

Regional Water Strategy

Macquarie–Castlereagh – Implementation Plan

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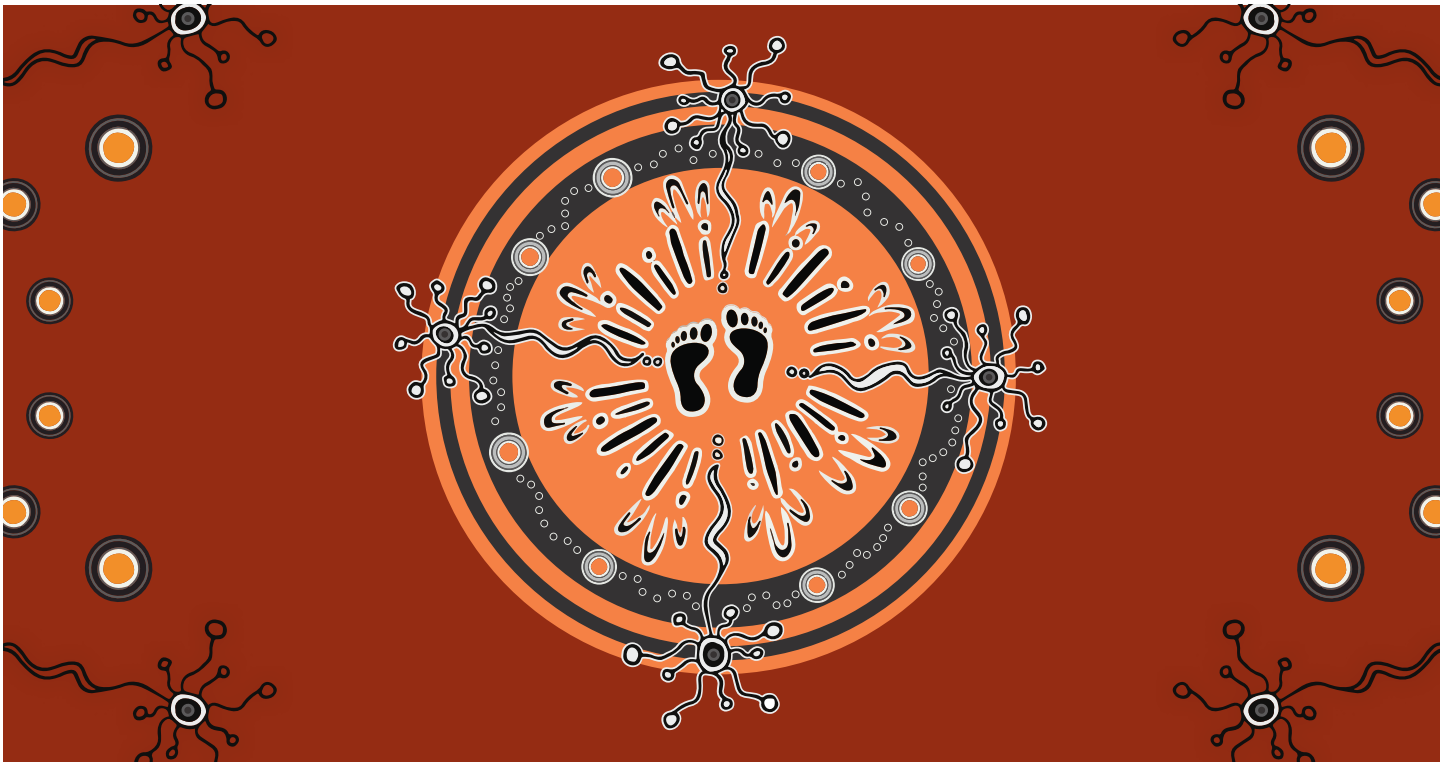
Cover image Image courtesy of Destination NSW. Macquarie River Rail Bridge, Dubbo.

More information water.dpie.nsw.gov.au/plans-and-programs/regional-water-strategies

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Acknowledging First Nations people

The NSW Government acknowledges First Nations people as the first Australian people and the traditional owners and custodians of the country's lands and water. First Nations people have lived in NSW for over 60,000 years and have formed significant spiritual, cultural, and economic connections with its lands and waters.

Today, they practise the oldest living culture on earth.

The NSW Government acknowledges the Gomeroi/Kamilaroi/Gamilaroi/Gamilaraay, Ngemba, Ngiyampaa, Wailwan and Wiradjuri nations from the Macquarie–Castlereagh region as having an intrinsic connection with the lands and waters of the Macquarie–Castlereagh Regional Water Strategy area. The landscape and its waters provide the First Nations people with essential links to their history and help them to maintain and practise their traditional culture and lifestyle.

We recognise the Traditional Owners as the first managers of Country. Incorporating their culture and knowledge into management of water in the region is a significant step towards closing the gap.

Under this regional water strategy, we seek to establish meaningful and collaborative relationships with First Nations people. We will seek to shift our focus to a Country-centred approach, respecting, recognising and empowering cultural and traditional Aboriginal knowledge in water management processes at a strategic level.

We show our respect for Elders past and present through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places where First Nations people are included socially, culturally and economically.

As we refine and implement the regional water strategy, we commit to helping support the health and wellbeing of waterways and Country by valuing, respecting and being guided by Traditional Owners/First Nations people, who know that if we care for Country, it will care for us.

We acknowledge that further work is required under this regional water strategy to inform how we care for Country and ensure First Nations people/Traditional Owners hold a strong voice in shaping the future for all communities.

Artwork by Nikita Ridgeway.

About this Implementation Plan

The Macquarie–Castlereagh Regional Water Strategy charts the long-term direction for delivering sustainable and resilient water services. It sets out clear and accountable actions for the government, local water utilities and industries to tackle the water-related challenges facing the Macquarie–Castlereagh region.

The Macquarie–Castlereagh Regional Water Strategy has a 20-year timeframe, and the prioritisation and implementation of its actions recognises this. We have already started work on many of the strategy's actions, and others will be delivered over a medium or longer-term time horizon. This acknowledges that, although all actions are important, we cannot implement all actions immediately.

The Macquarie–Castlereagh Regional Water Strategy has been designed to be adaptive. This means that we will update the strategy and our implementation plan to respond to changing circumstances and priorities. We will review and update the strategy at least every 5 years.

Immediate priorities for the Macquarie–Castlereagh Regional Water Strategy

The focus of the first stage of implementation will be on:

- **Preparing for the next drought and making sure every person can have safe access to drinking water:**
 - Being better prepared for the next drought by providing clarity about provision of water for critical needs in the upper Macquarie during times of scarcity (Action 1.3).
 - Accelerating policy and regulatory changes that support more innovative urban water supplies such as water re-use, stormwater harvesting and managed aquifer recharge (Action 1.5). These frameworks can help support future water security options for towns in the region.
 - Identifying funding pathways to invest in a demonstration plant for purified recycled water (Action 1.5) to support the research and long-term planning for treated water.
 - Supporting skills gaps in small local water utilities to make sure they have good quality water (Action 1.8).

- Considering policy changes and additional water entitlement to provide Orange City Council with a buffer for the next drought (Action 1.9).
- Starting to plan for the best long-term water supply options for Bathurst and Orange to secure their water supplies and reduce the risk of the towns running out of water (Action 1.6).

