

AUDITOR-GENERAL'S REPORT PERFORMANCE AUDIT

Protecting our Rivers Follow-up of 2003 Performance Audit



The Legislative Assembly
Parliament House
SYDNEY NSW 2000

The Legislative Council
Parliament House
SYDNEY NSW 2000

In accordance with section 38E of the *Public Finance and Audit Act 1983*, I present a report titled **Protecting our Rivers: Follow-up of 2003 Performance Audit**.

A handwritten signature in black ink that reads 'Peter Achterstraat'.

Peter Achterstraat
Auditor-General

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Foreword

Pollutants reach rivers from many sources. They come from run-off from agricultural land, drainage from irrigations schemes, contamination from industries, sewage overflows, urban stormwater systems and other sources across the catchment.

Polluted water can affect the health of humans and of crops, farm livestock, river plants and animals. For example:

- salt can damage crops, soils, water supply systems and makes water unsuitable to drink
- muddy water can suffocate life in a river, block irrigation sprays and pipes, and also leave water unsuitable to drink
- nutrients, such as phosphorus and nitrogen from agricultural fertilisers, can encourage the growth of blue-green algae, which may cause serious health problems to humans and animals.

There are many other pollutants that affect water quality, including acidic substances, metals, pesticides and other chemical residues.

This audit follows up our 2003 performance audit 'Protecting our rivers' which examined whether the water quality of NSW rivers was being efficiently and effectively protected from unacceptable levels of pollution.

I believe this report will help to inform the public of the complexity and challenges that lie ahead and highlight the importance of systematically monitoring the river health and water quality of New South Wales rivers.

Peter Achterstraat
Auditor-General

May 2008

Executive summary

The focus of our audit

Our 2003 'Protecting our rivers' audit examined whether the water quality of New South Wales rivers was efficiently and effectively protected against unacceptable levels of pollution. In this follow up audit we examined whether there had been progress in addressing the recommendations of our 2003 audit. We also examined whether a monitoring system had been established to measure river health and water quality of NSW rivers.

By the time of our audit in 2003, agencies had been taking action to reduce the quantity of pollutants reaching rivers for more than 20 years. They considered that their actions had been effective. But they could not measure the effectiveness of their actions in every river system, as they had not established a comprehensive monitoring system to measure water quality or river health.

Our 2003 audit found there were significant gaps in the monitoring and evaluation of water quality. It was not possible, using the information available, to gauge the health of all rivers, the main risks to rivers or strategies for managing those risks. We also considered that the existing arrangements for managing water quality lacked the structure to ensure success. There was no lead entity to coordinate efforts to protect river water.

We recommended that the Government establish a lead entity with an appropriate governance structure and resources for implementing the State's objectives for water quality. The lead entity should develop:

- a framework for coordinated management of rivers
- a State river health and water quality strategy including a monitoring system for river water quality
- a plan to limit and reduce pollution in rivers, particularly diffuse source pollution.

We also recommended that the Government establish an independent environmental audit of river water quality.

Audit opinion

At the time of our 2003 audit agencies were unable to measure the water quality in NSW rivers as they had not established a comprehensive and ongoing monitoring system for water quality. Agencies are now developing a monitoring system to measure the progress against the State Plan 2006 target to improve the condition of riverine ecosystems by 2015. It may not be possible to identify an overall trend in the condition of riverine ecosystems by the State Plan target date of 2015. This is because riverine ecosystems do not respond rapidly to change in the environment. A long period of time is required to collect sufficient data to establish a baseline for all indicators being used and to determine trends, particularly given the prolonged drought.

The State Plan 2006 river ecosystems target to improve the condition of riverine ecosystems by 2015 will provide a clearer basis for agency accountability than the previous guidelines on selection of water quality and river flow objectives.

Agencies are now implementing the recommendations of our 2003 audit as part of their program to achieve the State Plan 2006 target for the condition of riverine ecosystems.

