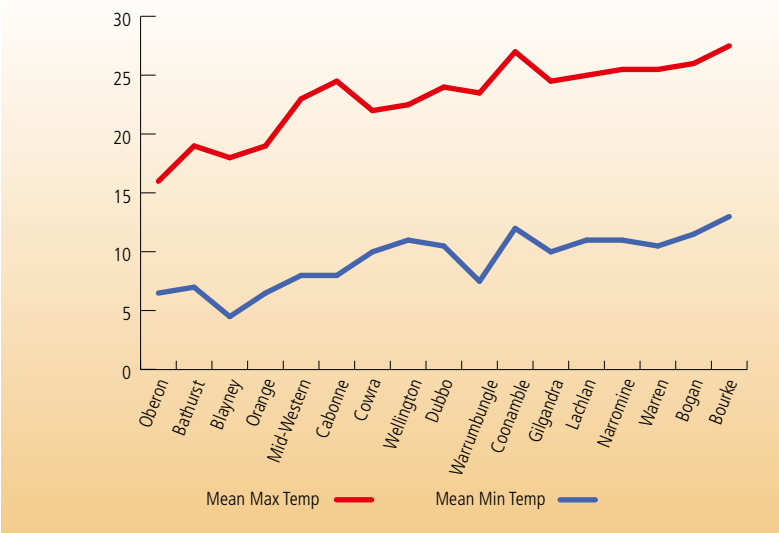
Figure 3 Annual Average Rainfall of participating Councils

and house ownership. There is also a greater percentage of the population who have an Indigenous background with 7.3% of the region's population being of Aboriginal or Torres Strait Islander heritage compared to the national average of 2.3% (ABS, 2009). This variation in population characteristics translate to different challenges being presented to the Councils that are unique to the reporting region.

Climate in the Central West

The climate of the Central West is highly variable as it covers a large geographic area and a range of topographies. Broadly, these can be grouped into tablelands, slopes and plains, reflecting the influence of the Great Dividing Range in the east through the slopes

Figure 4 Annual mean temperatures of participating Councils



Source: BOM, 2009

to the floodplains of the west and north-west. There is an overall decline in average annual rainfall moving west from the tablelands to the plains (Figure 3). Average daily minimum and maximum temperatures are lowest for the tablelands, intermediate for the slopes and highest for the plains (Figure 4).

The CSIRO has outlined the predicted impacts of climate change in the Central West Catchment (CSIRO, 2007a). It is predicted that storm intensity and frequency is likely to increase, decreasing the local reliability of rainfall. Extreme rainfall events will become more frequent, with a one in 40 year event predicted to increase by up to 20% by 2030. The number of days per year above 35°C is expected to increase from four to eleven by 2030. It is also thought that in areas of declining rainfall, the risk of land and water salinity will be increased.

This report

Themes

As discussed above, this report covers the 'traditional' themes used in NSW SoE reporting as required by legislation. The traditional reporting themes have been included under the following main themes for the report:

- Land
- Air
- Water
- Biodiversity
- Human Settlements
- Waste
- Towards Sustainability.

The last main theme ('Towards Sustainability') is a diversion from the traditional SoE reporting themes and reflects the desire for the participating Councils and CMAs to help move their local communities towards environmental sustainability.

Environmental issues

To respond to the proposed changes in SoE reporting related to the new Integrated Planning and Reporting Framework (DLG, 2009), each participating Council provided a list of environmental issues that could lead to the development of environmental objectives as required in future SoE reports. These environ-

mental issues were categorised and have been addressed under the main themes as follows:

- Land (Land Degradation)
- Air (Air Pollution)
- Water (Water Quantity, Water Quality)
- Biodiversity (Habitat Loss, Endangered Species, Invasive Species)
- Human Settlement (Population and Settlement Patterns, Noise Pollution, Management of Aboriginal Heritage, Management of Non-Aboriginal Heritage)
- Waste (Waste Generation and Pollution, Waste Treatment and Disposal)
- Towards Sustainability (Sustainable Practices, Climate Change).

It should be stressed that the number of issues related to each theme does not reflect the importance of that theme in comparison to other themes; it reflects more the range of disparate issues under each theme.

It should also be noted that although they are discussed primarily under one theme, several issues such as climate change, where the impacts are pervasive, are further discussed under other themes.

Environmental indicators

Indicators are important management tools used in environmental reporting. They summarise and communicate information about the condition of key aspects of complex environments so that our decision making can be better informed.

In this report, a suite of indicators has been identified that help report on the environmental themes and issues listed above.

While many of the indicators for this Report have been selected from past Council SoE Reports and the 2007-08 Regional SoE Report, some new indicators have been selected, for which most of the participating Councils can provide meaningful data. Where indicators are new, data from previous years is not available to enable the presentation of environmental trends over time.

A list of Councils, that provided data for each indicator is found in the report appendix.

As stressed above, a Comprehensive SoE report such as this needs to include trends related to the environmental indicator data collected. Thus where comparison with 2007-08 or previous data is possible, trends



ABOVE Cattle farmers in Coonamble

for the indicators are provided in a summary table at the commencement of each theme chapter. The trends are highlighted as below using up arrows (signifying improvement), sideways arrows (no or little change) and downward arrow (showing a worsening trend).

- ↑ improvement
- no or little change
- ↓ worsening trend

There is an explanation for each trend within the chapter and possible reasons for it occurring.

Pressure-State-Response

The conventional way of reporting on each theme is using the 'Pressure-State-Response' model. This order has been modified to State-Pressure-Response in this report to initially highlight the current situation. Wording has also been changed as follows: Pressure to 'Threat', State to 'Condition'. The new terms are thought to be less technical.

In this report, Condition-Threat-Response is related to each environmental issue as sub-headings. Environmental indicators are tagged to one of these sub-headings. A further sub-heading called 'Future Challenges' is found at the end of each issue report and lists suggested future actions and concerns relevant to the reporting for that theme.



This chapter focuses on the condition of the land in the participating Council areas. The landscape of the reporting area is diverse in character, including residential, agricultural, industrial and natural landscapes. Land is a natural asset that can be considered to consist of a diversity of geological forms; topsoil availability; soil health; land that supports natural systems; and land available to support a variety of human uses (including open space for public access).

The riverine and floodplain areas provide great aesthetic and recreational opportunities for the region’s residents and tourists, as well as important water resources for the economy and environment. Land provides a number of services that we rely on, including food production, rural/urban lifestyles and work and recreation opportunities that ultimately support human health. Land resources also provide a range of environmental services.

A major issue in the region is land degradation caused by soil erosion, salinity and contamination.

Issue - Land Degradation

Condition

The soils of the catchments vary according to geology and landscape. Soil health issues can be broken up into three components - fertility (salinity, acidity, and nutrients), biology (the number, condition and type of soil biota) and physical characteristics (structure, sodicity and erosion) (Central West CMA, 2007). There is a high degree of interaction between the causes and effects relating to fertility, biological activity and physical characteristics. The

tablelands and slopes have ratings of poor soil health, but there is a trend toward improved cropping and grazing management practices.

