Sustainable Rivers Audit – an assessment of river health in the Murray–Darling Basin

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Abstract

The Sustainable Rivers Audit (SRA) is an initiative of the Murray–Darling Basin Commission (MDBC) partnership. The river condition assessments provided by the SRA will inform the development and implementation of management initiatives within the Basin and, along with the CSIRO Sustainable Yields project, will provide critical information to address water resource allocation.

The SRA has completed the first basin-wide assessment of river condition for the Murray–Darling Basin, based on hydrology, fish and macroinvertebrate themes for 2004–2007. River ecosystem health has been assessed by combining information about the status and trends of environmental indicators in each of the 23 SRA valleys within the basin.

The paper presents river health assessments for the 23 valleys, river health comparisons among valleys and an overall assessment of the basin's river health. It also includes an overview of the conceptual foundations and framework for the SRA, its methods, compliance and quality assurance, and plans for future enhancements.

Background

The Sustainable Rivers Audit program is a partnership between the MDBC, the Australian Government and each of the Basin Governments: Australian Capital Territory, New South Wales, South Australia, Queensland and Victoria (Figure 1). Field sampling is usually undertaken by state agencies, data management and data analysis are undertaken by MDBC and interpretation and reporting is conducted by independent ecologists (the Independent Sustainable Rivers Audit Group, ISRAG).
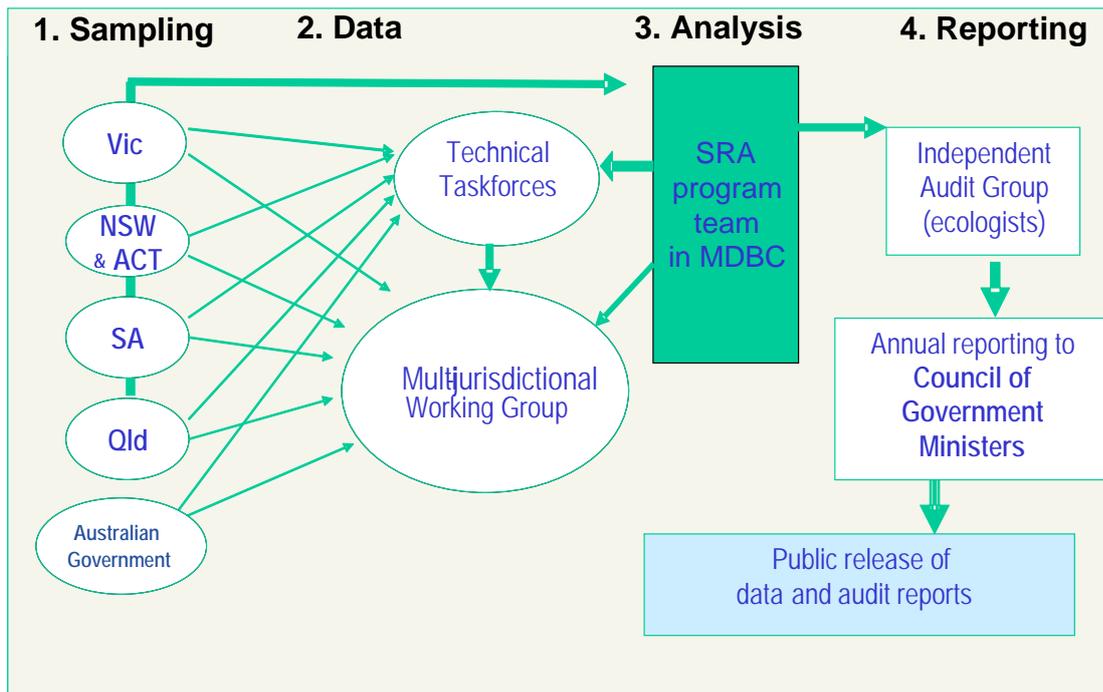
Figure 1 SRA partners and their functional roles. State agencies undertake sampling informed by technical taskforces and coordinated by a multi-jurisdictional working group. MDBC manages and analyses data. Interpretation and reporting is undertaken by independent ecologists.

The core purpose of the SRA program is to provide regular, consistent and comprehensive Basin-wide scientific assessments of the condition of the Murray – Darling Basin's rivers. These are for informing the development and implementation of natural resource management initiatives within the Basin by MDBC and its partner jurisdictions.

The SRA gathers quantitative information on environmental indicators in valleys throughout the Basin. The indicators provide 'windows' on particular components of the river ecosystems, and are grouped as themes. The data are acquired systematically using agreed protocols and quality assurance processes (MDBC 2007). Within each valley there are 1–4 zones, defined in most cases by altitude. Sampling sites are located randomly within zones, to enable unbiased statistical analyses and representative reporting (Davies *et al* 2008).

The indicators are combined to form quantitative measures of condition for each theme, and theme condition ratings are combined to assess *ecosystem health*, with a series of expert rules (Negnevitsky, 2002). The approach avoids the need for sharp boundaries between categories of assessment and makes the expert panel approach transparent, quantifiable and repeatable. Condition assessments for each valley are related to a benchmark called reference condition. This estimates the status of a component (for example, the fish community) as it would be had there been no significant human intervention in the landscape. Reference condition is a benchmark representing the river ecosystem in good health, but is not a target for management (Davies *et al* 2008).