The Government has appointed a lead entity, the Natural Resources and Environment CEOs Cluster Group (NR&E CEO Cluster Group) to coordinate achieving the 13 natural resource targets in the State Plan 2006, including the target for the condition of riverine ecosystems. The NR&E CEO Cluster Group is striving to achieve this target. In our view the NR&E CEO Cluster Group lacks the governance structure and resources for the long program required as it has no direct funding and cannot direct agency priorities. However, the agencies advise that the NR&E CEO Cluster Group is responsible to the Premier for achieving the natural resources targets. The CEOs on the NR&E CEO Cluster Group will agree on allocation of tasks to agencies and the individual CEOs can negotiate priorities and budget allocations for their tasks within their own agencies.

The Government responded to our 2003 audit recommendation to establish an independent environmental audit of river water quality. In late 2003 it established the Natural Resources Commission (NRC) to undertake independent audits of natural resources. The NRC is currently required to report against the 13 statewide natural resources targets in the State Plan 2006. The NRC has legislative capacity to undertake audits of other natural resource management plans and issues, as required by the Minister. We believe that the NRC would be an appropriate entity to undertake such reviews.

Key Audit Findings

Chapter 1: Measuring river health and water quality

Can NSW agencies now measure whether there has been an improvement in the river health and water quality of NSW rivers?

Agencies are establishing a monitoring system for the State Plan 2006 target: 'By 2015 there is an improvement in the condition of riverine ecosystems'. This target is a further development from the water quality and river flow objectives that applied at the time of our 2003 audit. The monitoring system will measure trends in the condition of river ecosystems, initially using fish, macroinvertebrates and hydrology indicators. The condition of riverine ecosystems indicates the overall condition and health of the river.

The approach of monitoring the condition of riverine ecosystems to indicate river health was developed for the Murray Darling Basin Commission's Sustainable Rivers Audit of rivers in the Murray Darling Basin, which commenced in 2004.

NSW agencies have implemented the Sustainable Rivers Audit approach within the river valleys of the Murray Darling Basin. They have commenced a program of monitoring the State's coastal rivers using the same methodology. Additional indicators of river health are being developed to add to the Sustainable Rivers Audit approach - riverine vegetation and river physical form. They are also implementing a new water quality monitoring program that will eventually provide a statewide coverage for turbidity, nutrients and salinity.

It is not yet clear how long it will take to demonstrate valid trends in the overall condition of riverine ecosystems. Riverine ecosystems do not respond rapidly to change in the environment and are affected by variability of climate, such as the severe drought since 2001. Agencies expect to take until about 2012 to effectively establish a meaningful baseline for indicators being used for assessing river health, and then further time for monitoring and analysis to establish the trend. Monitoring that is underway is expected to present a snapshot of the current condition of river systems across NSW and for each Catchment Management Authority area by the end of 2008.

**Chapter 2:
Progress in
addressing the
recommendations of
the 2003 audit**

Has there been progress in addressing the recommendations of the 2003 audit?

We made a number of recommendations in our 2003 audit to improve the protection of water quality of NSW rivers. The Government and the agencies are now implementing our 2003 audit recommendations as part of the program to achieve the State Plan 2006 target to improve the condition of riverine ecosystems by 2015.

The 2003 recommendations (in bold) and our findings on the actions being taken to implement them are:

We recommended that the Government establish a lead entity to implement the State's objectives for river health and water quality.

The Department of Environment and Climate Change has overall responsibility for leading the response on Priority E4 of the State Plan 2006 and reporting on progress. Priority E4 contains 13 State Plan natural resource targets, including the target to improve the condition of riverine ecosystems by 2015. The Natural Resources and Environment CEOs Cluster (NR&E CEO Cluster Group) is lead entity/coordinator for all 13 natural resources targets.

and that the lead entity:

- **develop a framework for coordinated management of river health and water quality**

The Water CEOs Group (now replaced by the NR&E CEO Cluster Group) agreed to a draft framework document that broadly describes the responsibilities of agencies involved in managing river health and water quality.