Lower nutrients and poorer soil types are characterised in the tablelands due to higher total rainfall. The geology of the area is dominated by coarse grained, acidic rocks resulting in sandy textured soils that are developed in-situ and susceptible to erosion (Central West CMA, 2007). The slopes have variable geology with soils types that are less fragile and have higher nutrient levels. They also have naturally higher salt stores, increasing the risk of land degradation due to salinity (Central West CMA, 2007). The plains are dominated by alluvial and aeolian soil development resulting in higher fertility and clay contents that have a higher shrink-swell potential and can be susceptible to compaction problems.

Erosion

Erosion is a significant land factor that influences water quality in our streams and habitat quality. Erosion generally occurs where land has been disturbed or where water concentrates, such as unsealed roads, roadsides and driveways, agricultural areas (cropping, land clearing and over grazing), industrial areas, stormwater outlets, where vegetation is otherwise removed and in waterways. Impacts from erosion include loss of arable land and habitat, weed invasion, soil loss, dust storms and sedimentation of waterways. Although Councils do not hold data on the extent of erosion affected land in their LGA’s, the Central West CMA reports that 100,000 ha of land is affected.

Salinity

While there are many causes of salinity (including irrigation and removal of vegetation), the effects on land resources can be very



significant regardless of the cause. Salinity changes the soil structure, increasing the erosion hazard. Limited vegetation will grow on saline areas, reducing feed for stock, habitat for native species and changing the local ecosystem. Salt also affects infrastructure such as roads and buildings which may cause high economic impacts for the local Council and community. For example, the salinity impacts on rural roads have been costed between \$100/km/year (very slight impact) and \$1200/km/year (severe impact) (DIPNR, 2005). Salinity levels in rivers are discussed in the Water chapter.

Identified by the recent Murray Darling Basin Salinity Audit, and confirmed by the Central West Catchment Salinity Risk Assessment (Humphries, 2000), the Bogan, Castlereagh and Macquarie catchments are recognised as being among the most “at risk” of serious salinity problems.

Contamination

Contaminated land has the potential for immediate or long-term adverse effects on

human health and the environment. Land contamination is usually the impact of past land uses such as service stations, fuel depots, horticultural facilities, orchards, sheep dips, agri-chemical dumps, pistol ranges, mines, landfills and gasworks. A site is classified as contaminated when hazardous substances occur at concentrations that are above normal background levels, posing a potential risk to human health or the environment. The Department of Environment, Climate Change and Water (DECCW) maintains a register of contaminated sites, and local Councils also register further contaminated sites such as old landfills. Some participating Councils also maintain a list of potentially contaminated sites based on past land use.

Indicator – Number of contaminated land sites (Contaminated land register)

Under the Contaminated Land Management Act 1997, DECCW may declare that some contaminated lands are “significant enough to

ABOVE Erosion gullies at Sawpit Creek, Bathurst, prior to rehabilitation

Table 4 Summary table of indicator trends – Land Degradation

Issue	Indicator	2007-08	2008-09	Trend
Contamination	Number of Contaminated land sites – contaminated land register	6	6	➡
	Number of Contaminated land sites – potentially contaminated sites	523	755	⬇

- ⬆ improvement
- ➡ no or little change
- ⬇ worsening trend

Note – the above trends are for data in 2007-08 and 2008-09 from the same sources. They should be read in terms of limitations outlined in the discussion below. Note also that there are some new indicators for 2008-09 for which no comparison could be made with 2007-08. Refer to the Appendix for Councils included in trend data.



Land

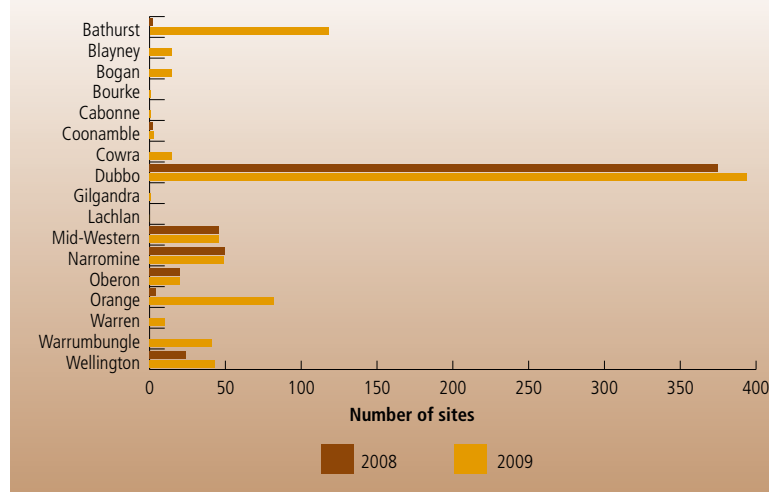


Figure 5 Number of potentially contaminated sites in each LGA

warrant regulation". These lands are listed in a register of contaminated lands found on the DECCW website at <http://www.environment.nsw.gov.au/clmapp/aboutregister.aspx>.

As shown in the summary table (Table 4) at the front of this chapter, the number of sites on the contaminated land register in the region remained the same in 2008-09 (the total in 2007-08 was six but Weddin Council with one site was not involved in this report. Cowra Shire Council, now included in the report, also has one site so the total for 2008-09 is also six). Apart from Cowra Shire, the registered contaminated sites are located in Bathurst, Dubbo and Orange LGAs.

Indicator – Number of contaminated land sites (potentially contaminated sites)

Local Councils deal with other contamination under the planning and development framework, including State Environmental Planning Policy No. 55 – Remediation of Land and the Managing Land Contamination – Planning Guidelines. This type of site, although possibly contaminated, does not pose an unacceptable risk under its current or approved use to the best of Council's knowledge. The planning and development process will determine what remediation is needed to make the land suitable for a different use.

In 2008-09, local Councils across the reporting region identified 738 potentially contaminated sites. Figure 5 shows the number of potentially contaminated sites in

each of the 17 LGAs and compares 2007-08 figures with 2008-09 where reported by Councils.

It should be noted that it is difficult to compare this data across LGAs due to the fact that much of it relies on different registers maintained by Council that differ in content and may not be updated on a regular basis. One of the reasons for the high value recorded for Dubbo is that this Council have attempted to identify all possible sites that may contain contamination due to past or present land use.

Comparing those Councils that reported in 2007-08 with the same Councils in 2008-09, there appears to be an increase in the number of potentially contaminated sites across the region and thus a 'worsening trend' for this indicator (as shown in the summary table, Table 4, at the start of this chapter). However, another possible reason for the increase in contaminated sites could be due to better reporting methods. Councils are becoming more aware of previously contaminated sites and are including them on their registers so that these issues can be addressed should a change in land use warrant it.

