ANNUAL REPORT 2011–12 COMMONWEALTH ENVIRONMENTAL WATER



Straw-necked ibis (*Threskiornis spinicollis*) nests and eggs, Gywdir wetlands, March 2012. Permission granted to use the photograph from the Commonwealth Environment Water Office. (Andrew Huxham)

Abbreviations

Basin	Murray–Darling Basin
Department, the	Australian Government Department of Sustainability, Environment, Water, Population and Communities
Holder	Commonwealth Environmental Water Holder
Standing Committee	House of Representatives Standing Committee on Regional Australia

Glossary

Basin states refers to those states and territories that cover the Murray–Darling Basin: the Australian Capital Territory, New South Wales, South Australia, Queensland and Victoria.

Commonwealth environmental water refers to the water managed by the Commonwealth Environmental Water Holder to protect and restore rivers, wetlands and other environmental assets in the Murray–Darling Basin.

Commonwealth Environmental Water Holder is the statutory position that heads Commonwealth Environmental Water Office.

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Executive summary

Overview for 2011–12

The Commonwealth Environmental Water Office is led by, and supports, the Commonwealth Environmental Water Holder in the performance of statutory responsibilities under the *Water Act 2007*. Its objectives are to protect and restore rivers, wetlands and other environmental assets in the Murray–Darling Basin (the Basin).

Since 2009, 1233 gigalitres of Commonwealth environmental water was delivered for the environment across the Basin, of which 680 gigalitres were delivered in 2011–12. Commonwealth environmental water has been delivered together with more than 133.4 gigalitres of water from delivery partners.

Higher than average rainfall since 2010 brought about wetter than average conditions in most catchments in the Basin. Higher river flows and wetter soil conditions have substantially helped the environmental recovery of freshwater ecosystems in many Basin catchments, and the addition of Commonwealth environmental water helped to consolidate these recovery processes. Commonwealth environmental water has also been actively managed to mitigate potential threats to some catchments, such as hypoxic blackwater events, which resulted from natural flooding. The Commonwealth Environmental Water Office will continue to work with delivery partners and the Basin states to support an ecological recovery that builds the resilience of Basin rivers and wetlands to cope with future dry conditions.

The Commonwealth Environmental Water Office now manages 1368 gigalitres of water entitlements, which has a long-term average yield of 981 gigalitres per year. This comprises 41 entitlement types across 18 catchments in four states.

The volume of water allocations available against these entitlements in 2011–12 was 980 gigalitres; 331 gigalitres of Commonwealth environmental water was carried over from 2010–11. In total, 1311 gigalitres of water was available for environmental management in the year, of which 53 per cent was used. Based on preliminary figures, the use in New South Wales and Victoria by all entitlement holders is likely to be around 45 per cent. The balance of Commonwealth environmental water was carried over to support environmental watering opportunities in 2012–13. The wetter than average conditions during 2011–12 contributed to 41 per cent of the carryover being held in the southern connected Basin and 59 per cent of the carryover being held in the Basin.

During the year, steps were made to build additional institutional arrangements. This recognises the expanding scale, function, range of watering possibilities and complexity of the activities and responsibilities of the Commonwealth Environmental Water Office.

The Australian Government's response to the House of Representatives Standing Committee on Regional Australia report Of drought and flooding rains: inquiry into the impact of the guide to the Murray–Darling Basin Plan in regional Australia (the Windsor Inquiry; see Resources) led to the implementation of a number of initiatives. One of these was the establishment of the Commonwealth Environmental Water Office in December 2011. The office operates as a distinct entity within the Australian Government Department of Sustainability, Environment, Water, Population and Communities. This provides clear separation between the department's water policy and program roles, and the statutory position of the Commonwealth Environmental Water Holder. The Commonwealth Environmental Water Holder has been made substantive a dedicated position; previously, the statutory office holder had other duties.

Other initiatives included the establishment of a Commonwealth Environmental Water Stakeholder Reference Panel. An advisory council will be established in 2012–13. The council and panel will provide specialist expertise to the Holder. The establishment of a Stakeholder Engagement and Reporting section in the Commonwealth Environmental Water Office increases transparency, accountability and stakeholder engagement.