- **develop a strategy to define the role of the water quality objectives, call for a formal risk assessment of rivers and strengthen systems for water quality monitoring**
 - the State Plan 2006 target includes a target for the condition of riverine ecosystems and guidelines have been issued to define the role of the water quality objectives
 - no formal risk assessment of NSW rivers has been undertaken since 1997
 - the agencies are developing a comprehensive statewide monitoring system for the State Plan 2006 target for river health that they expect to be fully operational in 2008-09. Valid trends may not be evident in all indicators by 2015 - the State Plan 2006 target date to achieve improvement.

- **develop a plan for pollution, particularly diffuse source pollution.**

The agencies have advised that diffuse source pollution is the main source of pollution to rivers remaining to be addressed. The lead entity has prepared a statewide draft plan to limit and reduce diffuse source pollution from priority sources across NSW catchments as part of the program to achieve the State Plan 2006 target for the condition of riverine ecosystems. This plan will build upon existing programs and will initiate and coordinate new management actions across the State. There has also been significant action to address urban stormwater management.

We also recommended that the Government establish an independent environmental review of river health and water quality.

Our 2003 audit noted that no entity regularly audited river water quality. In late 2003 the Government established the Natural Resources Commission (NRC). The NRC currently audits the effectiveness of the Catchment Management Authorities' implementation of their catchment action plans. It has been tasked with reporting against the 13 statewide natural resources targets in the State Plan 2006. The NRC has legislative capacity to undertake audits of other natural resource management plans and issues, as required by the Minister. We believe that the NRC would be an appropriate entity to undertake such reviews.

Response from the Department of Environment and Climate Change

Thank you for the opportunity to provide a formal response to the Follow up of the 2003 Performance Audit 'Protecting our rivers'.

As you would be aware the Department of Environment and Climate Change (DECC) has worked closely with the Auditor-General's Office as they prepared this report. We believe the report is now a fair and reasonable account of the general issues involved in managing and monitoring river health and water quality in NSW.

However, it has been difficult to reflect the full extent of the governance changes and technical challenges faced by Government agencies since the 2003 Audit. Soon after the 2003 Audit the Government introduced substantial reforms to natural resource management in NSW, which included the establishment of the Natural Resources Commission (NRC) and the establishment of Catchment Management Authorities (CMAs). The NRC was charged with developing standards and targets for natural resources management (including the target for riverine health) for Government's consideration and auditing the Catchment Action Plans developed by the CMAs. Considerable effort (time and resources) by relevant Departments went into assisting the NRC develop the statewide standard and targets throughout 2004-05.

Following this stage there was an intensive effort from relevant agencies to develop a NSW Natural Resources Monitoring, Evaluation and Reporting Strategy to support the implementation of the natural resource standard and targets for both agencies and CMAs. The strategy represents the first time that such a comprehensive, statewide monitoring strategy has been developed across all natural resource agencies and put in place. This is the result of some three years of work undertaken by several departments with the NRC to develop the strategy, through the early developmental stages, consultation and refinement of methodologies and analytical methods. Implementation of the strategy will involve a massive amount of data collection and analysis by the participating agencies for years to come.

The Audit report correctly points out that some of the indicators and measures adopted in the monitoring strategy will take some years to develop an adequate data base to be able to understand the baseline condition and then some further time to get a meaningful picture of trends. In the case of the riverine health target the Government is better placed than for some other targets as it put in place community agreed water quality objectives for each river valley in 1998. These objectives provide a benchmark for measurement of river condition against desired environmental values and these can be measured in a quantitative sense through the application of the ANZECC/ARMCANZ Guidelines for Fresh and Marine Water Quality published in 2000. The roll out of the Monitoring and Evaluation Strategy will build on this part of the NSW water reforms and provide a consistent and rigorous monitoring program into the future.

In addition, for the first time the Government will have a NSW Strategy for Diffuse Source Water Pollution which has also involved considerable time and effort to research and develop a methodology for setting priorities and brokering agreed projects and partnerships across agencies, local councils and CMAs. This project should provide a framework for addressing this very complex and widespread problem in a far more focussed and coordinated way than has been attempted in the past.