- **Progressing initiatives that support community and industry adaptation to a changing climate:**

- Confirming funding sources to progress studies to understand the feasibility of raising the full supply level in Burrendong Dam, providing better drought resilience for landholders on the effluent creeks and more efficient ways to deliver water for high priority needs in the region's west (Actions 2.1, 2.3 and 2.4). These are foundational activities needed to confirm the appropriate infrastructure and operating arrangements needed to support the region during dry periods.
- Finalising the Climate Vulnerability Assessment for crops in the Macquarie Valley (Action 3.3) to support agricultural industries in adapting to climate change.

- **Remediating fish barriers and improving flows across catchments:**

- Removing impediments to effective environmental water delivery (Action 4.1), and remediating fish barriers (Action 4.2) and unapproved floodwork structures (Action 4.3).
- Progressing water sharing plan changes to improve downstream flows and protect the first flush of water after a drought (Action 2.5).

- **Advancing Aboriginal people's access to water:**

- Progressing the development of an Aboriginal Water Strategy and setting up the framework to better engage with, and support place-based initiatives to deliver cultural and economic outcomes (Actions 3.5, 3.6 and 3.7).

We have prioritised actions based on:

- results of our analyses
- discussions with local councils and other government agencies
- community feedback
- critical risks that need immediate attention
- available funding and funding opportunities.

Responsibilities

The implementation plan also outlines responsibilities for delivery. This will allow us to:

- monitor the progress of actions
- assess the effectiveness of the strategy
- identify areas for improvement.

Key implementation partners

In order to effectively implement the actions, we will work with a diverse group of partners to lead a range of the actions. These include the following government agencies, local government, community groups, industry groups and individuals:

- Asset owners
- Central NSW Joint Organisation (CNSWJO)
- Central Tablelands Water
- Commonwealth Environmental Water Office (CEWO)
- CSIRO
- Department of Planning and Environment–Crown Lands (DPE–Crown Lands)
- Department of Planning and Environment–Environment and Heritage (DPE–Environment and Heritage)
- Department of Planning and Environment–Water (DPE–Water)
- Department of Primary Industries–Agriculture (DPI–Agriculture)
- Department of Primary Industries–Fisheries (DPI–Fisheries)
- Department of Regional NSW (DRNSW)
- First Nations/Aboriginal peak groups and communities
- Local Land Services
- Local water utilities/local councils
- National Parks and Wildlife Services
- Natural Resources Access Regulator (NRAR)
- NSW Environment Protection Authority (NSW EPA)
- NSW Health
- Training Services NSW
- WaterNSW.

Monitoring, evaluation and progress reporting

An integrated monitoring and reporting framework has been developed for the various NSW water strategies. We will apply this framework to the Macquarie–Castlereagh Regional Water Strategy, and regularly report on the progress of implementation.

These progress reports will provide transparency in, and accountability for, delivering the strategy to the NSW community.

Reading the Implementation Plan

The Macquarie–Castlereagh Regional Water Strategy is the result of significant analysis and community engagement and builds on a range of existing commitments and work already underway. This work and community feedback is the rationale for how implementation of the actions have been prioritised and is recorded under the heading **‘Our starting point’**.

There is some work that can commence very soon. Programs planned to start in the next 12 months are recorded under the heading **‘What we will do next’**.

There is some work that will take more time or rely on other actions to be completed first before they can begin. Programs that are not due to commence for more than 12 months are recorded under the heading **‘What we will do later’**. These programs may also be subject to funding approval.

There may be some instances where a column is blank. This is because we cannot begin implementing every action at once. The monitoring framework will help the department and the community assess the progression of implementing the strategy in full.

The NSW Government agency or partner identified as responsible for delivering each program in the strategy is listed as **‘Lead’** under each sub-action.

Agencies or partners who play a supporting role in delivering the program are listed as **‘Supported by’** under each sub-action.

Figure 1. Regional water strategies process

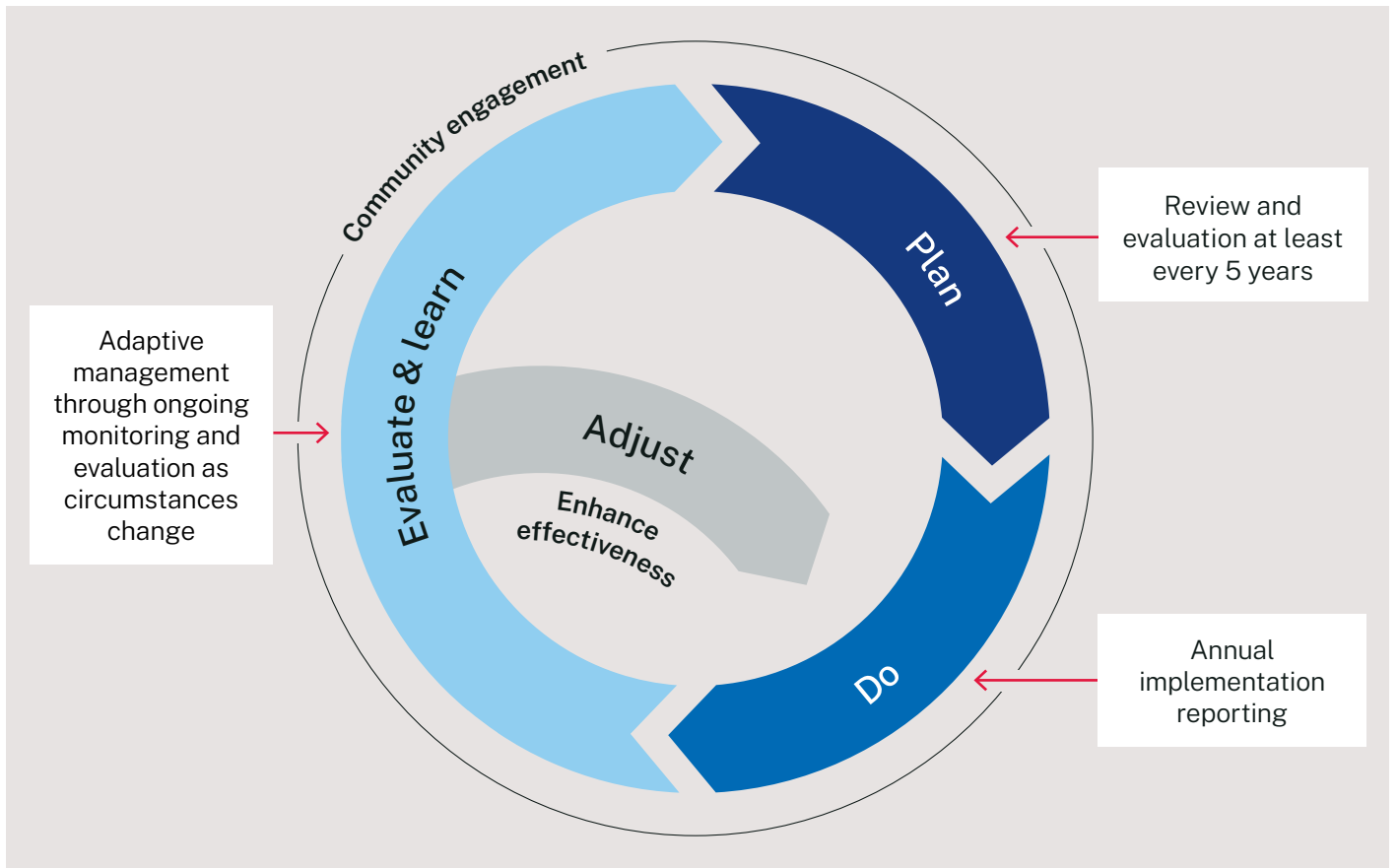


Image courtesy of Destination NSW. Dunns Swamp in Wollemi National Park, near Rylstone.

