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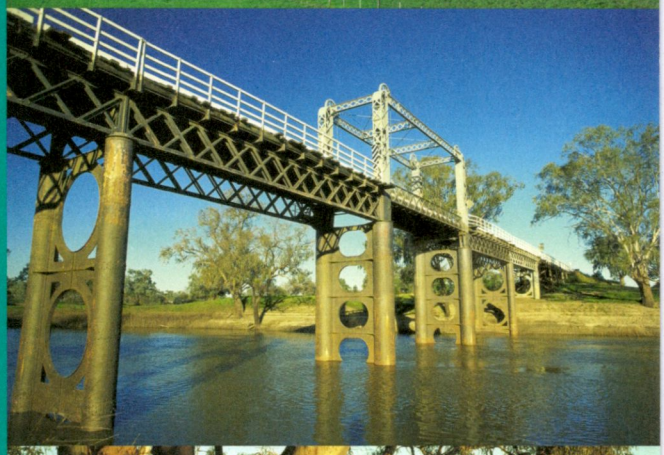


Investing in our catchments

Water quality and its role in river health

Department of **Environment and Conservation** NSW

Restoring and keeping our rivers and waterways healthy is one of the central tasks facing catchment managers. Water quality is one of the fundamental aspects of river health: ecological processes which sustain native fish populations, vegetation, wetlands and birdlife depend on it. And so do our own many uses of water – for irrigation, watering stock, drinking, fishing and recreation, and to meet cultural and spiritual needs.

In New South Wales, Catchment Management Authorities are playing a vital role in protecting the health and integrity of both our landscapes and waterways. The Catchment Action Plans they are developing and the associated on-ground investments can make a big contribution to protecting water quality. Actions targeted to improve water quality in particular problem areas can also benefit other aspects of river health, such as biodiversity.

Working together

The Department of Environment and Conservation (DEC) has experience and expertise in assessing and advising on water quality and river health in NSW. We have developed a range of tools and models to assess and manage the health of waterways. DEC can advise Catchment Management Authorities (CMAs) on:

- the best ways to assess and monitor the condition of water quality and river health
- the risks and threats to water quality, including the use of models on how the system works and what is driving water quality issues
- the links between water quality, and flow and river health
- identifying which investment and actions will give the best return in improving water quality, river health and aquatic biodiversity.

DEC can help CMAs focus their investment to get the best value for water quality and river health, as well as meeting other community goals. DEC will work with CMAs to develop service agreements identifying these contributions.

By building on work to date, CMAs will be able to get the most effective investment on the ground quickly.

Water quality framework

National Water Quality Management Strategy

All States and Territories and the Commonwealth have agreed on a national strategy for achieving best practice management of water quality: the National Water Quality Management Strategy. Under the strategy, 'water quality' is defined as the physical, chemical and biological attributes and/or condition of water that affect its ability to support certain values and uses.

The strategy sets out a process for communities to agree on a range of values and uses for their waterways (such as protection of aquatic ecosystem health and drinking water) and the water quality criteria needed to support them. Used together, the values, uses and supporting criteria provide practical tools for managing water quality.

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000; the '*ANZECC Guidelines*') is the core reference manual for assessing and managing water quality under the strategy. Prepared by scientists from across Australia and New Zealand, the guidelines are used by water managers to assess whether the quality of a water source is good enough for a range of desired community uses. These include human consumption, recreation, food production and maintaining aquatic ecosystem health.

NSW community values and water uses

Consistent with the national strategy, NSW has identified Water Quality Objectives (WQOs) which reflect the community's values and uses for its waterways. This involved extensive consultation with communities in catchments across the State in 1998-99. For some coastal catchments, the Healthy Rivers Commission has further confirmed or refined the WQOs.

WQOs recognise the community's values for water endorsed by Government ...

... including protection of aquatic ecosystems, visual amenity, secondary and primary recreation, livestock watering, irrigation, homestead, drinking water and aquatic foods.

... and the water quality needed to support those values.