The Department agrees that an independent environmental review of river health and water quality is desirable, and that the NRC is well placed to do so.

We thank you and your staff for the opportunity to contribute to this follow up Audit, in particular for the time necessary to explain the new arrangements and detailed concepts involved in the management of river health in New South Wales.

(signed)

*Lisa Corbyn
Director General*

Dated: 29 April 2008

Response from the Department of Water and Energy

I refer to your letter of 1 April 2008 concerning The Audit Office's final report on the follow-up performance audit 'Protecting our Rivers', and I thank you for the opportunity to provide a formal response.

As you know, the Department of Water and Energy (DWE) has devoted a significant amount of time and effort to assist the Auditor-General's Office in preparing this report. We believe the report now reflects much better the current natural resources directions that the Government has implemented in an effort to tackle the complexities of river health and water management, rather than just the water quality component. This has been borne out not only by the Government's decision to establish targets for river health within its State Plan 2006, but also recent Australian Government initiatives within the Murray Darling Basin.

The report appropriately recognises that state agencies and Catchment Management Authorities have made significant progress since the original audit in 2003. The DWE agrees that more needs to be done, in particular to derive the necessary baselines for monitoring and reporting against the state targets, but also to ensure ongoing assessment of our progress towards these targets.

The creation of DWE as a Division of Government in April 2007, places the Department in a position to lend strong and effective support into the future to ensure that sufficient information is available for government to measure its performance against its agreed targets for river health. The DWE is working collaboratively with both the Department of Environment and Climate Change and Department of Primary Industries to ensure this is achieved.

(signed)

*Mark Duffy
Director-General*

Dated: 29 April 2008

1 Measuring river health and water quality

At a glance

The key question we wanted to answer was:

Can NSW agencies now measure whether there has been an improvement in the river health and water quality of NSW rivers?

Agencies are establishing a monitoring system for the State Plan 2006 target: 'By 2015 there is an improvement in the condition of riverine ecosystems'. This target is a further development from the water quality and river flow objectives that applied at the time of our 2003 audit. The monitoring system will measure trends in the condition of river ecosystems, initially using fish, macroinvertebrates and hydrology indicators. The condition of riverine ecosystems indicates the overall condition and health of the river.

The approach of monitoring the condition of riverine ecosystems to indicate river health was developed for the Murray Darling Basin Commission's Sustainable Rivers Audit of rivers in the Murray Darling Basin, which commenced in 2004. NSW agencies have implemented the Sustainable Rivers Audit approach within the river valleys of the Murray Darling Basin. They have commenced a program of monitoring the State's coastal rivers using the same methodology. Additional indicators of river health are being developed to add to the Sustainable Rivers Audit approach - riverine vegetation and river physical form. They are also implementing a new water quality monitoring program that will eventually provide a statewide coverage for turbidity, nutrients and salinity.

It is not yet clear how long it will take to demonstrate valid trends in the overall condition of riverine ecosystems. Riverine ecosystems do not respond rapidly to change in the environment and are affected by variability of climate, such as the severe drought since 2001. Agencies expect to take until about 2012 to effectively establish a meaningful baseline for indicators being used for assessing river health, and then further time for monitoring and analysis to establish the trend. Monitoring that is underway is expected to present a snapshot of the current condition of river systems across NSW and for each Catchment Management Authority area by the end of 2008.

1.1 Is there a monitoring system for river health and water quality?

Our assessment Agencies are establishing a monitoring system for the State Plan 2006 target: 'By 2015 there is an improvement in the condition of riverine ecosystems'. This target is a further development from the water quality and river flow objectives that applied at the time of our 2003 audit. The monitoring system will measure trends in the condition of river ecosystems, initially using fish, macroinvertebrates and hydrology indicators. The condition of riverine ecosystems indicates the overall condition and health of the river.

Pollutant discharges reduced New South Wales agencies began taking action in the 1970s to reduce the amounts of pollutants discharged to rivers. They began by licensing factories and other 'point sources' of pollutants discharging to metropolitan waters then extended their focus to industries across the state. They also introduced programs for reduction of pollution from urban stormwater, for better treatment of urban wastewater and for interception of saline waters.

