

EXECUTIVE SUMMARY

19 yearsmonitored evidence base.
*MRI, 2006–2025***40.6 ML**structure holding capacity.
*vs 500–800 ML/day equivalent without
rehydration***6x**native fish increase
*Mountain galaxias 2016–2023***The core argument**

Sustainable Diversion Limits (SDL) assessments assume a fixed relationship between water volume and environmental outcomes. Nineteen years of monitoring from the Mulloon Rehydration Initiative (MRI) challenges this assumption. Landscape condition is a critical and currently unaccounted variable — a rehydrated system achieves equivalent ecological outcomes with a fraction of the water a degraded system requires.

Landscape rehydration should be formally recognised in the SDL/ESLT (Environmentally Sustainable Levels of Take), accounting framework as a tool that improves environmental return per megalitre — complementing, not replacing, water recovery.

What the MRI evidence shows (2006–2025)

- Zero-flow days reduced. Post-intervention: 0 zero-flow days across 1,480 data points, versus 32 pre-intervention — directly addressing Barwon–Darling Barwaan–Culliwatta–Baaka baseflow failures.
- Floodplain connectivity at no additional allocation. Overbank frequency increased using existing flows; a single structure raised water levels by 0.64 m. No new water entitlement required.
- Biodiversity recovery across multiple taxa. Native fish increased 6-fold; frog species richness trebled at monitored sites; invasive *Gambusia* absent from long-treated reaches.
- Cost negligible relative to water recovery. Approximately \$525,000 per year across 23,000 ha. One gigalitre of water recovery would fund multiple years of monitoring that could reshape SDL determinations across the entire Basin.
- Downstream flows not diminished. Structures hold less than one day’s median flow before water passes through and returns downstream. Downstream median flow (131 ML/day) exceeds the flow entering the treated reach (95 ML/day).

The Opportunity: the same water, delivered into a rehydrated landscape, produces substantially better outcomes.

Three asks

1. **Recognise landscape condition in SDL assessments.** Assess landscape condition as a variable in SDL/ESLT determinations — starting with northern Basin SDL units (Barwon–Darling, Menindee Lakes, Lower Darling/Baaka) where baseflow failures are most acute.
2. **Fund MRI monitoring.** Fund continued MRI monitoring as a Basin Plan research priority. The cheapest knowledge investment available for the 2036 Review and to underpin models for emerging natural capital markets— trivial relative to the cost of water recovery, yet capable of informing SDL determinations across the entire Basin.
3. **Reform the regulatory framework.** Establish a nationally consistent, streamlined regulatory pathway for landscape rehydration to enable scale-up across Basin states and territories. Current regulatory burden applies the same weight to environmentally-positive interventions as to potentially harmful ones.

Bottom line: In a constrained fiscal and hydrological environment, options that improve the efficiency of existing environmental water are of high value. Landscape rehydration is that option — supported by 19 years of peer-reviewed monitoring data.

Submission to the 2026 Murray–Darling Basin Plan Review

Mulloon Institute

1 May 2026

Introduction

This submission:

- Introduces the Mulloon Institute,
- presents a summary of the Mulloon Institute’s (MI) approach to landscape rehydration and ecosystem restoration, and the evidence base underpinning it,
- summarises the demonstrated benefits of landscape rehydration for addressing key issues facing the Basin, including river connectivity, floodplain and wetland health, native fish decline and water quality,
- presents a novel argument regarding the relationship between landscape rehydration and Sustainable Diversion Limits (SDLs) and Environmentally Sustainable Levels of Take (ESLT), emphasising the critical importance of upper reaches of streams to Basin water quantity and quality and climate adaptation, and
- addresses the Discussion Paper feedback questions.

The Mulloon Institute

The Mulloon Institute (MI) is Australia’s leading scientific and practice organisation in landscape rehydration and restoration, which turns degraded incised channels into rehydrated, connected, vegetated systems. Its work focuses on partnering with rural and First Nations communities to rebuild climate-resilient Australian landscapes through science-backed approaches that capture and retain water in the landscape, restoring hydrological processes using physical interventions and regenerative land management. MI is a non-profit organisation guided by independent Science Advisory and Law Committees, employs 29 staff, and currently manages >\$11m in grant and project funding.

MI has gained significant funding for [catchment scale](#) landscape rehydration, [monitoring](#), capacity building and [First Nations](#) engagement from the Department of Agriculture Fisheries and Forestry (DAFF) under the Natural Heritage Trust and the Future Drought Fund; WaterNSW for [water stewardship](#) projects for water quality outcomes across Sydney’s extensive drinking water catchment; the NSW Department of Primary Industries and industry partners to develop the [CREST Tool](#) (a model to prioritise catchments across the State suitable for landscape rehydration) (the catchments of the northern Basin emerged as the highest priority regardless of how criteria were weighted); and the NSW Environmental Trust for [on-ground](#) landscape rehydration works at scale.