For each of those values, nationally agreed guidelines and criteria help to determine the water quality that will protect it. The central reference is the *ANZECC Guidelines*.

The WQOs and *ANZECC Guidelines* provide long-term goals for water quality. They help us assess the state of our catchments, identify and prioritise risks and threats, develop management action plans, and direct on-ground investment to deal with water quality 'hotspots'.

NSW standards and targets

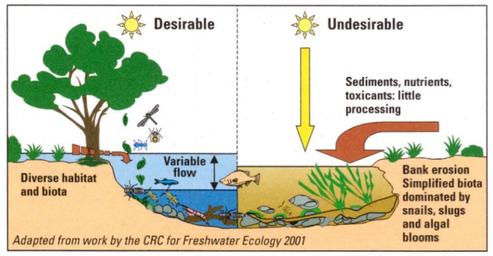
The Natural Resources Commission (NRC) is developing statewide standards and targets for managing natural resources. These will take into account the community's established values and goals for natural resources, including those for water. The Catchment Action Plans (CAPs) being developed by CMAs will include regional targets consistent with the statewide standards and targets prepared by the NRC.

Managing catchment water quality and river health

Good water quality and healthy aquatic ecosystems depend on each other. By recognising the factors that affect water quality and river health, we can target management of land, vegetation and rivers to achieve such community goals as supporting economic, cultural and recreational uses, and maintaining healthy aquatic ecosystems. See the section 'What drives water quality in our catchments?' for more.

A review of the types of activities in the catchment can identify those likely to generate pollutants or pose other risks to water quality. This can help CMAs target action and investment to areas where they will be the most effective in protecting water quality, as well as bringing other environmental benefits.

Conceptual models, such as the cross-section of a stream shown below, can be used to identify and simplify the cause-effect relationships that influence water quality and river health. These models complement existing water quality data or can be applied even where there is no data. By using them to identify risks, the on-ground actions needed to support or improve water quality can become clearer.



Adapted from work by the CRC for Freshwater Ecology 2001

Building on work to date: Catchment Blueprints

Catchment Blueprints were developed by the former Catchment Management Boards to set priorities for managing natural resources in each NSW catchment. Much of this work used WQOs and the *ANZECC Guidelines* as benchmarks for water quality. This may be useful for CMAs preparing their CAPs as the following examples show:

- Salinity assessments of western NSW catchments used WQOs and the *ANZECC Guidelines* to develop end-of-valley salinity targets. Meeting these targets will be consistent with supporting and protecting the use of water for irrigation and drinking, and aquatic ecosystem health values.
- The Catchment Blueprint for the Lachlan River set a 10-year target to reduce turbidity in upland landscapes by 10%. Management actions to achieve this target include maintaining existing native riparian vegetation and establishing additional native vegetation along 15% of 'priority' streams.

Building on work to date: assessment and monitoring

The DEC can advise CMAs on the design of water quality monitoring programs and/or how to assess and interpret river health using existing data. For example, DEC is experienced in using AUSRIVAS, a rapid assessment technique that is able to evaluate water quality and river health where there is little existing information.

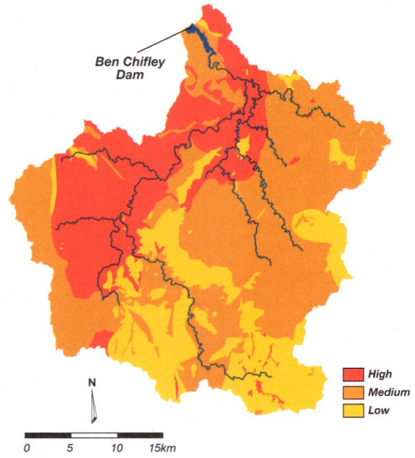
DEC has also been working with the Murray-Darling Basin Commission on the Sustainable Rivers Audit. This aims to determine the ecological condition and health of river valleys in the basin, give us a better insight into the variability of river health indicators (such as fish, macroinvertebrates and hydrology), and detect trends in river health over time. This more comprehensive picture of river health will be vital in managing natural resources in the basin.