Priority 1

Ensure safe and reliable water supplies for growing regional cities and towns

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 1.1:</p> <p>Move towards an enduring level of supply to support regional cities and towns</p>	<p>The NSW Government's new regulatory and assurance framework for local water utilities encourages them to develop and apply sound water security criteria and service levels through a traditional approach, an enduring supply approach, or another credible and robust approach.¹</p> <p>The use of an enduring supply approach can help utilities evaluate options for meeting customer and communities' minimum water needs during long and extreme drought.</p> <p>This requires utilities to understand how much water is needed by the community; the water that will be available from existing sources in an extreme drought; and what additional options are available, how much they can supply and how long they will take to deliver.</p> <p>This is a more robust approach to drought planning which is likely to support future investments to increase drought resilience.</p>	<p>Establish common guidelines for the concept of enduring supply.</p>	<p>Where relevant, local and state governments will use the guidelines as a basis for water security assessments and analysis on when to trigger additional water supply investments in the future.</p>	<p>DPE-Water</p>	

1. See www.water.dpie.nsw.gov.au/local-water-utilities/water-utility-strategic-planning/strategic-planning-outcomes

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 1.2:</p> <p>Establish a coordination approach involving all levels of government for implementing actions under Priority 1</p>	<p>Local government has been an important contributor to the Macquarie–Castlereagh Regional Water Strategy and there is interest in continuing strategic water planning partnerships across all levels of government via a formalised governance framework.</p>	<p>The department will work in partnership with local councils and local water utilities to establish an enduring framework to coordinate the local council and town water-related actions under Priority 1.</p> <p>The governance framework is expected to operate alongside a similar framework in the Lachlan region. This will assist local councils and the NSW Government to consider and address key cross-regional water security issues in a coordinated manner.</p>	<p>Evaluate the effectiveness of the framework in driving improved water security outcomes for the Macquarie–Castlereagh region.</p>	<p>DPE–Water</p> <p>Local councils</p> <p>CNSWJO</p> <p>Central Tablelands Water</p>	<p>DRNSW</p>



Image courtesy of Department of Primary Industries. Sunrise at Ben Chifley Dam, Bathurst.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.3: Develop measures for managing extreme events in the upper Macquarie catchment	<p>The NSW Government’s Extreme Events Policy establishes the principles for managing water resources within the NSW Murray–Darling Basin during an extreme event.</p> <p>It outlines a range of possible measures for water managers to use as conditions deteriorate. The details of these measures are outlined in the individual incident response guides for surface water and groundwater systems.</p>	<p>As part of the remake of the <i>Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012</i>, review the triggers for suspending irrigation access below Chifley Dam and Suma Park Dam.</p>		DPE–Water	<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>DPI–Agriculture</p> <p>Bathurst Regional Council</p>
		<p>Support future decision-making and communication under the NSW Extreme Events Policy by:</p> <ul style="list-style-type: none"> identifying the critical human and critical environmental needs during extreme drought in the Campbells River, Macquarie River upstream of Bathurst, Fish River and Winburndale Rivulet developing guidelines for how and when minimum flow water releases from town dams in the upper Macquarie could change during extreme droughts, and the communication protocols associated with the changes developing a Critical Water Advisory Panel (established under the Extreme Events Policy) specifically for the upper Macquarie. 		DPE–Water	<p>Bathurst Regional Council</p> <p>Orange City Council</p> <p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>DPI–Agriculture</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.3: Develop measures for managing extreme events in the upper Macquarie catchment (continued)		Identify the appropriate location and seek funding for new stream gauges: <ul style="list-style-type: none"> • between Chifley Dam and Bathurst’s water supply offtake • other areas as required. 		DPE-Water	Bathurst Regional Council Orange City Council
			Update drought contingency and water emergency response plans.	Bathurst Regional Council Orange City Council	DPE-Water



Image courtesy of Destination NSW. Historic buildings in the country town of Gulgong.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.4: Maintain a strong focus on urban water conservation and efficiency	The NSW Government's Water Efficiency Program is supporting community adoption of urban water efficiency, water conservation and demand management measures through initiatives such as the Regional Leakage Reduction Program, Washing Machine Replacement Trial and Smart Approved WaterMark Program.	Develop tools and resources to support local water utilities using the NSW Water Efficiency Framework, including a non-residential project handbook. Collaborate with local water utilities on research projects that will inform water efficiency planning.	Continue to identify water efficiency projects and initiatives across all sectors, including Aboriginal communities.	DPE-Water	
	The program has also developed the NSW Water Efficiency Framework for government, water utilities, councils and large businesses to use when implementing water efficiency initiatives.	Support councils to implement pilot projects in active leak detection, pressure management audits, training and knowledge, and improved data and system capability.	Evaluate the success of pilot projects and seek funding for additional initiatives.	DPE-Water	CNSWJO
	The Central NSW Joint Organisation is overseeing a joint leakage reduction initiative across its member councils, including Orange, Bathurst and Oberon. The initiative has audited member councils' water loss management approaches and provided tailored assistance to improve approaches through co-funding infrastructure upgrades and training. Coonamble, Warrumbungle Shire, Dubbo, Gilgandra and Cobar councils are also participating in the Regional Leakage Reduction Program.				

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.4: Maintain a strong focus on urban water conservation and efficiency (continued)	Through the Aboriginal Communities Water and Sewerage Program, ongoing leak repair and community-designed education programs are also being undertaken. These programs promote water-wise behaviour and demand management measures in discrete Aboriginal communities.				
Action 1.5: Invest in innovative water management options	Recycled and re-use of water The government has developed an engagement framework to collaborate with local water utilities, regulators and industry experts on a policy for, and regulatory barriers to, recycled water. Consultation with these stakeholders began in June 2021.	Develop a draft Recycled Water Roadmap for consultation, informed by targeted engagement with local water utilities and other stakeholders. Finalise the Recycled Water Roadmap that will identify policy and regulatory options based on the feedback from consultation.	Progress regulatory reform, update guidelines and identify opportunities to facilitate water recycling.	DPE-Water	NSW Health NSW EPA