MI’s own commercial farms of 2,500 hectares near Bungendore on the NSW Southern Tablelands form the heart of the [Mulloon Rehydration Initiative](#) (MRI): a catchment-scale landscape rehydration project delivered in partnership with 23 landholders across 23,000 hectares, and recognised by the United Nations Sustainable Development Solutions Network in 2015 as a demonstrator of sustainable and profitable farming. MI’s work has gained international recognition including at COP 16 UNCCD in Riyadh in 2024 (Australian

case Study for the UN [Economics of Drought Report](#)) and through ongoing collaboration and advice on Nature based solutions with the [Ecosystem Research Institute](#) in Japan since 2023.

Landscape Rehydration Defined

This submission refers to “landscape rehydration”. Landscape rehydration involves restoring the natural movement, storage and cycling of water in degraded landscapes. Such projects use natural infrastructure made from soil, rocks, logs and vegetation, adapted management and other nature-based solutions to slow the flow of water and repair ‘landscape function’: the patterns and processes by which a landscape retains and uses its vital resources as a biophysical system. Further information on the science, principles and practices of landscape rehydration can be found in the [Regenerative Power of Water](#).

Why is Landscape Rehydration Required?

The first-person accounts of the European explorers, pastoralists and surveyors provide us with a compelling record of how the landscapes looked and functioned at the time of colonisation. In February 1822, explorer William Kearns described the Molonglo River floodplain running through the Carwoola floodplain as ‘the finest plain we ever saw’. He noted that the river was a ‘chain of connected ponds’ running from the southern end of the plains before taking a course through the range of hills (Throsby, 1822).

There are many other descriptions of broad low-relief valleys that were thinly treed on the slopes, with grassy valley floors containing chains of ponds. These valleys were filled with deep, layered sediments which, later evidence has revealed, have eroded and refilled many times over many millions of years. Geomorphically, these are known as ‘cut and fill’ landscapes. They are very fertile, yet inherently fragile.

The way these fertile, yet fragile landscapes functioned quickly changed once pastoralism spread across Australia. The discontinuous chain of ponds systems flowing through intact alluvial sediments would have had base flow water levels close to the top of the bank, reflecting the level of the underlying groundwater. Rapid soil erosion commenced in the early decades of the 19th century and a landscape which had never seen hard-hooved animals before was suddenly overrun with them. By 1830 there was almost two million Merino sheep in Australia and by 1890 there were nearly 100 million sheep and ten million head of cattle.

Colonial land use practices removed vegetation and led to incision of creeks and rivers through the alluvial sediments. The functional hydrological and ecological connection between creeks and rivers was rapidly lost. Like pulling the plug out of a bathtub, the deep and chronic erosion of creeks and gullies has lowered the water-table, drained wetlands, eroded gullies and dramatically reduced the water holding capacity of the soils. Further information on the impacts of colonisation on landscape function can be found in the [Regenerative Power of Water](#).

Design and Delivery of Nature based solutions

It is important to note that the design of nature based solutions or natural infrastructure for landscape repair and reinstating hydrological processes has a high degree of technical rigour including application of geomorphic, hydrological and engineering principles and processes by highly qualified teams of landscape planners which include environmental engineers, hydrologists and ecologists.

The Mulloon Rehydration Initiative: Evidence Base

The MRI is Australia's longest-standing and most intensively monitored catchment-scale landscape rehydration project, operating continuously since 2006. Sixty instream bed control structures have been installed along 15 km of Mulloon Creek to raise the historically incised bed level and in turn seek to restore the hydrological connection of the Mulloon Creek and floodplain. A peer-reviewed paper reporting monitoring results from 2006–2025 is in preparation (Bernardi et al, forthcoming), building on the published monitoring framework (<https://onlinelibrary.wiley.com/doi/full/10.1111/emr.12549>) Key findings from 19 years of monitoring, directly relevant to the Basin Plan Review, are as follows.

Water Quality

Zhu, Y. (2024) found that the instream structures have had a positive influence on the water quality of Mulloon Creek. Parameters analysed included turbidity, electrical conductivity, pH, dissolved oxygen, oxidation-reduction potential and temperature. Results revealed reduced electrical conductivity, temperature stabilisation, and higher dissolved oxygen levels post instream structure installation. The research indicates instream structures have promoted water mixing, subsequently reducing salinity and supporting healthier aquatic ecosystems.

