Murray-Darling Conservation Alliance

Submission to the Murray-Darling Basin Plan Review

April 2026

Table of contents

Executive summary

The Murray-Darling is Australia's largest river system — stretching thousands of kilometres across south-eastern Australia. Its rivers are the lifeblood of communities, sustaining towns, farms, culture and unique ecosystems. For the Traditional Owners, these waters are sacred — central to responsibilities, identity, culture, cultural economies and wellbeing. For farmers, they are a vital source of livelihood. For millions of Australians, they provide clean drinking water and places of recreation, reflection and connection with nature. The lands and waters of the Murray-Darling have high ecological value, supporting a diverse range of animals, plants and ecosystems that are nationally and internationally significant. There are around 30,000 wetlands across the Basin, including 16 wetlands that are listed under the Ramsar Convention as wetlands of international importance. The health of these ecosystems is fundamental for providing clean water and thriving landscapes to enable Basin communities to prosper.

Despite some progress since the Basin Plan was introduced in 2012, too much water is still being taken from rivers and aquifers for irrigation and not enough water is reaching important wetland and floodplain ecosystems. The health of the river system continues to decline. Toxic algal blooms, mass fish kills, declining waterbird and fish populations, and reduced water quality all point to a river system under severe stress. Climate change is adding further pressure, bringing hotter temperatures and less water flowing into rivers.

The Basin Plan Review is a once in a decade opportunity to turn things around for the river system. We are hopeful that the review will provide an accurate and transparent account of Basin Plan implementation including an evaluation against Basin Plan objectives and the intent of the Water Act 2007 (Water Act) – outlining what needs to change to improve outcomes.

The Basin Plan is not delivering on many of its objectives, or the objects of the Water Act. For example, it has not adequately given effect to international agreements; established environmentally sustainable limits on the quantities of surface water and groundwater that can be taken for consumptive use; protected and restored water-dependent ecosystems; regularly connected rivers and creeks to their floodplains; provided communities with access to sufficient and reliable water supplies that are fit for purpose; nor adequately taken into account spiritual, cultural, environmental, social and economic matters relevant to Indigenous people.

Restoring the Murray-Darling to health demands bold action. We must choose a better future — one that puts healthy rivers, the rights and aspirations of Traditional Owners, and healthy communities at the centre. We need to re-think our approach to managing this important river system and we need to shift away from treating it as an irrigation channel and towards respecting the needs of the rivers, creeks and wetlands and protecting and restoring their cultural and ecological values. This is not only vital for the ecological and cultural wellbeing of the system, but for the health of all Basin communities and economies. The long-term future of Basin communities and industries relies on a healthy, functioning river system.

Our recommendations for healthy Basin ecosystems and communities

Our vision is for a healthy and flourishing Murray Darling Basin, where rivers flow from their source to the sea; Traditional Owners own and manage land and water; where wetlands support abundant life and regional communities are supported with diverse and resilient economies.

Our full list of recommendations is included in the recommendations section below. In summary:

1. Protect and restore wetlands

- Ensure at least 60% of wetlands in the Murray-Darling Basin are protected, restored and are receiving optimal watering.
- Protect and restore Ramsar-listed wetlands in the Basin.
- Improve monitoring of vegetation health and reporting against targets for water-dependent vegetation communities.

2. Connect rivers with floodplains and wetlands

- Prioritise implementation of the Constraints Relaxation Roadmap, incentivising states to overcome barriers to implementation.
- Progress constraints relaxation work independently from the SDLAM projects.
- Implement measures for the Commonwealth Government to take a more active role including sharing risks and costs with state governments and participating in landholder engagement.

3. Connect rivers along their length

- Require states to define, protect and publicly report on Planned Environmental Water.
- Legislate flow targets that reflect scientifically derived environmental flow requirements and require that flow targets are achieved before large upstream extractions are permitted.
- Manage infrastructure barriers in rivers by introducing a licensing system and requiring upgrades to meet environmental and cultural standards.

4. Return water to nature

- Complete the delivery of existing water recovery commitments under the 2012 Basin Plan.
- Ensure the Sustainable Diversion Limit Assessment factors in climate change impacts when evaluating whether water extraction levels are consistent with the Environmentally Sustainable Level of Take.
- Ensure surface and ground water Sustainable Diversion Limits are informed by ecological modelling of flow requirements, climate projections and a water audit.

5. Deliver First Nations water justice

- Work with Traditional Owners to return lands and waters to Traditional Owner management to enable restoration of wetland and floodplain ecosystems and continuation of culture, learning from the successful Gayini example.
- Implement in full, the United Nations Declaration on the Rights of Indigenous People (UNDRIP) in the Water Act, the Basin Plan, and all other subsidiary instruments.
- Legislate the requirement to recover and protect cultural flows, as defined by the Echuca Declaration (2007), and resource Traditional Owner groups to participate in implementation of Cultural Flows.

6. Improve water quality

- Ensure water quality is monitored at the river valley level with the active involvement of Traditional Owners, and that the results are published regularly.
- Establish water reserves to support water quality outcomes, with water to be delivered in response to water quality crises.
- Invest in restoring riparian vegetation in partnership with Traditional Owners to filter runoff and stabilise river banks.

7. Prepare for the impacts of climate change

- Ensure the Basin Plan, Sustainable Diversion Limits, water recovery targets and water sharing rules are informed by the latest climate change projections.
- Embed climate change adaptation in the objectives of the Basin Plan, with a focus on building ecological resilience.
- Implement enforceable end-of-system flow targets to protect ecosystem health in a drying climate.

8. Reduce the impacts of floodplain harvesting

- Accurately measure the volume of water being taken by floodplain harvesting.
- Reduce the volume of water that can be extracted by floodplain harvesting to below 1994 levels.
- Ensure floodplain harvesting cannot take place unless downstream environmental flow targets are being met.

9. Deliver world-leading governance

- Adopt double-entry water accounting systems that monitor water remaining in a river as well as water extracted, test this against Basin Plan water model projections, and publish an annual assessment of discrepancies.

- Undertake regular water auditing using on-ground monitoring and satellite imaging to look at where, when and how water is being used across the Basin.
- Embed the role of the Inspector-General of Water Compliance in all aspects of Basin Plan oversight and include in their role a 5-yearly evaluation of governance.
- Require that state hydrological modelling is compatible with Basin-wide standards and methodology, is independently verified and that modelling and underlying assumptions are published.

10. Invest in regional communities

- Recommend program objectives and next steps for establishing a Basin Transition and Resilience Fund to support Basin communities to adapt to a future with less water through diversification of production systems and reduced dependence on irrigation.
- Ensure drinking water quality across the Basin is monitored and publicly reported on a regular basis in line with the Australian Drinking Water Guidelines.
- Support off-river infrastructure upgrades to ensure all Basin communities have a safe and reliable domestic water supply.

Introduction

About the Alliance

The Murray-Darling Conservation Alliance is a national voice for the rivers, wetlands and wildlife of the Murray-Darling Basin. Members of the Alliance, which was formed in 2022, include peak bodies in every Basin state, representing half a million people in rural communities and east-coast cities. Our vision is for a healthy and flourishing Murray-Darling Basin, where rivers flow from their source to the sea; Traditional Owners own and manage land and water; where wetlands support abundant life and regional communities are supported with diverse and resilient economies. The 2026 review of the Murray-Darling Basin Plan is a critical opportunity to set a clear path towards this vision.

What we think the review should cover

Chapter 5 of the Basin Plan sets out the management objectives and outcomes to be achieved. The Basin Plan Review should seek to provide an accurate and transparent appraisal of whether the Basin Plan is meeting its objectives, whether it is delivering the intent of the *Water Act 2007* (the Water Act) and what needs to change to improve outcomes. It should also look at whether the Basin Plan is based on the best available science and what needs to be updated, particularly in light of the latest climate change projections.

The review is a once in a decade opportunity to improve the system. The health of the Murray-Darling is critical for our nation, for Traditional Owners and for all Basin communities. We must take this opportunity to learn from the last 13 years of implementation and make major improvements to save this important river system that is on the brink of collapse. Section 50(4a) of the Water Act requires that the review must consider the management of climate change risks; matters relevant to Indigenous people in relation to the management of Basin Water resources; and the extent to which the Basin Plan recognises and protects the interests of Indigenous people and supports opportunities for their participation in determining priorities and strategies for the use of Basin water resources.

Questions that we believe should be answered in the Review include:

- Has the Basin Plan adequately given effect to international agreements as required under section 5.02 (1)(a) of the Basin Plan?

- Has the Basin Plan established environmentally sustainable limits on the quantities of surface water and groundwater that can be taken for consumptive use (i.e. limits that support the restoration and protection of water-dependent ecosystems and ecosystem functions) as required under section 5.05 of the Basin Plan?
- Have water-dependent ecosystems been protected and restored as required under section 5.03(1)(a) of the Basin Plan?
- Are rivers and creeks regularly connected to their floodplains as required under section 5.02(2)(c) of the Basin Plan?
- Do communities have access to sufficient and reliable water supplies that are fit for domestic, recreational and cultural use as required under section 5.02(2)(a) of the Basin Plan?
- Is the Basin Plan delivering the objects of the Water Act, in particular is it complying with section 3(d)(ii) (protecting and restoring ecological values)?
- Is work being done to ensure the Basin Plan delivers on object 3(fa) (ensuring that water management takes into account spiritual, cultural, environmental, social and economic matters relevant to Indigenous people) that was added to the Water Act in 2023?
- Is the Basin Plan based on the best available scientific knowledge as required under section 21(4)(b) of the Water Act? If not, what needs to be updated?
- Is Basin Plan governance efficient, effective and transparent?
- Is the Basin Plan delivering benefits for, and respecting the knowledge, needs and cultural economies of, Traditional Owners?

Some of the recommendations offered in this submission extend beyond the scope of the Basin Plan review and the mandate of the Murray-Darling Basin Authority (MDBA). We have included these to provide a holistic set of recommendations for restoring and protecting the health of the Murray-Darling system.

State of the Basin

We believe the answer to each of the questions listed in the previous section is a resounding 'no'. Despite some progress since the Basin Plan was introduced in 2012, too much water is still being taken from rivers and aquifers for irrigation and not enough water is reaching important wetland and floodplain ecosystems. The

health of the river system continues to decline (Chen et. al. 2021, Colloff et. al. 2024, Government of South Australia 2019).

Where environmental water has been restored, we've seen real improvements — but too little water has been returned to the environment overall, and Basin ecosystems remain at risk. Only 4% of wetlands in the Basin are getting the water they need to be healthy (Chen et. al. in publication) and threatened species like the Macquarie Perch and Murray Cod are at risk of extinction (Environment Victoria 2023). Constraints relaxation has stalled, and barriers to the natural flooding that is necessary for getting water to wetlands and floodplains remain in place. Toxic algal blooms, mass fish kills, declining waterbird and fish populations, and reduced water quality all point to a river system under severe stress. Climate change is adding further pressure, bringing hotter temperatures and less water flowing into rivers.

In January 2026, Federal Environment Minister Murray Watt announced the formal listing of the Lower Murray River as a critically endangered ecological community under the EPBC Act. A critically endangered listing means there is at least a 50% chance the community will become extinct in the immediate future. The Macquarie Marshes in northern New South Wales, one of the 16 globally significant Ramsar-listed wetlands in the Basin, was also listed as endangered.

The Plan has clearly not achieved many of its core objectives and in its current form is not capable of delivering on the objects of the Water Act. We cannot continue with the same broken approach to river management over the next 10 years and expect a different result - particularly as climate impacts grow. We need to re-think our approach to managing this important river system and we need to shift away from treating it as an irrigation channel and towards respecting the needs of the rivers, creeks and wetlands and protecting and restoring their cultural and ecological values. This is not only vital for the ecological and cultural wellbeing of the system, but for the health of all Basin communities and economies. The long-term future of Basin communities and industries relies entirely on a healthy, functioning river system.

Priority issues that need to be addressed

Climate change

The discussion paper suggests no meaningful action in response to climate change. The paper proposes to leave the Sustainable Diversion Limits (SDLs) largely unchanged despite the latest science indicating that climate change will most likely result in reduced water availability and increased water demand. The 2012 Basin Plan failed to consider climate change projections. Given the latest modelling indicates that the Basin will be hotter and drier on average, with less water flowing into rivers, it would be irresponsible to ignore climate change for another 10 years. Doing so would only be delaying the inevitable changes that are needed and expose species, ecosystems and Basin communities to unacceptable levels of climate risk.

We need to make changes to how much water we take and how we manage these rivers today. Ignoring the truth is no longer an option. The SDL Assessment must factor in the observed and projected impacts of climate change in evaluating whether the SDLs reflect an Environmentally Sustainable Level of Take.

For further detail on our proposed response to climate change, see recommendations 7A-I.

The unsustainable level of water extraction

According to the Water Act, the SDLs must reflect an Environmentally Sustainable Level of Take (ESLT). The ESLT is defined in the Water Act (section 4) as the level at which water can be taken from that water resource which, if exceeded, would compromise: (a) key environmental assets of the water resource; or (b) key ecosystem functions of the water resource; or (c) the productive base of the water resource; or (d) key environmental outcomes for the water resource.

Current levels of extraction clearly exceed a sustainable level of extraction, evidenced by the ecological damage that can be seen across the Basin and by scientific modelling consistently indicating that water extraction levels need to be reduced well below current levels to represent ESLT. The Basin Plan Review submission by Dr Matthew Colloff and Prof. Jamie Pittock provides a detailed account of why the SDLs do not represent an ESLT. The SDL Assessment needs to reevaluate whether the SDLs reflect the ESLT.

To date, the evaluation against the ESLT has lacked transparency and appears to be so open to interpretation as to be meaningless. A clear methodology for how SDLs are assessed against ESLT is not available.