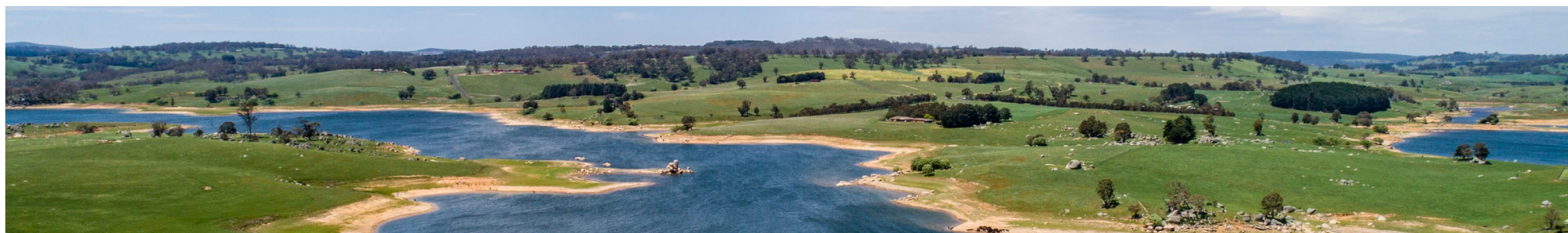


Image courtesy of Destination NSW. Lake Oberon, Oberon.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.5: Invest in innovative water management options (continued)			<p>Develop resources that will enable water utilities to increase water literacy and progress community engagement on diverse sources of water.</p> <p>Identify opportunities to share and learn from diversification projects, enabling peer-to-peer information sharing.</p> <p>Support community acceptance campaigns that help local water utilities diversify their water sources.</p>	DPE-Water	Local councils
	<p>Orange City Council conducted a community acceptance survey of purified recycled water in 2021. The survey found that while purified recycled water is not currently the community's preferred option, people are supportive of it and willing to discuss it.²</p> <p>Orange City Council is exploring opportunities to build an advanced water treatment demonstration facility.³ The water produced by the demonstration plant would initially be supplied to Cadia Hill Gold Mine.</p>	<p>Pursue pathways to support council obtaining funding for a business case to assess the feasibility of an advanced water treatment demonstration facility at Orange, identified within council's Integrated Water Cycle Management (May 2013).</p> <p>This is a multi-year project.</p>		Orange City Council	DPE-Water

2. www.orange.nsw.gov.au/water/community-open-to-recycled-water-being-part-of-the-future-water-supply-mix-in-orange-survey-shows/

3. No decision on purified recycled water will be taken without extensive community consultation and stringent government approvals.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.5: Invest in innovative water management options (continued)	Stormwater harvesting				
	The government is reviewing current regulatory settings and challenges for stormwater capture.	Develop and consult on a draft stormwater harvesting discussion paper.	Develop and consult on a draft policy framework for stormwater harvesting, informed by feedback from consultation on the stormwater harvesting discussion paper.	DPE-Water	
	Managed aquifer recharge				
	The NSW Water Strategy aims to investigate and enable managed aquifer recharge. This will be done by developing a new policy and regulatory framework in NSW and identifying where it is technically and economically viable. Before managed aquifer recharge is adopted in NSW we will undertake further analysis, testing and community consultation.	Commence the development of a policy framework for managed groundwater recharge covering all activities that purposefully put water into aquifers, including managed aquifer recharge. Produce managed aquifer recharge feasibility maps for aquifers across NSW.	Implement the managed groundwater recharge policy framework, which includes the rules and requirements under which managed aquifer recharge can operate in NSW. Explore the feasibility potential of managed aquifer recharge, including its cost effectiveness and how efficiently the stored water can be accessed. Determine public acceptance, particularly the impacts on and benefits for Aboriginal cultural heritage and environmental flows – including specific pilot schemes.	DPE-Water	WaterNSW

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 1.6:</p> <p>Plan for the best long-term augmentation solution for the upper Macquarie</p>	<p>A range of studies are underway that will contribute to the planning needed to identify the best long-term augmentation solution(s) for the upper Macquarie’s regional cities and towns. These include:</p> <ul style="list-style-type: none"> • Fish River Supply Scheme Strategic Plan (WaterNSW) • Sub-Regional Town Water Strategy (Cabonne Council, Central Tablelands Water and Orange City Council) • Strategic Water Plan (Lithgow City Council) • Belubula Water Security Project (Department of Planning and Environment–Water). 	<p>Secure funding to conduct critical studies and activities to assess the feasibility of each short-listed option. These critical studies are needed to input into business cases to assess the best long-term options for Bathurst and Orange. The critical studies are outlined below.</p> <p>Supply water to upper Macquarie towns from the Fish River or Coxs River catchment</p> <ul style="list-style-type: none"> • Develop a strategic water plan for the Fish River–Wywandy to understand the water implications from transitioning coal-based industries (Department of Planning and Environment–Water). • Identify strategic risks and opportunities associated with supplying water to upper Macquarie towns as part of the Fish River Supply Scheme Strategic Plan (WaterNSW). <p>Supply water to Bathurst and/or Orange from the Lachlan Valley</p> <ul style="list-style-type: none"> • Investigate the feasibility of the Lake Rowlands augmentation option and assess the effectiveness of this option in reducing Orange’s water security risks. 	<p>Seek funding to prepare a business case to determine the best long-term town water supply solution(s) for the upper Macquarie.</p> <p>This is a multi-year project.</p>	DPE–Water	<p>WaterNSW</p> <p>Orange City Council</p> <p>Bathurst Regional Council</p> <p>Cabonne Council</p> <p>Central Tablelands Water</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.6: Plan for the best long-term augmentation solution for the upper Macquarie (continued)		<p>Use some of the flood mitigation storage in Burrendong Dam for water supply (see Action 2.4)</p> <ul style="list-style-type: none"> • Undertake a dam safety assessment as required under the <i>Dam Safety Act 2015</i> and Dam Safety Regulation 2019. • Assess the impact on environmental water to ensure there is no net reduction in the quantity and effectiveness of Planned Environmental Water as required under the Basin Plan. 			
Action 1.7: Reduce uncertainty in groundwater security for the region's towns	<p>The NSW Groundwater Strategy identifies statewide priority actions for how groundwater resources can be managed sustainably into the future.</p>	<p>Continue to support local water utilities in strategic planning for communities that rely on groundwater for current or future water security.</p> <p>Continue to support local water utilities to develop groundwater models for their borefields, including Dubbo.</p>	<p>Review how critical needs and high priority uses, such as local water utility licences, are considered when assessing the impacts on aquifers and other users in the Macquarie–Castlereagh region.</p>	DPE–Water	DPE–Environment and Heritage

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.8: Support skills, capacity building and water quality in Oberon and other local water utilities	<p>The government supports local councils in regional NSW to ensure the provision of safe and secure water and sewerage to towns and communities. This can include:</p> <ul style="list-style-type: none"> providing technical support and training to operate and maintain water treatment works through the Town Water Risk Reduction Program addressing critical skills shortages and boosting water operations training and employment opportunities helping optimise the performance of high-risk water treatment infrastructure using innovative technology in partnership with NSW Health. <p>The department's draft water industry skills and training action plan has commenced implementation, supporting previous work identifying what skills are in shortage and opportunities for potential economies of scale to reduce shortages.</p>	<p>Department of Planning and Environment–Water will continue to provide local water utilities with technical assistance.</p> <p>Continue to implement the draft skills and training action plan.</p>	<p>Support councils to address key training and skills gaps that can support delivery of water to communities.</p>	<p>DPE–Water</p> <p>Training Services NSW</p>	<p>Local councils</p>
		<p>Explore options to improve the quality of raw water supplied to Oberon to reduce treatment difficulties as part of the WaterNSW Fish River strategy planning process. These options may include catchment management and aeration of Oberon Dam.</p>		<p>WaterNSW</p>	<p>Oberon Council</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 1.9: Provide additional water from the Wambuul / Macquarie River for Orange	<p>Orange currently has a pipeline from the Wambuul / Macquarie River and a licence to take water from the river for town water supply. This is an important part of Orange’s water supply system.</p>	<p>As part of the remake of the <i>Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012</i>, review the access licence rules the Wambuul / Macquarie River to Orange Pipeline to ensure water supply for critical human needs during drought.</p>		DPE-Water	Orange City Council
	<p>Analysis for the regional water strategy showed that increasing the annual volume Orange can extract from the Wambuul / Macquarie River would decrease its water security risks without impacting Burrendong Dam’s storage levels or water reliability for water users downstream of Burrendong Dam.</p>	<p>Explore options for obtaining additional water entitlement, including from the water market.</p>		Orange City Council	DPE-Water



Image courtesy of Destination NSW. Macquarie River, Dubbo.