Downstream flows are not diminished

The most significant concern about landscape rehydration — that instream structures reduce downstream flows — is directly refuted by the MRI monitoring data (https://mullooninstitute.org/wp-content/uploads/2026/03/Moore_Bernadi-Mulloon-Home-Farm-2006-2020.pdf). The 60 structures in the lower and mid Mulloon Creek have a combined maximum holding capacity of approximately 40.6 megalitres (ML), compared to a median daily flow of 41.27 ML/day at the Lower Mulloon gauge. The structures hold less than one day's median flow, briefly, before water continues through or over the structures. Median flow downstream of the treated Mid Mulloon reach (131.1 ML/day post-intervention) is greater than flow entering it (95.3 ML/day), evidencing that structures do not diminish downstream flows and that water stored in the floodplain seeps out over time. Total structure capacity represents approximately 15% of the combined harvestable right in the monitored sections — a fraction that is temporarily held and then released, not consumed.

Low flows and base flows are maintained or improved

Prior to intervention, the Mid Mulloon reach recorded 32 zero-flow days over the monitoring period. Post-intervention, zero-flow days at Mid Mulloon dropped to zero across

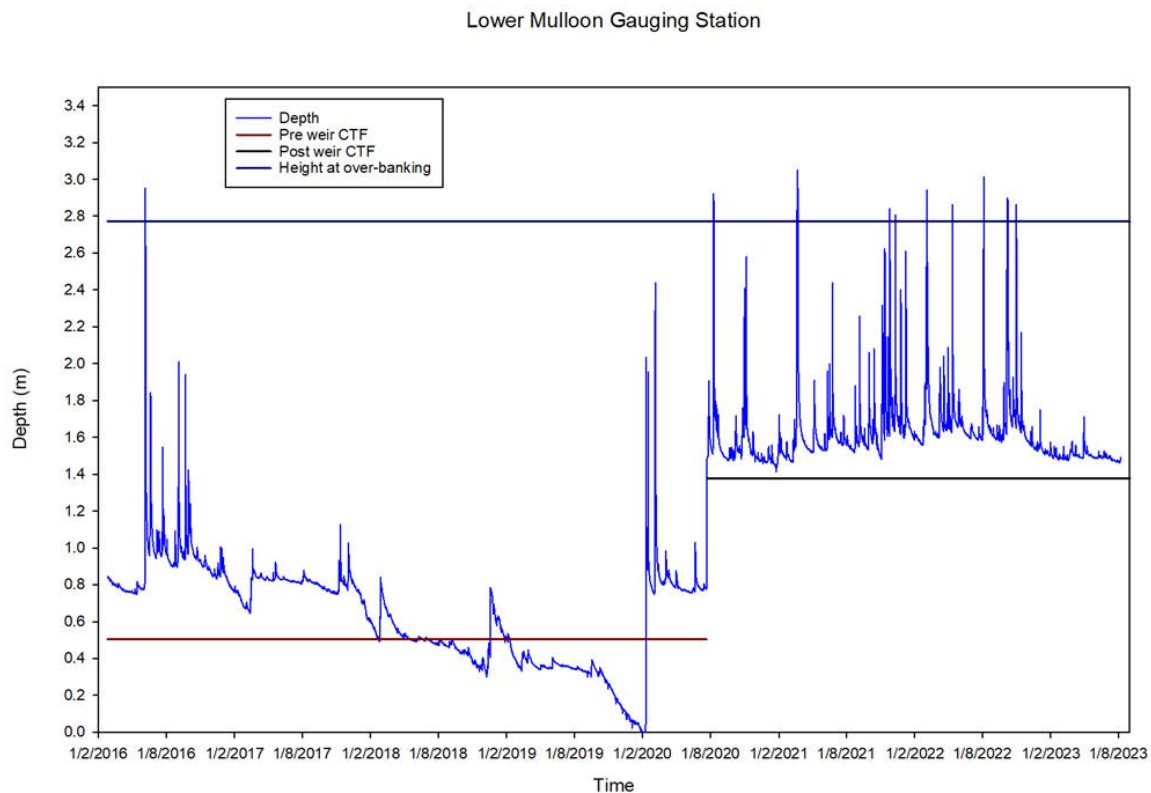
1,480 data points (2018–2023). The structures maintain ponded systems during dry periods, providing refugia for aquatic life and base flows to downstream reaches. This is due to the attenuation of flows during medium or high flow periods then the slow release of water during low flow periods. This is directly relevant to the Discussion Paper’s identification of inadequate base flows through the Barwon–Darling, Menindee Lakes and Lower Darling (Baaka) as a priority issue for the Basin Plan Review.