There needs to be a rigorous and transparent assessment of SDLs against the ESLT during this review period, and in any future consideration of SDLs. This will require updated analysis to inform the ecological water requirements for each catchment area and climate change projections. Ecological modelling of water requirements is a core requirement to ensure the Basin Plan meets the objects of the Water Act. Yet, this essential modelling has not been undertaken since 2011. In addition, changes need to be made so that the SDLs can't continue to be increased as the Baseline Diversion Limit is increased (see recommendation 9i).

For further detail on our proposals to address the over-allocation of water, see recommendations 4A-E.

Water rights and water justice for First Nations

The current water management system is built on the dispossession of Traditional Owners and perpetuates their ongoing exclusion from management and ownership. The Water Act, as amended in late 2023, requires this Review to consider and report on important questions about whether the Basin Plan is working for First Nations peoples. The discussion paper has neglected opportunities to engage with and propose ways to address critical issues faced by First Nations across the Basin – including dispossession of water access and rights, minimal participation opportunities, the failure to provide for cultural flows and in many communities a lack of access to clean drinking water. The discussion paper does not clearly demonstrate that there has been adequate, appropriate consultation with First Nations that reflects the principles in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Australia is a signatory of UNDRIP and furthermore UNDRIP is regarded as best practice, so the MDBA should be adhering to it as a matter of principle.

As a matter of priority we need to address these injustices and move beyond participation and knowledge exchange to supporting First Nations leadership and returning lands and waters to Traditional Owner management and ownership. This means taking immediate action to implement the UNDRIP in the Water Act and the Basin Plan; work with Traditional Owners to return lands and waters to Traditional Owner ownership and management to enable restoration of wetland and floodplain ecosystems and continuation of culture; legislate the requirement

to deliver and protect cultural flows, as defined by the Echuca Declaration; and invest in Traditional Owner-led, designed and implemented research to estimate the value of, and better understand, cultural economies.

For further detail see recommendations 5A-F.

Governance, data and transparency

There are serious failings in Basin Plan governance, data integrity and transparency and immediate action is needed to address these. Three examples demonstrate the extent of these issues:

Firstly, there is no reliable data available on Basin-wide historic or current water extractions. This is a major risk to the credibility of the Plan and an impediment to informed and effective water management. We spent around 6 months attempting to work with MDBA staff to gain a clear understanding of water extraction across the Basin with the aim of answering a simple question: has water extraction decreased since the Basin Plan was introduced?

We did not receive an accurate answer to this question. That there is no reliable data available to answer this fundamental question is unacceptable. Our understanding is that this answer is not readily available because data has been reported differently over time - pre-Basin Plan data was reported under The Cap, and post-Basin Plan it has been reported under varying arrangements, with idiosyncratic state reporting. The MDBA did not provide data sets to enable us to compare pre-2012 extraction with post-2012 extraction. We believe this important question should be considered in detail by the MDBA and that data should be published to answer this question. If that is not possible, a clear explanation should be given, outlining why this question cannot be answered and identifying steps toward data integration.

Second, state hydrological models are 'black box' models. They lack transparency and do not provide reliable estimates of water extraction. The assumptions behind these models are not public and the MDBA seems to lack the ability to scrutinise these models. State governments are able to adjust the assumptions of these models to deliver the outcomes they want, and use these modelled estimates to report water extraction rather than using metered data. This undermines the integrity of the Plan and calls into question the accuracy of reported data – and whether it represents what is happening on the ground and where water is actually being used.

Third, floodplain harvesting (a major form of take in the northern Basin) is not accurately reported. The majority of floodplain harvesting take is not measured – it is instead reported as estimates. NSW floodplain harvesting take is not currently reported in the Annual Take Report as a distinct form of take. Independent researchers estimated that mean annual floodplain harvesting take in NSW from 2004-20 was 778 GL/yr (Brown et. al. 2022). This is equivalent to 9% of the Basin-wide total annual take in 2022-23. Until states accurately report floodplain harvesting, we will not have a clear understanding of water extraction levels across the Basin.

We recommend immediate action including adopting double-entry water accounting systems that monitor water remaining in a river and water extracted, testing these observations against model projections, and publishing an annual assessment of discrepancies; undertaking regular water auditing using on-ground monitoring and satellite imaging; publishing consistent, comparable datasets showing annual historic water diversion and extraction; investing in long-term ecological and cultural monitoring of an expanded network of sites linked to Basin Plan objectives and regularly publishing results; and requiring that state hydrological modelling (and any other related modelling) is compatible with Basin-wide standards and methodology, transparent and auditable.

For a full list of our governance proposals see recommendations 9A-K and for our proposals on reducing the impacts of floodplain harvesting see recommendations 8A-D.

Constraints to overbank flows

Overbank flows are necessary for getting water to floodplains and wetlands. But barriers remain and according to new research only 4% of Basin wetlands are getting the water they need and around 40% have received no flows at all in the 36 years from 1988 to 2024 (Chen et. al. in publication). There is no substitute for addressing these barriers to important overbank flows. Infrastructure projects or offsets schemes will not shift the reality of the situation, which is that water managers need to be able to deliver overbank flows.

Relaxing constraints to overbank flows needs to be progressed as a high priority. The Commonwealth could accelerate constraints relaxation by ensuring it progresses independently of the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) offsets projects; sharing risks for unforeseen inundations with state governments; and communicating the social and economic benefits of

constraints relaxation for communities e.g. flood risk reduction, infrastructure improvement. It is vital that constraints relaxation is progressed.

For a full list of our proposals see recommendations 2A-E.

Northern Basin connectivity

Connectivity of the northern Basin needs to be addressed as a high priority. The fish kills, algal blooms, poor water quality and instances of rivers running dry all point to a system in trouble. The continuation of current practices will lead to the ecological collapse of the Darling/Baaka River.

Historically the Barwon-Darling/Baaka River flowed more than 90 per cent of the time, with deep pools remaining even when flows slowed. Connectivity reforms that create and protect base flows are critical for building ecological resilience. Base flows represent the minimum water needs of rivers. In the northern Basin, base flows are defined as a base-flow most of the time, a small flush once a year and a larger flush every second year. Once a river runs dry it takes more water to get it flowing again, reducing the efficiency of environmental water use and causing ecological damage by letting the river dry out.

The NSW Connectivity Expert Panel (the Panel) provided detailed recommendations on restoring connectivity in the northern Basin (Connectivity Expert Panel 2024).. The Panel emphasised the importance of protecting base flows and extending resumption of flow rules to protect the first flows following periods of drought. We support the implementation of these measures, alongside an evaluation of SDLs that takes into account updated floodplain harvesting data and climate change projections. These measures need to be implemented in combination, any one approach in isolation will not solve the problem.

The Panel recommended that baseflows be restored through implementing minimum daily flow rules at the end of systems, restricting floodplain harvesting access under certain conditions in alignment with restrictions that apply to supplementary take (another opportunistic form of take), and releasing water from dams where necessary to achieve end-of-system flows. Floodplain harvesting has been identified in many reports as a significant contributing factor to the loss of base flows. Ensuring floodplain harvesting is limited as for supplementary water access and ensuring that all rainfall runoff that is captured

on farm is brought into the licencing regime are important steps for achieving base-flow connectivity in the northern Basin.

The Panel also recommended extending the current resumption of flow rules into the northern Basin tributaries to provide for a small flushing flow after extended dry periods all the way to Menindee Lakes prior to allowing extraction. These first flows are vital for ecosystems and restore life to rivers following drought. Protecting them from extraction is a critical element of restoring connectivity.

For a full list of our proposals for improving connectivity in the northern Basin see recommendations 3A-D.

Our response to options proposed in the Discussion Paper

The Murray-Darling Basin Plan Review Discussion Paper proposes a series of options in response to issues. This section outlines our response to these options, including alternative proposals for addressing the issues raised.

An initial assessment of sustainable diversion limits (SDLs) (Chapter 3)

The initial SDL assessments for surface water have identified 4 priority issues requiring action: river connectivity in the northern Basin, end-of-system outcomes, floodplain and wetland health, and native fish decline.

We agree that these four issues need to be addressed and we have provided recommendations relating to these issues in the recommendations section. We also note that addressing the over-allocation of water and returning water to the environment would help to address all of these issues. These are not four unrelated issues, they are all related to the lack of water available for nature, combined with the altered flow regime and the barriers to overland flow and fish passage.

Native fish, for example, need clean water and they need connected rivers that enable them to move between habitats. Reducing invasive carp populations is important but would not in isolation be enough to support the recovery of native fish species. Further, the current conditions created by irrigation and over-extraction of water (consistent slow flows, creation of weir pools etc.) are providing favourable conditions for carp to thrive. A more natural flow regime would provide less favourable conditions for carp and enable native fish species to recover.

The initial SDL assessments for groundwater show more work is needed in 3 groundwater SDL units, to determine whether the SDL reflects an environmentally sustainable level of take. These are the Upper Namoi Alluvium, Lower Namoi Alluvium and the Lower Gwydir Alluvium.

We are supportive of further work being done to determine whether the SDLs represent ESLT. We also note our concerns mentioned in the key issue section about the SDL Assessment methodology and whether it is accurately considering climate change impacts, and our concerns about how SDLs are evaluated against ESLT.

Maximising the benefits of water for the environment (Chapter 4)

Reduce duplication and inefficiency in preparing annual environmental watering priorities and long-term watering plans.

We are supportive of streamlining provided it does not reduce transparency or accountability.

Improve the Basin-wide environmental watering strategy to support strategic planning and transparent prioritisation of the environmental water portfolio.

We are supportive of improvements provided they do not reduce transparency or accountability.

Make adaptation explicit in environmental water planning. Require long-term watering plans to identify vulnerable environmental outcomes and transitioning ecosystems, and improve knowledge sharing through the environmental watering plans.

We support efforts to plan for climate change and to enable adaptive management as climate change impacts are experienced. We support identifying ecosystems that are vulnerable to climate impacts and ecosystems that are transitioning, however we encourage consideration of all options, particularly increasing water recovery targets, for sustaining ecosystems before triage is considered.

Ensure environmental water is transparently accounted for and protected as it moves through the system.

We support efforts to transparently account for environmental water. We recommend reporting that shows Commonwealth and State Held Environmental Water delivered. We note the need to ensure measurement and monitoring are fit for purpose and that systems are adjusted to consider the nature of environmental water delivery.

For example, the water management system in NSW is designed to facilitate the delivery of irrigation water. The delivery of water for the environment does not fit neatly into the existing management processes, resulting in legal and compliance ambiguities delaying deliveries of water for the environment in NSW. An overhaul of water delivery systems is required so that the delivery of water for the

environment is not jeopardised because it doesn't fit the frame of the current system.

We strongly support the protection of environmental water as it moves through the system. The protection of Planned Environmental Water must be a high priority in the interests of restoring connectivity in the northern Basin.

Invest in coordinated and transparent environmental water delivery and outcomes reporting.

We are supportive of ensuring publicly accessible reporting of the delivery of environmental water including the annual allocation volume, water delivered, water traded, water forfeited and water lost to evaporation through state-based carryover rules. We also support clear public reporting of the outcomes of environmental water delivered.

Strengthen First Nations peoples' involvement in planning, delivery and monitoring of water for the environment to deliver improved environment outcomes, and support Cultural, spiritual and community co-benefits.

Embed First Nations knowledge. Integrate First Nations knowledge into monitoring, evaluation and reporting processes.

We support these options but they are not enough. We encourage a shift from First Nations involvement towards First Nations leadership and self-determination. We support working with First Nations Peoples to respectfully learn from their knowledge and integrate it into water management. We also note the need to address the ongoing dispossession of First Nations and to restore lands and waters to Traditional Owner management and ownership and deliver water rights and cultural flows.

Consultation and participation is not enough. We need to address the current water injustice by returning ownership, power and autonomy to First Nations as the Traditional Custodians of the lands and waters of the Murray-Darling Basin. See recommendations 5A-F.

Enable environmental water holders to prioritise environmental watering in areas where land and water management actions are coordinated, where appropriate.

We support this provided there is clear guidance on where this is appropriate and safeguards to ensure it doesn't result in some areas consistently missing out

on water. This principle should not be used to justify water delivery that primarily supports, or disproportionately benefits, private, extractive economic interest.

Improving river connectivity in the northern Basin (Chapter 5)

Include objectives and outcomes in the Basin Plan that specifically support end-of-system connectivity in the northern Basin.

Improve environmental water management, coordination and planning in the northern Basin.

NSW improves river connectivity across connected catchments of the northern Basin.

We support these options and note that additional work will be needed. Northern Basin connectivity needs to be addressed as a high priority, as outlined in the priority issues section and in recommendations 3A-E. We strongly support implementing the recommendations of the NSW Connectivity Expert Panel. We reiterate that base flows need to be delivered through Planned Environmental Water rather than Held Environmental Water and that implementing resumption of flow rules in the absence of delivering base flows will not be enough to restore connectivity in the northern Basin.

For more detail see recommendations 3A-E.

Improving floodplain and wetland health (Chapter 6)

Continue the New South Wales' Murrumbidgee Reconnecting River Country program and extend the Gwydir Reconnecting Watercourse Country program beyond December 2026.

Take practical and incremental steps to increase environmental flows in priority areas for the Goulburn and Murray, developed in consultation with, and supported by, local communities and landholders.

We support these options, but recommend that constraints relaxation work needs to be progressed as soon as possible for the sake of sustaining important wetland and floodplain ecosystems. This work has already been delayed and we

are concerned that continuing with incremental progress will be too slow and could result in extinctions. We understand that some aspects of constraints relaxation work will take years, but that does not need to hold up work on other constraints relaxation projects. It is vital that water reaches wetlands and floodplains and supporting states to implement constraints relaxation measures should be a high priority for the Commonwealth.