Threat

Land Clearing

The clearing of natural vegetation compounds land degradation problems such as erosion and salinity. Rainfall and overland flow, that is usually taken up by vegetation, erode sections of the land away producing a gully effect. The excess water also soaks into the ground and adds to rising water tables which bring salt deposits with them, increasing soil salinity and reducing the productivity of soils.

Agriculture

Agriculture can cause significant impacts on land if it is not managed sustainably. These impacts can include loss of groundcover, causing erosion and therefore loss of topsoil, changes to soil structure and health, increases in soil acidity and increased areas of soil scalds. Extreme impacts may lead to desertification and loss of soil fertility. Intensive agriculture in the plains areas of the Central West is also causing rising acidity levels in areas that due to a lower rainfall have not previously experienced these problems. The inappropriate

use of fertilisers is also a major contributing factor to soil acidification.

Inappropriate development and land use change

Inappropriate development in environmentally sensitive areas can contribute to land degradation, for example, development in areas of highly erodible or fragile soils, on saline prone soils or on land which fronts streams or in wetland areas can exacerbate land degradation issues. Inappropriate subdivision of rural lands can also threaten agricultural productivity and biological diversity.

Climate Change

The predicted impacts of climate change will vary depending on various land features such as fertility, biology and physical soil characteristics mentioned above, as well as the area of green cover and water availability. However, while there is no uniform response, it is generally accepted that as temperatures rise, soil moisture and thus nutrient availability decreases, as does the soils ability to support vegetation.

This is particularly prevalent in arid lands compared to forested areas and combined with increased temperatures, causes a "baking" of the land.

Soils can also be either a net sink or a net source for greenhouse gases (GHG). In more densely vegetated areas, including perennial pastures, carbon dioxide (CO₂) is plentiful due to plant respiration. Because of the high availability of CO₂ in these areas, the growth rate of plants is also increased.

This enhances soil organic matter and results in healthier soils. Healthier soils will support a greater population of micro-organisms. These soil micro-organisms also contribute CO₂ to the environment, however their contribution to building soil and soil carbon is far more significant. A current estimate of global carbon stocks in soil is approximately 1750 +/- 250 Gt (Royal Society, 2001).

Response

Agricultural lands

A significant focus of CMA funding programs has been improving soil management in agriculture, not only for soil health but also

Wiradjuri saying—'Ngangaana-gu Kairai billa's dya Kairai billa's durai ngangana ngindu' 'Look after the land and the rivers and the land and the rivers will look after you'

(Cec Grant – 2001)

to limit soil losses from impacts of stock, stormwater and flooding, and wind erosion. Targeted incentive funding for farmers has included increased groundcover percentages, improving soil tillage and improving the organic content of soils.

The Central West CAP outlines management targets, which include: 'By 2016, 50,000ha of the catchment will be managed to have a desirable perennial plant component for landscape protection (MTSS1)'.

The Central West CMA 2008-09 Annual Report notes that approximately 36,702ha is now managed for perennial plants under landscape protection projects which is more than 70% of the target.

Rehabilitation of degraded sites has also been a significant activity to reduce impacts on land resources. Programs undertaken by private landholders, the CMAs and Councils have included re-vegetation of streams and creeks to limit stream bank erosion; improving land management of salinity recharge areas, which also contribute to soil damage and erosion hazards; soil conservation works such as contour banks and gully remediation on farms and some public lands and improving industrial development rehabilitation conditions for larger impact activities such as quarries and mines.

The Central West CMA has recently produced a series of best practice guides to improving agricultural land management. These guides include information on the topics of:

- Managing sodic soils
- Land and soil capability
- Soil management in pasture systems
- Economics of non-tillage farming systems
- Channel erosion
- Gully erosion.

Conventional tillage methods and set stocking have significantly reduced perennial groundcover within the Lachlan Catchment

as well. This contributes to wind and water erosion, soil structure decline, organic carbon loss and salinity. To improve soil health, the main management actions that are being implemented are based on maintaining optimal groundcover all year round, minimising ground disturbance from machinery and compaction by stock and machinery (Lachlan CMA, 2006).

Indicator – Extent of erosion affected land rehabilitated

This is a new indicator and thus cannot provide a trend for 2008-09. From the responses by two Councils that reported and the Central West CMA, 14,514 ha of erosion affected land was rehabilitated across the region from 2005-2009.

Inappropriate development and land use change

Some Councils are using Environmentally Sensitive Area mapping provided by DECCW and other relevant state agencies in their planning processes and decisions to help protect against inappropriate development. Council's are also attempting to address inappropriate sub-division of rural lands and development of environmentally sensitive land through the LEP process and other planning controls.

Urban Sediment

Many of the reporting Councils have developed sediment and erosion control policies, which although relating primarily to urban areas, aim to mitigate the effects of stormwater on water quality.

For example, they may require builders to install sediment controls around a site to prevent any soil material leaving the site, and to keep and stockpile topsoil for rehabilitation purposes. This is further discussed in the Water chapter.

Contamination

A range of projects have been undertaken across the reporting area to address this issue. Responses to contamination include both research to locate and identify contaminated sites, and on ground works to address contamination issues.

Many of the Councils have identified a list of potentially contaminated sites and are seeking funding or cooperative projects. For example, Lachlan Shire Council has identified that priority areas are older landfills and disused service stations. It is noted that there is only limited information for potentially contaminated sites.

There are several projects being carried out across the region involving the rehabilitation of contaminated sites. For example, Wellington Shire Council is working on a former gasworks site. Bathurst Regional Council is also remediating a gasworks site (see case study).

Indicator – Number of contaminated sites rehabilitated

All 17 participating Councils reported on this indicator for 2008-09. They reported that 24 sites across the region have been rehabilitated. The data for trend analysis for this indicator is very limited as only one local Council reported on this indicator in 2007-08.

Salinity

Salinity management has traditionally been the role of the agricultural sector and the State Government, through remedial works, education programs and monitoring of river salinity levels.

Councils are starting to address the issue, depending on the current level of risk identified in the LGA and therefore the priority of the issue to the local community. For example, Dubbo City Council has identified urban salinity as an issue for some years. Urban salinity can affect infrastructure such as buildings, driveways, fences and roads, as well as limiting plant growth. Council has therefore invested in a range of management options to effectively monitor and manage salinity in and around Dubbo.

An example of the management options put in place by Dubbo City Council is the Dubbo Urban Salinity Network. Commencing in 2004 and consisting of 129 bores covering the Dubbo urban area, the Network is one of the best monitoring networks in Australia. Groundwater levels and conductivity data are collected monthly to assist Council in effectively managing salinity across the urban area.

Data collected by Dubbo City council has identified salinity issues in areas not previously considered to be at risk. Council is now using the data collected since 2005 to develop groundwater, soils and salinity hazard mapping to assist in future land use planning and salinity management.