Floodplain connectivity is enhanced with minimal water volumes

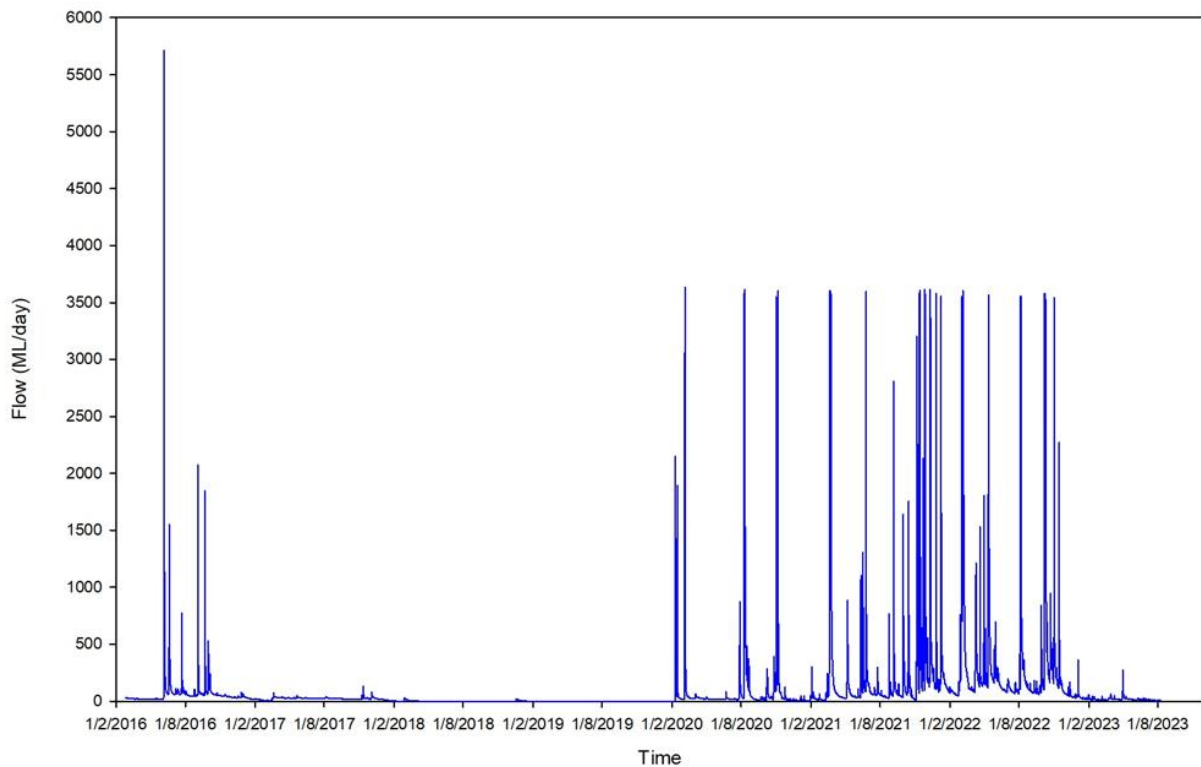
Monitoring has recorded a measurable increase in overbank flows post-intervention. The graphs following indicate:

- water depth and the increased number of overbanking events post installation of in-stream structures in August 2020,
- water flow rates at lower Mulloon stream gauging station associated with overbanking events which reveal a flow rate of over 5500 ML/day needed for overbanking and a flow rate of 3500 ML/day needed for overbanking post instream structures in August 2020.

At one gauge site, a single instream structure raised water level by 0.64 metres, increasing the frequency of overbank flows and floodplain inundation. Evidence of groundwater level rises associated with overbank events has been recorded via episodic filling of flood runners on the alluvial plain. These floodplain connectivity gains are achieved without any additional water entitlement, using only the existing flow regime more efficiently.



Lower Mulloon Gauging Station



Biodiversity responses are positive across multiple taxa

Nineteen years of multi-taxa monitoring has recorded consistently positive biodiversity responses:

- **Native fish:** Mountain galaxias (*Galaxias olidus*) numbers increased from 203 individuals in 2016 to 1,341 in 2023 across all sites. Home Farm sites (upper Mulloon), treated since 2006, recorded no invasive *Gambusia* in any of three surveys. Habitat complexity created by structures is the proposed mechanism, with ponded systems providing refugia and supporting predator diversity.
- **Aquatic invertebrates:** Ponds maintained by structures retained adequate dissolved oxygen even during the Tinderbox drought of 2017–19, providing refugia when surrounding reaches ceased to flow. Sensitive taxa including caddisflies and stoneflies recovered rapidly once flows returned.
- **Frogs:** Species richness at Site 26, surveyed before and after instream structure installation in 2020, increased from 3 species (pre-installation) to 8 species in 2023, with 9 species detected in total.
- **Vegetation:** NDVI improvements were consistent across all treated Property Management Areas (PMAs), including during dry conditions. Biomass recovery was faster post-intervention, with PMAs maintaining productivity during low-rainfall seasons.
- **Birds:** Waterbird numbers and species richness were highest in the most recent 2024 survey, following instream structure installation in the lower Mulloon section.

