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Case Study 22

The Goulburn Broken Water Quality Strategy

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ABOUT THE GOULBURN BROKEN CATCHMENT

The Goulburn Broken catchment covers 2.3 million ha in south eastern Australia. Approximately 2/3 of the catchment is cleared for agriculture and the balance is forested. About 270 000 ha is developed for irrigation, mainly irrigated perennial pasture. Rainfall varies substantially, from 1600 mm/yr in the Great Dividing Range to less than 450 mm/yr on the Murray Plain. Although the catchment is only 2% of the Murray Darling Basin, it supplies 11% of the Basin's streamflow. The upper parts of the catchment produce a water resource of 2 800 000 ML which is utilised for a variety of purposes in irrigation districts and by other users further to the west and downstream along the River Murray. The network of food processing industries in the Goulburn Valley is recognised as one of Australia's "food bowl" centres.

WHY HAVE A STRATEGY?

The Goulburn Broken catchment is one of three high priority catchments targeted by the Murray Darling Basin Ministerial Council's Algal Management Strategy to develop and implement catchment management strategies addressing algal and nutrient problems.

The Goulburn Broken Water Quality Working Group (WQWG) and the Catchment Management Authority's River Environment and Water Quality Committee has coordinated development of a water quality management strategy for the Goulburn Broken Catchment. The Strategy was finalised in April 1997.

NUTRIENTS

Reports on catchment water quality as measured against the concentration of the plant nutrients, nitrogen (N) and phosphorus (P), indicate a progressive decline in water quality down the catchment. Excessive quantities of these nutrients can lead to excess growth of nuisance aquatic algae, including blue green algae.

Since 1993/94 the Goulburn Broken Catchment has exported an average of 366 t of phosphorus and 2630 t of nitrogen per year to the Murray River. The nutrient export figure varies from year to year depending on stream flows. High nutrient loads are exported in years of high flow (wet years), while lesser loads are exported in years of low flow (dry years).

BLUE GREEN ALGAL (CYANOBACTERIA) BLOOMS

A result of the increased levels of the nutrients in our waterways has been the increased recording (and occurrence) of blue green algal blooms in the catchment. Up to mid 1995, 61 major algal blooms had been recorded in the Goulburn Broken Catchment. Blooms in Lake Mokoan have received wide publicity, and other blooms have been recorded in major irrigation storages, urban storages, farm dams and other water bodies.

DEVELOPING A WATER QUALITY STRATEGY

Preparation of the strategy has involved

- establishment of a Water Quality Working Group
- community consultation and involvement
- implementation of an extension program
- audit of existing water quality information
- identification and prioritising of major sources of nutrients (Table 1)
- identification of best management practices to manage nutrients.

Some nutrient sources, for example urban stormwater and septic tanks, do not appear to have a high significance from a regional perspective, but are recognised as being important at a local level. Seasonality of inputs varies across sources. Nutrients from irrigation drains, in particular, reach waterways in summer when algal bloom risks are higher. Other nutrient sources contribute during the wetter late winter-spring period.

TABLE 1
Key nutrient sources (estimated) - typical year

Nutrient Source	Phosphorus (TP) tonnes		Nitrogen (TN) tonnes	
Irrigation drains	169	47%	619	21%
Dryland - diffuse	110	30%	1866	65%
Sewerage treatment plants	50.5	14%	184	6%
Intensive animal industries (fish farms)	30	5%	141	5%
urban stormwater	12.3	3%	70	2%
Total	371.8		2880	

These figures are derived from a combination of nutrient auditing and modelling using AEAM (Adaptive Environment Assessment and Management) and CMSS (Catchment Management Support System) models (O'Shannassy et al 1994).

THE STRATEGY.

Objectives:

- minimise blue green algae outbreaks in the Goulburn Broken catchment
- minimise nutrient contributions to the River Murray
- enhance the riverine environment.
- foster regional development (by ensuring quality water to industry, agriculture and the community) and
- minimise/optimize water treatment costs.

The Strategy concentrates on phosphorus reduction activities. At the time of its preparation this was seen as the best way of reducing the risk and impact of blue green algal blooms. Opportunities to reduce nitrogen inputs will be pursued when they are cost effective, can be associated with phosphorus management and can be shown to reduce the risk of blue green algal blooms.

