



MD–WERP Newsletter #5 March 2024

# **Message from the Governing Panel**

It has now been more than 10 years since the introduction of the Murray–Darling Basin Plan. Bringing everyone together to agree on a Plan aimed at ensuring a resilient and sustainable future for the Basin and its communities and industries was a remarkable achievement.

Much has changed in terms of the environment, climate change, water management, and the economic, social and cultural life of the Basin since the Plan's inception in 2012. The period has encompassed a wide range of climatic conditions, such as the 2017–19 extreme drought and the widespread flooding across much of the Basin in 2022–23. Over this period, ongoing implementation of the Basin Plan has delivered more water for the environment and enhanced the connections between rivers, floodplains and wetlands. Science and research are at the forefront of monitoring and assessing the associated change.

The projects funded by the Australian Government through the Murray–Darling Water and Environment Research Program (MD–WERP) are strengthening scientific knowledge of the Murray-Darling Basin by generating new knowledge, innovation, and tools to assist the Australian Government to address the objectives of the Basin Plan.

As projects are completed, we are publishing the findings and sharing the new science and knowledge. Our projects are underpinning the focus of the MD–WERP — that is, to deliver practical research on issues central to the future of the Basin and for project findings to be used to strengthen the evidence base for informed water and environmental management decisions.

A key focus for the research program is to inform the 2026 Murray–Darling Basin Plan Review and the broader water reform journey for the Basin. A priority for program leads be to ensure the projects funded through the MD–WERP and undertaken by research consortia led by our Program partners the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and La Trobe University will be widely communicated and have maximum impact for policy makers.

It is encouraging that everyone connected with the MD–WERP continues to work together with passion and commitment to ensure we can help to bring about real and lasting change for the Basin's environment, communities, industries and First Nations.

**Professor Rob Vertessy FTSE** 

Chair, MD–WERP Governing Panel

Welcome to our latest e-newsletter updating on what's been happening in MD–WERP since May 2023.

# In this edition

- New reports and peer reviewed journal articles
- Spotlight: Waterbird foraging habitats
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# MD-WERP projects continue to deliver positive outcomes

Projects funded through the MD–WERP are continuing to uncover new information and generate new tools designed to improve water and environmental management and outcomes for Basin communities and industries. The projects are also encouraging and fostering strong cooperation and collaboration between Program partners, researchers, government agencies, communities, First Nations and end users to ensure the new science and tools being developed will be adopted to deliver real and lasting impacts for the Basin and its people.

The MDBA began preparations for the <u>2026 Murray–Darling Basin Plan Review</u> during 2022-2023, with the review <u>Roadmap</u> launched in June 2023. It is the first full review of the Basin Plan since its inception in 2012. The roadmap outlines the work that needs to be undertaken and the engagement required during the next 3 years to successfully deliver the Basin Plan Review. Many of the new science and tools being developed through MD–WERP projects will directly inform the Review to ensure the best outcomes for the Basin.

Understanding the impacts of climate adaption options, the importance and identification of stakeholder values for managing the Basin, identification and prioritisation of waterbird foraging habitats, and trends in blue-green algal blooms are among the findings in 11 key MD–WERP project reports published recently.

## T1.FS3 Assessing the sensitivity of water resources in the Murray–Darling to fire and climate change

This study has assessed the potential impacts of bushfires on water availability under a changing climate for more than 100 catchments in the Murray–Darling Basin. Under the investigated future climate scenario, fire weather is projected to be more severe, and frequency and extent of bushfires is projected to increase. Catchment average Leaf area index (LAI) is projected to decrease due to the increased frequency and extent of bushfires, but the reductions are relatively small because fires are still expected to occur relatively infrequently and any individual fire will only cover part of the catchment. Changes in future runoff are expected to be dominated by the direct impacts of changes in future rainfall and potential evaporation.