A number of other key communication and governance activities have also been completed or progressed:

- publication of the Commonwealth Environmental Water: Monitoring, Evaluation Reporting and Improvement Framework, and publication of the Commonwealth Environmental Water—trading arrangements discussion paper (see Resources)
- development of the Environmental Asset Database by the Commonwealth Environmental Water Office and the Murray–Darling Basin Authority to assist both agencies to store and retrieve the best available, up-to-date information on the environmental assets of the Murray–Darling Basin
- continued use of the Commonwealth Environmental Water Office website as a primary means of providing stakeholders with timely information on key issues, including holdings, trading, carryover and new publications
- continued development of sound working relationships with other water holders in the Basin states and their respective agencies
- continued engagement of stakeholders at a local level to seek their advice, comments and participation in the use of Commonwealth environmental water.

Mr Ian Robinson, the first Commonwealth Environmental Water Holder, moved from the position in May 2012 to take up other duties in the Australian Government. Mr Robinson played the pivotal role in establishing the new function of the Commonwealth Environmental Water Office from 2008. This marks an important contribution to reform in the Basin and institution building in the Australian Government.

Outlook for 2012–13

The Commonwealth Environmental Water Office will continue to work with its partners in the Basin states and local catchments to build on the improved ecological conditions that have resulted from the past two years of wetter conditions. The return of drier conditions to areas of the Basin during 2012–13 may result in environmental watering options that have not been available recently because of the wet conditions.

Taking into account expected allocations, water carried over from 2011–12 and potential growth of the Commonwealth holdings of water entitlements, it is anticipated that the volume of Commonwealth environmental water available in 2012–13 will be greater than that available in 2011–12. An increased range of water use options may become possible and be actively managed, especially if Basin catchments return to drier conditions.

Before the 2012–13 Budget, Commonwealth Environmental Water Office activity was reported as part of the department's 'Outcome 4, Program 4.1: Water reform'. To provide greater transparency and accountability, a new outcome has been established in the department's 2012–13 Portfolio Budget Statements (see Resources) for Commonwealth Environmental Water: Outcome 6: Protection and restoration of environmental assets through the management and use of Commonwealth environmental water. More details on the key priorities for the Commonwealth Environmental Water Office in 2012–13 are provided in the Commonwealth Environmental Water Office 2012–13 business plan.

The Commonwealth Environmental Water Office is part of a broader water reform program for the Basin. The Murray–Darling Basin Authority is responsible under the Commonwealth *Water Act 2007* for developing a Basin Plan that sets sustainable diversion limits and includes an environmental watering plan. The Commonwealth Environmental Water Holder must manage the water holdings in accordance with the environmental watering plan. It is anticipated that the Basin Plan will be made in 2012–13, and the transition will begin to the environmental water management framework in the Basin Plan.

Until the Basin Plan is developed, the use of Commonwealth environmental water will continue under established arrangements to deliver environmental water to protect and restore the environmental assets of the Basin. In consultation between the Murray–Darling Basin Authority and the states, communities and industries in the Basin, watering actions will continue to be directed to the objectives set out in A framework for determining Commonwealth environmental water, consideration will also be given to Basin-wide annual priorities, and to identified needs of local communities and catchments. Throughout this process, the Commonwealth Environmental Water Office will continue to build its institutional arrangements, including local engagement, transparency and accountability to key stakeholders.

David Parker Commonwealth Environmental Water Holder

August 2012

The Commonwealth Environmental Water Office

Establishment of the Commonwealth Environmental Water Office

The House of Representatives Standing Committee on Regional Australia (the Standing Committee) produced a report *Of drought and flooding rains: inquiry into the impact of the guide to the Murray–Darling Basin Plan in regional Australia* (the Windsor Inquiry). As part of its response to this report, the Australian Government agreed to establish a separate Commonwealth Environmental Water Office. The office was established in December 2011 and operates as a distinct entity within the Australian Government Department of Sustainability, Environment, Water, Population and Communities.