The Central West CMA has a salinity management program under the CAP. This program targets the replanting and management of recharge areas through the use of perennial plants and other vegetation on agricultural land. It also addresses improving water efficiency in irrigation areas to limit groundwater recharge in saline areas, and encourages Councils to address urban salinity issues.

Indicator – Extent of salinity affected land rehabilitated

This is a new indicator for 2008-09. The Central West CMA reported that 89,011 ha of salinity affected land in the region has been rehabilitated from 2005-2009.

The Central West CMA, reported in its 2008-09 Annual Report that through its salinity management program, significant inroads had been made in achieving salinity related management targets. This progress is shown in Table 5.

Future challenges

Future challenges related to land degradation across the region include:

- Understanding the nature and extent of erosion across the region
- Obtaining consistent data in relation to some land degradation issues (e.g. potentially contaminated sites)
- The availability of funding to address land degradation issues. Note that the Water Quality and Salinity Alliance is developing a five year plan that will outline actions and can be used to support funding applications.

A further challenge is to ensure that Environmentally Sensitive Area mapping, prepared by the relevant state agencies to highlight the location and diversity of sensitive lands, is used by the Councils to protect rural lands and ecosystem services they provide from

Case Study: Site Remediation of Bathurst Gasworks

Bathurst Regional Council was able to gain funding of \$500,000 from the NSW Environmental Trust to implement remediation works at the former Bathurst Gasworks site, a scheduled site under the *Contaminated Lands Management Act 1997*. Bathurst Regional Council has entered into a Voluntary Remediation Agreement with DECCW which allows remediation works to be undertaken as funding becomes available. The Stage 1 Remediation Project included the removal of more than 190m³ of tarry wastes from a variety of structures on the site such as a tar well and tar separator tanks. The tarry wastes were mixed with fly ash and approximately 80% were treated by a process known as Batch Thermal Desorption. The remaining tarry wastes were treated by cement fixation and stabilisation. All treated wastes were able to be classified as solid waste and were disposed of at the Bathurst Waste Management Centre. The Stage 1 Remediation Project has been successful in removing tarry wastes from the site that were known to be impacting on the surrounding soil and groundwater.

In June 2009, Bathurst Regional Council was awarded \$90,453 to undertake further remediation works at the former Bathurst Gas Works site. The Stage 2 Remediation Project will commence later in 2009 and will include the installation of additional groundwater monitoring wells, laboratory analysis of groundwater samples from the wells and an assessment of two gasometers (or gas holders) present on the site. The results of the Stage 2 Remediation Project will allow Bathurst Regional Council and DECCW to negotiate what further remediation works, if any, will be required at the site.

Table 5 Central West CMA progress against targets for salinity land management

Management Target	Goal	Progress (June 2009)
MTSA2 – Large interception plantings on 30,000 ha of key upland landscapes	30,000 ha	7,346 ha
MTSA3 - Remnant vegetation in 150,000 ha of key saline landscapes	150,000 ha	10,626 ha
MTSA5 – Perennials increased by 100,000 ha in identified recharge landscapes	100,000 ha	56,210 ha
MTSA6 – Water efficient farming systems in 300,000 ha of dryland cropping farming	300,000 ha	46,424 ha
MTSA8 – All 17 Local Government Councils involved in urban salinity management	17 Councils	13 Councils Note other four Councils have their main urban centre outside Central West Catchment boundaries.

Source: Central West CMA Annual Report 2008-09

undesirable settlement and agricultural intensification which could compromise both biodiversity and primary production.



The atmosphere is an essential natural asset that supports the health of the planet and our quality of life. Our atmosphere also regulates the type and amount of radiation that hits the earth's surface from the sun (the ozone layer), regulates temperature (through the 'greenhouse effect') and provides the gases that plants need to grow and animals, including people, need to breathe.

However, there are substances in the air which may impair the health of humans, plants and animals, reduce visibility or change the temperature balance. While many of these substances, including greenhouse gases and some pollutants (such as dust) occur naturally, human based activity has rapidly increased the amount of these substances in our atmosphere, which has resulted in impacts to air quality and changes to our earth's climate system.

These changes include depletion of the ozone layer; while monitoring of the ozone layer shows a recent stabilisation of atmospheric ozone, levels are still significantly below pre-1980 levels. One of the most significant environmental issues facing our community is human induced climate change caused by greenhouse gases, whereby the addition of carbon dioxide and some other gases to the atmosphere is increasing the rate at which our atmosphere warms. As climate change will have an impact on all other themes in this report, greenhouse gases and their impacts are covered in detail in the

Towards Sustainability chapter and are also mentioned in other chapters.

Issue – Air Pollution

Condition Regional Air Quality

Indicator – Number of days that air pollution maximum goals were exceeded

Much of the State-level air quality monitoring is confined to the Greater Metropolitan area which includes Sydney, Wollongong and Newcastle. DECCW has recently begun monitoring at one site in the reporting region, Bathurst; however, ozone and particulates are the only air pollutants measured at this site. Particulates can include particles, dust, smoke, plant spores, bacteria and salt. Particulate matter may be a primary pollutant, such as smoke particles, or a secondary pollutant formed from the chemical reaction of gaseous pollutants.

Human activities resulting in particulate matter in the air include mining; burning of fossil fuels; transportation; agricultural and hazard reduction burning; the use of incinerators; and the use of solid fuel for cooking and heating. Particulate matter can be usefully classified by size. Large particles usually settle out of the air quickly while smaller particles may remain suspended for days or months. Rainfall is an important mechanism for removing particles from the air.

The size of a particle also determines its potential impact on human health. Larger particles are usually trapped in the nose and throat and swallowed. Smaller particles may reach the lungs and cause irritation there. Fine particles can be carried deep into the lungs and irritate the airways. When exposed to particulate pollution, people suffering from heart disease may experience symptoms such as chest pain, and shortness of breath.

Particulate pollution can also aggravate existing respiratory diseases such as asthma and chronic bronchitis (DECCW, 2009).

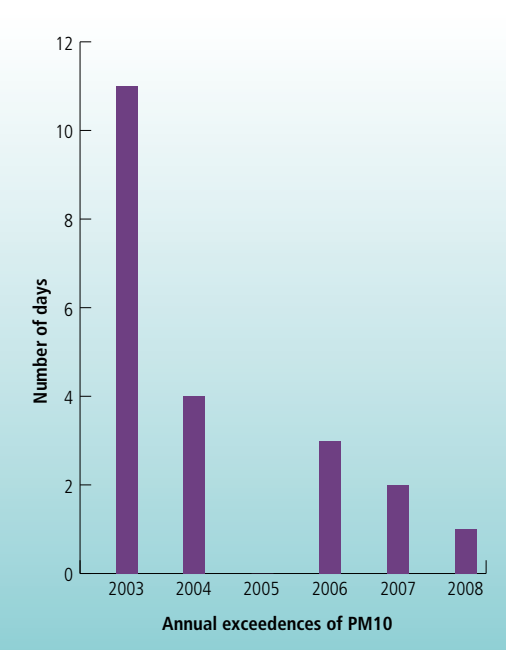
The National Environment Protection Measure (NEPM) sets maximum goals or standards for each pollutant type, except for visibility, which is set by DECCW. When these goals are exceeded, they are recorded. The graph for Bathurst (Figure 6) shows the number of days per year that particulate matter exceeded the standards.