By 2003 At the time of our 2003 audit, agencies assessed the extent licensing had reduced the pollution reaching rivers by monitoring compliance with licences. They did not have a comprehensive statewide system to monitor water quality of NSW rivers. A statewide water quality system monitoring system had been developed in the 1980s and operated until 2000 but was then discontinued.

At this stage the Government had not established targets for water quality that provided a clear basis for agency accountability. In 1998 the Government had endorsed interim water quality and river flow objectives that had been agreed with communities for 31 NSW rivers. The objectives were supported by detailed technical guidelines. However they were advisory only and meant to provide a framework for assessing the environmental values for rivers sought by the community (Appendix 3).

We made a number of recommendations in our 2003 audit report. The recommendations included that agencies define the role of the water quality objectives and that they develop a monitoring system for river water quality. The purpose of the monitoring system was to provide reliable data to manage and report on the water quality of NSW rivers.

Government established State natural resource targets

The Government in 2003 established the Natural Resources Commission (NRC) as its independent advisor on natural resources. The NRC developed 13 targets for natural resources management. The Government approved the NRC's 13 targets in 2005 and included them in the State Plan 2006.

The Government appointed the Natural Resources and Environment CEOs Cluster Group (NR&E CEO Cluster Group) as lead entity to achieve the State Plan 2006 targets for natural resources. The NR&E CEO Cluster Group developed the NSW Natural Resources Monitoring, Evaluation and Reporting Strategy to monitor and report on progress against the 13 State natural resources targets. The strategy has been agreed by Government and the NR&E CEO Cluster Group is now coordinating implementation. Not all components are yet fully operational, but agencies expect them to be operational by 2009.

The 13 State Plan 2006 natural resource targets include a target for the condition of rivers. The target is: 'By 2015 there is an improvement in the condition of riverine ecosystems'. This target is a further development from the water quality and river flow objectives that applied at the time of our 2003 audit.

While agencies are focussed on achieving the State Plan 2006 riverine ecosystems target and the other natural resource targets, the water quality objectives still have a role. Agencies, catchment management authorities, local government and others use the water quality objectives and their supporting indicators and criteria for regional planning and regulation. Users called for practical assistance to assist them to implement and apply these objectives. The Department of Environment and Climate Change since 2004 has developed and published documents to guide how these objectives could be used with the existing technical guidelines as benchmarks for assessing progress in water quality in NSW rivers (Appendix 3).

The NR&E CEO Cluster Group is coordinating initiatives to achieve the State Plan riverine ecosystems target (Chapter 2). It is also coordinating development of a comprehensive monitoring system for this target as part of its overall natural resource monitoring and reporting strategy. The Department of Environment and Climate Change and the Department of Water and Energy are the key agencies for implementing the monitoring strategy. They have chosen to monitor the condition of riverine ecosystems - initially measured using fish, macroinvertebrates and hydrology - as an indicator of the overall condition and health of a river. This approach was developed for the Murray Darling Basin Commission's Sustainable Rivers Audit. Agencies advise that it represents current best international practice.

There has now been three years of monitoring of the inland rivers and one of coastal rivers using the three initial indicators - fish, macroinvertebrates and hydrology. Agencies also are developing additional indicators - riverine vegetation and river physical form - to assess other elements of river health. The additional indicators will be used in conjunction with the three initial indicators.

Monitoring and reporting progress on the State Plan riverine ecosystems target

Agencies expect to take until about 2012 to complete baselines for all indicators being used and then further time for monitoring and analysis to establish trends. As a result it may not be possible to establish valid trends in all these indicators until the full monitoring system has been operational for several years. This needs to be well before 2015 so that it is possible to measure and report progress against the State Plan 2006 target for riverine ecosystems.