Priority 2

Reduce water security risks in the region's west

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 2.1: Investigate options to improve water delivery efficiency for high priority needs		<p>Secure funding to commence critical studies that will assess the benefits, risks and feasibility of changing the operation of the effluent creeks in dry periods, including:</p> <ul style="list-style-type: none"> • alternative water supply options • assessing the ecological values of the creek, the water required to maintain them and potential impacts of alternative supply of water in dry times. <p>This is a multi-year project.</p>	<p>Following the results of the critical studies, seek funding to prepare a business case to determine the best water efficiency solutions for the mid-to-lower Macquarie Valley.</p> <p>This is a multi-year project.</p>	DPE-Water	WaterNSW DPI-Fisheries DPE-Environment and Heritage
Action 2.2: Upgrade the Nyngan to Cobar Pipeline and associated infrastructure	<p>A business case for this project will be completed in 2023. It is jointly funded by the NSW and Australian governments.</p>	<p>Construct new pump stations at Nyngan, Hermidale and Cobar (Stage 1).</p> <p>Identify funding sources for Stage 2 of the project (replace 100 km of existing pipeline).</p> <p>This is a multi-year project.</p>		DPE-Water	

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 2.3: Investigate how much water should be set aside in Burrendong Dam for dry periods	<p>A priority of the NSW Water Strategy is to ensure water resource management is supported by the most up-to-date understanding of climate, including climate change and its risks to water resources.</p>	<p>Commence a desktop pilot – informed by the regional water strategies – in a specific valley to test scenarios for water availability and allocations in that area based on predicted climate risk modelling scenarios. This will inform consideration of changes to water allocation in the Macquarie Valley.</p>	<p>Develop and consult on a discussion paper that identifies options for incorporating climate risk information into water allocation decision making, informed by findings of the desktop pilot.</p> <p>Expand application of the pilot to other valleys and engage with key water users in pilot valleys to discuss options, outputs and findings.</p>	DPE–Water	<p>DPI– Fisheries</p> <p>DPE– Environment and Heritage</p> <p>WaterNSW</p>
Action 2.4: Continue to investigate regional water security solutions for the region’s west		<p>Secure funding for critical studies that will assess if repurposing a portion of Burrendong Dam’s flood mitigation zone for water supply is feasible, including:</p> <ul style="list-style-type: none"> • Undertaking a dam safety assessment as required under the <i>Dam Safety Act 2015</i> and Dam Safety Regulation 2019. • Assessing the impact on environmental water to ensure there is no net reduction in the quantity and effectiveness of Planned Environmental Water compared to when the Basin Plan commenced, as required under the Basin Plan. <p>This is a multi-year project.</p>	<p>Following the results of the critical studies, seek approvals and funding to implement preferred options coming out of the business case.</p>	DPE–Water WaterNSW	<p>DPI– Fisheries</p> <p>DPE– Environment and Heritage</p> <p>DPI– Agriculture</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 2.5:</p> <p>Fully implement the NSW Floodplain Harvesting Program</p>	<p>The government has issued floodplain harvesting access licences and water supply works approvals, including measurement and reporting requirements, in the Macquarie Regulated River.</p>	<p>Implement floodplain harvesting licence and approval compliance and enforcement activity in accordance with NRAR’s published regulatory priorities and compliance reporting commitments.</p> <p>The advice from the Connectivity Expert Panel will inform changes to access arrangements for floodplain harvesting in the Macquarie Valley.</p> <p>This in an ongoing activity.</p>		<p>DPE-Water</p> <p>NRAR</p>	



Image courtesy of Ines Richter, Department of Planning and Environment. Gin Gin Weir, NSW.

Priority 3

Support industry and community climate adaptation

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 3.1: Invest in continuous improvement to surface and groundwater modelling	<p>The government has undertaken recent improvements to the region's surface water model, including:</p> <ul style="list-style-type: none"> • representation of water taken by floodplain harvesting • representation of how environmental water managers use licensed water • development of a river system model for the region's unregulated river catchments, including the upper Macquarie and Castlereagh systems • incorporation of newly developed long-term climate datasets. 	<p>Upgrade the Macquarie–Cudgegong Regulated River system model into a Source platform.</p> <p>Improve understanding and modelling capability of return flows from floodplains. This includes looking at methods and data to identify and undertake pilot projects that will test the methodology and suitability for valley-wide application.</p> <p>This is a multi-year program.</p>	<p>Recalibrate the Macquarie–Castlereagh water system model to account for different components of water take, once sufficient floodplain harvesting and measurement data for unregulated river non-urban water take are available.</p> <p>Publish reports on how models have been built and peer reviewed to build community confidence in the models.</p>	DPE–Water	<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>WaterNSW</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 3.1: Invest in continuous improvement to surface and groundwater modelling (continued)	<p>The government has developed a numerical model for the Upper Macquarie Alluvial Groundwater Source.</p>	<p>Collaborate with CSIRO to research the impacts of climate change on groundwater resources.</p>	<p>Continue upgrading numerical groundwater models.</p> <p>Publish peer-reviewed documentation for the numerical groundwater models.</p> <p>Investigate expanding the monitoring bore network to fill data gaps needed to improve the models.</p> <p>Research the need for multi-disciplinary models incorporating socio-economic and physical data as well as groundwater volume, level and quality data.</p>	DPE-Water	CSIRO