PM10 is used to define air particles that are up to 10 micrometers in diameter and are among the coarser particles that can be measured in air quality analysis. As shown in Figure 6, the number of days that the air pollution maximum for particulates (PM10) was exceeded for 2008 was only one day, slightly less than the two days for 2007. However, as shown in the summary table (Table 6), when comparing 2007-08 with 2008-09 there was an increase in exceedances and thus a worsening trend.

Air Quality Complaints

Indicator - Number of air quality complaints to local Councils

As shown in the summary table (Table 6) at the start of this chapter, the number of complaints to the local Councils about air quality matters (not including odour issues) reduced significantly from 194 complaints in 2007-08 to 66 complaints in 2008-09. This comparison involved the same eleven Councils. Note that



Source: DECCW website

Figure 6 Number of days that air pollution goals were exceeded at Bathurst

odour may have been included in the 2007-08 air quality data.

There were a total of 104 air quality complaints received in 2008-09 from all 17 participating Councils. The types of air quality complaints across the Council areas are shown in Figure 7.

Burn-offs were the main specified air quality complaint with complaints about wood smoke and dust also significant. The high number of air quality complaints for Dubbo appear to due to asbestos complaints, spray painting and emissions from food outlets.

There were 103 air quality complaints received on the EPA Pollution Line across the

BELOW Hazard reduction burn over Bathurst

Table 6 Summary table of indicator trends – Air Pollution

Issue	Indicator	2007-08	2008-09	Trend
Air Pollution	Number of days that air pollution maximum goals for particulate matter were exceeded*	1	5	↓
	Number of premises on the National Pollution Inventory**	42	51	↓
	Number of Environment Protection Licences issued	158	202	↓
	Number of air quality complaints to local Councils	194	66	↑

* Data collected at Bathurst – only monitoring station.

** Compares 2006-07 data with 2007-08

- ↑ improvement
- no or little change
- ↓ worsening trend

Note – the above trends are for data in 2007-08 and 2008-09 from the same sources. They should be read in terms of limitations outlined in the discussion below. Note also that there are some new indicators for 2008-09 for which no comparison could be made with 2007-08. Refer to the Appendix for Councils included in trend data.



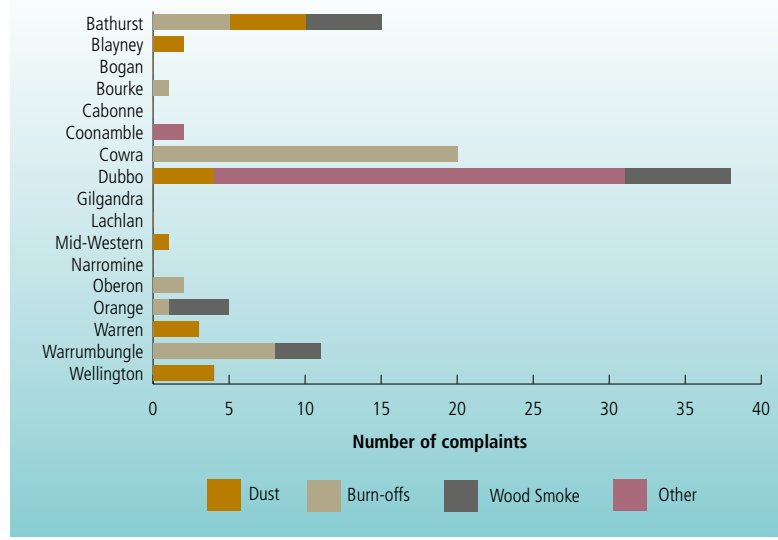


Figure 7 Types of air quality complaints to local Councils

region. Note that some of these could be the same as those sent to the local Councils.

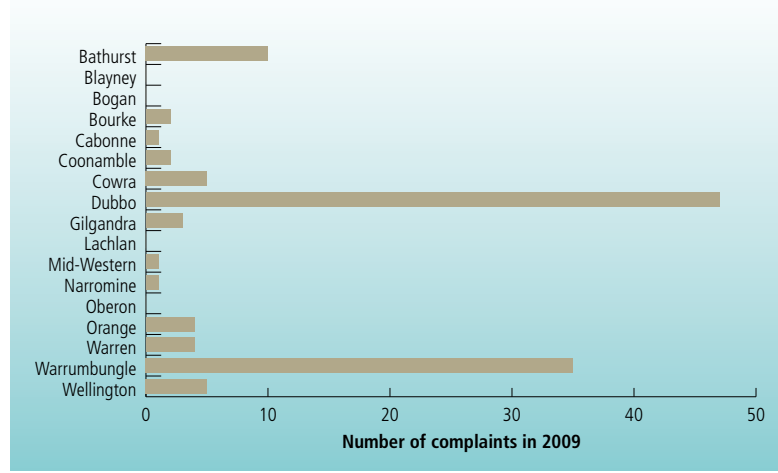
Odour Complaints

Indicator – Number of odour complaints

Some complaints can be related to odour from sources such as food outlets and factories. This is a new indicator as the 2007-08 data for odour complaints were included in air quality complaints.

The 17 participating local Councils reported that there were 120 odour complaints received in 2008-09 across the reporting region. Figure 8 shows the number of odour complaints reported by each Council. The large number of complaints received by Dubbo City Council were mostly

Figure 8 Number of odour complaints received by each local Council



attributed to Council's reticulated sewer system. The large number for Warrumbungle Shire Council relate to keeping animals such as horses in residential areas, and an incident at a local abattoir. Twenty five odour complaints from the region were received by the EPA Pollution Line in 2008-09.

Threat

General Air Pollution Sources

Indicator – Number of premises on the National Pollution Inventory

The National Pollutant Inventory (NPI) lists pollutant emissions from various industrial facility sources, and diffuse sources. Diffuse sources are from small facilities, transport and households.

As shown in the summary table (Table 6), the number of NPI industry pollution emitters in the region (for the same Councils) rose from 42 in 2006-07 to 49 in the last NPI reporting period (2007-08). This trend appears to be a direct result of industrial expansion in the larger centres such as Bathurst, Dubbo and Orange.

The number of diffuse polluters remained constant although this may be due to issues with reporting pollution sources regularly.