Building on work in inland catchments

In the catchment of the Ben Chifley Dam near Bathurst, local communities, the Australian National University, DEC and DIPNR have collaborated to develop a tool to help water quality managers in their decision-making.

The project measured the input of nutrients from different parts of the catchment into the reservoir, how they moved within the water storage, and the main factors which stimulate problem algal blooms. Management options can be modelled at different scales (individual river reach or sub-catchment) to identify where significant pollutants are generated and transported and hence where to target action.

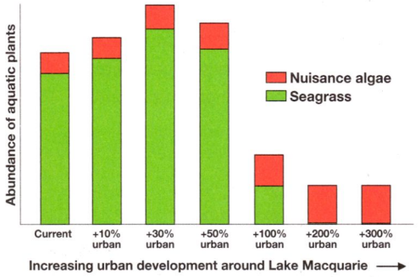
The Chifley decision support tool is a good example of new and useful techniques for prioritising catchment management works on sediments and nutrients which can be applied to similar environmental issues in other NSW catchments.



The Chifley decision support tool is able to model a range of water quality management factors, such as the risk of gully erosion (above).

Building on work in coastal catchments

DEC has been working with councils and CSIRO to help predict the impacts of different development scenarios around coastal lakes. The Sustainable Loads Model has been able to quantify the relationship between catchment activities and the ecological responses within Lake Macquarie near Newcastle. The model can be used to explore the effects on nutrient loads in lakes of different developments within their catchments. Nutrients are the underlying cause of periodic problem algal blooms in most lakes.



The Sustainable Loads Model can predict the impact of nutrient loads from different levels of development on the health of coastal lakes.

The DEC Sustainable Loads Model has the potential to provide catchment managers elsewhere with a tool to assist them plan and achieve sustainable development.

Building on work to date: economic tools

Economic tools and incentives provide further scope to achieve cost-effective water quality outcomes. DEC has been developing economic tools for industry, councils and the broader community to achieve environmental outcomes through initiatives such as load-based licensing, green offset schemes and the Hunter River Salinity Trading Scheme.

Offsets, in particular, can be a useful tool for managing environmental quality in catchments. 'Green' offsets require developers to offset the environmental impacts of their developments by cutting other sources of pollution nearby.

DEC is currently piloting a number of programs to demonstrate how offsets can work on the ground. A project in Sydney's South Creek is testing a framework for trading between diffuse and point sources of nutrient pollution. DEC is also applying the offsets approach to manage salt loads in western NSW. In this project, licensed premises are offsetting salt emissions by investing in works that reduce salinity from diffuse sources.

DEC can give CMAs practical advice on where economic tools can be effective in their own catchments.

What drives water quality in our catchments?

Changes in water quality can be caused by pollution from both point sources (such as industrial and treated sewage discharges) and diffuse sources (such as stormwater runoff from agricultural and urban areas). There is also a growing understanding that water quality is closely related to overall river health, which is affected by changes in catchment condition, channel form, riverbank and floodplain condition, flow variability and in-stream habitat.