Landscape Rehydration, Sustainable Diversion Limits and Environmentally Sustainable Levels of Take

MI draws the Authority's attention to a consequential relationship between landscape rehydration and the SDL/ESLT framework that has not been adequately considered in Basin Plan policy to date. A critical gap in Basin policy concerns the role of streams in the upper catchments in maintaining the health of major rivers and sites, see article February 2026 [Climate change is drying out the 'forgotten rivers' that keep the Murray-Darling alive. We need a new plan.](#)

The SDL assessments at the heart of this Review determine the maximum volume of water that can be extracted from rivers and groundwater systems while reflecting an environmentally sustainable level of take. These assessments implicitly assume that the relationship between water volume and environmental outcome is fixed: that a given volume of environmental water will produce a given environmental outcome. The MRI monitoring data demonstrates that this assumption is incorrect.

The relationship between water volume and environmental outcome is not fixed — it depends fundamentally on the condition and hydrological function of the receiving landscape. A degraded, incised, disconnected channel requires significantly more water to achieve the same ecological response in the landscape than a rehydrated channel with intact riparian vegetation, functioning ponded systems and connected floodplain. This means that:

- SDL assessments that do not account for landscape condition and hydrological function may be systematically overestimating the volume of water needed to achieve an ESLT in degraded catchments, and
- existing environmental water allocations may be able to achieve substantially better outcomes if the waterways and surrounding landscape into which they are delivered is restored through rehydration.

Put directly: landscape rehydration improves the efficiency of environmental outcomes per megalitre of water. The MRI evidence shows that 40.6 ML of structure holding capacity — a volume that represents one day of median daily flow — maintains base flows, prevents zero-flow periods, supports fish and invertebrate refugia, increases overbank frequency, and produces measurable biodiversity improvements. These are outcomes that, in a degraded system, would require substantial environmental water allocations to achieve, if they could be achieved at all through water delivery alone. Modelling reveals that it would require flows across the Mulloon system ranging from 500ML/d in mid to lower Mulloon and up to 800ML/day in upper Mulloon to achieve similar results.

MI therefore submits that the 2026 Basin Plan Review should:

- recognise landscape condition as a variable that materially affects what constitutes an environmentally sustainable level of take in any given SDL unit;
- direct the MDBA to assess, as part of SDL reviews, whether landscape rehydration projects in priority catchments could improve environmental outcomes per megalitre and thereby inform SDL determinations; and

- expand the SDL accounting framework to explicitly recognise ‘non-water driver’ interventions — including landscape rehydration — as a tool for improving the environmental outcomes achievable from a given volume of water.

MI emphasises that this argument is additive, not substitutive. Landscape rehydration complements — and does not replace — the need for adequate SDLs and continued environmental water recovery. Rather, it means that a given volume of environmental water, combined with restored landscape and hydrological function, can achieve outcomes that would otherwise require significantly more water. This is particularly important in the constrained fiscal and hydrological environment the Discussion Paper describes, where options that improve the efficiency of existing environmental water are of high value. Reduced flows under changed climates will make such efficiencies even more imperative.

Benefits of Landscape Rehydration for Basin Plan Priorities

Landscape rehydration projects use natural infrastructure made from soil, rocks, logs and vegetation and adapted management to slow the flow of water and repair ‘landscape function’: the patterns and processes by which a landscape retains and uses its vital resources as a biophysical system. Their multiple benefits directly address the four priority issues identified in the SDL assessments:

- **River connectivity in the northern Basin:** by maintaining base flows and ponded systems during low-flow periods, rehydration structures directly address connectivity failures across the system, while reinstating riffle sections in the stream can contribute to increased dissolved oxygen levels. The MRI demonstrates that landscape rehydration infrastructure (LRI) supports increased baseflows and reduced cease to flow periods in treated reaches. The CREST Tool, developed with NSW DPI, identifies northern Basin catchments as the highest priority for further investigation for rehydration regardless of how criteria are weighted.
- **Floodplain and wetland health:** rehydration structures can increase overbank flow frequency at minimal water volumes (see graphs on pages 5 and 6). This is complementary to constraints relaxation programs — the Reconnecting River Country programs should explicitly integrate landscape rehydration to maximise floodplain outcomes. Importantly, the MRI data demonstrates that LRI do not diminish downstream flows”. This indicates that we can water upstream floodplains and wetlands without depriving floodplains downstream. Importantly, evidence from the MRI shows that LRI do not reduce downstream water availability. By increasing temporary storage and infiltration, these systems improve flow persistence and baseflows, enabling upstream floodplain and wetland recovery without compromising downstream flow regimes.
- **Native fish decline:** habitat complexity created by ponded systems and riparian revegetation supports native fish recovery. The MRI records a 6-fold increase in native Mountain Galaxias (*Galaxias olidus*) numbers between 2016 and 2023, with invasive Gambusia (*Gambusia holbrooki*) absent from long-treated sites. Aquatic invertebrate refugia maintained during drought allow rapid recolonisation when flows return.
- **Water quality:** riparian revegetation reduces erosion and sediment input; ponded systems filter runoff; and maintaining flows during dry periods prevents the water