For detail see recommendations 2A-E.

Responding to native fish decline (Chapter 7)

Consider a targeted package to restore native fish in priority locations in the Basin that may include:

- Address barriers to fish passage and other hazards like irrigation diversion pumps.
- Ensure ongoing maintenance of existing fishways, particularly on the River Murray.
- Ensure there are multi-pronged approaches to manage invasive species such as carp.
- Invest in stocking, reintroduction and targeted recovery programs for rare and threatened species.
- Identify priority instream and riparian habitat restoration areas to support native fish recovery.

We support this work. We also note that restoring flows and improving connectivity is fundamental for native fish recovery. Native fish cannot thrive without good quality water and connected rivers. Restoring flows and connectivity should be a fundamental element of any work to restore native fish populations. We recommend the introduction of a licensing scheme for managing infrastructure in rivers to reduce barriers to fish passage.

For our proposals for improving connectivity see recommendations 3A-E and for our proposals for restoring water to nature see recommendations 4A-E.

Managing water quality (Chapter 8)

Improve the Basin Plan water quality management plan (Chapter 9 of the Basin Plan) by strengthening water quality objectives and targets.

Ensure Basin governments work together to manage Basin water quality hotspots by tackling the root causes of poor water quality and strengthen Basin governments' joint capacity for preventative action and early intervention.

Develop opportunities for First Nations peoples to participate and contribute their science and knowledges to understanding water quality, including through monitoring programs.

There are serious water quality problems across the Basin. The Basin Plan has not delivered on its objective that communities have sufficient and reliable water supplies that are fit for domestic, recreational and cultural use. Many communities cannot swim in the river as the water has become toxic. First Nations communities are suffering as rivers dry up or become contaminated and unsafe due to algal blooms or fish kills, causing cultural, ecological and social harm.

We support the proposed options but also note that water quality issues are closely linked to insufficient flows. Restoring water to nature and protecting and restoring wetlands and riparian vegetation are vital for improving water quality. We also note the need to ensure environmental water is not being used to solve water quality crises. This could be done by creating a dedicated reserve for water quality. As noted previously, we support opportunities for First Nations involvement but suggest we need to move beyond consultation and towards supporting First Nations management, ownership and leadership.

For our proposals for improving water quality see recommendations 6A-C, for protecting and restoring wetlands see recommendations 1A-E and for water justice for First Nations see recommendations 5A-F.

Water infrastructure and critical human water needs (Chapter 9)

Modernise water infrastructure across the Basin to reduce the risk of asset failure and safety risks, and to deliver on a broader range of values and interests, including improved Basin Plan outcomes.

We support this option and note that all infrastructure upgrades should seek to minimise environmental impacts including barriers to fish passage. We also note the need to improve drinking water suppliers and quality, particularly for remote communities, and to improve monitoring and public reporting of drinking water quality. We support off-river infrastructure upgrades to ensure all Basin communities have a safe and reliable domestic water supply.

Our proposals on water supply and supporting Basin communities are at recommendations 10A-D.

Consider minimum water resource plan requirements for state-based extreme event water planning to ensure adequate consultation processes and that planning is underpinned by robust climate assumptions.

We support planning for climate impacts including drought contingency planning and improved water allocation processes. In NSW for example, future drought risk is determined based on a capped historic record, where all droughts that have occurred since water sharing plans were gazetted in a catchment are ignored. This creates a high risk of water storages crashing. It is important that Water Resource Plans are required to include extreme event water planning and that they must consider the best available climate science.

Basin Plan regulatory design (Chapter 10)

Consider ways to reform WRPs by focusing the requirements on what matters most or shift away from accreditation to oversight of Basin states.

We do not support a shift away from accreditation of Water Resource Plans. These plans are an important mechanism for requiring states to comply with the Basin Plan, and for them to report data on water extraction. Some states have demonstrated a lack of commitment to implementing the Basin Plan and there should be no weakening of the requirements for them to comply. Public trust in Basin Plan implementation and the integrity and availability of data is low and removing the requirement for accreditation of Water Resource Plan would not support rebuilding trust.

Improve SDL accounting and compliance including clarifying definitions and improving consistency and knowledge.

We support efforts to improve SDL accounting and compliance. We also note the need for transparent and accessible public reporting that enables greater community understanding of how water is being used across the Basin and given an honest account of where information is lacking and where data integrity or reliability is low.

Refine water trading rules to improve how exemptions for environmental water delivery work, support compliance and align with broader water market reforms.

We support improved integrity and compliance in the water market. We do not support streamlining that would reduce transparency, nor any changes that would impede the delivery of environmental water.

Streamline Basin Plan reporting to support compliance, outcomes assessment, First Nations participation and adaptive management.

Basin Plan reporting should be accessible and easier to understand and locate. We support reporting that encourages compliance and enables an accurate assessment of outcomes. We do not support streamlining that would reduce First Nations participation.

Improving science and knowledge to inform Basin water management (Chapter 11)

Build understanding of the complexities and interactions of environmental, economic, social and Cultural outcomes in the Basin through sustained research capacity, community involvement, and a greater focus on science synthesis, collaboration and communication.

We support building understanding, particularly by ensuring the latest peer-reviewed research is considered in management decisions and planning. We note it would be beneficial to conduct a comprehensive review of how the key drivers of change are affecting Basin communities, including water reform (unbundling and financialisation of water rights), the Basin Plan (water recovery and adaptive management) and broader challenges (climate change, commodity prices, trade sanctions, mechanisation), and to publish and broadly communicate the findings. See recommendation 10A.

Strengthen opportunities for First Nations peoples to contribute their science and knowledges.

We support this. First Nations peoples have a long history of being custodians of land and water and a deep knowledge of the Murray-Darling Basin and current management practices could be greatly improved by considering this knowledge. As noted previously, we support opportunities for First Nations involvement but suggest we need to move beyond consultation and towards supporting and resourcing First Nations management, ownership and leadership.

Monitor water flows, availability and river connectivity, and how these interact with ecosystems and climate change, to ensure effective water planning and delivery across the Basin.

We support greater monitoring of water use, flows and ecological outcomes. There is currently a lack of reliable data on where water is being extracted and how water is moving through the system. State data is largely based on modeled estimates and there is insufficient testing of these estimates against observed water flows. We recommend adopting double-entry water accounting and undertaking regular water auditing, alongside other governance reforms.

For detail on our proposals to improve governance and transparency see recommendations 9A-K.

Enhance groundwater knowledge across the Basin.

We support efforts to improve knowledge of groundwater across the Basin. There is a need for greater understanding of groundwater availability and movement and the interaction between surface water and groundwater resources. This is particularly important as the climate changes and demand for groundwater increases. We also note that groundwater SDLs were increased when the Basin Plan was introduced and that many of these resources are underallocated. We recommend a review of groundwater SDLs to identify units where SDLs can be reduced at least back to pre-2012 levels.

Increase our knowledge on how native fish can be better protected at the Basin scale.

We support increasing knowledge on native fish protection and suggest this include consideration of the latest peer-reviewed research.

Improve understanding of water quality drivers and impacts to deliver a greater predictive capacity, so water managers can pre-empt events.

We support this and note the need to establish reserves for managing water quality events and that increased flows will help to address water quality issues. Source points for pollution events should be identified, and steps taken to reassess the effectiveness of environmental protection licences in limiting contamination.

Address knowledge gaps preventing more targeted action shown by the initial SDL assessments relating to groundwater, environmental condition and non-water drivers.

We support this but note that some non-water drivers, e.g. invasive carp, are linked to water availability and flow patterns. For example, the current conditions created by irrigation and over-extraction of water (consistent slow flows, creation of weir pools etc.) are providing favourable conditions for carp to thrive. A more natural flow regime would provide less favourable conditions for carp and enable native fish species to recover.

Improve methods for SDL accounting to more accurately estimate water take and future water demands.

We strongly support efforts to improve the accuracy of water take data. In particular there is a need to ensure floodplain harvesting take is accurately measured and reported. As such a large proportion of take, having an accurate understanding of this is critical to understanding whether water extraction is below the SDLs.

For detail on our proposals to improve governance and transparency see recommendations 9A-K and for addressing floodplain harvesting see recommendations 8A-D.

Improve modelling and predictive capacity by continuing collaborative development of models and forward-facing tools with Basin governments.

We strongly support efforts to improve the accuracy and transparency of state models. As mentioned in the key issue section, state hydrological models are 'black box' models that lack transparency and may not provide reliable estimates of water extraction. The assumptions behind these models are not public and the MDBA seems to lack the ability to scrutinise these models. State

governments are able to adjust the assumptions of these models to deliver the outcomes they want, and use these modelled estimates to report water extraction rather than using metred data. This undermines the integrity of the Plan and calls into question the accuracy of reported data and whether it represents what is happening on the ground and where water is actually being used.

See recommendation 9K.

Our recommendations for restoring the Murray-Darling to health

Our vision is for a healthy and flourishing Murray Darling Basin, where rivers flow from their source to the sea; Traditional Owners own and manage land and water; where wetlands support abundant life and regional communities are supported with diverse and resilient economies. These are our recommendations for working towards that vision and for supporting resilient ecosystems and communities across the Basin as the climate changes.

1. Protect and restore wetlands

Recommendations

A. Ensure at least 60% of wetlands in the Murray-Darling Basin are protected and restored and are receiving optimal watering.

B. Ensure all Ramsar-listed wetlands in the Basin are protected, restored and receiving optimal watering.

C. Improve monitoring of vegetation health in partnership with Traditional Owners and report against targets for water-dependent vegetation communities.

D. Encourage state governments to implement programs to encourage landholders to restore riparian vegetation and wetlands, and install fencing to exclude livestock from significant habitat areas.

E. Link to the Australian Bushland Program to support Indigenous, other non-government and state acquisition of high conservation value wetlands for conservation.

Our position

The Murray-Darling Basin is Australia's largest river system and has high ecological and cultural value. It is a living system with integral value and needs to be treated with respect and care, not as an irrigation channel. Restoring the health of rivers, wetlands, billabongs, aquifers and floodplains of the Basin and protecting them for the future is crucial for the survival of the many threatened species and ecological communities that depend on these systems. It is also important for Traditional Owners who have lived alongside and cared for these

environments for over 60,000 years. Healthy ecosystems and healthy rivers are closely linked to the wellbeing of Traditional Owners throughout the Basin and rights of Traditional Owners to practice culture and sustain cultural economies.

Decades of engineering and over-allocation of water have significantly reduced runoff to rivers, creeks and wetlands as well as recharging of groundwaters. The Basin's ecosystems are suffering as a result and species that depend on the natural flooding cycle face extinction if the problem is not resolved.

Currently around 8% of inland water ecosystems (freshwater-dependent ecosystems including rivers, lakes, wetlands and streams) in the Murray-Darling Basin are protected (Chen et. al. 2025). Current research suggests only 4% of wetlands in the Basin are receiving enough water to maintain healthy ecological function (Chen et. al. in publication). That means 96% of the Basin's wetlands aren't getting the water they need to thrive. As a result, species and ecosystems are suffering and the ability of Traditional Owners to uphold their custodial responsibilities to care for Country is being severely compromised. Continuing with current management practices would see a devastating loss of ecosystems and living cultural heritage throughout the Basin. This would be an unacceptable loss of biodiversity and would not align with Australia's commitments under global agreements.

Protecting and restoring at least 60% of inland water ecosystems across the Basin, would not only give these ecosystems the lifeline they need, but it would improve water quality and amenity for Basin communities. In addition to providing critical habitat, healthy riparian and wetland ecosystems stabilise river banks, improve water quality by reducing sediment runoff and taking up nutrients, help moderate river temperatures, support drought refuges, support cultural economies and contribute to carbon storage. It would also deliver a range of social and economic benefits for communities through improved water quality, amenity, improved eco-tourism opportunities, cultural economies and job and career opportunities.

Protecting and restoring 60% of wetlands in the Basin would align with meeting Australia's commitments under the Global Biodiversity Framework which has a goal of halting and reversing biodiversity loss by 2030, including inland water ecosystems.. We recommend protecting and restoring 60% of Basin wetlands as a starting point that would be a proactive benchmark for success for the next phase of the Basin Plan. As only 8% of Basin wetlands are currently protected, achieving this target would demand significant effort and mobilisation of

resources toward protecting ecosystems. This recommendation is not a suggestion for triage or writing off the remaining 40% and should be seen as a first stage target to drive action and ambition.

See supporting information for further detail and references.

2. Connect rivers with floodplains and wetlands

Recommendations

A. Prioritise implementation of the Constraints Relaxation Roadmap aiming for delivery in under 10 years where feasible, incentivising states to overcome barriers to implementation.

B. Progress constraints relaxation work independently from the SDLAM projects so this work can progress regardless of SDLAM project delays or discontinuation.

C. Implement measures for the Commonwealth Government to take a more active role including sharing risks and costs with state governments and participating in landholder engagement.

D. Model the social and economic benefits of constraints relaxation for communities (e.g. flood risk reduction, infrastructure improvement).

E. Enable regular controlled overbank flows in the Lower Murray to cleanse floodplains of organic matter, reducing the potential for larger flood events to lead to severe blackwater events.

Our position

Enabling a more natural flow regime is crucial for reconnecting rivers with floodplains and wetlands. A river's capacity to connect with its wetlands and floodplains is extremely important to its health. For example, flows that connect wetlands to the main river channel allow fish to move to new areas to find food and shelter and to breed. Riverine ecosystems have evolved over thousands of years with a natural pattern of seasonal flows and flooding and support a mosaic of different vegetation types and habitats with different watering requirements. The centuries-old river red gums along the rivers, the black box woodlands on the floodplains, and the many wetlands of the Basin each have particular watering needs that can be met through a flow regime with periodic flooding.