The standing committee recommended a focus on:

- developing scientific and engineering expertise to deliver an efficient environmental watering plan
- improving knowledge of the water needs of environmental assets and how best to manage them
- · transparency and accountability to key stakeholders, including the community.

Improving transparency, accountability and stakeholder engagement

Consistent with the recommendations of the standing committee, the Commonwealth Environmental Water Office is building on existing communication and community engagement activities by:

- establishing new advisory panels that bring together stakeholders with an interest and expertise in the use of Commonwealth environmental water in the Basin (see Advisory groups, below)
- improving the Commonwealth Environmental Water Office website to include more detailed information about environmental watering in each catchment in the Basin and provide an avenue for people to contribute to decisions on the use of Commonwealth environmental water
- · regularly engaging with local stakeholders on a catchment by catchment basis
- releasing publications and engaging in targeted consultation on the approach to key strategic issues, including water use, water trade, water shepherding, and monitoring and evaluation.

A Stakeholder Engagement and Reporting section has been created within the Commonwealth Environmental Water Office to manage stakeholder issues and ensure that accurate and timely information is conveyed to stakeholders. The section will be responsible for improving information and communication to stakeholders through the website, the Commonwealth environmental water annual report and the 2010–11 Commonwealth environmental water outcomes report.

Advisory groups

The Commonwealth Environmental Water Holder's decisions are to be informed by three advisory groups:

- Commonwealth Environmental Water Scientific Advisory Panel
- Commonwealth Environmental Water Advisory Council
- Commonwealth Environmental Water Stakeholder Reference Panel.

In May 2012 the Commonwealth Environmental Water Office began to establish the Advisory Council and Stakeholder Reference Panel, with the aim of providing advice to the Holder on the use and management of Commonwealth environmental water and stakeholder engagement. These two groups complement the Scientific Advisory Panel.

The Commonwealth Environmental Water Scientific Advisory Panel (formerly known as the Environmental Water Scientific Advisory Committee) is an independent panel of scientists with expertise in fields such as hydrology, limnology, river operations management, river and floodplain ecology, and the management of aquatic ecosystems. The panel was established in 2008 to advise the Holder on the use of environmental water, including:

- · methods for determining the relative priority of environmental assets
- · areas that merit additional investigation, including additional research
- · assessment of the benefits of the use of environmental water.

The members of the panel are:

- Professor Angela Arthington, Australian Rivers Institute, Griffith University
- · Mr David Dole, Consultant to the Murray–Darling Basin Authority
- Dr Ben Gawne, Murray–Darling Freshwater Research Centre
- Professor Barry Hart, Director, Water Science Pty Ltd
- · Professor Richard Kingsford, University of New South Wales
- · Dr Michael Stewardson, University of Melbourne
- · Professor Keith Walker, University of Adelaide
- Professor Robyn Watts, Charles Sturt University.

The Commonwealth Environmental Water Advisory Council will provide independent high-level advice to the Holder on:

- · river operations and water delivery
- portfolio management
- financial management and governance
- · communications and stakeholder engagement.

It is anticipated that the membership of the council will be finalised and the council will have held its first meeting by early 2013. The members of the council will be selected to provide a balance of expertise in the above disciplines.

The Commonwealth Environmental Water Stakeholder Reference Panel formalises previous arrangements used to consult with stakeholders. The panel will advise the Holder on a range of stakeholder issues, including:

- · information and views on Commonwealth environmental water
- · identification of priority stakeholder issues involving Commonwealth environmental water
- opportunities and methods for engaging stakeholders on Commonwealth environmental water
- assessment of the effectiveness of stakeholder engagement about Commonwealth
 environmental water.