In the next two sections of this chapter we outline the development of the monitoring system for the condition of riverine ecosystems. We particularly discuss two steps in the implementation:

- Section 1.2 examines how targets and indicators have been established for the condition of riverine ecosystems
- Section 1.3 examines the timetable to establish a baseline and trend in the condition of riverine ecosystems.

1.2 Have targets and indicators been established?

Our assessment

The approach of monitoring the condition of riverine ecosystems to indicate river health was developed for the Murray Darling Basin Commission's Sustainable Rivers Audit of rivers in the Murray Darling Basin, which commenced in 2004. NSW agencies have implemented the Sustainable Rivers Audit approach within the river valleys of the Murray Darling Basin. They have commenced a program of monitoring the State's coastal rivers using the same methodology. Additional indicators of river health are being developed to add to the Sustainable Rivers Audit approach - riverine vegetation and river physical form. They are also implementing a new water quality monitoring program that will eventually provide a statewide coverage for turbidity, nutrients and salinity.

River health target in State Plan 2006

In 2006 the Government issued the first NSW State Plan. Priority E4 in the State Plan contains 13 targets for better outcomes for natural resources. The targets had been developed by the Natural Resources Commission (NRC), which in 2003 took over the Healthy Rivers Commission's independent advisory role to the Government.

Natural Resource Target 5 from the State Plan is: 'By 2015 there is an improvement in the condition of riverine ecosystems'.

The Natural Resources Commission selected this target as an indicator of river health based on joint research by the Murray-Darling Basin Commission and NSW, Queensland, Victoria and the ACT, each of which has adopted the same or similar targets.

Murray-Darling Basin Commission research on river health indicators

The Murray-Darling Basin Commission (MDBC) coordinates management of rivers in the Murray-Darling Basin. It works with NSW agencies to manage the Murray and Darling rivers and the NSW inland rivers that flow to the Murray and Darling rivers.

The MDBC's research indicated that water quality indicators were unlikely to be an efficient means of assessing river health in the Murray-Darling Basin. It found that water quality indicators - physical and chemical measures of water quality - are highly variable over time in Australian rivers and have to be monitored frequently. This makes them expensive to monitor.

The MDBC found that riverine ecosystems, which change more slowly over time, would be more cost effective to monitor. It concluded that the condition of ecological indicators such as fish, macroinvertebrates and hydrology, supplemented with some physical and chemical measures such as salinity, would be the best and most cost effective indicators of river health.

This research was developed in a joint program with the States. NSW has also adopted this approach for monitoring NSW coastal rivers.

The Government has established an interdepartmental chief executive's committee, the Natural Resources and Environment CEO Cluster Group (NR&E CEO Cluster Group), to develop initiatives to achieve the state natural resources targets, including the riverine ecosystems target.

The NR&E CEO Cluster Group's initiatives to achieve the riverine ecosystems target include actions to address diffuse source pollution, as recommended in our 2003 audit. It is also undertaking other initiatives that in 2003 were part of the program to address the river flow objectives and outside the scope of the 2003 report. We discuss the range of initiatives being undertaken to improve the condition of riverine ecosystems in Chapter 2.

Many of the initiatives to improve riverine ecosystems will contribute to achieving other natural resources targets. For example, fencing of riverbanks will prevent stock reaching the river edge. This will improve the condition of riverine ecosystems by reducing erosion and the amount of sediment muddying the river. It may also contribute to improving the condition of native vegetation and fauna, two of the 13 natural resources targets.

The NR&E CEO Cluster Group is overseeing development of the monitoring system to identify trends in the condition of riverine ecosystems (NSW Monitoring, Evaluation and Reporting Strategy). The Natural Resources Commission, when it set the riverine ecosystems target, did not fully define how the target would be monitored. At the time the methodology for monitoring of riverine ecosystems was not as well established as the methodology for monitoring water quality. It has been necessary to develop a new methodology, with the participation of the agencies, to measure some aspects of the condition of riverine ecosystems.

The NR&E CEO Cluster Group has adopted the MDBC’s approach (based on the Sustainable Rivers Audit) to monitoring the condition of riverine ecosystems. It has assigned the Department of Water and Energy (DWE) as the lead agency to coordinate monitoring for the riverine ecosystems target.