In the limited areas where water for the environment has been delivered under the Basin Plan, there is evidence of environmental restoration and improvement. However, only 4% of Basin wetlands are receiving the water they need, leaving the vast majority deprived of the water they need to survive. Without more water for the environment, and without addressing impediments to flooding known as 'constraints' (such as bridges, roads and private property), it will not be possible to reverse the overall declining environmental condition of the Basin. Efforts to reduce these barriers to natural flows are referred to as 'constraints relaxation'.

Flood events are crucial for getting water across the floodplain, and for maintaining ecological and cultural health throughout the system. In addition to direct ecological benefits, allowing more regular managed overbank inundation helps to reduce the severity of blackwater events. Severe events occur when large floods wash accumulated organic matter downstream, leading to high bacteria levels and low oxygen availability for fish. This can result in major fish kills and cultural harms. Enabling regular controlled overbank flows in the Lower Murray is important for triggering natural processes on floodplains to process organic matter, take up nutrients, retain sediment, flush salt, and water the vegetation, and to reduce the potential for larger flood events to lead to severe blackwater events and the accumulation of pollutants in the Lower Lakes.

In many areas, constraints limit water managers' ability to release enough water from dams to create the overbank flows that are necessary to reconnect rivers with their floodplains. These constraints arise because such flows would flood private land and infrastructure, inundate bridges or impede access routes. Responsibility for addressing these constraints and enabling more natural flow regimes rests with state governments, with each state applying different tools and approaches.

Implementation of constraints relaxation work has been far too slow and this work needs to be prioritised and resourced. The Commonwealth can play an important role in incentivising or requiring states to implement the roadmap. Constraints relaxation is vital for delivering the 80,000 ML/day at the South Australian border that is necessary for inundating 75% of the Riverland wetlands in South Australia (Murray-Darling Basin Authority 2012). While we acknowledge the complexity of managing the impacts of constraints relaxation, our view is that this work should be prioritised and progressed sooner than outlined in the Constraints Relaxation Implementation Roadmap where possible, and must be done in partnership with Traditional Owners. Species and ecosystems are

already struggling and will continue to decline until these barriers to controlled overbank flows are addressed.

See supporting information for further detail and references.

3. Connect rivers along their length

Recommendations

A. Require states to implement a set Basin-wide definition of Planned Environmental Water, ensure its protection and publicly report on how Planned Environmental Water is being protected.

B. Legislate flow targets that reflect scientifically derived environmental flow requirements; embed flow targets into operational rules and water sharing plans; require that flow targets are achieved before large upstream extractions are permitted; improve flow gauge coverage; and monitor and report performance against flow targets.

C. Require states to implement measures to protect and improve connectivity in the northern Basin through Water Resource Plans.

D. Manage infrastructure barriers in rivers, including by introducing a licensing system and requiring infrastructure owners to upgrade infrastructure to meet environmental and cultural standards.

E. Encourage/incentivise/support the NSW Government to implement the recommendations of the NSW Connectivity Expert Panel.

Our position

Maintaining connectivity along the length of rivers, by ensuring they continue to flow and by removing barriers to fish passage, is essential for restoring river health, protecting species and cultural landscapes and supporting Traditional Owners' relational obligations to downstream neighbours. Improving longitudinal connectivity enables the movement of species between habitats, including totemic species, and is particularly important for protecting the health of declining native fish populations. Improving connectivity requires thorough consideration of the interaction between surface and groundwater systems, including where they traverse state and catchment boundaries. Increased effort is needed to improve connectivity of rivers along their length and this work must

be progressed as a high priority to restore river health and protect vulnerable species and communities.

Legislating flow targets that reflect the environmental flow requirements of rivers and Traditional Owner requirements is necessary for embedding and prioritising the maintenance of flows. The evidence is clear: reduced connectivity of rivers along their length is contributing to fish kills and having severe impacts on ecosystem and cultural health and downstream communities. Unless we make changes, we will continue to witness these damaging fish kills along the rivers and the decline of native fish populations.

The definition of Planned Environmental Water varies between states, the Commonwealth and even within catchments. To secure the long-term health and resilience of the Murray-Darling Basin, it is critical that all forms of Planned Environmental Water are formally and consistently defined, protected, and accounted for across all Basin jurisdictions.

The current ambiguity and inconsistent treatment of Planned Environmental Water in state-based water resource plans create significant risks, potentially undermining the environmental outcomes sought by the Water Act 2007 and the Basin Plan. A lack of a clear, legally enforceable Basin-wide definition allows for water intended for environmental purposes, or water that is outside of the market to potentially be reclassified and extracted, diminishing the effectiveness of the Held Environmental Water portfolio and jeopardising the ecological health of rivers, wetlands, and floodplains.

It is imperative that the Commonwealth Government requires all Basin states to implement a single, comprehensive definition of Planned Environmental Water within their legal frameworks, ensure its absolute protection from consumptive take, and publicly report on the measures taken to identify and protect the different types of Planned Environmental Water.

See supporting information for further detail and references.

4. Return water to nature

Recommendations

A. Complete the delivery of existing water recovery commitments under the 2012 Basin Plan.

B. Ensure the Sustainable Diversion Limit Assessment factors in climate change impacts and the interaction between reduced runoff and water extraction when evaluating whether water extraction levels are consistent with the Environmentally Sustainable Level of Take.

C. Ensure surface and ground water Sustainable Diversion Limits are informed by ecological modelling of flow requirements, climate projections and a water audit (see recommendation 9B for more detail on water auditing).

D. Revise how the Environmentally Sustainable Level of Take is defined and assessed to ensure ecological health and climate impacts are taken into account.

E. Following the SDLAM reconciliation, recover water to address the shortfall from unsuccessful SDLAM projects and end this program, not allowing any new projects or any further extension of deadlines for delivery.

Our position

When rivers have the water they need, they sustain a thriving ecosystem and support healthy and resilient regional communities including Traditional Owner communities.Too much water has been taken from the rivers and aquifers of the Murray-Darling Basin for too long, denying waterways the flows they need to be healthy and denying Traditional Owners from fulfilling their obligations to care for Country. We need to reduce how much water we are taking from the river, taking into account the escalating impacts of climate change, and we need to accurately measure progress. Water recovery should deliver water through transparent, reliable methods rather than through offsets from water infrastructure or efficiency projects. And we need clear and consistent public reporting that shows water extraction and delivery of environmental water over time.

The 3200 GL water recovery target set in the 2012 Basin Plan was too low and did not factor in climate change or take into account Traditional Owner needs

and rights. The target was set well below the minimum water recovery volume that was recommended by the best available science as essential for a healthy Basin system. Water recovery to date falls well short of what is needed for healthy rivers. As of 30 September 2025, only 2245 GL of surface water had been recovered towards the original 3200 GL target.

It is critical to complete the commitments of the original Basin Plan including by recovering the 450 GL and recovering water to address the shortfall from unsuccessful SDLAM projects. The Basin and its ecosystems are in ongoing decline and are losing resilience. Returning minimum health to rivers and their ecosystems is critical, not just for the environment, but for all the dependent communities and industries that rely on continued access to sufficient water of suitable quality.

The SDLAM projects have largely failed to deliver outcomes and have delayed Basin Plan implementation, with serious negative consequences for Basin health. Since 2017, the 605GL has remained available for irrigation despite most projects not having been delivered. Given that most of the SDLAM offsetting works & measures have never been operational, throughout the life of the Basin Plan, the Basin environment has neither had the use of this water or the benefit of any offsetting measure. This situation is ongoing and is a significant contributing factor in the various failures to achieve environmental flow requirements and Basin Plan objectives outlined in this submission.

We need to better understand what is needed to support healthy rivers, aquifers, wetlands and floodplains across the Basin, in terms of volume of flows, flooding levels, water quality and timing and duration of flows, including cultural flows. There is a need for updated modelling, factoring in the latest climate projections, to answer these questions. Modelling of environmental watering requirements for ecosystem health has not been undertaken since 2011, leaving significant knowledge gaps that need to be addressed to enable informed decisions about restoring and sustaining the health of rivers, wetlands and floodplains.

There is also a need to resource First Nations to develop and lead cultural flows modelling, factoring in the climate projections. Neither the current the Aboriginal Water Entitlements Program or the Cultural Flows for Cultural Economies funding facilitate this essential work and additional resources are urgently required for First Nation developed, led and implemented work.

See supporting information for further detail and references.

5. Deliver First Nations water justice

Recommendations

A. Implement in full, the United Nations Declaration on the Rights of Indigenous People (UNDRIP) within parent and subsidiary instruments, including the Water Act (parent), the Basin Plan, and all other subsidiary instruments, including Water Resource Plans.

B. Recognise and sustainably resource all Basin Nations and MLDRIN in the oversight of UNDRIP implementation within the Water Act, Basin Plan, and all other subsidiary instruments, including Water Resource Plans.

C. Work with Traditional Owners to return lands and waters to Traditional Owner ownership and management to enable restoration of wetland and floodplain ecosystems and continuation of culture, learning from the successful Gayini example.

D. Legislate the requirement to recover and protect cultural flows, as defined by the Echuca Declaration (2007), and resource Traditional Owner groups to participate in implementation of Cultural Flows.

E. Invest in Traditional Owner-led, designed and implemented research to estimate the value of, and better understand, cultural economies.

F. Deliver the commitments in the Restoring Our Rivers Act 2023 including by sustainably resourcing and working with all Basin Nations and MLDRIN to strengthen the rules guiding preparation of the Basin Plan to give effect to matters relevant to Basin Traditional Owners.

Our position

We support genuine Traditional Owner-led self-determination and water justice for Traditional Owners across the Murray-Darling Basin. This requires recognising and giving practical and enforceable effect to Traditional Owners' rights and interests in water through the Water Act, the Basin Plan and associated subsidiary instruments including Water Resource Plans. It includes the return and allocation of water rights to Traditional Owners and agreement making in relation to river management.

The Murray-Darling Basin includes the unceded territories of over 40 First Nations. Approximately five per cent (120,000) of the total Basin population is Indigenous, maintaining enduring cultural, spiritual, economic and governance responsibilities to Country. Colonisation and its ongoing legacies have resulted in the dispossession of land and water, with First Nations organisations holding only a minimal share of Basin water entitlements. At the same time, successive policy frameworks have enabled over-extraction and entrenched the marketisation and financialisation of water. These settings have compounded inequity by degrading rivers and floodplains, limiting Traditional Owner influence in water governance, and systematically excluding First Nations from the economic benefits derived from Basin water resources.

This structural imbalance directly informs the case for reform. Justice and equity in Basin management require more than consultation, they require redistribution of access, authority, and benefit. Embedding Traditional Owner water rights within Basin settings is a fundamental matter of human rights that needs urgent attention in its own right. It is not an add-on to environmental reform, it is integral to achieving ecologically sustainable outcomes and lawful recognition of rights.

See supporting information for further detail and references.

6. Improve water quality

Recommendations

A. Ensure water quality is monitored at the river valley level with the active involvement of Traditional Owners, and that the results are published regularly.

B. Establish water reserves to support water quality outcomes, with water to be delivered in response to water quality crises. The reserves should not be sourced from the existing environmental water portfolio, but underwritten by the consumptive pool – recognising that systemic water quality crises are shared by all users, caused disproportionately by extractive use.

C. Invest in restoring riparian vegetation in partnership with Traditional Owners to filter runoff and stabilise river banks (see section 1 for more detail).

Our position

The degraded state of the river system and over-extraction of water is leading to poor water quality in many areas, with direct impacts on Basin communities,

Traditional Owners and river health. To improve water quality we need to restore flows to our rivers and restore vegetation along waterways, in partnership with Traditional Owners. Trees and other vegetation along river banks and wetlands act as a buffer, trapping sediments, pollutants and nutrients before they enter waterways, preventing erosion and sedimentation that can otherwise damage riverbeds and reduce water quality. This improves water quality and significantly reduces the likelihood of toxic algal blooms.

Water quality declines when flows are reduced, because the nutrients and sediment that would normally be washed down the river are trapped. As a river stops flowing the pools of water that remain in the riverbed heat up, allowing bacteria and algae to increase. This is why periods of reduced or no-flow in warmer months can lead to algal blooms. As mentioned in section 1, enabling delivery of more frequent controlled overbank flows is important for flushing out nutrients and avoiding larger inflows of nutrients in the event of larger floods. This highlights the importance of constraints relaxation for improving water quality.

Access to clean, safe water is the most basic human right according to the United Nations and is essential for human health and the full enjoyment of life. In addition to supporting healthy ecosystem function, good quality water and healthy rivers are important for agricultural production as well as recreation and enjoyment such as swimming, fishing and kayaking which are an important part of life in many Basin communities.

More than 3 million people living in and around the Murray-Darling Basin rely on water from the river system, that's over 10% of Australia's population. The quality of this water varies depending on where in the Basin communities are located. Many communities across the Basin are suffering from water shortages, poor quality drinking water and extended periods of low water quality that trigger events like algal blooms and fish kills. Water quality and supply issues are having impacts on health, the continuation of First Nations culture, recreation and wellbeing, and the tourism economy, which brings around $15 billion into Basin economies each year. Visitors come to enjoy the beauty of the rivers, wetlands, lakes and their surroundings. When rivers, wetlands and lakes start to dry up or water quality decreases, tourism is impacted and many small businesses that rely on tourism lose money, damaging the local economy.

There must be an increased effort to improve river health and water quality across the Basin to support ecosystem recovery, healthy communities,

continuation of First Nations culture, and thriving economies including cultural economies.

See supporting information for further detail and references.

