Fishing for the best flows

Long-term studies are needed to ensure that environmental flows meet the needs of critical ecological processes.

Achieving a balance between consumptive use and environmental flows is technically complex and requires difficult choices to be made between the interests of various sectors of the community. These choices must account for critical ecological processes, and how they are affected by flow.

In the absence of ecological data for a particular river system, interim environmental flows are required to guide environmental managers.

One way to do this is through 'expert panels', which include specialists in fish and invertebrate ecology, botany, and fluvial geomorphology among others.

Where possible, experimental releases from a dam are made, and members of the panel assess the impacts of a range of flows on river habitat.

Historical stream flow records are also considered. If experimental releases of water are not possible, the panel makes judgements about the ecological consequences of flows at various heights at different times of the year.

This approach has helped to meet the immediate needs of environmental managers, and underpins existing environmental-flow regimes.

In New South Wales and Victoria, the 'translucent dam' approach allows a certain percentage of winter rainfall – which would normally be retained in dams for the irrigation season – to flow into the rivers, providing pulses of water based on natural rainfall.

The final percentage, or 'translucent dam rule', is decided by means of a compromise between what the expert panel agrees should be released, and what the water authority is prepared to release once the off-stream requirements of irrigators are considered.

For example, in the Snowy River, 28% of water entering regulating dams is released, once those dams are filled to a certain level. While such flows may appear useful in the short term, long-term studies are needed to ensure the flows meet the needs of critical ecological processes.

Fish ecologist Dr Paul Humphries, of the Murray-Darling Freshwater Research Centre and Monash University, has spent the past seven years trying to address this question in Victoria's Campaspe River.

Campaspe River experiment

Humphries says the original concept for the study was to look at the effect of changes in flow regimes on the abundance of macroinvertebrates and native fish, by monitoring the fauna before and after the release of an experimental environmental flow.

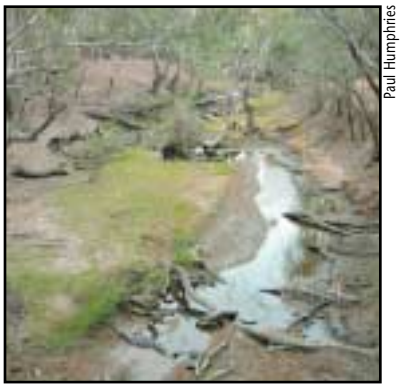
An ongoing flow regime, or translucent dam rule, could then be recommended that would benefit the plants and animals, while maintaining existing supplies to the community.

'The Campaspe project sought a translucent dam rule which provided for off-stream use,' Humphries says.

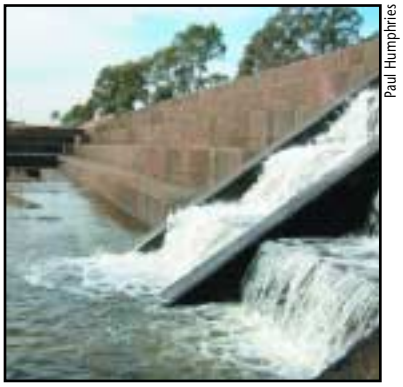
'So we looked at a hydrograph of the river and asked, what are the major parts that are missing or have changed since the river was regulated? And how can we change that scenario so that irrigators still get most of what they want, while achieving a more natural flow regime?'

In collaboration with Goulburn-Murray Water, the team came up with a translucent dam rule of 25%. This meant that during winter, if the regulating dam,

Chester Merrick, CSIRO Land and Water



Paul Humphries



Paul Humphries

Studies led by Dr Paul Humphries in Victoria's Campaspe and Broken rivers highlighted the importance of low and high flows and their timing for fish breeding and recruitment, and this information is being incorporated into management practices. The studies linked declines in species diversity to the effects of fast water on fish habitats.