Factors that drive water quality	What CMAs can do
Catchment condition Physical factors (such as climate, geology, slope and soil type) combine with the consequences of past and current land uses to affect the rate and volume of runoff from land and the flow in the waterway. Vegetation cover, ground cover, cropping and grazing practices affect how much soil, nutrients and other pollutants are carried by runoff into the waterway.	CMAs can use information on the soil type, classification and use of land to identify high-risk areas requiring management. These areas can be targeted for extension and incentives to refine understanding and improve uptake of good practices, and to develop property vegetation plans.
Channel form River channels are naturally dynamic along their length, but certain changes to land and river management can lead to a complex, healthy and productive system becoming a simple, degraded, unproductive channel, unsuitable for many uses. Water quality can be affected by the resulting changes in the characteristics of flow, riverbanks and floodplains.	CMAs can use information on erosion hotspots and channel health to help decide where to invest in restoring form and function to river and stream channels. Investment could include restoring native vegetation, modifying or removing artificial structures that disrupt channel form and function, and managing flow regimes.
Pollutants Pollutants can damage rivers and wetlands. Point sources of pollution are regulated by DEC and local councils. However in many catchments, diffuse sources are the major contributors of pollutants to waterways.	CMAs can use a range of information to identify the areas that contribute most to diffuse pollution. Programs to reduce the input of pollutants to waterways can focus on incentives and training for farms and urban areas to improve stormwater management and target reducing other priority pollution sources.
Riverbank and floodplain vegetation The presence and quality of riverbank and floodplain vegetation can significantly influence in-stream water quality. The trees, shrubs and grasses of riverbanks, floodplains and wetlands filter out sediments, nutrients and other pollutants by intercepting runoff from the land. They also physically stabilise the bed and banks of channels and provide shade that reduces the light available to stimulate nuisance algal growth in the water. The branches and leaves that fall from streamside vegetation provide important habitat for river life and contribute to the food chain. Floodplains form an essential part of the river system. Floods transport leaf litter, sediments, fish and other creatures in and out of billabongs, anabranches and other wetlands. These processes play a key role in maintaining water quality.	CMAs can play a key role in retaining and increasing native riparian vegetation and maintaining healthy floodplains by working with landholders to develop property vegetation plans, improve understanding, and provide incentives promoting vegetation and floodplain management that contributes to river health.
Flow variability A variable flow of water is important for maintaining habitat, aquatic biodiversity, healthy wetlands and floodplains, channel form and the stability of riverbanks. Retaining or restoring natural peaks and other features of natural flow variability also improves water quality, helping to prevent the development of algal blooms.	CMAs can help to maintain and restore variable flows by contributing community knowledge to implementing environmental flows locally, as well as by buying and managing water for specific environmental and/or water quality needs.
In-stream habitat, biodiversity and ecological processes River plants, snags, channel form, and different-sized sediments directly support fish and other aquatic life. Diversity in a river's physical habitat supports diversity in river life. This in turn influences how pollutants are processed and the water quality that results from in-stream ecological cycles.	CMAs can gain water quality benefits by maintaining and improving in-stream ecological processes. This can include retaining and increasing riverbank and floodplain vegetation, promoting the retention of snags, managing invasive weeds, ensuring a variable flow and reducing the impacts of weirs and other structures.

Contacting the DEC

Each CMA has a designated DEC contact officer available to provide the key point for coordination and interaction between DEC and the CMA. These contact officers can provide further details about the tools outlined in this leaflet.

Simply call DEC Pollution Line on 131 555 for details of your contact officer.

Reference

ANZECC/ARMCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian & New Zealand Environment & Conservation Council and Agriculture & Resource Management Council of Australia & New Zealand

Acknowledgements

The conceptual model figure was adapted from work done by the CRC for Freshwater Ecology (CRCFE) during development of a framework for the Sustainable Rivers Audit 2001.

Ben Chifley Dam Catchment Decision Support System was developed by the Australian National University's Integrated Catchment Assessment and Management Centre (iCAM), in partnership with DEC, Department of Infrastructure, Planning and Natural Resources (DIPNR) and Ben Chifley Catchment Steering Committee.

Photos:
Front cover (top to bottom): DEC; Tourism NSW; Tourism NSW; DIPNR; Tourism NSW

Inside (left to right): Tourism NSW; Tourism NSW; Landcare NSW; iCAM; CRCFE; Landcare NSW

Published by:

Department of Environment and Conservation
59–61 Goulburn Street, Sydney
PO Box A290, Sydney South 1232
Phone: (02) 9995 5000 *(switchboard)*
Phone: 131 555 *(publications and information requests)*
Fax: (02) 9995 5999
TTY: (02) 9211 4723
Web: www.environment.nsw.gov.au
Email: info@environment.nsw.gov.au

ISBN 1 74137 036 1
DEC 2006/510
First published October 2004; reprinted September 2006

Printed on recycled paper