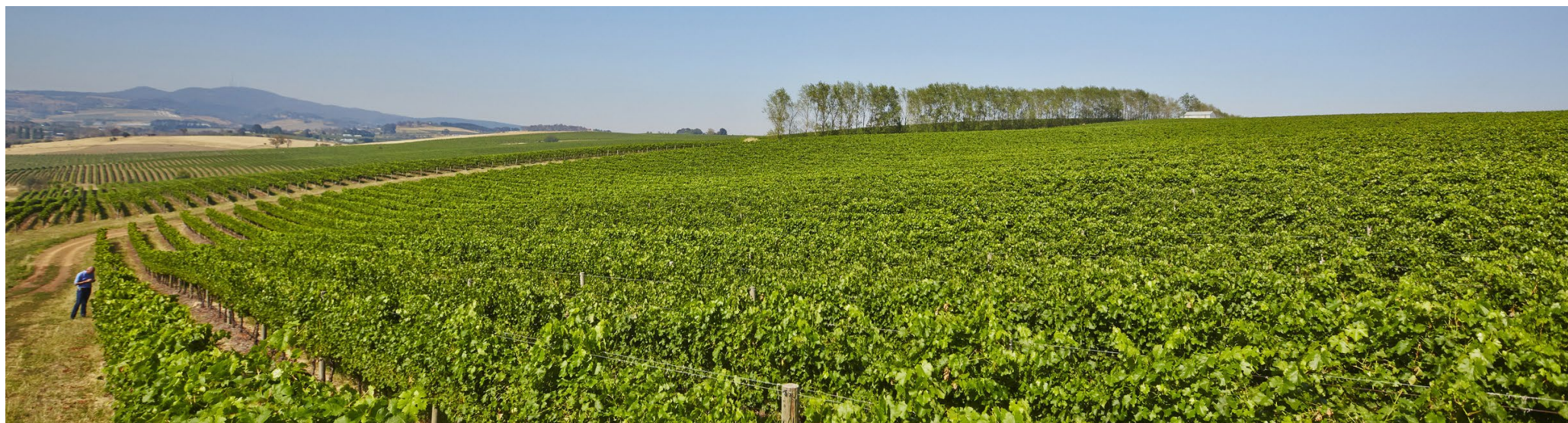


Image courtesy of Destination NSW. Philip Shaw Wines, Orange.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 3.2:</p> <p>Improve the collection, analysis and public access to water data and information</p>	<p>The government is improving the quality and range of water-related information made publicly available and ensuring it is easy to find, search and navigate.</p> <p>Online water data and information resources include:</p> <ul style="list-style-type: none"> • WaterInsights, an interactive tool that provides data on how water is shared, allocated and managed. Customers and the general public can download historic data at any location in addition to the short-term current water information. • SEED, the state’s central resource for sharing environmental data, now includes the stochastic climate datasets for the Macquarie–Castlereagh region. <p>The government has released the Allocation Methodology Summary for the Macquarie-Cudgegong Regulated River Water Source⁴ to provide easier access to information about how future water availability decisions are made.</p>	<p>Install new or improved gauging stations to improve network coverage/increase understanding of the flows in the Macquarie–Castlereagh system at the following locations:</p> <ul style="list-style-type: none"> • Marthaguy Creek upstream of Terrigal Creek • Macquarie River downstream of Castlereagh junction • Macquarie River at Brewon • Bogan River at Nyngan • Terrigal Creek upstream of Marthaguy Creek. <p>The project is supported through funding from the Australian Government’s Hydrometric Network and Remote Sensing Program, part of the Enhanced Water Monitoring and Information Initiative.</p>	<p>Publish 6, 12 and 24-month water storage outlooks for Burrendong and Windamere dams.</p> <p>Develop the Drought Flood Risk Index to provide early warning to water users on whether the Macquarie–Cudgegong regulated valley is at a higher risk of heading into drought or floods. The Drought Flood Risk Index will be made available on the WaterInsights portal.</p>	<p>DPE–Water</p> <p>WaterNSW</p>	

4. water.dpie.nsw.gov.au/allocations-availability/allocations/how-water-is-allocated/resource-assessment-process

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 3.3: Support adoption of farm climate adaptation and water efficiency measures	<p>The government is analysing the risks and opportunities of a changing climate to support resilience and adaptation in the agricultural sector.</p> <p>The Farms of the Future program has been expanded to support on-farm connectivity and encourage farmers to adopt AgTech to boost productivity, including water efficiency and drought preparedness.</p>	<p>Complete stage 1 of the Climate Vulnerability Assessment. This includes publishing summaries of the assessments of climate risk and opportunities for Macquarie–Castlereagh agricultural commodities, such as cotton and extensive livestock.</p>	<p>Implement stage 2 of the Climate Vulnerability Assessment. This includes integrating water data from the regional water strategies into the analyses and investigating adaptation responses for cotton.</p>	DPI–Agriculture	DPE–Water
		<p>Continue to roll-out the Farms of the Future pilots (funded until 2025).</p>	<p>Monitor outcomes of adoption of digital technologies under the Farms for the Future program to see if any gaps remain that may support further regional adaptation.</p>	DPI–Agriculture	
Action 3.4: Review groundwater extraction and condition limits using new knowledge	<p>The government is researching and assessing different methods to better inform the definition of groundwater source extraction limits in NSW. This work is based on a review of the historical context for defining extraction limits as well as a comparative analysis of international best-practice cases.</p>	<p>Review the government’s approach to setting long term average annual extraction limits including how we can better consider climate change and an improved understanding of resource sustainability and social-economic factors.</p>	<p>Review and update, where appropriate, the extraction and conditions limits for groundwater systems in the Macquarie–Castlereagh region through the review and remake of water sharing plans. Any changes to groundwater access will continue to be made in the context of an adaptive and consultative approach to groundwater management.</p>	DPE–Water	

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 3.5: Develop ongoing arrangements for participation of local Aboriginal people in water management	<p>Priority 2 of the NSW Water Strategy provides actions to strengthen the role of First Nations/Aboriginal people in water planning and management.</p> <p>The government has invested \$15 million to set up an Aboriginal Water Program and progress NSW's first Aboriginal Water Strategy.</p> <p>The government has put in place guidelines to ensure fair remuneration for sharing of knowledge from Aboriginal people/First Nations stakeholders.</p>	<p>Finalise the NSW Aboriginal Water Strategy and the Aboriginal water engagement framework.</p> <p>Establish regional Aboriginal water committees based on local protocol and governance specific for First Nations communities in the Macquarie–Castlereagh region.</p>	<p>Implement the NSW Aboriginal Water Strategy.</p> <p>Progress priorities identified by the regional committees and local communities.</p>	DPE–Water	First Nations/ Aboriginal peak groups and communities
	<p>The NSW Government has established Environmental Water Advisory Groups that provide advice on environmental watering priorities and include representation from a range of stakeholders including the local Aboriginal community.</p>	<p>Explore how First Nations/ Aboriginal people want to be represented on the Macquarie Environmental Water Advisory Group and how their priorities may be represented in annual environmental water planning.</p> <p>Provide training and support to Environmental Water Advisory Group members to further develop their cultural competence and capacity.</p>			DPE– Environment and Heritage

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 3.6:</p> <p>Support place-based initiatives to deliver cultural outcomes for Aboriginal people</p>	<p>Priority 2 of the NSW Water Strategy commits to working with First Nations/Aboriginal people to maintain and preserve water-related cultural sites and landscapes.</p> <p>The Australian Government’s Closing the Gap Report and Local and Regional Voice program have highlighted that Aboriginal people have expressed the desire for strong and inclusive partnerships, in which local communities set their own priorities and tailor services and projects to their unique situations.</p>	<p>Investigate a framework to support local place-based initiatives in the Macquarie–Castlereagh. This will involve developing fit-for-purpose programs that align with community values developed through engagement with regional Aboriginal water committees and local Aboriginal communities (see Action 3.5).</p>	<p>Continue to investigate and administer opportunities to deliver cultural outcomes from improved access to water, including the development of cultural watering plans.</p>	<p>DPE–Water</p>	<p>First Nations/ Aboriginal peak groups and communities</p> <p>Local Land Services</p>