## T1.SA1 Understanding possible adaption options in response to climate change

This technical paper provides a conceptual foundation for characterising and analysing climate adaptation options currently considered by industries, institutions and communities in the Murray–Darling Basin. A classification system was developed to guide the selection of appropriate climate change adaptation investigations, considering factors including geographic and temporal scale, sector, cost and other relevant facts. The paper also reviews how evidence for the impacts of adaptation options can be compiled to support policy making, focusing on the role of river system models.

## T1.SI1 Issues in managing a large river at a Basin scale

This issues paper identifies the current strengths, challenges and opportunities regarding the management of the Murray–Darling Basin and proposes a Basin-wide monitoring and management framework. The proposed framework suggests values held by different stakeholders in the Basin should be mapped and understood, followed by prioritising these values and understanding which values should and can be protected and which are unlikely to be protected. This understanding may be aided by modelling. Prioritisation should be based on conversations with the community.

#### T1.TK4 Values and vulnerability of the Murray–Darling Basin – Basin-wide rapid assessment

This report provides a rapid scan of economic, social, cultural, and environmental vulnerabilities of water resource plan areas through a 'values' lens (i.e., what matters most to communities). This was achieved by creating a flow-asset-values (FAV) framework, which uses a values-based approach to explore dimensions of vulnerability that are important to communities' culture and adaptability. Creation of the FAV framework is also described in the report.

## T2.6.4 RQ6 – Progress towards enhancing low flows predictions

The focus of this research project is to improve the simulation of low flows that are important to maintain environmental/refugia conditions (direct link to RQ9), avoid poor water quality risk and to support downstream water uses. This is a long standing and complex problem faced by hydrologists and water authorities across Australia (and the world) that needs to be addressed strategically and fit-for-purpose for the applications.

An algorithm has been developed to calibrate the flow in the Border Rivers and Gwydir catchments as a test case. The preliminary results show some improvement in the low flow simulations without negatively impacting the modelling of other parts of the flow hydrograph. The research in 2023-2024 will further develop and test the water exchange function and quantify model improvement in other key reaches in the Murray–Darling Basin.

## <u>T2.7.4 Description and metadata for two-monthly maximum flood water extent and depth for the Murray–</u> <u>Darling Basin</u>

This research aims to build on the capacity and models from previous research by developing a model that is suitable for systematic management and scenario planning. This requires multiple modelling runs across large areas, and over long simulation periods. The research will improve the prediction of flood inundation extent, depth and duration, and floodplain volumes. This technical report provides the descriptions and metadata for 2 Basin-wide datasets that have recently been published on the <u>CSIRO</u> <u>Data Access Portal</u>, providing a comprehensive view of the past 35 years of data.

## <u>T2.8a.4 Insights into forecast-informed operation of the Hume Dam release</u>

This report summarises key findings on how ensemble flow and demand forecasts can be used to inform decisions relating to the release of water from Hume Dam. Three decision rules that combine ensemble inflow and demand forecasts are compared to produce ensemble forecasts of the water excess and shortage from Lake Mulwala and given that, a recommended Hume Dam release. Increasing the limit on the rate of change in the Hume Dam release improves the system performance as doing so gives the system greater flexibility to adjust the Hume Dam release as needed in response to changing conditions.

## <u>T2.8b.3 Scripts and tools developed for trend and cluster analysis, GDE analysis, salinity mapping and time</u> <u>series analysis</u>

This report summarises the tools developed to perform different analyses, such as data preparation for time series analysis, groundwater-dependent ecosystem (GDE) data extraction and analysis from the BOM GDE Atlas, hierarchical and unsupervised clustering analysis of groundwater levels and salinity mapping in the main alluvial aquifers of the Basin. The scripts have been documented and implemented in open-source environments such as Python and R to ensure maximum reproducibility and traceability, and they are thoroughly commented on to aid interpretation, use, and adaptation to other analyses.