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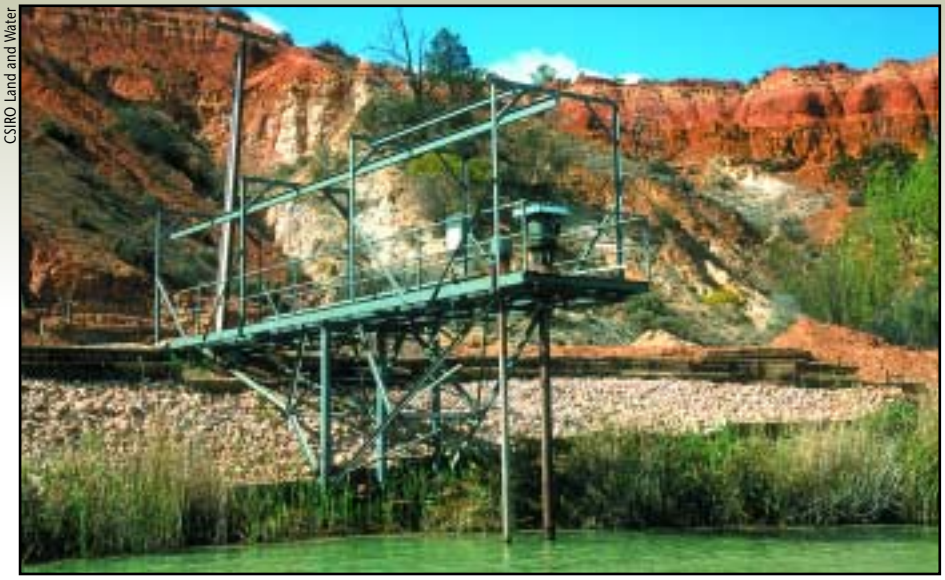

In New South Wales and Victoria, the 'translucent dam' approach allows a certain percentage of winter rainfall – which would normally be retained in dams for the irrigation season – to flow into the rivers, providing pulses of water based on natural rainfall.

Lake Eppalock, was at least two-thirds full, 25% of the water entering it would be released to the environment. This water would then mimic the natural hydrograph of the river, in terms of shape rather than volume.

While drought put an end to the environmental flow experiment, the team was able to continue with the second part of their study: comparing the condition of the Campaspe with that of the similar, but only mildly regulated, Broken River.

The team found that compared with the Broken River, the number of native fish species in the Campaspe had declined from upwards of 20 species to about three. The presence of Lake Eppalock had also changed the nature of the river.

'When cold, rushing water is released from Lake Eppalock, the nature of the normally warm, slow lowland river, downstream of the dam, changes to that of an upland stream,' Humphries says.

One of the key findings of the study was that native fish breed in the Campaspe River almost all year round, no matter what the river's condition. This suggests that the decline in native fish species is due to the poor survival of juvenile fish, because of the effects of fast water on habitat and food availability.

'Experiments in the Broken River, in which conditions have been changed to mimic irrigation flows, are resulting in the displacement of young fish out of their preferred habitats,' Humphries says. 'Of course there are many other things going on in the river that could have an effect, but we think flow has a serious impact.'

The study has highlighted the importance of low and high flows and their timing for fish breeding and recruitment, and this information is now being incorporated into management practices and the Murray Flows Assessment Tool (see story on page 27). But Humphries says long-term studies are needed in other stressed rivers to monitor biology before and after environmental flow changes.

'Most studies either can't or won't implement monitoring studies before and after a change in environmental flow, because it's either too expensive or time consuming,' he says.

'You can't see if a change in flow has an effect unless you know what the system was like beforehand,' Humphries says. 'And you need an unregulated reference river to ensure that any changes you do see are due to the environmental flow, and not other things such as a change in climate pattern.'

A pathway to revegetation

A NEW model for native vegetation management in New South Wales has been proposed by the Wentworth Group. The model seeks to resolve conflict over land clearing, and encompasses the need for a major investment in revegetation.

It simplifies native vegetation laws, environmental standards, water catchment strategies and regional structures, and the delivery of public funds to farmers.

The five interdependent components of the 'Wentworth Model for Landscape Conservation' are:

- strengthening and simplifying native vegetation regulations, ending the broadscale clearing of remnant vegetation and protected regrowth;
- setting environmental standards and clarifying responsibilities for native vegetation management which will, over time, create healthy rivers and catchments;
- using property management plans to provide investment security, management flexibility and financial support for farmers;
- providing significant levels of public funding to farmers to help meet new environmental standards and support on-ground conservation; and
- restructuring institutions by improving scientific input into policy setting, improving information systems, and regionalising administration.

More about the model

Wentworth Group of Concerned Scientists Report to Premier Carr. A new model for landscape conservation in New South Wales. (2003) http://www.wwf.org.au/downloads/new_model_for_landscape_conservation0203.pdf