quality crashes associated with cease to flow events. MRI water quality monitoring records electrical conductivity well below levels observed in comparable degraded systems and increased dissolved oxygen levels post instream structure installation especially during periods of high flow. Rehydrated reaches maintain stable oxygen regimes even during low-flow periods, where degraded systems often experience oxygen stress. These findings suggest that landscape rehydration supports resilient water quality conditions, including the maintenance of adequate dissolved oxygen for aquatic ecosystem health. This is attributed to greater water turbulence as water passes through and over the structures, facilitating aeration. Higher dissolved oxygen supports aquatic life and indicates healthier stream conditions.

Question 1: Issues and Options Presented in the Discussion Paper

MI acknowledges the thorough issue identification in the Discussion Paper, and in particular the identification of river connectivity in the northern Basin, end-of-system outcomes, floodplain and wetland health, and native fish decline as priority issues arising from the SDL assessments.

However, MI submits that the options presented are insufficiently focused on the receiving landscape as a determinant of environmental outcomes. The Discussion Paper is primarily oriented around:

- environmental water delivery volumes and management
- infrastructure modifications, and
- species recovery programs.

These are necessary but not sufficient. The Discussion Paper's own Chapter 11 identifies 'non-water drivers' as a critical knowledge gap in SDL assessments. Landscape condition is the most important non-water driver: the same volume of environmental water produces vastly different ecological outcomes in a degraded incised channel versus a rehydrated, connected, vegetated system. Ecosystem restoration through landscape rehydration is a fourth pathway — distinct from water delivery, infrastructure and species programs — that should be explicitly recognised in the options being considered by this Review.

There is an opportunity to take a systems approach through ecosystem restoration that will deliver multiple co-benefits to meet the challenges identified in the Discussion Paper. This approach is aligned with the United Nations Decade on Ecosystem Restoration (2021–2030) and Australia's obligations under the Kunming-Montreal Global Biodiversity Framework. The Basin Plan provides an opportunity to articulate these agreed, global principles through to national, state and local actors.

Question 2: Other Issues and Options to be Considered

SDL accounting and landscape condition

As argued above, the SDL accounting methodology should be expanded to recognise landscape condition as a variable affecting what volume of water constitutes an ESLT. MI recommends that the Review direct the MDBA to investigate, as part of its ongoing SDL assessment work, the degree to which landscape rehydration in priority catchments could improve environmental outcomes per megalitre and thereby inform future SDL

determinations. This investigation should include the northern Basin SDL units identified in the initial assessments — Barwon–Darling, Lower Darling and SA Murray — where the connectivity and base flow issues are most acute. The CREST Tool, which covers NSW, identifies high rehydration potential for catchments in the northern Basin.

Regulatory reform

A critical barrier to landscape rehydration at scale is regulations that are not fit for purpose to support landscape rehydration and restoration. Too many environmental regulatory processes are designed to prevent harm but ironically place an equivalent burden on environmentally-positive practices such as landscape rehydration. The MRI required strict regulatory approvals at the property scale and across multiple years as a precondition for demonstrating an unfamiliar set of practices. While this was appropriate for establishing the evidence base, the regulatory framework has not kept pace with the evidence. MI is leading three initiatives to address this:

- 1) the Water Stewardship Program, whereby partnering with the Ian Potter Foundation and WaterNSW and as the determining authority is enabling us to model due diligence and best practice through seven multi-landholder demonstration projects,
- 2) the LiFT project (Landscape Function Toolkit), that is developing more efficient and affordable monitoring methods for wider application; and
- 3) the Mulloon Law Committee, which has achieved some regulatory reform for landscape rehydration in NSW. The Review should support:
 - consultation and ideally agreement across Basin states and the Commonwealth on the outcomes sought from ecosystem restoration, as the basis for a streamlined regulatory approval pathway (as suggested in a proposed national code of practice for landscape rehydration)
 - creation and adoption of a streamlined pathway for landscape rehydration and ecosystem restoration, and
 - explicit inclusion of ecosystem restoration and landscape rehydration as eligible activities under Water Resource Plans (WRPs) in each Basin state.

Investment in ongoing MRI monitoring as a Basin Plan research priority

The MRI is the only intensively monitored catchment-scale landscape rehydration project in Australia. With 19 years of hydrological and biodiversity data, three stream gauges, two climate stations, soil moisture and groundwater monitoring, and multi-taxa biodiversity surveys, it constitutes a unique national research asset. Continued funding of MRI monitoring would directly serve the MDBA’s stated knowledge needs in Chapter 11 of the Discussion Paper — specifically around non-water drivers, SDL accounting methodology, base flow maintenance during drought, and the interaction between landscape condition and environmental water outcomes.