The members of the panel are:

- · Mrs Alex Anthony, Murray Catchment Management Authority
- Mrs Joan Burns, individual
- · Mr Tom Chesson, National Irrigators' Council
- · Mr Terry Korn, Australian Floodplain Association
- · Mr Tim Napier, Border Rivers Food & Fibre
- · Mrs Kathryn Ridge, individual
- Mr David Robinson, National Farmers' Federation
- Mr Jonathan LaNauze, Australian Conservation Foundation
- · Mrs Bev Smiles, Inland Rivers Network
- Mrs Sharon Starick, South Australian Murray–Darling Basin Natural Resources Management Board
- Mr Jason Wilson, Northern Murray–Darling Basin Aboriginal Nations.

Working with others

Landholders, natural resource management boards, catchment management authorities, local groups, state governments and others are involved in Commonwealth environmental water management, and the Commonwealth Environmental Water Office is committed to effective collaboration and stakeholder engagement to improve environmental water outcomes. This includes helping to determine where water is best used, delivering that water and monitoring the outcomes. The active management of a number of Commonwealth environmental watering actions to adapt to wet conditions during 2011–12 demonstrates the extent of these working relationships. Staff from the Commonwealth Environmental Water Office regularly work with landowners, delivery partners and other key stakeholders.

Figure 1 shows the arrangements for the management of Commonwealth environmental water, including the relationships between the Commonwealth Environmental Water Holder, the Commonwealth Environmental Water Office, the department, delivery partners and the Murray–Darling Basin Authority.

Figure 1: Key environmental water responsibilities



Commonwealth environmental water in 2011–12

Commonwealth environmental water available for use in 2011–12

Improved rainfall in 2011–12 and an increased size of Commonwealth environmental water holdings made a significant amount of water available for use.

The Commonwealth now holds 1368 gigalitres of registered water entitlements, which will deliver, on average, 984 gigalitres of water to the environment each year. Commonwealth environmental water holdings in the Murray–Darling Basin (at 30 June 2012) are listed in Appendix A.

Figure 2: Commonwealth environmental water availability and use since 2008–09



Water Availability and Use

Notes: Data have been updated since previous annual reports in accordance with revised accounting treatment of some entitlements and water use. Carryover figures do account for evaporative losses.

Use of Commonwealth environmental water in 2011–12

Widespread rainfall throughout Basin catchments changed the objectives of, opportunities for, and limitations on the use Commonwealth environmental water in 2011–12. In some cases, Commonwealth environmental watering events were suspended in response to very wet conditions and prospective rainfall events (see Catchment summaries). Following natural flooding in some areas, Commonwealth environmental water was used to help alleviate blackwater events (see Case study 1).

Commonwealth environmental water and 2011-12 floods

In the northern Basin, very high rainfall in the Queensland and northern New South Wales Murray–Darling Basin during late January and early February 2012 resulted in major flooding events across the Warrego, Condamine–Balonne, Moonie, Namoi, Gwydir and Barwon– Darling catchments. The Macquarie and Lachlan catchments experienced similar high rainfall at the end of February to early March 2012, also resulting in major flooding.

In the southern Basin, significant rainfall occurred in the Murray and Murrumbidgee catchments from February to March 2012. This led to high flows in the Murray system and major flooding in Broken Creek and the Murrumbidgee system. Some floodplain areas that were inundated are unlikely to have received water since before the drought.

In both the northern and southern Basin, delivery of Commonwealth environmental water was suspended in all areas that had a heightened risk to people or property due to high rainfall. The only action to continue was in the southern connected Basin in Jimaringle and Cockran creeks, where there was low risk.

Catchment summaries

Northern catchments

Barwon-Darling catchment

No Commonwealth environmental water was used in the Barwon–Darling system in 2011–12 because of the scale of natural flooding in the system, which meant that demand for additional environmental water was low. Water credited to the Commonwealth's Barwon–Darling allocation accounts in 2011–12 will be carried over for use under permanent water shepherding arrangements in future years. Water shepherding arrangements are currently being developed under a Commonwealth–New South Wales memorandum of understanding and will form the primary means of managing Commonwealth environmental water in the Barwon–Darling catchment.