Development of the program is described in the SRA program report (MDBC 2004) and key stages included:

- preparation of an initial scoping document (Whittington *et al* 2001),
- a pilot program to inform both experimental design (including power analysis) and implementation (MDBC 2004),
- roll-out of the macroinvertebrate, fish and hydrology themes from spring 2004
- further development of riverine vegetation and physical form themes from 2004 to 2007
- Approval in 2007 to implement the vegetation and physical form themes for reporting with the other themes in *SRA Report 2* due 2010.
- Publication of *SRA Report 1* (Davies *et al* 2008)

SRA Report 1 Findings

The full report (Davies 2008) and a summary report (MDBC 2008) are available from the following MDBC web page: www.mdbc.gov.au/SRA/river_health_check_-_sra_reprt_one

The culmination of data collection, analysis and interpretation from 487 fish sites, 773 macroinvertebrate sites and 469 hydrology sites was the condition and health assessments by ISRAG (Table 1). These were rated on a five-point scale from good through moderate, poor, very poor to extremely poor, depending on how different the theme components were from their respective benchmarks.

Only one valley was rated in good health (Paroo). Two were rated in moderate health (Border Rivers and Condamine). Seven others were in poor health and 13 were in very poor health. No valley was rated in extremely poor health (Table 1).

Fish sampling at 487 sites yielded more than 60,600 individuals in 38 species, weighing more than 4 tonnes. Twenty eight of these were native, many of them small species, contributing 57% of individuals but only 32% of biomass. Fish communities in the Paroo, Condamine and Border Rivers valleys were in moderate condition, those in eight other valleys were in extremely poor condition (Table 1). Those in the remaining valleys were in poor or very poor condition. Communities in the northern Basin generally were in better condition than those in the southern Basin (Davies et al 2008).

Macroinvertebrate samples taken from 773 sites included over 209,100 specimens of macroinvertebrates in 124 families. Communities in the Border Rivers, Upper Murray and Paroo valleys were in moderate condition, and those in the Avoca and Wimmera valleys were in very poor condition. The remaining Valleys were in poor condition (Table 1).

Hydrological data were available for 469 sites. For each site, five indicator values were calculated, representing changes in the flow regime due to human intervention. Site-based assessments of condition were made but, as sites were not randomly distributed, statistical comparisons at Valley and Zone scales were not possible. One third of all valleys were rated in good condition, and another third were in moderate to good condition (Table 1). Many of the sites in poor hydrological condition were in the lowland zones of the major rivers (Davies et al 2008).

Table 1 Condition and Ecosystem Health assessments
for Valleys in the Murray-Darling Basin, 2004–07

Rank	Valley	Ecosystem Health	Condition		
			Hydrology	Fish	Macro-invertebrates
1	**Paroo**	Good	Good	Moderate	Moderate
2	**Border Rivers**	Moderate	Moderate to Good	Moderate	Moderate
2	**Condamine**	Moderate	Moderate to Good	Moderate	Poor
3	**Namoi**	Poor	Good	Poor	Poor
3	**Ovens**	Poor	Good	Poor	Poor
3	**Warrego**	Poor	Good	Poor	Poor
4	**Gwydir**	Poor	Moderate to Good	Poor	Poor
5	**Darling**	Poor	Poor	Poor	Poor
5	**Murray, Lower**	Poor	Poor	Poor	Poor
5	**Murray, Central**	Poor	Moderate	Poor	Poor
6	**Murray, Upper**	Very Poor	Moderate to Good	Extremely Poor	Moderate
6	**Wimmera**	Very Poor	Poor	Poor	Very Poor
7	**Avoca**	Very Poor	Moderate to Good	Poor	Very Poor
7	**Broken**	Very Poor	Moderate to Good	Very Poor	Poor
7	**Macquarie**	Very Poor	Moderate to Good	Very Poor	Poor
8	**Campaspe**	Very Poor	Moderate	Extremely Poor	Poor
8	**Castlereagh**	Very Poor	Good	Extremely Poor	Poor
8	**Kiewa**	Very Poor	Good	Very Poor	Poor
8	**Lachlan**	Very Poor	Moderate to Good	Extremely Poor	Poor
8	**Loddon**	Very Poor	Moderate	Extremely Poor	Poor
8	**Mitta Mitta**	Very Poor	Good	Extremely Poor	Poor
9	**Goulburn**	Very Poor	Poor	Extremely Poor	Poor
9	**Murrumbidgee**	Very Poor	Poor to Moderate	Extremely Poor	Poor

Progress and Prospects

The Sustainable Rivers Audit is developing into an effective tool for surveillance of
the Basin's river ecosystems (Davies et al 2008). The addition of the vegetation and
physical form themes will expand the Audit and are particularly valuable as they
include floodplain environments. ISRAG noted that QA reviews undertaken for the

fish and macroinvertebrate themes are instrumental in refining methods and improving consistency between agencies.

The hydrology theme experienced problems due to data limitations, particularly the lack of randomness in sites. This will be overcome through a series of projects to expand the theme beyond the current modelled environments. ISRAG recommended that the SRA be expanded to include floodplain and terminal wetlands, including Ramsar Wetlands and icon sites in The Living Murray initiative. ISRAG also recommended the establishment of management goals for river health, at valley and smaller scales, across the Murray-Darling Basin, with the SRA playing a valuable role in their development and monitoring (Davies et al 2008).

References

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