7. Prepare for the impacts of climate change

Recommendations

A. Ensure the Basin Plan, Sustainable Diversion Limits, water recovery targets and water sharing rules are informed by observed climate impacts and the latest climate change projections.

B. Ensure observed and projected climate change impacts are adequately considered when evaluating whether Sustainable Diversion Limits represent an Environmentally Sustainable Level of Take.

C. Embed climate change adaptation in the objectives of the Basin Plan, with a focus on building ecological resilience to give species and ecosystems the best possible chance to survive in a changing climate.

D. Invest in ecosystem restoration in partnership with Traditional Owners, targeting priority species and ecosystems that are at highest risk from climate change.

E. Implement enforceable end-of-system flow targets that pause upstream water allocation and access when flows fall below critical thresholds or as environmental crises unfold to protect ecosystem health in a drying climate.

F. Reform allocation, access and operational rules so that climate risks are considered in water sharing.

G. Develop a transparent set of rules and guardrails to enable annual adjustments of water entitlements and water allocations based on climate trends.

H. Adopt conservative, debit-based allocation frameworks where allocations are calculated based on water held in storage or realised inflows.

I. Support Basin communities, including Traditional Owners, to adapt to a future with less water through regional transition funding, diversification of

production systems and reduced dependence on irrigation (see section 10 for further detail).

Our position

The Murray-Darling Basin is projected to be hotter and drier in a future climate, with more frequent and severe droughts. Runoff and water availability are highly likely to decline, and rainfall will become more variable. These are major impacts, and climate change must be a central consideration in the future Basin Plan.

The impacts of climate change will increase pressure on the already scarce water resources of the Basin and we need to rethink how we allocate this valuable resource. Increased temperatures, altered rainfall patterns and more intense droughts will reduce natural water availability for wetlands, adding to existing pressures. To respond to the changing climate we need new rules that help adjust to changing conditions and we need targeted restoration to give species and ecosystems the best chance of survival.

See supporting information for further detail and references.

8. Reduce the impacts of floodplain harvesting

Recommendations

A. Accurately measure the volume of water being taken by floodplain harvesting.

B. Reduce the volume of water that can be extracted by floodplain harvesting, aiming to reduce extraction to below 1994 levels.

C. Ensure floodplain harvesting cannot take place unless downstream environmental flow targets are being met.

D. Ensure floodplain harvesting cannot take place unless cultural responsibilities of Traditional Owners to care for Country are being met.

Our position

For too long, large upstream operators have been exploiting a legal loophole to harvest floodplain flows for their own profit at the expense of downstream communities and the environment. Floodplain harvesting, the collection,

extraction or impoundment of water flowing across floodplains, is widespread in the northern Basin. While now in the process of being licenced, the volume of water being taken is still largely unknown and the negative impacts of this practice has on river health are clear.

Floodplain harvesting is damaging because it takes water from the first flows after a drought, denying the environment these important 'first flush' flows that are so important for ecological and cultural health. Diverting this water stops the medium sized floods that would normally pulse through the tributary rivers, bringing life into the Darling-Baaka in between big flood events. Rainfall runoff that would have reached waterways is also captured by floodplain harvesting levees. A massive 44% of floodplain harvesting diversions consists of rainfall runoff capture, and a staggering 61% of this water capture is exempt from licencing (Connectivity Expert Panel Report, page 54). This practice denies Indigenous Nations rights to water downstream, which contradicts the priorities of the NSW Water Management Act and the Murray Darling Basin Plan.

The survival of rivers and their adjacent floodplains, wetlands, creeks and billabongs depends on these flows. Floodplain harvesting must be reduced to avoid damage to ecosystems and communities, including Traditional Owner communities, downstream. This is particularly important in a drying climate. Systems for licensing and regulating floodplain harvesting need to reduce the amount of water that can be taken.

See supporting information for further detail and references.

9. Deliver world-leading governance

Recommendations

A. Adopt double-entry water accounting systems that monitor water remaining in a river as well as water extracted, test this against Basin Plan water model projections, and publish an annual assessment of discrepancies.

B. Undertake regular water auditing using on-ground monitoring and satellite imaging to look at where, when and how water is being used across the Basin.

C. Publish annual progress reports on water recovery, water extraction (and diversion) and river health that show trends over time and are accessible to a general audience.

D. Publish consistent, comparable datasets showing annual historic water diversion and extraction to enable monitoring of trends pre-and post-Basin Plan.

E. Report the volume of environmental water delivered, traded, forfeited and carried over annually by the Commonwealth and State Water Holders compiling data to show trends over time and ensuring there is no double counting.

F. Embed the role of the Inspector-General of Water Compliance in all aspects of Basin Plan oversight (and include the Snowy, upper Murrumbidgee and other montane rivers) and include in their role a 5-yearly evaluation of governance.

G. Undertake an independent functional review of the Commonwealth institutional and governance arrangements for Basin Plan implementation and identify opportunities for improvement.

H. Incentivise states to enforce laws relating to water theft and establish controls on currently unlicenced diversions (e.g. floodplain harvesting, farm dams).

I. Minimise further changes to the Baseline Diversion Limit and introduce a mechanism to ensure auditing and transparent reporting of any changes.

J. Invest in long-term ecological and cultural monitoring of an expanded network of sites linked to Basin Plan objectives (not just areas receiving Commonwealth Held Environmental Water) and regularly publish results that show trends over time and are accessible to a general audience.

K. Require that state hydrological modelling (and any other related modelling) is compatible with Basin-wide standards and methodology, is independently verified and that modelling and underlying assumptions are published.

Our position

There needs to be greater transparency and accountability in implementing the Basin Plan and a more accurate understanding of how water is being used. Implementing double entry accounting is crucial rather than relying on models and incomplete information which creates uncertainty and makes it difficult to accurately track progress. There also needs to be increased investment in ecological and cultural monitoring to improve knowledge of where water is flowing and how ecosystems and cultural landscapes respond so that this can inform environmental and cultural watering regimes.

To date, implementation of the Basin Plan has been hampered by the non-cooperation of states and delays on project delivery. There has been a lack of transparency and accountability, leaving communities and Traditional Owners with custodial responsibilities to care for Country in the dark while state governments face few consequences for their lack of cooperation. There has been little transparency, public reporting has been complex and inaccessible to the average community member and Traditional Owners alike. This lack of transparency, along with widespread water theft, questions about the integrity of water market operators and lack of consistent, reliable Basin-wide water accounting have eroded public confidence in the Plan and governments' commitment to restoring the health of the Murray-Darling rivers, wetlands, floodplains and aquifers.

We need to rebuild public trust in the Basin Plan through accessible, accurate reporting that shows trends over time. Community members should be able to easily find out where water is going, what the rules are and how rivers, wetlands and aquifers are changing.

See supporting information for further detail and references.

10. Invest in regional communities

Recommendations

A. Conduct a comprehensive review of how the key drivers of change are affecting Basin communities, including water reform (unbundling and financialisation of water rights), the Basin Plan (water recovery and adaptive management) and broader challenges (climate change, commodity prices, trade sanctions, mechanisation), identifying the impacts of each.

B. Recommend program objectives and next steps for establishing a Basin Transition and Resilience Fund to support Basin communities to adapt to a future with less water through diversification of production systems and reduced dependence on irrigation.

C. Ensure drinking water quality across the Basin is monitored and publicly reported on a regular basis in line with the Australian Drinking Water Guidelines (Australian Government 2019).

D. Support off-river infrastructure upgrades to ensure all Basin communities have a safe and reliable domestic water supply.

Our position

We want to see thriving Basin communities with diverse and resilient economies. And we want to see Basin residents have better access to clean water and a healthy environment. Basin communities rely on the rivers, both for water use, but also for recreation and because the rivers are an important part of what makes Basin towns beautiful and enjoyable places to live. The over-extraction of water has a direct impact on downstream communities and it's time to prioritise healthy rivers that can support healthy communities. It is possible to have both, provided we use water carefully and make changes to adapt to the drying climate.

Basin communities are on the front lines of climate change, reduced river flows and erratic flood events. They experience the reality of droughts and rivers running dry, of unprecedented flooding, and of fish kills and algal blooms. There is a need for ongoing programs to support communities to adapt to a drying and increasingly uncertain climate so that they can build diverse, resilient economies including cultural economies. With the climate changing, we are not going to be able to maintain the current scale or area of irrigation. We will need to adapt and transform our economies. These are major changes and communities will need to be supported to make these structural adjustments so that Basin communities can continue to thrive in a drier climate.

Appendix 1. Supporting information

Background 1 – Protect and restore wetlands

The Murray-Darling Basin supports a diverse range of animals, plants and ecosystems that are nationally and internationally significant. It is home to 35 endangered bird species and 16 endangered mammal species. There are around 30,000 wetlands across the Basin, including 16 wetlands that are listed under the Ramsar Convention as rare or unique wetlands of international importance for conserving global biological diversity.

In 2022, Australia joined other parties to the Convention on Biological Diversity in adopting the Kunming-Montreal Global Biodiversity Framework. The Global Biodiversity Framework sets out an ambitious agenda to halt and reverse biodiversity loss by 2030 and to live in harmony with nature by 2050. It has 23 action-oriented targets to achieve by 2030 and 4 outcome-oriented goals to achieve by 2050. It includes targets of protecting at least 30% of representative areas of inland water ecosystems by 2030 and restoring at least 30% of degraded inland water ecosystems by 2030.

A 2024 independent evaluation of Basin Plan implementation found that many aspects of Basin Plan implementation are poorly monitored and reported, and while five of seven economic targets, relating to irrigated agriculture and capital value of land, showed improvement, only two of 20 Indigenous, environmental, social and compliance indicator targets were met (Colloff et. al. 2024). This shows a neglect of Australia's responsibilities to protect biodiversity under international agreements. A study assessing environmental watering from 2014 to 2019 found that less than 1% of major Basin wetlands received Commonwealth Held Environmental Water (Chen et. al. 2021). It is estimated that restoring native vegetation throughout Australia's riparian zones could sequester nearly 1 billion tonnes of carbon dioxide equivalent (Wentworth Group 2024).

The 2025 Sustainable Rivers Audit (SRA) (Murray-Darling Basin Authority 2025b) assessed the condition and trend for eight environmental indicators in each of the 23 Basin valleys from 2019-2023. As most of these years were wetter than average, the assessment is unlikely to represent the longer-term average condition of the Basin. The SRA concluded that overall, there is an urgent need to reverse the declining trajectory for waterbird populations. There has been a decade-on-decade reduction in habitat for waterbirds across Eastern Australia since aerial waterbird surveys began in the 1980s and subsequent declines in waterbird abundance (Colloff et al. 2024).

Background 2 and 3 - Connect rivers

There are three types of river connectivity:

- longitudinal connectivity, which is when a river is connected along its length, or the river is flowing;
- lateral connectivity, which is when a river is connected to the wetlands and floodplains either side of the river (the river has enough water to flow into the smaller waterways either side of the main river channel); and
- vertical connectivity, which is when a saturated, conductive pathway exists through the riverbed, and depending on prevailing influences the river feeds the aquifer or the aquifer feeds the river.

The Connectivity Expert Panel for the NSW Government (2024) recommended a holistic approach to restoring longitudinal connectivity that ensures the Darling/Baaka River receives:

- a base flows all the time
- a small flush once a year
- a larger flush every second year

This is the minimum flow regime required for maintaining the Darling/Baaka River.

Flow targets

Environmental Flow Requirements represent the minimum flows needed at particular places and times to sustain important environmental assets and functions. They have been defined for rivers across the Murray-Darling Basin by state governments in the Long-term Watering Plans for each catchment. However, these requirements are not enforceable and are largely not being met.

Research has demonstrated that less than one-third of Environmental Flow Requirements have been achieved since the Basin Plan was introduced, and river health continues to decline. The Wentworth Group of Concerned Scientists (2023) assessed 72 science-based Environmental Flow Requirements at 23 strategically located gauges across the Basin over the period 1979-2022. The key findings included:

- Only 31% of the assessed Environmental Flow Requirements were achieved over the full 43-year period, and since the Basin Plan was introduced (2012-2022) this fell to 26%.

- Achievement rates were lower downstream and particularly along the Darling/Baaka and main stem of the River Murray.
- The researchers concluded that four key factors limited this achievement:
    1. Insufficient long-term volumes of water for the environment (only ~2,100 GL/y recovered vs ~3,200 GL/y target).
    2. Physical and operational constraints (e.g., property, infrastructure, corridors) prevent delivering required flows.
    3. EFRs are not embedded robustly into water-planning / management rules.
    4. Climate change and future drying are not adequately accounted for in current extraction limits and planning.

Achieving Environmental Flow Requirements is essential for restoring and maintaining the health of Basin rivers and wetlands, and will be increasingly important as the climate becomes hotter and drier, and rainfall variability increases. Setting extraction limits and recovering water is important, but if Environmental Flow Requirements are not met, the system will not recover. A focus on meeting flow requirements will be necessary for preventing ecosystem collapse, fish kills, algal blooms, floodplain and wetland degradation and increasing risk of species extinction.

Background 4 - Return water to nature

History of water recovery targets and associated commitments

The 2012 Basin Plan set a water recovery target of 2750 GL/yr, plus an additional 450 GL/yr to be achieved through efficiency measures and additional Held Environmental Water, a combined volume of 3200 GL/yr. The target of 3200 GL/yr (2750 GL/yr plus an additional 450 GL/yr) was well below the amount of water recovery that was needed to restore rivers and wetlands to health and deliver on the environmental objectives of the Water Act according to the best available science, including the MDBA's own analysis (Murray-Darling Basin Authority 2011, La Nauze and Carmody 2011). The Basin Plan included a mechanism for supply measure projects to be used to offset water recovery, which was later enacted as outlined in the following sections.