Large floods in the Gwydir, Namoi and Border Rivers catchments in November and December 2011 resulted in major flooding in the Barwon and Darling rivers. Additional heavy rainfall and flooding across the northern Basin during January and February 2012 generated a much larger flood that flowed through the Menindee Lakes. Flows peaked at Bourke in early March at around 240 gigalitres per day. This natural flooding event caused continued high releases from the Menindee Lakes Scheme into the lower Darling River and Great Darling Anabranch. Since 2010 the lower Darling River has experienced three high flow events, resulting in end of system flows in the Great Darling Anabranch for the first time in 10 years.

Border Rivers catchment

During 2011–12, 1 gigalitre of unregulated water was used to support natural flows that promote native fish movement and maintain high value waterholes and riparian vegetation in the Sundown National Park (see Appendix C, Table A3). No Commonwealth environmental watering occurred in the Border Rivers catchment before 2011–12.

Condamine-Balonne catchment

The lower Balonne experienced a series of large natural flows over the summer of 2011–12. The first flow, in early December 2011, was quickly followed by a second smaller peak. Heavy rainfall in northern New South Wales and south-west Queensland in late January 2012 (particularly in the Maranoa system) then culminated in record flood levels at St George (around 300 gigalitres per day) in early February 2012. The 2011–12 floods also in resulted in extensive wetting of the Lower Balonne Floodplain.

Two small flow events in March and early April 2012 triggered water harvesting (see Appendix C, Table A4). In the Queensland lower Balonne area, Commonwealth environmental water (3.1 gigalitres) contributed to inundation of the Culgoa Floodplain and Narran Lakes (water was only taken outside periods of major flooding). Nebine Creek, which had essentially been dry since a large flood in March 2010, received 0.1 gigalitres in February 2012.

Gwydir catchment

The Gwydir catchment experienced significant floods in November and December 2011 and again in late January to early February 2012, with flows of approximately 580 gigalitres reaching the Gwydir wetlands (at Yarraman).

During 2011–12 a total of 1.2 gigalitres of Commonwealth environmental water was delivered (in early October 2011, before the floods) for use in the Gwydir Wetlands (see Appendix C, Table A5). Commonwealth water was delivered in conjunction with New South Wales water and natural flows to inundate core wetland areas. Active management in response to rainfall and updated rain forecasts for the catchment resulted in this watering action being suspended in mid-October 2011.

Lachlan catchment

Heavy rainfall during February and March 2012 resulted in major flooding in the Lachlan catchment. This event led to Wyangala Dam spilling for the first time in more than a decade. Commonwealth environmental water in the Lachlan was delivered by mid-December 2011, before these flood events (see Appendix C, Table A6).

A total of 3.9 gigalitres of Commonwealth environmental water was made available to provide flows through Muggabah Creek near Booligal. This action built on previous environmental watering activities and 2010–11 inflows in the Merrimajeel system. The action aimed to improve system connectivity, support wetland vegetation and provide habitat for bird species.

Merrimajeel Creek received 4.9 gigalitres of Commonwealth environmental water to support habitat for a wide variety of wetland-dependent species, including threatened species and migratory birds. Merrowie Creek (Tarwong Lakes) also received 11.3 gigalitres of Commonwealth environmental water to prolong the inundation of Lake Tarwong. The aim of this watering action was to improve the health of wetland vegetation and provide habitat for colonial nesting birds and Sloane's froglet.

Macquarie-Castlereagh catchment

The Macquarie catchment received widespread rainfall of more than 150 mm in early March 2012. This rainfall resulted in high streamflows in the Macquarie River, its tributaries and effluent creeks, and the Macquarie Marshes.

Commonwealth environmental water provided 35 gigalitres to the Macquarie Marshes from September 2011, and five gigalitres from December 2011. Commonwealth environmental water deliveries in the Macquarie ceased at the end of January 2012 (before the flood events). The aim of these watering actions was to build on the improved wetland condition that resulted from the flows of 2010–11 (see Appendix C, Table A7).