Solid Fuel Heaters and Backyard Burning

Domestic wood heating, industrial premises and diesel vehicles are the major sources of particulate pollution in urban areas (DECC, 2006). There is little data available relating to the number of wood heaters in use, although some Councils do have complaint records relating to wood smoke (see Figure 7).

Open burning is also a significant source of particle pollution. It is regulated by the *Protection of the Environment Operations (Clean Air) Regulation 2002*. The Regulation prohibits burning of certain articles and vegetation in urban areas and regulates conditions in which burning can be undertaken in rural areas. The burning of dead and dry vegetation in urban areas of the Central and Western region may be permitted in some circumstances, depending on the policies of the local Council and Rural Fire Service.

Fires

Bushfires emit large quantities of carbon dioxide, other gases, and also significant

amounts of particulates. Bushfire management activities involving the prescribed use of fire (for hazard reduction) are highly regulated, both operationally and with regards to potential environmental impacts. The local area Bush Fire Risk Management Plans contain references to smoke management, and the need for operational plans to consider the effects of smoke on nearby residences, and sensitive locations such as hospitals, aged care facilities, schools and tourist centres. These plans state that all burn plans must include measures to reduce the impact of smoke as far as practicable.

The impact of smoke resulting from wildfire is impossible to manage and may have significant implications for local and regional air quality. Given the weather conditions that are conducive to very high and extreme fire danger across the Central and Western Council areas, the occurrence of wildfire under these conditions will typically result in large quantities of smoke being blown for long distances downwind of the fire. This has the potential to severely impact on air quality within the region, affecting residents, tourists and businesses alike. The composition of smoke from an intense wildfire may be substantially different from that of a low intensity prescribed burn, and exposure may have implications for the health of persons with respiratory illness (DECC, 2006).

Agriculture

Some agricultural activities can impact on the atmosphere, including stubble burning, spray drift and dust caused by tillage. Stubble burning, believed to have returned nutrients to the soil following harvest of a crop, produces smoke and ash across large areas of land as well as releasing large amounts of carbon dioxide. This practice is becoming less favoured as conservation farming techniques promote retention of organic matter. Spray drift from application of herbicides and pesticides, including aerially applied sprays (crop dusting) is penalised under pollution regulation however it still occurs on a regular basis and affects both biodiversity and human health. Ploughing or tilling the soil in dry conditions causes dust, and in the recent dry climate dust storms have been recorded across the reporting area. Dust has significant human health impacts.

The atmosphere surrounding the earth consists of a complex mix of gases that support life on earth by providing air for us to breathe and maintaining a suitable temperature. This balance includes nitrogen (78%), oxygen (21%), carbon dioxide (0.04%), small trace amounts of other gases and water vapour.

Motor Vehicles

Although vehicle numbers and kilometres travelled are increasing, improved technologies and tighter regulatory controls are expected to reduce per capita motor vehicle emissions each year. Vehicle emissions contribute to reduced local air quality due to particulate pollutants, volatile organic compounds and nitrous oxides.

Indoor Air Pollution

Indoor air includes air in homes, schools, shopping centres, vehicles, and indoor workplaces. Australians spend approximately 85% of their time indoors, much of it at home (DECC, 2006). The quality of indoor air depends on factors such as the type of building materials used; the types of products used indoors (including paint, electrical appliances, furniture and cleaning products); the proximity to outdoor sources of air pollution; types of indoor heating or cooling used; building ventilation rates; the use of the building (including whether smoking occurs); and diurnal, seasonal and climatic conditions. Many pollutants, such as nitrogen dioxide, carbon monoxide, fine particles and formaldehyde, can be present at higher concentrations indoors than outdoors. The National Occupational Health and Safety Commission sets exposure standards for workplaces, but there are no Australian standards for indoor air in other settings.

Commercial and Industrial Sources

Indicator – Number of Environment Protection Licences issued

Under the *Protection of the Environment Operations Act 1997* (PoEO Act 1997),



industries over a certain threshold must be licensed to pollute air or water. There are currently 202 active Environment Protection Licences for premises across the reporting area, as issued by DECCW under the PoEO Act 1997. As shown in the summary table (Table 6), there were 158 active licences in 2007-08 thus indicating a worsening trend in the potential for air and water pollution. It also indicates ongoing vigilance of the State Government in managing emissions.

Many of these licenses do not relate to air and a number are issued to Council's own operational facilities such as sewage treatment plants which may discharge to waterways. Smaller industries may also cause pollution, and the local Council has regulatory controls over these premises.

The National Pollution Inventory (see results above) also records emissions for 93 compounds, and is a National Environmental Protection Measure implemented by the national environment department. It includes point source and diffuse emissions, some reported directly by industrial sources and some estimated by the relevant State Government.

Response

Fires

While fires are regulated by both pollution and burning regulations, education plays a key role in the response of local Councils to this issue. DECCW has produced a woodsmoke resource kit for Council officers, targeting improvements in residential wood fire use to limit smoke. Council officers have powers under the PoEO Act 1997 to issue notices regarding smoky fires. Some Councils, such as Bathurst Regional, are also offering rebates to encourage householders to upgrade their older wood heaters to more efficient forms of heating such as gas.

Hazard reduction burns and limiting the impact of smoke from these is managed by Bushfire Risk Management Plans, developed by the local Bushfire Management Committee (BFMC). The BFMCs are comprised of local land managers including local Councils, DECCW, the Land and Property Management Authority (formerly the NSW Department of Lands) and the Rural Fire Service (RFS).

These plans now include assessment and management of environmental assets

(threatened and vulnerable species, significant flora and fauna), as well as human settlement (buildings, properties, houses), economic assets (such as primary production land, commercial forests or tourist destinations) and cultural assets (Aboriginal or non-Aboriginal heritage areas and sites). Education is also very important in reducing this impact, and the media is used in peak seasons to raise awareness of fire risks (advertising, radio announcements, television advertising, risk indicators).

Emission of Air Pollutants

The majority of emissions are regulated by the PoEO Act 1997, and while local Councils have some control over licensed premises in the LGA, many emission sources are managed by State regulation. For example, while motor vehicles continue to contribute a significant source of atmospheric emissions, fuel standards and vehicle technologies are set by various State and Federal guidelines.

Councils may also respond to air quality complaints and issue notices or warnings under the PoEO Act 1997. DECCW has acknowledged that further support is required for Councils to have a role in air quality management, particularly outside of the greater metropolitan area where data is not available from the Daily Regional Air Quality Index (apart from the recently installed Bathurst monitoring site). DECCW has developed education and support material for Council staff to assist with air quality issues, which is available at www.environment.nsw.gov.au/air/index.htm.

Many Councils are also attempting to reduce their own emissions from sources such as their motor vehicle fleet. For example, Dubbo City Council uses E10 in their passenger fleet and is trialing biodiesel in many of its heavy vehicle fleet.