It is well documented, including by the South Australian Murray-Darling Basin Royal Commission, that the determination of the water recovery target (and the Sustainable Diversion Limit and Environmentally Sustainable Level of Take) was a

political fix not based on science (Colloff and Pittock 2022) and was therefore unlawful (Government of South Australia - Royal Commission 2019).

The water recovery target was adjusted down in 2016 following the Northern Basin Review, which found that the same ecological outcomes could be achieved with 70 GL/yr less water recovery. This happened not long before the massive fish kills near Menindee in late 2018 and early 2019 that further highlighted the declining health of the northern Basin. The South Australian Royal Commission found this reduction was not based on scientific evidence and was linked to pressure from irrigators in the northern Basin (Government of South Australia - Royal Commission 2019, pp. 432-452).

Due to resistance to water recovery targets from some Basin states - notably NSW and Victoria, ministers agreed in 2017 that the water recovery target could be adjusted down by 605 GL/yr if states delivered "Sustainable Diversion Limit Adjustment Mechanism (SDLAM)" projects that were intended to deliver improved environmental outcomes with less water. This enacted the mechanism that had been included in the Basin Plan to enable such offsets projects. Projects include supply measures such as building or improving river or water management structures to deliver and hold water on floodplains or changes to river operating rules; constraints measures such as upgrades to crossings and bridges or changes to river operating practices and rules; and efficiency measures such as upgrades to irrigation systems, urban water efficiency or installing water meters. Since 2017, that 605GL has remained available for irrigation despite most projects not having been delivered. Given that most of the SDLAM offsetting works and measures have never been operational, throughout the life of the Basin Plan, the Basin environment has neither had the use of this water or the benefit of any offsetting measure. This situation is ongoing and is a significant contributing factor in the various failures to achieve environmental flow requirements and Basin Plan objectives outlined in this submission.

The water recovery target was already too low, and these adjustments brought it even further below the amount of water recovery that the best available scientific evidence had stated the rivers needed, leaving a target of 2525 GL/yr including the 450 GL/yr commitment.

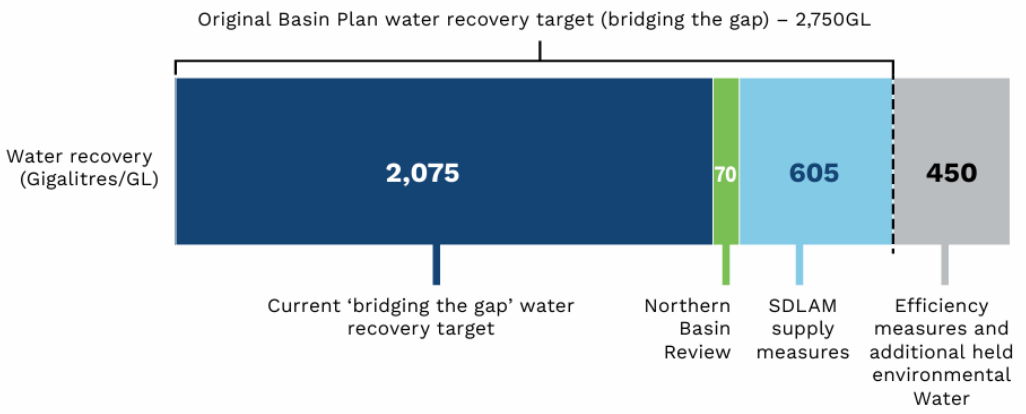

Figure 1. Original and revised water recovery targets. Source: Murray-Darling Basin Authority 2025a.

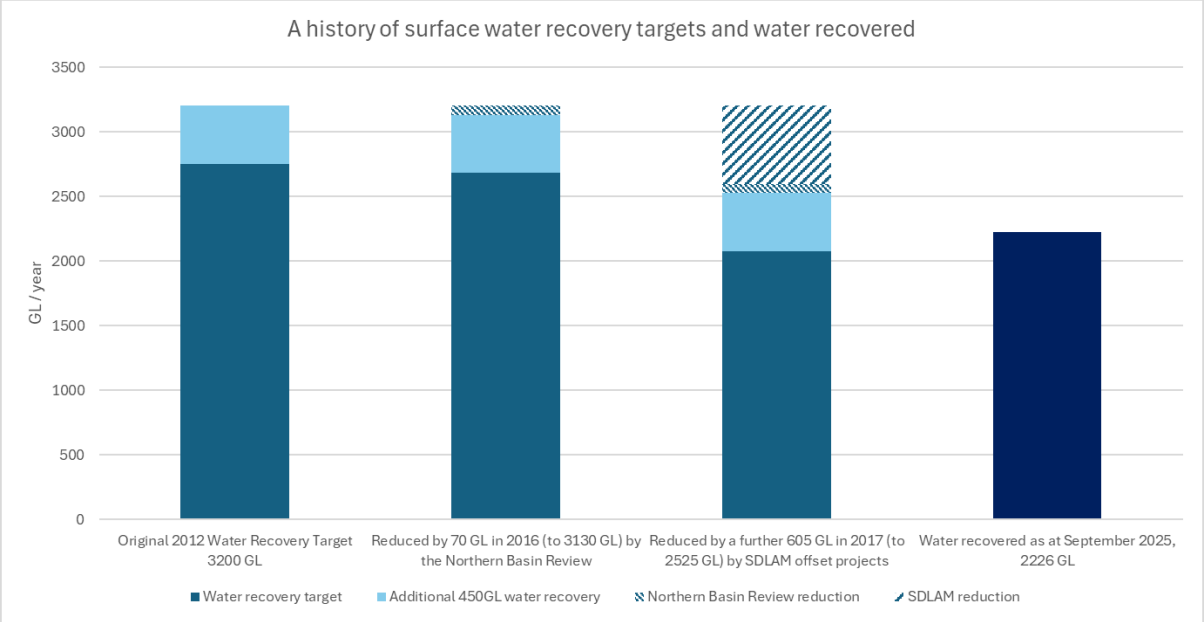

Figure 2. Reduction in the water recovery target over time and water recovery to date. Water recovery data sourced from: DCCEEW 2026.

How much water is needed for healthy rivers and wetlands?

Modelling of environmental watering requirements to support ecosystem health consistent with the objectives of the Act was commissioned by the MDBA in 2011 to inform the Guide to the Basin Plan. In the absence of more recent estimates, these 2011 estimates offer a useful benchmark against which to assess water

recovery progress to date. Updated modelling that factors in climate projections is needed to better understand the water needs of the system.

The 2011 modelling identified the range of surface water that needed to be available to the environment in order to meet the environmental objectives of the Water Act as being between 23,000 GL/yr and 26,000 GL/y (long-term average). Based on the estimated level of extraction at that time, the analysis found that at least 3900 GL/yr and up to 6900 GL/yr of additional water recovery was needed to fulfil the objectives of the Water Act.[1] Cultural Flows, as articulated in the Echuca Declaration, were not considered in this analysis. Additional consideration is needed of the water rights and needs of Traditional Owners.

Returning 3900 GL/yr to the environment offered a *low certainty* of success and a high dependence on a long-term return to wetter climatic conditions across the Basin.The Guide acknowledged that 3900 GL/yr was unlikely to succeed as it relied on a return to wetter climate conditions over the long term, which was not a realistic assumption given climate change projections were for increased frequency and severity of droughts and reduced mean annual runoff in the Basin.

Returning 6900 GL/yr to the environment offered *high certainty* of success in achieving the objectives of the Water Act. This level of reduction had a lower dependence on a return to wetter climatic conditions across the Basin and provided greater resilience to the Basin's water-dependent ecosystems — including under projected long term climate conditions. The mid-point between these estimates (the median) is 5400 GL/yr of additional water recovery.

The estimated level of water extractions pre-2012 (the 'Baseline Diversion Limit') has since been increased by 350GL, meaning that 350 GL/yr more water recovery would be needed to achieve flows of 23,000 – 26,000 GL/yr than previously thought.

[1] The ecological modelling estimated that water recovery of 3900-6900GL/yr was required to meet the environmental objectives of the Act. The Guide, informed by the modelling, published water recovery requirements of 3000-7600GL/yr by applying a 20% uncertainty to the lower bound and a 10% uncertainty to the upper bound. To avoid potential bias by selecting different uncertainties we have used the original modelled estimates of 3900GL/yr and 6900GL/yr, but note there are uncertainty margins on both of these in the order of 10-20%.

Is recovered water actually flowing?

A report by the Wentworth Group of Concerned Scientists (2019) found that despite just over 2000 GL of water having been recovered for the environment, environmental flow targets had failed to be achieved; annual average flows were up to 40% to 60% smaller than expected under the Basin Plan; and observed flows were similar to, or less than, the baseline (pre-Basin Plan) model results. This research revealed that instead of an increase, there had actually been no improvement or even a decline in water flows since the implementation of the Basin Plan. Recent research found that the majority of Environmental Watering Requirements across the Basin were not met in the ten years following Basin Plan implementation (Sheldon et. al. 2024).

A 2018 submission by a group of experts to the South Australian Murray-Darling Basin Royal Commission stated that environmental water recovery is not likely to be on target because current practice does not account for a) return flows; b) increasing utilisation of water entitlements by stakeholders; c) substitution of groundwater for surface-water diversions and d) climate change impacts over time (Wheeler et. al. 2018). Colloff and Pittock (2022) found that only around two thirds of recovered environmental water was delivered from 2008 to 2020 because some of the entitlements held by the CEWO are of low security (including from overland flows) and unlikely to be realised except during periods of very high rainfall.

More rigorous accounting and reporting of environmental water is needed to better understand where water is flowing and what impact it has on the environment. There is also a need for better information to enable Traditional Owners to understand the movement of water on a Nation by Nation basis.

Climate change impacts and water recovery

Climate change impacts were not factored into the Basin Plan (Pittock et. al. 2015). The latest science indicates the future climate of the Basin is likely to feature decreased mean annual runoff, increased average temperatures, more time spent in drought, and a trend for a drier climate in the southern Basin. With reduced total water availability in a future climate, mimicking natural flood events through timed environmental releases to coincide with, and 'piggy back' on, natural high flow events is likely to become more difficult.

Water buybacks and Basin communities

Voluntary purchase of water entitlements (water buybacks) has proven to be the most efficient and cost effective method for recovering water for the environment (Grafton and Wheeler 2018, Productivity Commission 2020, Wheeler 2024, Wheeler et. al. 2024).

Claims that water buybacks have negative impacts on Basin communities often downplay or ignore the benefits that buybacks bring for farmers and communities. Irrigators often have surplus water entitlements and buybacks give them flexibility in how they use funds after selling their water entitlements. They can use that money to reduce debt, invest in farm assets or in other ways, either on or off farm. Reducing debt can be a significant positive outcome for farmers, increasing their flexibility and building resilience. By comparison, irrigation efficiency programs (an alternative method for recovering water for the environment), have proven to be costly and produce more negative environmental externality impacts than water buybacks (Wheeler 2024). Irrigation efficiency programs can also have the unintended consequence of increasing water consumption due to increased water use by existing crops, a switch to more water-intensive crops or an expansion of irrigated areas, combined with reduced 'return flows' - a reduction in non-consumed water that is returned to the landscape (Grafton et. al. 2018). As at August 2022 $4.5 billion had been spent on irrigation efficiency programs to recover 670 GL/yr and $2.7 billion had been spent on water buybacks to recover 1270 GL/yr (Wheeler 2024). The average cost was therefore $2100 per ML recovered via buybacks and $6500 per ML recovered from irrigation efficiency programs. At these average costs per ML, spending $1 billion delivered around 474 GL/yr via water recovery and 153 GL/yr via water efficiency upgrades.

The 2025 Basin Plan Evaluation Report (Murray-Darling Basin Authority 2025a) demonstrates that, even with water recovery, the Basin economy has continued to grow during the Basin Plan's implementation. While noting that it is challenging to isolate the contribution of water recovery from other drivers of change, the report suggests that Basin Plan water reforms have had relatively minor impacts on regional economies and that changes in regional economic conditions are largely determined by other influences.

In real terms, Gross Regional Product is estimated to have grown from just under $210 billion in 2011 to just over $230 billion in 2021, an increase of 11.5%. Sales revenue from business activity increased from around $170 billion in 2002 to

$350 billion in 2022, with the fastest growth during this period being from 2012 to 2022, averaging 6.2% growth per year in real terms. The gross value of agricultural production has continued to grow in the Basin, increasing by 49% from 2007 to 2025. In real terms, the gross value of agricultural production (GVAP) in the Basin in 2020–21 was about $35.1 billion, compared with $27.8 billion in 2012–13 and $23.6 billion in 2007–08. This represents an increase of 26% since the Basin Plan was adopted in 2012.

A 2020 independent assessment of social and economic conditions in the Basin recommended that as a priority, governments should increase First Nations peoples' access to water for economic and social purposes, and fund First Nations to work with experts on valuing ecosystem services provided by, and the benefits arising from, culturally significant sites (Sefton et. al., 2020).

Complementary measures

Non-flow measures to improve biodiversity and river health such as infrastructure works to provide fish passage or mitigate downstream effects of cold water releases from storages, in-stream snagging to provide fish habitat, restoration of riparian vegetation and removing barriers to floodplain connectivity, are important. However, these measures, referred to as 'complementary measures', are not a substitute for water recovery and should not be used to offset the need for additional environmental water. They are useful measures that are necessary for improved river health and they need to be pursued in addition to water recovery.

Groundwater

The 2011 Guide found that the additional groundwater that needed to be provided for the environment was between 99 GL and 227 GL per year. The lower end of this range represented a 'high' risk approach and the upper end of the range represented a 'low' risk approach. The CSIRO Sustainable Yields Project (2011) also identified the need to reduce groundwater extraction. These estimates did not consider Traditional Owners' understanding of annual groundwater needs.