Moonie catchment

The lower areas of the Moonie catchment received very heavy rainfall in late January and early February 2012, which generated major flooding in the lower catchment. Flows at Nindigully peaked on 5 February 2012 at just over 41 gigalitres per day. This is the second highest flood on record; it is exceeded only by the very large floods (more than 80 gigalitres per day) in March 2010.

Commonwealth environmental water in the Moonie River was delivered by late December 2011, before these flood events. A total of 1.4 gigalitres of unregulated Commonwealth environmental water was provided in the Moonie River to support the first significant post winter flow event in the system, and associated migration and spawning cues for native fish (see Appendix C, Table A8).

Warrego catchment

Exceedingly heavy rainfall in late January and early February 2012 in headwater and midcatchment areas caused a very large flood through the Warrego system. Flow at Wyandra in the midcatchment peaked at just over 300 gigalitres per day, which was only slightly below the highest flood peak record at Wyandra. The February–March floods provided significant inflows to the nationally significant Lower Warrego distributary system, including the Cuttaburra Basin, and to the Western Floodplain on Toorale Station.

Commonwealth environmental water provided 33.8 gigalitres in the Warrego catchment in 2011–12 (see Appendix C, Table A9), comprising the following:

- Queensland–Warrego: before major flooding, 16 gigalitres of Commonwealth environmental water supported flows along the main stem of the river, connecting waterholes. Take for instream purposes was suspended when major flood levels at Charleville were reached. After this major flooding receded, an additional 11.2 gigalitres was taken in the Queensland Warrego.
- New South Wales–Warrego (Toorale): 17.8 gigalitres of water were used at Toorale Station to contribute to instream watering in the lower Warrego River and the lower Darling River, and to inundate waterbird habitat and key floodplain vegetation communities of the Western Floodplain.

Southern catchments

Broken, Campaspe, Goulburn, Loddon and Ovens catchments

Rainfall throughout 2011–12 was above average, resulting in high flows in all northern Victorian rivers and significant inflows into storages, particularly Lake Eildon and Lake Eppalock. High rainfall during February and March 2012 resulted in flooding along Broken Creek. Active management allowed Commonwealth environmental watering actions to be suspended in a number of the northern Victorian catchments in response to increased natural flows.

Environmental water delivery in the Goulburn and Campaspe rivers occurred in combination with other releases by the Victorian Environmental Water Holder and the Living Murray program, and complemented consumptive deliveries by Goulburn–Murray Water to maximise environmental benefits and achieve outcomes at multiple sites. Delivery has been coordinated by the regional catchment management authorities.

A total of 152.5 gigalitres of Commonwealth environmental water was delivered to these catchments during 2011–12 (see Appendix C, Table A10). A large proportion of this total was delivered in the Goulburn catchment. These watering actions contributed to maintaining aquatic habitat and supporting fish recruitment, riverine vegetation and ecosystem function.

The Commonwealth environmental water actions undertaken in the Goulburn and Broken Creek systems during 2011–12 also provided more than 94 gigalitres of return flows to the Murray River system. These large-scale, multisite environmental watering actions are capable of providing system-wide environmental benefits.

Murray catchment

Above-average rainfall in the Murray catchment during March and April 2012 resulted in high flows along the Murray River from Hume Dam to South Australia and in the Edward–Wakool system. Active management resulted in a number of Commonwealth environmental watering actions being suspended in certain areas in response to the increased natural flows, and the potential for an unacceptable risk to people or property.



Jimaringle Creek, an ephemeral watercourse in the Edward–Wakool River system, before (left image—2 March 2012) and after (right image—11 April 2012) environmental watering (jointly provided by the Commonwealth and New South Wales). Permission granted to use the photograph from the Murray Catchment Management Authority. (Josh Campbell)

During 2011–12 a total of 343.4 gigalitres of Commonwealth environmental water was delivered to the Murray catchment (see Appendix C, Table A11). These watering actions supported multiple environmental outcomes in the River Murray Channel, Lower Lakes and Coorong in South Australia. Outcomes included the provision of fish refuge and replenishment flows to reduce the impact of blackwater events that occurred in the catchment as a result of the natural flooding events.