Several Councils are also educating residents about ways to minimize air pollution. For example, Oberon Council provided homeowners with a pamphlet which outlines methods to reduce wood smoke.

Future challenges

Future challenges will include how to manage increased health problems, particularly respiratory if levels of dust and pollen increase due to drier conditions that may arise due to

climate change. Drier conditions could also cause an increase in bushfire events, in both frequency and severity, which will have a significant impact on air quality. An example of a recent fire that had regional air quality implications was the Goonoo Forest Fire in 2007 which burnt through 26,500 ha and lasted for 13 days, covering a large area of the region with smoke.

Following the 2009 Victorian bushfires, there has been significant pressure on the RFS to step up hazard reduction activities, risk assessments and targeting those areas identified as high risk. However, there is a need to consider the balance between safety and biodiversity protection. A challenge will be to incorporate biodiversity considerations into

fire management within local regulators. The challenge is to implement mitigation strategies to reduce the risk to these areas. Communities may not be receptive to taking individual action and other measures can have impacts on land and biodiversity.

Some hazard reduction activities around properties involve the removal of most vegetation, leading to increased erosion and sedimentation and loss of habitat. Increasing the amount of hazard reduction burning will also lead to an increase in the number of days where smoke may impact on local air quality.

A further challenge for Councils is the roll out of educational programs to increase awareness and encourage people to change practices and advise Council of local issues.

Case Study: Cabonne RFS Zone hazard reduction approach

An important hazard reduction approach has been developed in the Cabonne Zone of the RFS. This zone covers the fire districts of Orange, Blayney, Cabonne and Cowra. Following a significant fire event in Goobang National Park in 2001/2002, the local fire management committee reviewed its risk management plan. The Goobang Fire highlighted many shortcomings in the plan including a lack of practical on-ground fire management solutions, poor integration across land tenures and limited community support due to a lack of understanding and input during its formulation. Through the local Bush Fire Management Committee (Canobolas BFMC) a new approach to risk planning was developed that aims to assist in solving these issues.

Two guiding principles have driven this process.

1. A landscape, tenure blind approach to risk management planning. For the first time the performance of agencies, landholders, brigades and the Canobolas BFMC as a whole can be measured and assessed objectively, based on principles that meet community protection and ecological key performance indicators simultaneously.
2. A commitment to a change in the community consultation process. Traditionally agencies have interpreted

community participation as "informing" the public of a pre-determined decision. Canobolas BFMC had taken the approach of "collaborating" with and "involving" the community in developing alternatives and identifying the agreed solution. It held 80 community meetings over an 18 month period, consulting with over 2500 people. This has led to greater levels of problem ownership by all participants and a more durable, workable solution between all parties.

The Canobolas Project has contributed significantly to the future direction of fire risk management planning and the lessons learnt from the application of this process have been included in the NSW Risk Management Planning Guidelines. From its approval in 2004/2005, the implementation of the plan has gained continual momentum resulting in record levels of hazard reduction being completed within the Canobolas Zone in 2007/2008 and 2008/2009.

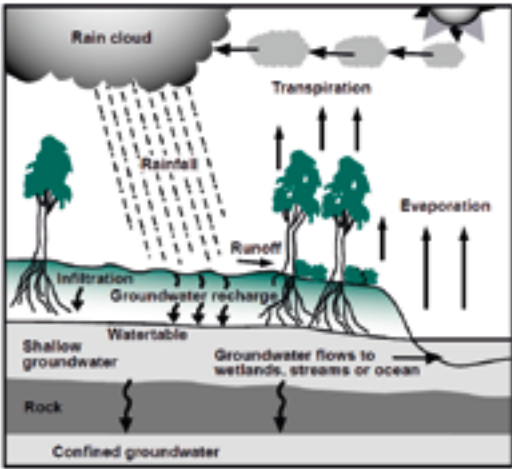
The Canobolas Zone Risk Management Plan was audited at the end of its fourth year of implementation in 2008 and achieved the highest audit result achieved in NSW to date.

A 91.6% implementation across 805 strategies was recorded in the NSW RFS 2008 Annual Report.



This chapter reports on the quality of receiving waters and the consumption of potable water in the reporting region. Indicators have been selected to measure and gauge issues of water quality and water quantity. In this chapter ‘water’ refers to the rivers, aquatic habitats, creeks, wetlands, groundwater, dams, stormwater, potable water and the catchment activities which may impact upon them. Most Councils within the reporting area are their own water authority with the exception of some of the smaller councils such as Wellington, Blayney and Cabonne who are serviced by Central Tablelands Water.

Figure 9 The natural water cycle



Source: Waters and Rivers Commission, 1998

Water is essential for sustaining life. Water exists in our environment in many forms and is constantly moving as part of a dynamic system called the ‘water cycle’ (Figure 9). Water comes to land through rain, flowing over the surface of the earth, pooling in puddles or lakes, moving through creeks, streams and rivers and also sinking into soil (infiltration) and replenishing groundwater. Water from the soil is taken up by plants and used by them to grow. Water leaves plants in the biological process of transpiration and evaporates from soil, freshwater bodies and the ocean to return to the atmosphere, ready to make rain again.

Table 7 Summary table of indicator trends – Water Quantity

Issue	Indicator	2007-08	2008-09	Trend
Dam levels	Average dam levels	20.3%	23.4%	↑
Council water consumption	Area of irrigated Council managed parks, sportsgrounds, public open space	670 ha	583 ha	↑
	Treated water used by Council for irrigation	499 ML	501 ML	→
	Untreated water used by Council for irrigation	211 ML	195 ML	↑
Water extraction	Actual volume extracted through surface water licences	232 GL*	129 GL	↑
Reticulated filtered consumption	Annual consumption (Total from WTP)	26,620 ML	27,468 ML	→
	Annual metered supply	22,180 ML	22,708 ML	↓
	Average annual household use (kL/household)	303 kL	294 kL	↑
	Total number of serviced properties	59,088	62,614	↓

* data is for 2005-06

- ↑ improvement
- no or little change
- ↓ worsening trend

Note – the above trends are for data in 2007-08 and 2008-09 from the same sources. They should be read in terms of limitations outlined in the discussion below.
Note also that there are some new indicators for 2008-09 for which no comparison could be made with 2007-08. Refer to Appendix for Councils included in trend data.

- Waterways across the catchment are important for many reasons:
- They act as a ‘barometer’ for the whole environment. Most activities that occur on the land are ultimately reflected in the health of waterways
 - They support a diverse range of ecosystems
 - The vast majority of our streams and creeks ultimately enter, and impact upon, the integrity of internationally important wetlands such as the Macquarie Marshes
 - Many waterways are in, or discharge into, drinking water catchments.

With the development of the Central West CMA’s CAP (2007), there is greater responsibility as well as greater opportunity for local Councils, government agencies and the community to work collaboratively to look after our waterways.