Image courtesy of Destination NSW. Indigenous Cultural Adventures, Orange.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 3.7:</p> <p>Support the development of new water-related Aboriginal business opportunities</p>	<p>In August 2022, the NSW Government endorsed in principle a new inland waters target under the National Agreement on Closing the Gap. This target commits 3% of the total volume of water access entitlements nationally to be held by Aboriginal corporations by 2031. The government will undertake activities to progress outcomes under the National Closing the Gap Agreement in consultation with First Nations/ Aboriginal people.</p> <p>Priority 2 of the NSW Water Strategy also commits to providing Aboriginal ownership of and access to water for cultural and economic purposes.</p> <p>Aboriginal business development opportunities are being supported through a range of programs including the Regional Aboriginal Partnership Program.</p>	<p>The draft Aboriginal Water Strategy will explore market and non-market mechanisms for obtaining water to meet the inland waters target. These mechanisms will be examined as part of developing the draft Aboriginal Water Strategy cultural and economic outcomes for Aboriginal people.</p> <p>This is a multi-year program.</p>		DPE–Water	<p>DRNSW</p> <p>First Nations/ Aboriginal peak groups and communities</p> <p>Local councils</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 3.8:</p> <p>Modernise the water management framework so it can continue to support sustainable economic diversification</p>	<p>The government is making significant place-based investments in the Macquarie–Castlereagh region and surrounding areas to build strong communities and support industry development and diversification.</p> <p>We need to begin work now to make sure our water management framework can cater to these new industries by supporting sustainable access to water.</p>	<p>Use evidence from this regional water strategy to inform future industrial and land use planning strategies to ensure there are sustainable water sources available to support new industries.</p> <p>This will include consulting with the Central West Regional Expert Panel, established under the Royalties for Rejuvenation Fund, on ways to support sustainable economic diversification for coal mining communities.⁵</p>	<p>Address water-related policy and regulatory barriers around supporting new and diverse industries setting up in the Macquarie–Castlereagh region.</p>	DPE–Water	DRNSW
<p>Action 3.9:</p> <p>Support public access to the Macquarie Marshes Nature Reserve</p>	<p>The Macquarie Marshes Nature Reserve is not open to the general public. Requests for access to the reserve are assessed by the NSW National Parks and Wildlife Service and may be authorised for Aboriginal cultural practice, education, research and monitoring, and appropriate low impact nature-based recreation and experiences.</p>	<p>Investigate and secure legal vehicle access to parts of the nature reserve as required for management and appropriate public access.</p> <p>Establish partnerships to:</p> <ul style="list-style-type: none"> raise awareness of opportunities, and consents needed, to visit the reserve promote the cultural and environmental values of the park. 	<p>Review the plan of management for the nature reserve, which will include endorsement of appropriate public access and visitor use of the nature reserve.</p> <p>Progress local and state government processes aimed at improving Traditional Owner management and access to Country.</p>	National Parks and Wildlife Service	First Nations/ Aboriginal peak groups and communities

5. The Central West Regional Expert Panel covers the local government areas of Mid-Western and Lithgow.

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 3.10: Increase transparency in the management of groundwater resources in the region	The government has published a NSW Groundwater Strategy.	Develop and publish guidance about the current approach to management of groundwater sources where the entitlement 'share value' is low.	Develop a groundwater level management framework with a series of escalating management actions corresponding to stages of localised water level decline.	DPE-Water	WaterNSW



Image courtesy of Nicola Brookhouse, Department of Planning and Environment. Gingham Creek at Cresswell, Macquarie Marshes.

Priority 4

Improve the health and resilience of natural systems

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
<p>Action 4.1:</p> <p>Modify or remove impediments to effective environmental watering</p>	<p>Through the Northern Basin Toolkit measures, the Australian Government has committed \$2.9 million for the Macquarie Marshes Enhanced Watering Project. This project and other related projects aim to improve efficacy of managed water deliveries and restore connections between river, wetlands, and floodplain.</p> <p>The government is reviewing options and assessing the best way to complete this work.</p>	<p>Continue implementation of works designed to remove impediments to effective water delivery:</p> <ul style="list-style-type: none"> • Oxley Break – finalise the scope of complementary works, including stability works • The Breakaway – finalise designs for the fishway and in-channel work • Monkeygar Creek – finalise scoping study to determine locations, costs, justification and community perspectives. <p>Seek funding to further reduce physical constraints that impact on the ability of water to move through rivers and across floodplains at the following locations:</p> <ul style="list-style-type: none"> • the Cudgegong River at Rocky Waterhole Bridge • upper Crooked Creek (also refer to Action 2.1). <p>These are multi-year projects.</p>	<p>Complete construction for fishway and works at the Breakaway to stabilise channel, ensure fish passage along the whole channel and to mitigate erosion risk.</p>	<p>DPE–Water</p>	<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.2: Mitigate impacts to native fish communities	Native fish passage The government has assessed barriers to fish passage in the Macquarie–Castlereagh region. Seven sites are identified as priority for remediation under the NSW Fish Passage Strategy. WaterNSW has secured IPART funding to construct fishways at 2 priority sites – Dubbo North Weir and Marebone Break Regulator.	Continue to install fishways at priority, funded sites in the Macquarie–Castlereagh region: <ul style="list-style-type: none"> • Dubbo North Weir • Marebone Break Regulator. 		WaterNSW	DPI–Fisheries DPE–Water
		Seek funding to improve fish passage at the priority site of: <ul style="list-style-type: none"> • Gin Gin Weir. 			
		Seek funding to improve fish passage at other priority sites: <ul style="list-style-type: none"> • Bulgeraga Creek regulator at the Bifurcation • Narromine Weir • Warren Shire Council (town) Weir • Gum Cowal regulator at the bifurcation. 	Seek funding to improve fish passage at an additional 39 priority barriers in the Macquarie–Castlereagh region as part of future fish passage remediation programs.	DPI–Fisheries	Asset owners

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.2: Mitigate impacts to native fish communities (continued)	Cold water pollution				
	The NSW Cold Water Pollution Strategy identified Burrendong Dam as a priority site for future mitigation activities.	The NSW Government is currently reviewing and updating the Cold Water Pollution Strategy. This will include an updated assessment of all large dams that have the potential to cause cold water pollution. Progress investigations into alternative infrastructure, new technologies and operational changes to arrive at a preferred solution for Burrendong Dam.	Explore funding opportunities to implement the preferred capital and operational solution for Burrendong Dam.	DPI–Fisheries WaterNSW	DPE–Water
	Fish diversion screens				
	The government is developing the NSW Diversion Screening Strategy, which aims to sustain native fish populations and protect vital irrigation infrastructure. The strategy will provide \$13.5 million in funding for diversion screens at priority sites in the Macquarie Valley.	Install fish friendly diversion works at 20 pumps (across 7 priority sites) near Narromine, Trangie and Warren. Seek funding to install fish friendly diversion works at the remaining 30 priority sites in the Macquarie Valley. Commence the 3-year fish monitoring program funded by the Fisheries Research Development Council.	Identify additional critical pump sites in the Macquarie Valley that could benefit from fish diversion screens. Undertake a business case for obtaining funding for the additional sites.	DPI–Fisheries	Asset owners