These objectives will be achieved by applying a number of principles to water quality management, including:

- implementation of an integrated and coordinated approach
- adoption of nutrient best management practices by resource managers
- summer nutrient load and concentration reductions are the first priority to reduce risk and impact of blooms
- adaptive approaches to take into account new, or enhanced, scientific knowledge
- non structural measures, such as municipal planning schemes, to complement structural works
- cost effectiveness - nutrient management will only be implemented where it is cost effective
- nutrient balance and sustainability - long term sustainability requires that nutrients applied to land should equal nutrients removed in produce
- cooperative approaches are preferred over regulatory approaches
- sub catchment approaches - local communities will develop and implement detailed nutrient management plans
- monitoring and accountability - monitoring programs will be implemented; results and works activities will be regularly reported to the catchment community and key funding organisations
- responsibility to carry out specific actions will be clearly assigned

- equity - one in, all in; all sectors in the catchment will be required to achieve management targets
- no net increase of nutrients - new developments cannot increase nutrient loads leaving the catchment.

The Goulburn Broken Catchment Management Authority has responsibility for implementing this strategy. The Authority has delegated this responsibility to its Implementation Committees. The Authority's River Environment and Water Quality Committee will oversee implementation. The preferred strategy will be implemented via a number of coordinated programs that have been integrated across a wide range of land and water management programs underway in the catchment. The 20 year Strategy implementation period commenced in 1997.

WHAT WILL BE DONE.

Coordinated implementation of the strategy over a twenty year period will reduce potential catchment phosphorus loads by 65% at an estimated cost of A\$150M (discounted at 8% over 20 years) by:

- reducing nutrient loads from irrigation drains, with farmers adopting farm irrigation water reuse systems, drain diversion and fertiliser best management practices. Point source inputs to drains will be managed.
- minimising loads from sewage treatment plants.
- reducing sediment movement and P availability in streams by improving stream condition and installing filter strips along streams
- reducing the output of nutrients from fish farms
- ensuring all new developments in the catchment recognise water quality and nutrient issues
- together with a process for coordinating strategy implementation, monitoring and evaluation.

The strategy proposes that costs be shared between Federal and State Governments (17% each) and catchment stakeholders (66%). Cost sharing is derived from polluter and beneficiary pays principles. Catchment stakeholders will contribute towards works activities and will provide the full cost of on going operations and maintenance of these works. Contributions from downstream beneficiaries will be made via State and Federal Governments. A study of economic benefits vs costs indicates a benefit:cost ratio of between 1.1 and 2.2. The benefits do not include environmental or public health benefits nor do they include intangibles such as the continuing ability to export manufactured products or maintenance of the catchment's Clean and Green image.

At the end of the 20 year implementation period annual P loads in the Goulburn River at McCoys Bridge, and in the Broken Creek at Rices Weir, will be reduced by an estimated 229 t (current 291 t) and 56 t (currently 61 t) respectively. (These figures are based on CMSS modelling).

Strategy targets will be measured in terms of best management practice (BMP) adoption levels.

IMPLEMENTATION OF STRATEGY

The Strategy is now being used as the basis for action in the catchment. For example:

- Goulburn-Murray Water, which manages irrigation areas, is developing drain management strategies

- Urban Water Authorities are implementing strategies to deal with discharges from sewage treatment plants (for example Goulburn Valley Water is undertaking a \$3M upgrade to their Shepparton Sewerage Treatment Plant. This will reduce P discharges by 80 to 90%)
- waterway managers are implementing waterway management programs.

STRATEGY ASSUMPTIONS AND HARD QUESTIONS.

During Strategy development we had access to a large amount of scientific information about nutrients and nutrient management options. Despite this we had to try to answer a number of difficult questions. We found that there was often no definitive scientific answer to our questions and in the end we had to make certain assumptions and move on, recognising that the Strategy would have to be adaptive to incorporate new knowledge as it came along. Some of these questions, or assumptions, included:

- reducing phosphorus will reduce the risk and impact of blue green algal blooms
- how much do phosphorus levels need to be reduced to give a desired outcome
- phosphorus from all sources has equal bioavailability
- what happens to the phosphorus stored in sediment in lakes and rivers?

Research programs underway will provide answers to some of these questions. The catchment community accepts, that once these results are known, the Strategy may requires alteration, or adaptation, to take research results into account. The group overseeing Strategy implementation has the role of achieving this.

CONCLUSION

Development of an integrated and coordinated water quality strategy for the Goulburn Broken catchment has been completed and implementation is now proceeding. Substantial reductions of nutrient outputs have been achieved from sewage treatment plants, but it is too early to determine whether objectives are being met.

RELEVANT PUBLICATIONS

Goulburn Broken River Environment and Water Quality Committee (1997). Goulburn Broken Catchment Water Quality Strategy - a Component of the Goulburn Broken Regional Catchment Strategy.

Government of Victoria (1995). Nutrient Management Strategy for Victorian Inland Waters.

Murray Darling Basin Ministerial Council, (1994). Algal Management Strategy.

O'Shannassy, K., Cottingham, P., Dunn, R. (1994). The Use of Decision Support Systems to Assess Nutrient Export from the Goulburn-Broken Basin. Water Ecoscience Report 2/94. ISBN 0 7306 60451