Issue – Water quantity

Condition

The upper reaches of the Bogan and the Castlereagh Rivers are largely unregulated rivers and there are two main dams regulating flows in the Macquarie Valley. Windamere Dam on the Cudgegong River, upstream of Mudgee has a capacity of 368,000mL and Burrendong Dam located upstream of Wellington at the junction of the Macquarie and Cudgegong River has a capacity of 1,189,000mL (Central West CMA, 2007).
The Macquarie River has a regulated section between Burrendong Dam and Pilicawarrina in the Marshes which includes Bulgeraga, Duck and Gunningbar Creeks. Other water courses that are augmented by river regulation include the Ewenmar system, lower Bogan River, Marra, Crooked and Marthaguy Creeks and the lower Macquarie River (Central West CMA, 2007).

Table 8 Summary table of indicator trends – Water Quality

Issue	Indicator	2007-08	2008-09	Trend
Industrial/ Agricultural Pollution	Number of Erosion & Sediment Control complaints received by Council	29	27	↑
	Total volume of trade waste discharged to sewer	786 ML	676 ML	↑
	Percentage Effluent reuse by Councils	58 %	83 %	↑
Stormwater Pollution	Number of gross pollutant traps installed	27	35	↑
	Total catchment area of GPTs	2,181 ha	4,472 ha	↑
	Volume of litter collected in GPTs	278 t	258 t	↑
Surface & Ground Water Quality	E.coli – Percentage samples exceeding ANZECC guidelines for irrigated crops and dairy	24%	37%	↓
	Total Nitrogen – Percentage samples exceeding ANZECC guidelines for algal growth	0%	2%	↓
	Total Phosphorus – Percentage samples exceeding ANZECC guidelines for algal growth	51%	67%	↓
Town Water Quality	Number of drinking water complaints	429	620	↓
	Number of instances drinking water guidelines not met	70	35	↑
Waste water treatment	Number of septic related complaints	11	18	↓

- ↑ improvement
- no or little change
- ↓ worsening trend

Note – the above trends are for data in 2007-08 and 2008-09 from the same sources. They should be read in terms of limitations outlined in the discussion below.
Note also that there are some new indicators for 2008-09 for which no comparison could be made with 2007-08. Refer to Appendix for Councils included in trend data.



ABOVE Tiger Bay
Wetlands, Warren

Continued demand for surface water and the lack of rainfall (drought) has placed significant pressure on not only town water supplies but also water licences and allocation for agriculture and industry. Many towns across the reporting areas had been on medium to high level water restrictions for a period of years, with some under emergency water controls due to low dam storage levels.

Regulation of river flows can cause a range of impacts including:

- Introducing barriers to fish (and other species) moving through the habitat
- Reducing the peak and trough effect of rainfall and minor floods leaving areas without fresh water for longer periods
- Changing seasonal variation
- Reducing flows across the landscape
- Reducing the amount of water in flood events, limiting the area affected, time affected and depth of water

- Changing water temperatures through shallow water (usually warmer) or dam releases (usually colder)
- Increased channelisation and isolation of rivers from the floodplains.

All other streams within the catchment are unregulated with impacts on the natural flow regime largely a result of extractive demand and the construction of town water supply schemes. The level of impact within the catchment will vary according to extractive demand, available flow and groundwater levels.

Within the Lachlan Catchment, the Lachlan River rises near Lake George and terminates in the Great Cumbung Swamp near Oxley, 1450 river kilometres to the west. There are an unusual number of effluent streams along its lower section including Willandra, Merrowie and Middle Creeks. These effluent streams flow intermittently from the Lachlan River,

delivering water as far as 160-180 kilometres west of the main channel. The Lachlan River itself is only intermittently connected to the Murrumbidgee River when both rivers are in flood. Major tributaries above the township of Forbes include the Abercrombie, Boorowa, Belubula and Crookwell Rivers. The Bland and Goobang Creeks flow into the Lachlan River upstream of Condobolin. The main dam regulating flows in the Lachlan River is Wyangala Dam which has a capacity of 1,220,000 ML, (Lachlan CMA, 2007).

Almost half of the sub-catchments in the Lachlan Catchment have been identified as having high hydrologic stress and ten of these are considered to have high environmental values. In some areas of the catchment, river flow regulation, instream structures and requirements of water for 'beneficial uses' have altered flow regimes, resulting in both higher and lower flows than the natural state and consequently a reduction in wetland health, area and water quality (Lachlan CMA, 2006).

The Western Catchment is not a catchment in the traditional sense, as it encompasses a series of river systems. These include the Barwon-Darling, Culgoa, Paroo, Warrego, Narran, Bokhara, Birrie, Bulloo Overflow and part of the Bogan Rivers. Many of these rivers originate in Queensland with the Condamine-Balonne system contributing 20% and the MacIntyre and Border Rivers contributing 35% of tributary flows entering the Barwon-Darling system. The Great Artesian Basin underlies much of the northern part of the Western Catchment area (Western CMA, 2007).

Groundwater is an important natural resource across the reporting region, and the volume of water stored in the pores and fractures of rocks below the watertable vastly exceeds the volume of fresh surface water resources (Western CMA, 2007).

Indicator – Average dam levels

Dam storage levels indicate both the current rainfall and the pressures that water consumption place on water storages. Four dams in the region – Carcoar, Windamere, Wyangala and Burrendong – were used to indicate dam levels. As shown in the summary table (Table 7), average levels for these dams rose slightly from 20.3% capacity in 2007-08

to 23.4% in 2008-09. The low figures for both years indicate the extended drought across the region.

The fluctuations in dam levels throughout the reporting period should be noted in relation to these average figures. For example, in 2008-09, Windamere Dam was higher than the 2007-08 level, but fell over the summer to less than the 2007-08 level. The Lachlan River was particularly impacted by drought throughout the reporting period.

Water is essential for sustaining life. Water exists in our environment in many forms and is constantly moving as part of a dynamic system called the 'water cycle'

Threat

Irrigation

Irrigation places significant pressure on water resources. While many irrigators have had little to no allocation over the past year, historically over allocation of water licences has seen additional stress placed on aquatic habitats such as the Macquarie Marshes despite the requirement for environmental flows. Within the region however, irrigators in the tablelands have not been subject to the same reductions in water allocations as the slopes and plains. Studies for the Sustainable Rivers Audit, undertaken by the Murray Darling Basin Authority clearly indicated that the more regulated the river system, the more degraded the habitat. Weirs, dams and floodgates all affect fish movements, reduce water quality and impact on ecosystems. The demand for groundwater extraction, particularly for irrigation, is increasing and placing additional pressure on aquifers and ecosystems.

Indicator - Actual volume extracted through surface water licences

As shown in the summary table (Table 7), there was a decrease in the amount of surface water extracted from 232 GL in 2005-06 (the last available statistics) to 129 GL in 2008-09. This reflects the reduced allocations to irrigators as a result of drought conditions.