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.3: Remediate unapproved floodplain structures	<p>The NSW and Australian government's have jointly funded the Improving Floodplain Connections program.</p> <p>Preliminary assessments are being undertaken in locations including the Macquarie Valley.</p>	<p>Continue implementation of the Improving Floodplain Connections program in the Macquarie Valley. This will include:</p> <ul style="list-style-type: none"> • field assessments • landholder engagement • modelling and assessment • remediation works • evaluation. <p>This is a multi-year program.</p>		<p>DPE–Water</p> <p>NRAR</p> <p>DPE–Crown Lands</p>	<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>DPI–Agriculture</p> <p>WaterNSW</p>
Action 4.4: Provide clarity for environmental needs during drought operations	<p>The NSW Government has published an updated Extreme Events Policy which establishes the principles for managing water resources within the NSW Murray–Darling Basin during an extreme event.</p> <p>It outlines a range of possible measures for water managers to use as conditions deteriorate. The details of these measures are outlined in the individual incident response guides for surface water systems (regulated and unregulated) and groundwater systems.</p>	<p>Develop the Macquarie and Cudgegong Regulated River Drought Management Plan, which will outline future drought response activities that align to regulatory and policy requirements in the valley.</p>		WaterNSW	<p>DPE–Water</p> <p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>CEWO</p>
		<p>Investigate providing additional water quality monitoring key parameters, such as dissolved oxygen and temperature, in the Macquarie during normal and drought operations and river re-start protocols.</p>		DPE–Water	<p>DPI–Fisheries</p> <p>DPE–Environment and Heritage</p> <p>WaterNSW</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.5: Assess gaps and better understand how a changing climate could impact flow regimes and identify adaptation options	<p>The Macquarie–Castlereagh Regional Water Strategy has analysed how different climate scenarios could impact on flow regimes in the region.</p> <p>The Department of Planning and Environment–Water is working with the Murray–Darling Basin Authority to use this new climate information for the Macquarie–Wambuul catchment to develop and demonstrate a process for understanding river system vulnerability to climate change, identifying adaptation options and evaluating their effectiveness.</p>	<p>Identify if the implementation of actions to improve connectivity with the Barwon–Darling (Action 2.5) have addressed some of the current gaps in the flow regime.</p> <p>Identify if the analysis for Action 2.3 (Investigate how much water should be set aside in Burrendong Dam for dry periods) has informed this action.</p>	<p>Work with water managers and technical experts to scope and commence work to improve understanding of impacts of climate change on the frequency and adequacy of different flow types required to maintain and protect important ecological assets.</p>	DPE–Water	<p>DPE–Environment and Heritage</p> <p>CEWO</p> <p>WaterNSW</p> <p>DPI–Fisheries</p>
		<p>Review and update the Macquarie–Castlereagh Long-Term Water Plan.</p>			<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>CEWO</p> <p>DPE–Water</p>
Action 4.6: Identify regionally significant riparian, wetland and floodplain areas to protect or rehabilitate	<p>Local Land Services provides a range of extension services and advice to landholders on best practice natural resource management.</p> <p>The NSW Government has released an updated River Condition Index long-term reporting tool that provides statewide river conditions including an indicator on riparian vegetation.</p>	<p>Identify and seek funding to address log jams and willow rafts in the Macquarie River.</p>		NSW EPA	
			<p>Seek funding to rehabilitate priority sites in the Macquarie–Castlereagh based on learnings from implementing related actions under this priority (Actions 4.1–4.3).</p>	<p>DPI–Fisheries</p> <p>Local Land Services</p>	<p>DPI–Environment and Heritage</p>

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.6: Identify regionally significant riparian, wetland and floodplain areas to protect or rehabilitate (continued)	<p>Baseline extent of water dependent riparian, wetland and floodplain vegetation have been established. Datasets for the identification and assigning of ecological value for vegetation and wetland groundwater dependent ecosystems are available on the Sharing and Enabling Environmental Data (SEED)⁶ website.</p> <p>Water sharing plans and water resource plans set objectives and rules for monitoring, evaluating, reporting and management of water dependent vegetation.</p>	<p>Monitor ongoing conditions of water dependent vegetation.</p> <p>Correlate relationships between condition of water dependent vegetation, wetland and floodplain vegetation.</p> <p>Research methods to assess the relationship of Environmental Water Requirements, inundation extent and water dependent riparian, wetland and floodplain vegetation, and assess cultural and ecological value.</p> <p>Scope and implement a program to improve water dependent riparian, wetland and floodplain vegetation data, information products, and adaptive management decisions for the benefit of social-cultural and environmental outcomes.</p> <p>Continue groundwater level monitoring and reporting of data in the Macquarie–Castlereagh region.</p>	<p>Future activities will be informed by the NSW Water Sharing Plan Monitoring, Evaluation and Reporting Strategy.</p>	DPE–Water	<p>CEWO</p> <p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p>
	<p>The government has mapped identified groundwater dependent ecosystems with the various Macquarie–Castlereagh Alluvium Water Sharing Plans (2020).</p>	<p>Continue ongoing improvements to groundwater dependent ecosystem mapping products for the Macquarie–Castlereagh region.</p>	<p>Scope a long-term program to improve groundwater dependent ecosystem data and information products to inform sustainable groundwater management approaches and decisions.</p>	DPE–Water	DPE–Environment and Heritage

6. www.seed.nsw.gov.au

Action	Our starting point	What we will do next	What we will do later	Lead	Supported by
Action 4.7: Investigate ways to improve connectivity with the Barwon–Darling on a multi-valley scale	<p>The NSW Government has established an independent Connectivity Expert Panel to provide advice on amendments to water sharing plans to improve connectivity with the Barwon–Darling and regulate floodplain harvesting.</p>	<p>Consult on advice from the Connectivity Expert Panel and progress any relevant changes to relevant water plans in the Macquarie–Castlereagh region.</p> <p>Continue to implement the recommendations of the Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event, as outlined in the NSW Government response, and provide an annual report on implementation.</p>	<p>Continue to investigate whether broader reform is needed for improving connectivity during dry periods to inform the review of the Murray–Darling Basin Plan.</p>	DPE–Water	<p>DPE–Environment and Heritage</p> <p>DPI–Fisheries</p> <p>WaterNSW</p>

Ongoing monitoring, adaptation and reporting

The Macquarie–Castlereagh Regional Water Strategy is designed to respond to changing circumstances. We will undertake a formal review of the strategy at least every 5 years or in response to significant changing conditions and government priorities. The formal review will ensure that the key assumptions, such as population and demographics, have not significantly changed.

Amendments may be made in response to key changes in water demand, social preferences, science and technology, economic conditions, or other events,

including how climate change assumptions and responses evolve. These amendments may result in a shift in priorities, and the implementation plan will be updated to reflect this.

We will report every year against actions in the implementation plan, so that the community can track our progress and we can demonstrate which actions have been delivered, or continue to be delivered, in that year.

Table 1. Supporting activities

Action	Lead agency	What we'll deliver in the next 3 years
Reporting	DPE–Water	Publish an annual progress update on delivery of the actions in the Macquarie–Castlereagh Regional Water Strategy Implementation Plan so that the community can track progress.
Monitoring and evaluation	DPE–Water	Apply the framework developed for the NSW Water Strategy to monitor, review and report against the actions in the Macquarie–Castlereagh Regional Water Strategy.
Review	DPE–Water	Undertake a formal review of the Macquarie–Castlereagh Regional Water Strategy at least every 5 years, or in response to changing circumstances. The formal review will ensure that the key assumptions, such as population and demographics, have not significantly changed.



Image courtesy of Peter Robey, Department of Planning and Environment. River landscape, Dubbo.

