



# WaterShed

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## Can We Really Measure River Health?

by Professor Peter Cullen

We frequently get asked if we can show how river health will improve as we make environmental allocations and deliver more appropriate flow regimes. Those who believe society would get a better return by diverting more water for irrigation in particular want to see real outcomes for what they see as their sacrifices.

The CRC for Freshwater Ecology has been asked to develop a way of measuring the health of the rivers to better inform the various trade-offs that society must make. Our proposals will be considered by the Murray Darling Basin Ministerial Council in August.

People are interested in biological outcomes when they think of rivers. For too long we have tried to use water quality measures and then hydrologic measures as surrogates for river health, rather than trying to measure

it directly. These factors are inputs that lead to certain biological outcomes, but they are not useful as outcomes in themselves.

We now have national data sets of aquatic invertebrates collected by the states under the National River Health Program. These are being used by the CRC to provide the biological elements of the waterways condition part of the Land and Water Audit. They will also be used in the 2001 Federal State of the Environment Report. Assoc Prof Richard Norris is leading the team that is breaking new ground internationally in the biological assessment of river health.

Many people equate river health with fish populations. The CRC has also developed tools for fish survey, and

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these have been demonstrated in the NSW Rivers Survey. These tools need to be used more widely to ensure we have a good knowledge of both native fish, sporting fish and nuisance fish, all of concern to the public.

There are other biological elements that are important. Algal populations, algal blooms, aquatic plants, aquatic weeds, riparian vegetation and water birds are all being used in some parts of the Murray Darling Basin (MDB) to track the condition of aquatic ecosystems.

**a proposal for a Sustainable Rivers Audit...**

We are proposing a Sustainable Rivers Audit that measures river health based initially on two sources of information -the AUSRIVAS models of aquatic invertebrates, and a measure of fish populations such as the Index of Biotic Integrity.

Beneath these two measures of biological outcome, we need three further measures - an index of water quality (probably combining Total Phosphorus, electrical conductivity, pH and turbidity), an index of flow regime and an assessment of habitat. These three elements are drivers of the biological outcomes and serve as useful diagnostics in interpreting why the biological measures have moved.

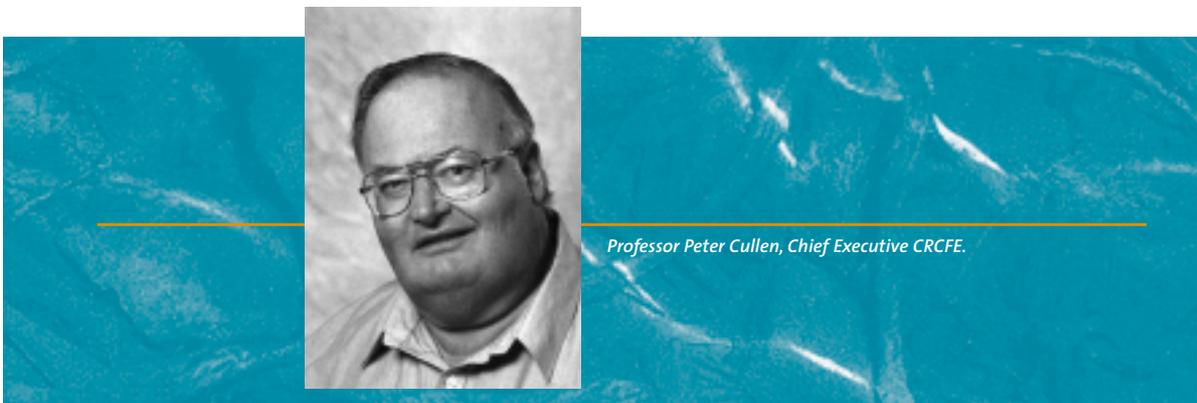
The proposal is that the biological measures, along with the water quality and flow index would be reported annually for each river valley in the MDB. A more comprehensive sustainability assessment would be carried out initially, and thereafter every five years.

There is still much work to be done after these broad ideas are accepted. We have to develop the various indices based on data that's common across the States of the Basin. We need to identify the sampling density needed to give useful answers. We need to work out how to scale the various measures to a common base, and how to aggregate them to get a meaningful set of information. Hopefully we might be able to get to the traffic light system being developed in Queensland as part of the WAMP process where we can show red, amber and green zones of river health. A red or amber result might then trigger more intensive monitoring or special studies to investigate what is going wrong.

**...and that states agree on a common basis for monitoring river health**

We are proposing that States agree on a common basis for monitoring river health based on invertebrates and fish. They also need to collect data on the drivers and report them in a common format. These would provide the input into a negotiation with some experienced ecologists who would discuss the result with State experts on a river valley basis. This is now happening with the auditing of the Cap in the Basin where the Independent Audit Group has a dialogue with State experts to resolve the flow allocation issues.

The habitat assessments are novel and draw heavily on the innovative work being done in the National Land and Water Audit. There are five elements to be reported:



*Professor Peter Cullen, Chief Executive CRCFE.*

1. Connectivity - reporting weirs and other blockages to fish movement, and length of levees which may block the interchange between the river and its floodplain during flood.
2. Riparian condition - an assessment of the riparian community, including weed plants like willows.
3. Woody debris in stream - critical fish habitat which we now appreciate needs to be protected.
4. Geomorphic - a measure of sand deposition, bank erosion and bed movement.
5. Wetland elements - the extent and condition of Ramsar and other nominated wetlands needs to be assessed.

There is much to be done to develop these broad ideas into a workable reporting system. Most States are now collecting much of this information. The challenge is to agree on the important information and then to collect it in a way that allows comparison across States. We do not need to keep building railway systems with different gauges that create difficulties when crossing State borders. We can do better than that: there is no excuse for continuing to make these sorts of mistakes when it comes to managing scarce and valuable resources like water.

### BUG LAB TEAM COMPLETE PROJECTS

Three different projects for study designs have recently been completed by the bug lab team at University of Canberra: environmental flows for the Woronora (Sydney Catchment Authority) and Cotter Rivers (ACT government and ACTEW Corporation, Heath Chester) and effectiveness of fish habitat rehabilitation in the Murrumbidgee River (ACT Government, Nerida Davies, Phil Sloane and Richard Norris).

### NICHOLAS BAUER JOINS THE NATIONAL LAND AND WATER AUDIT TEAM

Nicholas Bauer starts work with the National Land and Water Audit team at the University of Canberra soon. He will undertake much of the GIS work associated with the project.



Photo and description courtesy J Hawking from the Colour Guide to Invertebrates of Australian Inland Waters

The feature creature for this issue:

**Class** Insecta  
**Order** Hemiptera  
**Family** Belostomatidae  
**Genus** *Lethocerus*  
**Species** *L. insulanus*

Giant Water Bugs feature an abdomen without a respiratory siphon but with two flat, retractable respiratory filaments, and strong raptorial (grasping) forelegs. Up to 70mm in size, these carnivores are found amongst water weeds of still or slow-flowing waters in northern and eastern Australia.