## <u>T3.11.3 Predicting floodplain habitat inundation throughout the MDB to inform the management of</u> <u>environmental flows</u>

This study identified relationships between flow and inundation extent at a Basin scale and used them to predict inundation under different flow scenarios. The models predicted a reduction in inundation extent in the northwest of the Basin under a dry climate flow scenario, while under a without development (WOD) flow scenario, inundation extent in the northwest increased. This result suggests that floodplains in the northwest of the Basin may be at risk of habitat loss under a drying climate, and that water development in this region may have a deleterious impact on floodplain habitat availability. The models developed for this project are a relatively fast and effective way to predict floodplain inundation in different habitat types at the Basin scale.

## TP09 Foraging Habitats for Colonial Nesting Waterbirds in the Murray–Darling Basin

Waterbird populations across the Basin require appropriate management of not only breeding habitat, but also of foraging habitats to ensure that there are adequate food resources available for breeding and recruitment. This report describes methods for identifying and prioritising foraging habitats for potential management to support waterbirds throughout their lifecycle. Key findings include that obligate feeders travel much smaller distances to forage than generalist non-obligate feeders, and there were clear inundated habitat preferences between obligate and non-obligate colonial waterbirds for foraging.

## <u>TP13 Synthesis of Blue Green Algae (Cyanobacteria) bloom knowledge & analysis of recent trends in the</u> <u>Murray–Darling Basin</u>

This report provides a blue-green algae (BGA) knowledge summary of the environmental drivers of BGA blooms, bloom dynamics including eco-genomics, role of off- and on- river storages in bloom formation, emerging toxins and toxin producers, environmental triggers for toxin production, potential impacts, emerging techniques to monitor BGA blooms, and current management options/limitations. The report also explores trends in Murray–Darling Basin BGA blooms over time; explore linkages with changes in environmental parameters through combining existing data with hydrodynamics, weather (rainfall, temperature) and flow with cell count data if relevant in time and space and exploring any significant relationships.

## We now have a 'journals' section on the MD-WERP Get Involved website

Alongside producing reports and datasets, MD–WERP researchers are also publishing results from MD– WERP research in peer-reviewed scientific journals. The full list of published journal articles can be found on the <u>Peer-Reviewed Journal Articles</u> page of the website.

# Spotlight: Waterbird foraging habitats

## Q&A with Dr Heather McGinness, CSIRO

The MD–WERP team at MDBA recently caught up with one of the members of the team leading the report TP09 Foraging Habitats for Colonial Nesting Waterbirds in the Murray–Darling Basin, Dr Heather McGinness from CSIRO. She explained how the research developed a method for identifying and prioritising foraging habitats for potential management to support nesting waterbirds. The work was a collaboration between Jenny Hale, Shane Brooks, Heather, the MDBA and an advisory group including academics and commonwealth and state water holders – CEWH, NSW government, UNSW, CSIRO, VEWH, SA government and the MDBA.



Dr McGinness fitting a straw-necked ibis with a satellite transmitter. Photo: Ben Gawne

## What makes this recent research on waterbirds by the MD–WERP consortium so unique?

"We've been able to use the results of recent waterbird movement tracking research from the CEWH Flow-MER program about how far waterbirds travel to forage when nesting, to then map where we can provide foraging habitat for them during this time. We can look around known nesting sites and say, well, if we know they prefer to go this far or within this area to forage... then maybe we can help to manage particular wetlands within those areas to help provide extra food for them, at the right time."

## Why is it important to collaborate with other organisations on a piece of research such as this?

"It's absolutely necessary to collaborate. All of us have very different skills and knowledge in what we do to put together a big picture piece of work like this which has lots of moving parts.

"There's so much that goes into building up this picture of waterbird requirements and what we can do to support them. We need people with skills in mapping, classifying, and organising data, as well as knowledge of waterbirds – it all adds to the story of what's actually happening and possible.

"For example, the project couldn't have been done without Jenny Hale with her extensive background knowledge and data wrangling skills and Shane Brooks with his advanced GIS skills and experience.

"We worked together so well because we all brought such different and important things to the table."