Monitoring in the Murray Darling Basin is further advanced than for coastal rivers due to the MDBC’s coordinated Sustainable Rivers Audit in inland systems. This same monitoring methodology has been extended to coastal rivers of NSW and it will be important to develop benchmark data for coastal rivers, as has been done for inland rivers over the past three years.

DWE will lead a multi-agency team including the Department of Environment and Climate Change (DECC) and the Department of Primary Industries (DPI). DWE is already working with the MDBC, DECC and DPI to implement this monitoring program in NSW.

NSW riverine ecosystems indicators

Under the agreed NSW Monitoring, Evaluation and Reporting Strategy the current indicators selected to monitor the condition of NSW riverine ecosystems and agencies responsible for each indicator are:

Indicator of condition of riverine ecosystems	Responsible Agency
Fish assemblages* (fish ecosystems)	DPI
Macroinvertebrate assemblages* (macroinvertebrate ecosystems)	DECC
Salinity	DWE
Temperature	DWE
Turbidity	DWE
Hydrology	DWE
Frog assemblages* (pilot study frog ecosystems)	DWE
Riparian and aquatic vegetation	DWE/DECC
River physical form	DWE

*Assemblages are explained below

The ecological indicators are complex measures. For example, the proposed indicator for fish ecosystems - ‘Fish assemblages’ - will be determined by monitoring about 13 ‘metrics’ of fish ecosystems. These include ‘total number of fish species’, ‘proportion of fish species that is native’, ‘proportion of individual fish that is native’ and ‘proportion of fish biomass that is native’. The indicators for macroinvertebrates ecosystems and riparian and aquatic vegetation are similarly complex.

The reason for the complexity is that ecological indicators have been designed so that an improving trend will indicate improving river health - increasing native flora and fauna, improving water quality and a restoration of a pattern of 'naturalness' in the river's physical characteristics and flows. When the indicators are improving, the river will be trending towards a healthier condition.

1.3 Has a baseline and trend been established?

Our assessment

It is not yet clear how long it will take to demonstrate valid trends in the overall condition of riverine ecosystems. Riverine ecosystems do not respond rapidly to change in the environment and are affected by variability of climate, such as the severe drought since 2001. Agencies expect to take until about 2012 to effectively establish a meaningful baseline for indicators being used for assessing river health, and then further time for monitoring and analysis to establish the trend. Monitoring that is underway is expected to present a snapshot of the current condition of river systems across NSW and for each Catchment Management Authority area by the end of 2008.

Identifying the baseline

The purpose of the monitoring system is to determine whether the agencies' and Catchment Management Authority's initiatives are likely to achieve the State Plan 2006 target to improve the condition of riverine ecosystems by 2015.

Agencies advise that the first step is to establish the baseline for all indicators being used for the condition of riverine ecosystems. The baseline is the agreed existing condition of river ecosystems as measured by one or more indicators at a set date, such as 2006. It is the starting point to measure whether agency and Catchment management Authority's actions to improve river health are improving the condition of riverine ecosystems. A baseline condition will be established for each catchment and at many measuring stations on NSW rivers.

It will take several years to establish baselines for all indicators being used in the river systems in NSW. Measures of the condition of riverine ecosystems - fish, macroinvertebrates and hydrology - respond to both natural (such as climate) changes and manmade changes in riverine conditions. The severe drought since 2001, the most severe in recorded history, has affected riverine ecosystems and they will take some time to recover.

The baseline against which to measure the impact of agency actions will be identified, removing the effects of seasonal, cyclic and other natural change from the data. It will require several years of data at each monitoring station and extensive analysis to identify the baseline for all indicators being used.

Some data already exists on six of the riverine indicators listed in Section 1.2. There is a historical data record of salinity, temperature, turbidity and hydrology. There is also some data on fish assemblages and macroinvertebrates. This data is being analysed, and DWE expects to establish baselines for fish and macroinvertebrates assemblages for the Murray-Darling Basin rivers by 2008 and for other rivers by 2012. DWE is still investigating the monitoring methodology for the riverine vegetation, river physical form and frogs indicators and has not finalised a timetable for implementation.