The Wentworth Group of Concerned Scientists (2012a) raised concerns that the groundwater environmentally sustainable levels of take (ESLTs) in the draft Basin Plan were derived using unjustified assumptions; the assumptions ignored much of the long-term connectivity of surface and groundwater, which is a critical connection for Traditional Owners; there had been a steady increase in the Baseline Diversion Limit and the draft Basin Plan failed to identify impacts on

groundwater dependent ecosystems. In a later draft of the Plan the Wentworth Group of Concerned Scientists (2012b) identified that groundwater extractions were to increase by over 1,700 GL under the proposed Plan, with no evidence to support this increase in allocation. A groundwater recovery target of 38.45 GL/yr was adopted, well below the 'high risk' target option. As of 30 September 2025, 35.25 GL/yr of groundwater had been recovered.

The issue of reduced 'return flows' (irrigation water that is unused by crops and flows back into rivers and groundwater from farms) as a result of improved irrigation efficiency on farms, is further reducing groundwater recharge (Williams and Grafton 2018). There is potential for decreased availability of surface water to result in increased extraction of groundwater as a substitute water source.

Concerns have been raised that the risk assessment underpinning the Murray-Darling Basin Plan 'emphasises risks to surface water resources and does not fully consider or account for risks of depletion and degradation of groundwater resources and groundwater-dependent ecosystems' (Ross et. al. 2022).

Background 5 - Deliver First Nations water justice

Australian domestic law and policy (including the Water Act 2007) provides only cursory and inadequate consideration of First Nations water rights. The Water Act 2007 (Cth), the Basin Plan and subordinate instruments include limited, weak legal requirements that have largely failed to give effect to First Nations water rights or provide meaningful access to water for First Nations (Murray Lower Darling Rivers Indigenous Nations 2018, Kennedy et. al. 2022).

Commissioner Bret Walker SC, in delivering the report of the Murray Darling Royal Commission, highlighted that:

> "The absence in the Water Act and Basin Plan of any clear or express reference to the relevance of international obligations in the Biodiversity Convention to the role of Aboriginal people in the Basin's biodiversity is striking…A stronger legal platform for the role of Aboriginal people in managing Basin water resources is required." (Government of South Australia 2019)

First Nations have been largely excluded from water management and decision making, and dispossessed from water access and ownership. First Nations own

just 0.2% of available surface water in the Basin and in some regions, First Nations water ownership has decreased (Hartwig et. al. 2020).

The United Nations Declaration on the Rights of Indigenous People (UNDRIP) was adopted by the United Nations General Assembly in 2007 and endorsed by Australia in 2009. UNDRIP affirms the rights of Indigenous peoples to self-determination, to maintain and strengthen Indigenous peoples relationships with traditionally owned or otherwise occupied lands and waters, and to own, use, develop and control such lands and resources. It also establishes the standard of Free, Prior and Informed Consent (FPIC) in relation to decisions affecting Indigenous peoples' rights and interests.

In 2023, amendments to the Water Act through the Restoring Our Rivers legislation strengthened the rules guiding the preparation of the Basin Plan to take into account matters relevant to First Nations. This includes the requirement to consider how Water Resource Plans meet the principles of Free, Prior and Informed Consent. However, and despite Australia's endorsement of UNDRIP, UNDRIP principles have not been sufficiently implemented within Commonwealth water legislation or Basin governance frameworks. The Water Act 2007 and the Basin Plan 2012 recognise Indigenous values and uses of water, but further work is needed to embed substantive rights, enforceable agreement platforms, and decision making authority consistent with UNDRIP.

MLDRIN is a self-determined peak body representing Traditional Owner Nations across the southern Murray-Darling Basin. It is a Nation-appointed representative organisation with a mandate to advocate on water reform and governance affecting southern Basin Traditional Owners. As the recognised representative body for its member Nations, MLDRIN has a clear remit to advance implementation of UNDRIP and the Echuca Declaration within the governance settings.

The Australian Government's endorsement of UNDRIP, the partial reforms introduced through the *Restoring Our Rivers* amendments, and the longstanding articulation of Cultural Flows through the Echuca Declaration, establish a clear foundation for reform. However, without legislative reform, enforcement partnered with resourced Traditional Owner oversight, the rights affirmed within UNDRIP will remain aspirational. Full implementation requires embedding UNDRIP within the Water Act and the Basin Plan, legislating Cultural Flows and ensuring appropriate resourcing for Traditional Owner oversight and participation in Basin governance.

Background 6 - Improve water quality

Water quality impacts affecting the Basin include nutrient pollution, salinity, hypoxia/blackwater events, thermal stratification, algal blooms, sedimentation, acid sulphate soils, and PFAS contamination.

In 2019, the NSW Government was considering evacuating residents from up to 90 towns across the Basin as town water supplies came close to running out (The Fifth Estate 2019). In 2018, the Darling River stopped flowing through the NSW town of Wilcannia in NSW, becoming a series of stagnant ponds that harboured toxic algal blooms. This left the residents of Willcannia entirely reliant on bottled water and water trucked in from Broken Hill, 200km away (The Saturday Paper 2024).

A recent national study found that over 194,000 people at around 115 locations accessed water services that did not comply with health-based guideline values. Of these sites that did not comply, forty per cent were remote Indigenous communities, highlighting the disproportionate impact on First Nations Peoples. The study identified that monitoring and reporting gaps mean the actual incidence of non-compliance with the guidelines could be even higher than these estimates (Wyrwoll et. al. 2022).

A possible link between blue green algal blooms and motor neurone disease is being investigated. The number of deaths in Australia from the disease has more than doubled in the past 30 years. There is no confirmation of a direct link, but one theory is that a toxin produced by blue-green algae called Beta-N-Methylamino-L-Alanine (BMAA) might be a trigger for the disease. In 2024 the NSW Government set aside $2 million to investigate a potential cluster of motor neurone disease cases in the Riverina district (ABC News 2023).

It is possible to secure clean, reliable water supplies for regional towns with a range of off-river solutions including managed aquifer recharge, off-river storages and recycling with high standard water treatment plants (Commonwealth of Australia 2023).

Background 7 - Prepare for the impacts of climate change

The current Basin Plan did not factor in climate change impacts (or other key risks) when it was created and does not include any mechanisms to adapt to climate change (Pittock et. al. 2023). The *Water Amendment Act (Restoring Our Rivers) 2023* requires climate change be considered as a risk to water resources

in the review of the Basin Plan. Climate change projections are for a hotter and drier Basin with reduced runoff, increased variability of rainfall and more frequent and severe drought.

A 2022 study looking at climate adaptation options for a future revised Basin Plan identified the need to assess the total resource pool and all subsidiary targets and make major reforms to existing water entitlements and allocation regimes (Alexandra 2022). Climate change is acknowledged as a major influence on water availability and the economic prosperity of Basin towns, often having greater impacts than water reforms (Government of South Australia 2019, Wheeler et. al. 2024,). The Wentworth Group of Concerned Scientists (2023) argue that climate change and declining water availability mean it may not be possible to achieve all water requirements in the Basin going forward and we need to be prepared for managing the consequences of this change.

The 2025 Murray-Darling Basin Outlook assessed climate change projections for the Basin to 2050. It acknowledged that the climate of the Basin is already changing, becoming hotter and drier with decreased inflows and increased demand for water.

Key points from the Outlook are:

- The Basin is virtually certain to be hotter.
- Annual rainfall is likely to become more variable.
- Heavy rainfall is very likely to become more intense.
- Cool-season rainfall is likely to decline in the northern Basin and very likely to decline in the southern Basin.
- Drought is very likely to become more severe, occur more frequently and may be of longer duration.
- Runoff and water availability are very likely to decline, particularly in the south.
- The frequency of moderate flood inundation is likely to decline, but flood height and duration for large floods may increase.

Changes under the most likely 'hotter and drier' scenario in the modelling are shown in the table below. The table shows mean annual changes.

	Northern Basin	Southern Basin
Annual rainfall	-1.4%	-2.6%
Heavy rainfall	+5.2%	+5.2%
Runoff	-7.4%	-14.3%
Drought frequency	1 in 15 years	1 in 14 years

Background 8 - Reduce impacts of floodplain harvesting

What's the problem?

Floodplain harvesting – the diversion and storage of overland flows into on-farm dams – is widely practised by irrigators in the northern Basin. By reducing volumes of river flows, floodplain harvesting has negative effects on downstream water users and the environment. The volume of diversions is not known, creating a major source of uncertainty over water availability and use. A study of floodplain harvesting in northern New South Wales catchments (Border Rivers, Gwydir, Namoi, Macquarie and Barwon-Darling) found that storage capacity had risen from 557 GL in 1993–94 to 1,393 GL in 2019–20, a 2.5-fold increase in 26 years (Brown et. al. 2022). The study estimated mean annual floodplain harvesting take (2004–2020) in northern NSW was 778 GL. This represents half of the mean volume of Held Environmental Water released annually for the entire Basin between 2009–10 and 2018–19 (1,576 GL) and six times that for the northern NSW Basin (125 GL). The study concluded that volume of take from floodplain harvesting is not sustainable, is in breach of state and federal legislation and has a range of negative impacts on downstream communities and flow-dependent ecosystems. This also results in Traditional Owners situated in the Northern Basin being unable to meet their cultural obligations to pass on sufficient and healthy water to Traditional Owners in the southern Basin (Murray Lower Darling Rivers Indigenous Nations, 2021).

The rapid growth in floodplain harvesting correlates with the demise of the ecological condition of the Darling-Baaka River. The NSW Natural Resources Commission Review of the Barwon-Darling Water Sharing Plan (2019) called the Darling-Baaka an 'ecosystem in crisis', and pointed to the need for floodplain harvesting to be meaningfully reigned in.

Floodplain water harvesting is a legislated form of extraction under the Murray-Darling Basin Cap (Cap), one of the foundations of the water reforms in the Basin that limits extractions to the level of development in 1994. However, floodplain harvesting has never been regulated, measured, controlled or accounted for under the Cap (Slattery and Johnson 2021).

Licensing floodplain harvesting

Licencing floodplain harvesting is a necessary step towards restricting growth and reducing the amount of water taken. The NSW Government is in the final stages of licensing floodplain harvesting under the Water Management Act 2000 (NSW). However, generous carryover provisions of 500% and ineffective triggers for restrictions to come into place, mean in practice that restrictions on floodplain harvesting would be extremely rare.

Not only do floodplain harvesting levees capture floodwaters that have broken the banks of rivers, they also divert a lot of rainfall runoff from entering waterways. The NSW Connectivity Expert Panel report identifies that 44% of water diverted by floodplain harvesting levees is fresh rainfall runoff, and points out that a massive 61% of this water is exempt from licencing, therefore being 'off the books'.

In Queensland, floodplain harvesting is licenced in some areas such as the Lower Balonne, where floodplain harvesting is measured using storage meters and other on-farm measuring devices. In other areas, works-based authorisations aim to ensure that there is no increase in floodplain harvesting beyond 2000 levels. The Queensland Government placed a moratorium on additional floodplain harvesting development in 2000 and has aimed to prevent growth in use since that time through a combination of authorisations and licences. Additional work is planned to enable improved measurement and monitoring of floodplain harvesting in Queensland.

Changes to Baseline Diversion Limits (BDLs)

When the Basin Plan was established there was limited understanding of some types of water use, including floodplain harvesting. The Basin Plan used estimates of water use where data was lacking, and left open the option of updating estimates via Water Resource Plans when improved information became available.

As of October 2025 the Basin-wide BDL (the estimate of how much water was being extracted from the rivers pre-2012) had increased by around 350 GL as a

result of Water Resource Plans being accredited and containing updated estimates of historic water extraction, largely due to floodplain harvesting having been underestimated in the original Basin Plan (Murray-Darling Basin Authority 2026). This increase in the BDLs results in an equivalent increase in the Sustainable Diversion Limit (SDL), the long term average amount that can be taken from the river under the Basin Plan. While this may not necessarily represent new water extraction, it does mean that water extraction was significantly underestimated and the gap between what the rivers needed and what they were getting is even larger than previously thought. The amount of water recovery that is needed to restore healthy rivers is therefore greater than previously thought. It also raises the question of whether the increased SDLs have been assessed as still representing an Environmentally Sustainable Level of Take.

Background 9 - Deliver world-leading governance

A comprehensive and independent water audit is necessary to understand how and where water is being used across the Basin. Currently, our understanding of the system relies on differing state-based models that do not offer a comprehensive or accurate understanding of the system. Without an improved understanding, water managers are making best guesses about what is happening on the ground. Grafton and Williams (2019) call for an independent water audit of the Basin following international best practice. They suggest this can be achieved by remote-sensing methods using satellite data and that such approaches are already successfully being applied in the United States to measure water consumption. This should be undertaken in partnership with Traditional Owners.

Experts have been calling for double-entry water accounting to improve integrity and accuracy of water data and our understanding of water movement throughout the Basin (Wentworth Group of Concerned Scientists 2023, Colloff and Pittock 2022). They argue that current accounting methods lack rigour and are inaccurate and that water accounts should include the basic feature of double-entry accounting. They suggest that timely, publicly accessible, transparent, and reliable water accounts are critical for informed and responsible water management and restoring public confidence in water management.

Seidl and Wheeler (2024) identified water theft as a serious and ongoing challenge in the Basin and found that the average real expected penalty value of stealing water was well below existing market prices.