Key monitoring priorities for the next phase are: (i) extending hydrological data across a complete wet-dry cycle to strengthen attribution of flow outcomes to structures (ii) deeper investigation of groundwater recharge and bank storage dynamics and (iii) transferability

assessment for key northern Basin catchment types with different geology and geomorphology to Mulloon Creek.

The cost of this monitoring is trivial relative to the cost of water recovery. The MRI case study records total annual project costs of approximately \$525,000 across 23,000 hectares. The cost of recovering a single gigalitre of water entitlement in the Basin would fund multiple years of MRI monitoring, yet the knowledge generated could inform SDL determinations and environmental water management across the entire Basin for the next decade.

MI notes the challenge of monitoring across different landscapes, but also the rapidly increasing capabilities and efficiencies of monitoring of landscape, stream and riparian condition via remote sensing, for some of MI's experience outside the MRI see [Assessing rangeland rehydration: vegetation response to slowed water flows \(2026\)](#).

First Nations leadership in restoration

MI recognises and supports First Nations' leadership in restoration and water management. Landscape rehydration and caring for Country are deeply aligned: both are concerned with restoring the health and function of Country as a living system. MI has developed a First Nations Water Skills Certificate with Ranger Groups aligned to vocational training outcomes and delivers a high-impact "communities of practice" model that engages First Nations land managers as practitioners, not merely consultants. The Review should support:

- First Nations-led landscape rehydration projects on Country where traditional water management knowledge and rehydration practice can be complimentary,
- recognition of First Nations water knowledge in SDL assessment processes, including knowledge of how Country functioned hydrologically prior to European land use change, and
- equitable benefit-sharing arrangements from any commercialisation of ecosystem services generated by First Nations-led restoration projects.

Natural capital markets

New global financial reporting frameworks associated with the Taskforce on Climate-related Financial Disclosures (TCFD) and Taskforce on Nature-related Financial Disclosures (TNFD) are driving growing demand for credible nature repair outcomes. Australia's *Nature Repair Market Act 2023* provides a foundation, though market development is at an early stage. MI recommends that the Review embed consideration of nature repair markets as a long-term funding mechanism for landscape rehydration and ecosystem restoration in Basin planning, while acknowledging that Basin outcomes cannot be contingent on immature markets in the near term. Basin-wide data coordination and the CREST Tool provide an existing foundation for identifying and prioritising catchments for market investment.

Natural capital markets that incentivise positive environmental, social and cultural outcomes in the Basin will need to be underpinned by modelling to predict outcomes and direct which methodologies should be used where. The MRI and the work of MI nationally can assist the MDBA in undertaking and assessing emerging models.

Question 3: Priorities

MI identifies the following as priorities for the 2026 Basin Plan Review, in order of importance for landscape rehydration's contribution to Basin outcomes:

- **Recognise landscape condition in SDL assessments.** Direct the MDBA to investigate how landscape rehydration in priority catchments can improve environmental outcomes per megalitre and inform future ESLT determinations. This is the highest-leverage action available: it connects landscape restoration directly to the core regulatory framework of the Basin Plan and could improve outcomes in SDL units assessed as at risk without requiring additional water recovery.
- **Fund ongoing MRI and landscape restoration monitoring as a Basin Plan research priority.** The MRI is a unique national asset for answering the questions this Review cannot yet answer: how landscape rehydration interacts with SDLs, what non-water drivers most affect environmental outcomes, and how base flow maintenance during drought can be achieved at scale. Funding this monitoring is a high-value, low-cost investment in the knowledge base for the 2036 Review. Funding monitoring programs in other landscapes that can also inform landscape restoration in the Basin is also recommended.
- **Prioritise ecosystem restoration in northern Basin catchments.** The CREST Tool identifies northern Basin catchments as the highest priority for landscape rehydration regardless of criteria weighting. The SDL units — Barwon–Darling, Menindee Lakes and Lower Darling (Baaka)— are where connectivity and base flow issues are most acute. Investigation for landscape rehydration in these catchments should be initiated now, informed by the Menindee Review and integrated with the Reconnecting River Country programs.
- **Establish demonstration sites and integrate with existing programs.** The Reconnecting River Country Program in the Murray and Murrumbidgee valleys provides an immediate opportunity to demonstrate landscape-scale rehydration and ecosystem restoration. MI recommends that these programs explicitly incorporate landscape rehydration as a complementary measure to constraints relaxation, and that demonstration sites be established in partnership with local communities to generate transferable evidence.
- **Reform regulatory frameworks.** A streamlined, nationally consistent regulatory pathway for landscape rehydration projects — is essential to scaling these approaches across Basin states. The Review should recommend that Basin governments work collaboratively to develop and then adopt this pathway.
- **Build capacity and support community leadership.** A comprehensive education and capacity building program for rural communities, farmers, land managers, NRM professionals and First Nations communities, using the communities of practice model that has been developed for landscape rehydration should be funded at scale across the Basin.
- **First Nations leadership** in water management and restoration should be recognised and resourced by the MDBA, contributing to improved appreciation and acknowledgement of traditional knowledge and respect for cultural obligations to restore dignity to land and water in the Basin. The [First Nations Water Skills](#)