Murrumbidgee catchment

The Murrumbidgee catchment has experienced two large floods in the past two years. The flood event that commenced in March 2012 peaked at Wagga Wagga at more than 400 gigalitres per day, which is the highest flow since 1974. Commonwealth environmental watering actions were actively managed (actions were cancelled or suspended) to account for the wet conditions throughout the catchment.

A total of 83 gigalitres of Commonwealth environmental water was delivered to the Murrumbidgee catchment during 2011–12 (see Appendix C, Table A12). These watering actions provided connectivity of waterways, and supported wetland habitat and aquatic fauna, including small-bodied native fish.

Case Study 1: Providing fish refuge from the impact of hypoxic blackwater in the Murray River

Blackwater is the result of a natural process that occurs following the decay of organic material, such as leaf litter, that is washed into wetlands and waterways by floods. As the organic matter decays, oxygen held in the water is sometimes consumed faster than it can be replenished. The decay process darkens the water, turning it black. Blackwater with low dissolved oxygen is termed 'hypoxic blackwater'. The resulting low levels of dissolved oxygen in the water can stress or kill fish and other aquatic animals.

The inundation of floodplain areas along the Murrumbidgee River following heavy rainfall during March and April 2012 led to significant hypoxic blackwater levels in the Murrumbidgee River. The hypoxic blackwater had the potential to severely affect aquatic animals where it flowed into the Murray River. As the lower Murrumbidgee River was already in a state of natural flooding, environmental water could not be used in the Murrumbidgee River to help dilute areas of hypoxic blackwater occurring in the river during its peak. Instead, Commonwealth environmental water was provided to maintain flows in the Murray River at levels that would help to dilute hypoxic blackwater flowing out of the Murrumbidgee River.

Monitoring results on the Murray River on 8 May 2012 showed that:

- immediate and substantial mixing occurred within 170 metres of the junction of the Murray and Murrumbidgee rivers—five kilometres downstream of the confluence of the two rivers, there was a complete mixing of water
- although it was not possible for the additional flows of Commonwealth environmental water to completely counteract the negative impacts of hypoxic blackwater, these flows did maintain the river at levels that rapidly improved dissolved oxygen levels and created refuge areas of suitable habitat for fish and other aquatic species.



Hypoxic blackwater events can cause stress to fish, crayfish and other aquatic animals. (Murray–Darling Freshwater Research Centre)

Carryover of Commonwealth environmental water

Carryover is provided for in regulated parts of the Murray–Darling Basin. It allows water users to hold water in storages so that it is available in subsequent years. Carryover provides water users with greater flexibility to manage their own water availability across years.

Carryover governance

The Basin states have created rules that apply to the carryover of water. The rules manage the impact that water users may have on other users through their carryover decisions. The Commonwealth Environmental Water Office operates under the same rules, and pays the same fees and charges associated with its water as all other water entitlement holders. The Commonwealth can carry water over in the same way as when the water entitlements were managed for agricultural use:

- Carryover was previously available to the water entitlements now held by the Commonwealth, and acquisition of water for environmental purposes does not affect the maximum carryover in dams.
- The Commonwealth, like any other water holder, cannot fill up dams to the exclusion of other water users.

The Commonwealth Environmental Water Office will report each year on the volume of water that has been carried over on each entitlement type held in the Basin. Over the longer term, it is expected that the percentage of Commonwealth environmental water carried over will be similar to that of other water users, although, as for all water users, it will vary from year to year.

Commonwealth carryover in 2011–12

In 2011–12 many environmental requirements were met through natural high river flows and flooding. In very wet years, it makes sense to carry over some environmental water so that it is available in future years when it may be of more environmental benefit. The Commonwealth Environmental Water Office carried water over into 2011–12 and will carry water over into 2012–13 in many Basin catchments because use in future years is likely to produce more environmental benefit than further use in years with very high river flows.

There were higher volumes of carryover of Commonwealth environmental water into 2012–13 than in 2011-12. This is consistent with the approach of other users as there have been large inflows into storages (and therefore increases in allocations), while there has been relatively low water demand.