## How would you like to see this research used?

"In a best-case scenario, we'd be able to be much more targeted about where we put water, and when and for how long, for ideal food provision for these birds, particularly during nesting events.

"I think we've still got some way to go before we have a full understanding of how to do that everywhere, because we're working on such big scales with the Murray–Darling Basin and connected areas.

"Our knowledge, science and data are improving, meaning we can refine our methods for projects such as these and get better over time."

# 2023 MD–WERP Symposium wrap-up

On 19-20 July 2023, MD–WERP held its second annual symposium at the Canberra Rex Hotel. The symposium brought together nearly 180 (130 in person and nearly 50 online) scientists, researchers, government officials and research end-users to exchange ideas, knowledge and experiences of science in the Basin.

Building on the momentum of and feedback from the 2022 inaugural symposium, the 2023 symposium delved deeper into the research projects. It provided an important platform to discuss the significance of new science in shaping water policy decisions. There was key a focus on sharing research results and hosting discussions on how findings might be adopted for the benefit of the Basin and its communities.

To better understand how MD–WERP research outputs fit into the wider water reform journey, Authority Chair, Sir Angus Houston, addressed the symposium to outline the <u>Roadmap to the 2026 Basin Plan</u> <u>Review</u>. Attendees also heard about government priorities from the Department of Climate Change, Energy, the Environment and Water's water policy division and First Nations water policy branch.

MDBA Chief Executive, Andrew McConville, chaired a great MD–WERP Governing Panel Q&A session where he put them through their paces with questions from the audience on topics including:

- understanding and explaining the relationship between MD–WERP research and future policy decisions
- challenges around sharing and communicating research outputs and datasets with government stakeholders and members of the community.
- bringing together the outputs and findings from the 4 strategic research themes to collaborate on the large-scale problems we are trying to solve.

## Strategic research interactive poster sessions

A key focus of the 2023 symposium was the interactive poster sessions which enabled attendees to engage with individual research projects and researchers. Across the 2 days, 25 research projects presented information and initial findings, grouped under the program's strategic research themes:

- climate adaptation
- hydrology
- environmental outcomes
- social, economic, and cultural outcomes.

The sessions enabled attendees to engage with individual research projects and to look for opportunities and barriers to adopting the research outputs in their work. Based on feedback, most people found this structure very useful, although some wished for more time to delve further into the projects.

## Tactical research projects

Two tactical research projects were showcased through presentations on day 2, followed by a collective Q&A session that was very engaging and showed high levels of interest in the projects:

- Waterbird foraging habitats identification and prioritisation.
- Synthesis of Blue-green algae bloom knowledge and analysis of recent trends in the Murray– Darling Basin.

Feedback from the event was overwhelmingly positive. Researchers and end-users across all themes enjoyed the opportunity to collaborate, network and share knowledge, and stated that the symposium helped improve their understanding of the range of MD–WERP research projects. The posters and presentations from the event are available on the <u>MD–WERP Annual Symposium 2023 webpage</u>. The posters reflect research progress at the time of and for the purposes of collaboration at the symposium. They are not final research outcomes and are subject to copyright.

# Save the date: 21 June 2024 MD–WERP Symposium

This year, the annual MD–WERP Symposium will be held in Albury in conjunction with the 2024 River Reflections conference. Basin communities are a key stakeholder group for MD–WERP, so holding the Symposium in a regional area of the Basin will facilitate communication of project aims and outputs to stakeholders external to the program delivery.

Make sure you put in a placeholder to attend on **Friday 21 June 2024** – tickets will be available from Eventbrite in mid-March and advertised on the MDBA website <u>Conferences | Murray–Darling</u> <u>Basin Authority (mdba.gov.au)</u>

# What to expect in the next MD–WERP e-newsletter

- 2022–2023 Annual Progress Update
- More details on the 2024 MD–WERP Annual Symposium
- New publications

# **Contact Us**

We welcome your feedback or questions at any time. Please contact the MD–WERP Implementation Team via email at <u>MDWERP@mdba.gov.au</u>.