

Restoring a healthy environment in the Murray-Darling Basin

Water for a Healthy Country Flagship

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National Research
FLAGSHIPS
Water for a Healthy Country



Environmental rehabilitation of the ailing
Murray-Darling Basin is a key priority for Australia.

Studies by CSIRO and other research groups have shown the Murray-Darling Basin is stressed through lack of flows.

Through a range of projects, CSIRO researchers are improving our understanding of the health of ecosystems across the Basin, and identifying ways to ensure we can protect, preserve and improve its environmental values.

CSIRO's research is assisting water managers to quantify the water requirements of ecosystems and to improve delivery of this to protect ecological assets across the Basin.

Environmental water demands

The Murray-Darling Basin Authority (MDBA) is responsible for developing a Basin Plan to provide a new way for managing water in the Basin. It is identifying key environmental assets and ecosystem functions of water resources to be protected and is setting environmentally sustainable limits on the amount of water that can be taken from the Basin.

CSIRO has used its expertise in developing, modifying and linking river models to support the MDBA in its work of developing the best way to deliver water across the Basin. These river modelling tools can help water managers make inferences on the rules for releasing water in order to best support both the needs of the environment, irrigators and other users, not only for each river catchment but for the Basin as a whole.

Environmental research legacy

CSIRO has been conducting ecological research in the Basin for decades, establishing the Murray-Darling Freshwater Research Centre in 1986-87. Current centre partners are the MDBA, CSIRO, La Trobe University and the Department of the Environment, Water, Heritage and the Arts. Its work includes the importance of river-floodplain interactions, environmental flows, the ecology of wetlands and investigating the causes and management of algal blooms.

CSIRO has delivered a range of research projects across the Basin, including investigating how the ecosystems of the Basin's floodplains function, understanding how ecosystems respond to changing water availability, and how the aquatic animals of the Basin

respond to these changes. (See 'Ecological benefits', and 'At the river mouth').

CSIRO and the Freshwater Ecology Cooperative Research Centre collaborated to produce a comprehensive book "Rivers as Ecological Systems - the Murray-Darling Basin" that was published by the then Murray-Darling Basin Commission in 2001. The book provides ecological principles for water management. The book was associated with the development of the Murray Flow Assessment Tool, to predict the ecological benefits and impacts of different water flow scenarios along the Murray River.

This research was used to provide advice to the Murray-Darling Basin Ministerial Council about restoring the river's health. It led to the 2003 Living Murray First Step decision, which secured 500 gigalitres of water for the environment.



> CSIRO is developing knowledge to better understand how ecosystems respond to changes in climate, water availability and water quality, Monoman Creek, Chowilla Floodplain, South Australia.

Better environmental water management

Our research continues today, with CSIRO's development of a suite of tools and information, that brings together the best environmental monitoring, risk assessment and modelling tools, and integrate biophysical and socio-economic approaches.

This will help develop improved methods to monitor the health of ecosystems across Australia, and look at how they respond to environmental flows. Improving understanding of how to value environmental water is critical to justify the environment's share of a scarce resource.

CSIRO has developed an integrated socio-economic and environmental optimisation decision support tool that provides guidance on the development and operation of flow regulation infrastructure to improve wetland and floodplain environments during low flow conditions such as extended drought periods. The South Australian government's Murray Futures program is using this model to optimise infrastructure and water investments to maximise habitat diversity and improve ecological condition to the Lower River Murray.

CSIRO is also exploring opportunities to use genetic markers in Basin organisms to develop better ecological monitoring tools. CSIRO, in partnership with the Murray-Darling Freshwater Research Centre, are using environmental genomics and DNA chip technology to explore floodplain and wetland ecosystem resilience and the effects of prolonged drought on ecosystem function.

CSIRO has been involved in a number of intensive research studies including of the Chowilla Floodplain, the Barmah Forest and the Lowbidgee wetlands. Applying a combination of field data and technologies such as remote sensing and modelling is leading to better understanding of ecosystem functions and foodwebs.

At the river mouth

Scientists have developed a suite of tools to help land and water managers restore the ecology of South Australia's degraded Coorong and Murray Mouth region.

In 2009 the \$5.3 million Coorong, Lower Lakes and Murray Mouth Research Cluster, known as CLLAMMecology, provided the most comprehensive ecological study ever undertaken of this significant region. Lack of inflows have caused a loss of bird, fish and plants and salt levels more than four times seawater in parts.

Collaborating through one of the first Flagship Collaboration Clusters, researchers from CSIRO joined forces with Adelaide and Flinders universities, the South Australian Research and Development Institute, in the three-year study.

Optimising our water

Our science is supporting the management of water for the environment through the development of computer models, such as the River Murray Floodplain Inundation Model (RiM-FIM), that show where water flows to predict changes in floodplain habitat, wetland connectivity and ecosystem health.

These models can predict environmental responses to different water releases and weir regulation, over different times and durations. Other models predict responses of soil salinity and trees to different water flows. They can help optimise the impact of water releases to make the most of a limited resource for all users.

Ecological benefits

In May 2010 CSIRO released new research which identified 577 sets of data to investigate the relationships between watering strategies and the health of vegetation, fish and other biota across the Basin.

The *Ecological Outcomes of Flow Regimes in the Murray-Darling Basin* report provides information to help water managers to improve and justify delivery of environmental water, including to wetlands of international significance such as the Macquarie Marshes, Gwydir Wetlands and Narran Lakes.

Want to know more?

Environmental water: helping Australia better manage the allocation of water for the environment: <http://www.csiro.au/science/Environmental-Water.html>

CSIRO's Ecological Outcomes of Flow Regimes in the Murray-Darling Basin report: <http://www.csiro.au/resources/Ecological-Outcomes-of-Flow-Regimes-Report.html>

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CSIRO and the Flagships program

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