Firm trends may not be established by 2015

Agencies are taking actions to improve the condition of riverine ecosystems (See Chapter 2). The baseline, when established, will be the starting point to measure whether the agencies' actions are improving the condition of riverine ecosystems and therefore river health.

After the baseline for all indicators being used has been established it will require several more years of data and extensive analysis to identify the trend at each monitoring station. DWE advises that, if the baselines are established by 2010-12 as proposed, it may still be unable to demonstrate valid trends in the condition of riverine ecosystems and in river health by 2015 due to drought and other climatic variability or small natural variations in river health. The State Plan 2006 has set a target to improve the condition of riverine ecosystems by 2015.

Reporting until the monitoring system is operational

The agencies have advised that the Government is expecting progress reports on State Plan riverine ecosystems target well before 2015. Agencies will be reporting data on river condition as it becomes available. New South Wales issues a 'State of the Environment' report every three years. The next report is due in 2009. The agencies will use the best available assessment of river condition to prepare individual State of the Catchment reports by the end of 2008 to inform the 2009 State of the Environment report.

DWE anticipates being able to contribute some information to the State of the Environment Report 2009 from monitoring of riverine ecosystems undertaken to that time. However it will not have established statewide baselines for the condition of all riverine ecosystem indicators by 2009.

Agencies may also report progress of some aspects of their activities in terms of outputs. Catchment Management Authorities already use this form of reporting in their annual reports. Catchment Management Authorities do not have the resources to establish monitoring systems to measure their impacts on the condition of riverine ecosystems or other State Plan natural resource targets. They rely on state agencies developing the monitoring system. In the absence of a monitoring system they report outputs from their activities - the length of river banks fenced in the year, the area of soil protected against erosion and similar measures.

Output measures give some indication of the action that is occurring. However they do not provide an adequate basis to determine whether agencies' actions are effective and achieving the target. This can only be achieved by having a comprehensive, fully operational monitoring system.

2 Progress in addressing the recommendations of the 2003 audit

At a glance

The key question we wanted to answer was:

Has there been progress in addressing the recommendations of the 2003 audit?

We recommended that the Government establish a lead entity to implement the State's objectives for river health and water quality.

The Department of Environment and Climate Change has overall responsibility for leading the response on Priority E4 of the State Plan 2006 and reporting on progress. Priority E4 contains 13 State Plan natural resource targets, including the target to improve the condition of riverine ecosystems by 2015. The Natural Resources and Environment CEOs Cluster (NR&E CEO Cluster Group) is lead entity/coordinator for the riverine ecosystems target.

and that the lead entity:

- **develop a framework for coordinated management of river health and water quality**

The Water CEOs Group (now replaced by the NR&E CEO Cluster Group) agreed to a draft framework document that broadly describes the responsibilities of agencies involved in managing river health and water quality.

- **develop a strategy to define the role of the water quality objectives, call for a formal risk assessment of rivers and strengthen systems for water quality monitoring**

- the State Plan 2006 target includes a target for the condition of riverine ecosystems and guidelines have been issued to define the role of the water quality objectives

- no formal risk assessment of NSW rivers has been undertaken since 1997

- the agencies are developing a comprehensive statewide monitoring system for the State Plan 2006 target for river health that they expect to be fully operational in 2008/09. Valid trends may not be evident in all indicators by 2015 - the State Plan 2006 target date to achieve improvement.

- **develop a plan for pollution, particularly diffuse source pollution.**

The agencies have advised that diffuse source pollution is the main source of pollution to rivers remaining to be addressed. The lead entity has prepared a statewide draft plan to limit and reduce diffuse source pollution from priority sources across NSW catchments as part of the program to achieve the State Plan 2006 target for the condition of riverine ecosystems. This plan will build upon existing programs and will initiate and coordinate new management actions across the State. There has also been significant action to address urban stormwater management.