A study of rent-seeking behaviour and regulatory capture found evidence of both activities in the Basin (Grafton and Williams 2019). The authors described this as 'mediated corruption', as distinct from bribery or petty or grand corruption, where decision makers have received direct personal benefits from their decisions. Rather they describe that 'the government of the day has legally undertaken expenditures to benefit particular interests, mediated through the political process, even though this appears to be contrary to the stated goals of water reform, as per the Water Act 2007, and also best practice regulations agreed to by all Australian governments…'. They offered recommendations to reduce rent-seeking and regulatory capture in the irrigation sector, including: ensuring timely, accessible and independently audited water accounts; establishing an Integrity Commission and mandating that irrigators provide a publicly available, annual water monitoring plan that outlines where the water is sourced from, and for what, when and how the diverted water is used, including water storages.

References

ABC News (2023). Motor neurone disease rates are rising nationwide, Griffith residents want to know if they are a cluster, 24 August. https://www.abc.net.au/news/2023-08-24/motor-neurone-disease-research-funding-notifiable-disease/102731736

Alexandra, J. (2023). Climate adaptation options for the 2026 Basin Plan: opportunities for managing climate risk. Australasian Journal of Water Resources, 27(2), 257–270. https://doi.org/10.1080/13241583.2022.2133643

Australian Government (2019). Drinking Water Guidelines. https://www.waterquality.gov.au/guidelines/drinking-water

Brown, P., Colloff, M., Slattery, M., Johnson, W. and Guarino, F. (2022). An unsustainable level of take: on-farm storages and floodplain water harvesting in the northern Murray–Darling Basin, Australia. Australasian Journal of Water Resources, 26(1), 43–58. https://doi.org/10.1080/13241583.2022.2042061

Chen Y, Colloff MJ, Lukasiewicz A, Pittock J. (2021) A trickle, not a flood: environmental watering in the Murray–Darling Basin, Australia. *Marine & Freshwater Research* 72, 601–619.https://doi.org/10.1071/MF20172

Chen Y, Colloff MJ, Doherty MD, Pittock J. (2025). A consistent vegetation classification for wetland conservation and management in the Murray–Darling Basin, Australia, Marine & Freshwater Research, 76. https://doi.org/10.1071/MF24205

Colloff, M. and Pittock, J. (2022). Mind the Gap! Reconciling Environmental Water Requirements with Scarcity in the Murray–Darling Basin, Australia, Water, 14(2): 208. https://doi.org/10.3390/w14020208

Colloff, M., Lanyon, K., Pittock, J., Costanza-van den Belt, M., Wheeler, S., Grafton Q., Williams, J., Sheldon, F., Kingsford, R., Bino, G., Renzullo, L. and Moggridge, B. (2024). Murky waters running clearer? Monitoring, reporting and evaluation of the state of the Murray–Darling Basin after more than three decades of policy reform, *Marine & Freshwater Research,* 75. https://doi.org/10.1071/MF24193

Commonwealth of Australia (2023). Science for a water-secure future Informing sustainable and evidence-based water security infrastructure. https://www.nationalwatergrid.gov.au/sites/default/files/documents/science-for-water-secure-future-report-2023.pdf

Connectivity Expert Panel for the NSW Government (2024). Connectivity Expert Panel Final Report. https://www.water.dcceew.nsw.gov.au/sites/default/files/2025-08/connectivity-expert-panel-final-report.pdf

CSIRO (2011). Murray-Darling Basin Sustainable Yields Project, https://csiropedia.csiro.au/murray-darling-basin-sustainable-yields-project/

DCCEEW (2026) Implementing the Murray–Darling Basin Plan dashboard. Web page accessed 10 March 2026. https://www.dcceew.gov.au/water/policy/implementing-the-plan/dashboard#about-the-data_2

Environment Victoria (2023) Doomed without a drink: Threatened species at risk of extinction without environmental flows restored in rivers and wetlands. https://environmentvictoria.org.au/wp-content/uploads/2023/07/Doomed-without-a-drink-July-2023-FINAL-web-1.pdf

Government of South Australia (2019). Murray-Darling Basin Royal Commission Report. https://cdn.environment.sa.gov.au/environment/docs/murray-darling-basin-royal-commission-report.pdf

Grafton, Q. and Wheeler, S. (2018). Economics of Water Recovery in the Murray-Darling Basin, Australia. Annual Review Resource Economics. 10:487-510. https://doi.org/10.1146/annurev-resource-100517-023039

Grafton, Q. *et al.* (2018).The paradox of irrigation efficiency. Science, 361, 748-750 https://www.science.org/doi/10.1126/science.aat9314

Grafton, Q. and Williams, J. (2019). Thirst for certainty: the urgent need for a water audit of the Murray-Darling Basin, in Farm Policy Journal, 16(2):14-22. https://www.farminstitute.org.au/product/fpj1602c-grafton-rq-williams-j-2019-thirst-for-certainty-the-urgent-need-for-a-water-audit-of-the-murray-darling-basin/

Grafton, Q. and Williams, J. (2020). Rent-seeking behaviour and regulatory capture in the Murray-Darling Basin, Australia, *International Journal of Water Resources Development*, 36(2–3), 484–504. https://doi.org/10.1080/07900627.2019.1674132

Hartwig, L., Jackson, S. and Osborne, N. (2020). Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession, Land Use Policy, 99. https://doi.org/10.1016/j.landusepol.2020.104869

Kennedy, M., Kennedy, B. and Chandrashekeran, S. (2022) Terra nullius has been overturned. Now we must reverse aqua nullius and return water rights to First Nations people. The Conversation, 30 March. https://theconversation.com/terra-nullius-has-been-overturned-now-we-must-reverse-aqua-nullius-and-return-water-rights-to-first-nations-people-180037

La Nauze, J. and Carmody, E. (2011) Will the Basin Plan uphold Australia's Ramsar Convention obligations?, Australian Environment Review, 27(9), pp. 311-316. https://search.informit.org/doi/10.3316/agispt.20124390

Murray-Darling Basin Authority (2011). Guide to the Basin Plan Vols 1 and 2. https://cdn.environment.sa.gov.au/environment/docs/guide-to-basin-plan-vol-1-gen.pdf

Murray-Darling Basin Authority (2012). Hydrologic modelling of the relaxation of operational constraints in the southern connected system: Methods and results. https://www.mdba.gov.au/sites/default/files/publications/Hydrologic-modelling-relaxed-constraints-October-2012.pdf

Murray-Darling Basin Authority (2024). Constraints Relaxation Implementation Roadmap: A guide for governments to progress constraints relaxation projects. https://www.mdba.gov.au/sites/default/files/publications/constraints-relaxation-implementation-roadmap.pdf

Murray-Darling Basin Authority (2025a). Murray-Darling Basin Plan Evaluation Report. https://www.mdba.gov.au/water-management/basin-plan/basin-plan-evaluations/2025-basin-plan-evaluation

Murray–Darling Basin Authority (2025b). 2025 Sustainable Rivers Audit. https://www.mdba.gov.au/publications-and-data/publications/2025-sustainable-rivers-audit-reports-and-data

Murray-Darling Basin Authority (2026). 'Current diversion limits for the Basin', web page accessed 19 February 2026. https://www.mdba.gov.au/water-use/water-limits/current-diversion-limits-basin

Murray Lower Darling Rivers Indigenous Nations (2018). Submission to the South Australian Murray-Darling Basin Royal Commission. 7 June. https://mldrin.org/wp-content/uploads/2023/10/MLDRIN-Submission-SA-Royal-Commission-FINAL.pdf

Murray Lower Darling Rivers Indigenous Nations (2021). Submission to the New South Wales Select Committee Inquiry into Floodplain Harvesting. 20 August. https://www.parliament.nsw.gov.au/lcdocs/submissions/76068/0147%20Murray%20Lower%20Darling%20Rivers%20Indigenous%20Nations%20(MLDRIN).pdf

Murray Lower Darling Rivers Indigenous Nations (2026). About us (web page), accessed 21 January 2026, https://mldrin.org/about-us/.

NSW Natural Resources Commission (2019). Final report: Review of the Water Sharing Plan for the Barwon-Darling Unregulated and Alluvial Water Sources 2012. https://www.nrc.nsw.gov.au/water/wsp-reviews/completed-2019-2020

Pittock, J., Williams, J. and Grafton, R.Q. (2015) The Murray–Darling Basin Plan fails to deal adequately with climate change. Water 42(6), 28–34. https://openresearch-repository.anu.edu.au/server/api/core/bitstreams/ad7eac85-7b69-4286-a52d-19c2bbfff465/content

Pittock, J., Corbett, S., Colloff, M., Wyrwoll, P., Alexandra, J., Beavis, S., … Williams, J. (2023). A review of the risks to shared water resources in the Murray–Darling Basin. Australasian Journal of Water Resources, 27(1), 1–17. https://doi.org/10.1080/13241583.2023.2190493

Productivity Commission (2021). National Water Reform 2020, Inquiry Report no. 96, Canberra. https://www.pc.gov.au/inquiries-and-research/water-reform-2020/report/

Ross, A., Evans, R. and Nelson, R. (2023). Risks related to groundwater in the Murray Darling Basin. Australasian Journal of Water Resources, 27(1), 31–46. https://doi.org/10.1080/13241583.2022.2140904

Sefton, R, Peterson, D, Woods, R, Kassebaum, A, McKenzie, D, Simpson, B & Ramsay, M 2020, Final Report: Independent assessment of social and economic conditions in the Murray–Darling Basin, Panel for Independent Assessment of Social and Economic Conditions in the Murray– Darling Basin, Melbourne. https://www.mdba.gov.au/sites/default/files/publications/seftons-report-september-2020.pdf

Seidl, C. and Wheeler, S.A. (2024). Breaking Water Laws in the Murray-Darling Basin: Understanding Water Compliance Challenges and Stakeholder Perceptions, Water Resources Research, 60. https://doi.org/10.1029/2023WR035635.

Sheldon, F., Rocheta, E., Steinfeld, C., Colloff, M., Moggridge, B., Carmody, E., Hillman, T., Kingsford, R., Pittock, J. (2024) Are environmental water requirements being met in the Murray–Darling Basin, Australia?. Marine & Freshwater Research 75, MF23172. https://doi.org/10.1071/MF23172

Slattery and Johnson (2021). Floodplain water harvesting in the Northern New South Wales Murray-Darling Basin. https://inlandriversnetwork.org/wp-content/uploads/2021/02/21022-fph-final-report.pdf

Sustainable Rivers Audit and Outlook First Nations Leadership Group (2024). Water Country – a story of connection, loss, change, and hope for the future: First Nations Report for the Sustainable Rivers Audit, Murray–Darling Basin Authority, Canberra. https://www.mdba.gov.au/sites/default/files/publications/water-country-sra-first-nations-report.pdf

The Fifth Estate (2019). NSW considering evacuating up to 90 towns if they run out of water, 13 December. https://thefifthestate.com.au/articles/day-zero-might-mean-tough-choices-for-90-towns-looking-at-new-locations/

Wentworth Group of Concerned Scientists (2012a). Analysis of groundwater in the 2011 Draft Murray-Darling Basin Plan, https://wentworthgroup.org/wp-content/uploads/2013/10/Analysis-of-Groundwater-in-the-2011-Draft-Basin-Plan.pdf

Wentworth Group of Concerned Scientists (2012b). Wentworth Group Evaluation of Proposed Basin Plan. https://wentworthgroup.org/wp-content/uploads/2013/10/Wentworth-Group-Evaluation-of-Proposed-Basin-Plan.pdf

Wentworth Group of Concerned Scientists (2019). Water Flows in the Murray-Darling Basin: Observed versus expected, Summary Report. https://wentworthgroup.org/wp-content/uploads/2019/02/MDB-flows-summary.pdf

Wentworth Group of Concerned Scientists (2023). Are Murray-Darling Basin rivers getting the water they need to stay healthy? https://wentworthgroup.org/wp-content/uploads/2023/09/MDB-EWR-Report-8-Sept-2023-1.pdf

Wentworth Group of Concerned Scientists (2023). Murray-Darling Basin Plan: Implementation review 2023, Submission to the Productivity Commission July 2023. https://assets.pc.gov.au/__data/assets/pdf_file/0004/366619/sub081-basin-plan-2023.pdf

Wentworth Group of Concerned Scientists (2024). Blueprint to Repair Australia's Landscapes National case for a 30-year investment in a healthy, productive & resilient Australia Part I: Synthesis Report. https://wentworthgroup.org/wp-content/uploads/2024/07/Blueprint-to-Repair-Australias-Landscapes-Part-I-Synthesis-Report-Accessible.pdf

Wheeler, S. (2024). Comparing the success and failure of the Murray–Darling Basin Plan's water recovery programs. Australian Journal of Public Administration, 1–17. https://doi.org/10.1111/1467-8500.12672

Wheeler, S., Connor, J., Grafton, Q., Crase, L. and Quiggin, J. (2018). Submission to the Murray-Darling Basin Royal Commission. https://cdn.environment.sa.gov.au/environment/docs/profs-s-wheeler-j-connor-q-grafton-l-crase-j-quiggin-sa-qld-mdb-rc-gen.pdf

Wheeler, S., Xu, Y. and Zuo, A. (2024). Developing an economic quality assessment framework and applying it to water economic studies in the Murray-Darling Basin, *Environmental Science & Policy*, 152. https://doi.org/10.1016/j.envsci.2023.103654

Williams, J., and Grafton, Q. (2019). Missing in action: possible effects of water recovery on stream and river flows in the Murray–Darling Basin, Australia. Australasian Journal of Water Resources, 23(2), 78–87. https://doi.org/10.1080/13241583.2019.1579965

Wyrwoll, P., Manero, A., Taylor, K., Rose, E. and Grafton, Q. (2022). Measuring the gaps in drinking water quality and policy across regional and remote Australia. *npj Clean Water,* 5. https://doi.org/10.1038/s41545-022-00174-1