[Certificate](#) is an example of a co-design process that can equip young Indigenous people with skills and experience to deliver culturally appropriate water management in a restoration economy.

- **Create an enabling environment for natural capital investment.** Coordinate Basin-wide data to underpin nature repair markets; ensure equitable benefit-sharing with First Nations; and embed TNFD/TCFD-aligned reporting in Basin Plan monitoring frameworks to attract private capital to restoration.

Conclusion

Landscape rehydration offers a fourth pathway for the Basin Plan — distinct from, and complementary to, environmental water delivery, infrastructure improvement and species recovery programs. The 19 years of monitoring data from the Mulloon Rehydration Initiative provides the strongest available evidence that instream structures maintain and enhance downstream flows, minimise zero-flow events, improve floodplain connectivity, and produce positive biodiversity outcomes across multiple taxa — all at water volumes that are negligible relative to existing harvestable rights and SDLs.

Most significantly, this evidence supports a new argument: that landscape condition is a variable determining what volume of water constitutes an environmentally sustainable level of take. In order to improve environmental outcomes in SDL units assessed as at risk — and to do so in a constrained fiscal environment and under worsening climate conditions — requires the efficiency gains available through landscape rehydration to be incorporated into Basin Plan thinking, SDL assessments, and the options available to water managers.

MI looks forward to engaging with the Authority through the consultation process and is available to provide further information, data and expertise to support the Review.

Yours sincerely,



Carolyn Hall

Chief Executive Officer

Mulloon Institute

References

Bernardi, T., Clear, R., Cooper, P., Dovers, S., Freudenberger, D., Hazell, D., Hazell, P., Inskeep, C., Moore, L., Oliver, D., Patmore, S., Peel, L. and Sun, A. (forthcoming) Instream structures for environmental rehabilitation: results of monitoring the Mulloon Rehydration Initiative.

Murray–Darling Basin Authority (2026) 2026 Murray–Darling Basin Plan Review Discussion Paper. MDBA, Canberra.

Fisher, I. Hazell, P., Healy, E., Lennon, M., Inskeep, C & Smart, J. (2025) The Regenerative Power of Water – Nature Repair in the Sydney Catchment Area. Mulloon Institute,

Commissioned by Water NSW. https://mullooninstitute.org/wp-content/uploads/2025/04/The-Regenerative-Power-of-Water_WEB.pdf

Michael Gbenga Ogungbuyi, David Gallacher, Richard Azu Crabbe, Mike Clark, Tim Wiley, Caroline Mohammed and Matthew Tom Harrison (2026) Assessing rangeland rehydration: vegetation response to slowed water flows (in prep)
https://figshare.utas.edu.au/articles/journal_contribution/Assessing_rangeland_rehydration_vegetation_response_to_slowed_water_flows/31939851?file=63459972

Peel, L., Hazell, P., Bernardi, T., Dovers, S., Freudenberger, D., Hall, C., Hazell, D., Jehne, W., Moore, L. and Nairn, G. (2022) The Mulloon Rehydration Initiative: the project's establishment and monitoring framework. *Ecological Management and Restoration* 23(1), 25–42. <https://onlinelibrary.wiley.com/doi/10.1111/emr.12549>

Throsby, C. 1822. "Papers of Charles Throsby, including various journals of exploration, 1822- 1826." *Empire Studies. Australia Colonial Life And Settlement_Part2_Reel34_Vol2*. Compiled by Adam Matthew Digital. Marlborough, Wiltshire : Adam Matthew Digital, February.

Zhu, Y. (2024) 'Using seasonal rapid stream assessment (RSA) to monitor water quality and stream health parameters at Mulloon Creek, Bungendore NSW'. Masters Thesis. ANU. [//efaidnbmnnnibpcjpcglclefindmkaj/https://mullooninstitute.org/wp-content/uploads/2024/12/Using-seasonal-RSA-to-monitor-water-quality-and-stream-health-parameters-at-Mulloon-Creek-Bungendore-NSW.pdf](https://mullooninstitute.org/wp-content/uploads/2024/12/Using-seasonal-RSA-to-monitor-water-quality-and-stream-health-parameters-at-Mulloon-Creek-Bungendore-NSW.pdf)