The Commonwealth Environmental Water Office will carry 615 gigalitres (net) over into 2012–13 (see Appendix D). This is held across 11 catchments and is equivalent to about three per cent of the total public storage capacity across the Basin. The wetter than average conditions during 2011–12 contributed to 41 per cent of the carryover being held in the southern connected Basin and 59 per cent of the carryover being held in the northern Basin.



Part of the lower Murrumbidgee River catchment after Commonwealth environmental watering, February 2012. Permission granted to use the photograph from the Commonwealth Environmental Water Office. (Simon Banks)

Progress on key issues

2011–12 Portfolio Budget Statement key performance indicators

Outcomes against the key performance indicators for Commonwealth Environmental Water Office, as noted in the 2011–12 Portfolio Budget Statement for the department, are reported in two areas:

- Environmental watering actions, including a description of the watering actions undertaken and the objectives of those actions, are reported on the Commonwealth Environmental Water Office website <www.environment.gov.au/ewater/news/index.html> and in this annual report.
- The outcomes achieved in terms of improved health of rivers and wetlands are published in the 2011–12 Commonwealth Environmental Water outcomes report (to be published in early 2013).

Priorities for 2011–12

The priorities for the Commonwealth Environmental Water Office in 2011–12, as described in the Commonwealth Environmental Water Office 2011–12 business plan, were to:

 use Commonwealth environmental water to meet environmental needs, while ensuring that decision making is carried out in a consistent, rigorous, transparent and accountable manner (see Management of Commonwealth environmental water and Business and information systems, below)

- develop water use options and work towards resolving operational or institutional constraints on the delivery of water, including taking a more strategic approach with the development of 12-month water use plans and a five-year portfolio management strategy (see Business and information systems)
- increase internal capabilities for the effective management of Commonwealth environmental water, including finalising an Environmental Asset Database, and scoping an Environmental Water Management System and associated standard business and information processes (see Business and information systems)
- provide input into Murray–Darling Basin planning, particularly the Basin Plan, and align the management of Commonwealth environmental water with the proposed Basin Plan and environmental watering plan (see Draft Basin Plan and environmental watering plan)
- further develop the approach to managing the portfolio of Commonwealth environmental water assets, including considering a trading strategy (see Commonwealth environmental water trading framework)
- implement a monitoring, evaluation and reporting framework to provide a strategic approach to evaluating the use of Commonwealth environmental water (see Monitoring, evaluating and reporting on the use of Commonwealth environmental water)
- implement water shepherding arrangements that provide for legal protection, effective use and accurate accounting of Commonwealth environmental water used in unregulated rivers, including implementing arrangements under New South Wales and Queensland water shepherding agreements (see Environmental water shepherding, below)
- increase stakeholder and community engagement activities by improving the provision of information, more actively seeking local suggestions for water use, and strengthening and fostering new relationships across the Basin (see Working with others, above).

Draft Basin Plan and environmental watering plan

During 2011–12 the Commonwealth Environmental Water Office participated in discussions with the Murray–Darling Basin Authority, the Basin states and other Basin stakeholders to inform the development of relevant parts of the draft Basin Plan. Representatives from the department and the Commonwealth Environmental Water Office have been present at most public meetings regarding the draft Basin Plan held in conjunction with the Murray–Darling Basin Authority. Once the Basin Plan comes into effect, Commonwealth environmental water must be managed in accordance with the environmental watering plan. Until the Basin Plan is developed, Commonwealth environmental water will continue to be used in line with established arrangements (see Commonwealth environmental water decision-making framework).

The Murray–Darling Basin Authority's assessment of environmental water requirements across the Basin will also be used to inform water use decision making. This assessment underpins the proposed sustainable diversion limits and includes information on required flow rates and timing at key sites, as well as constraints on water use.

Business and information systems

Section 105(2)(c) of the *Water Act 2007* requires the Commonwealth Environmental Water Holder to maintain an up-to-date record of the holdings. Currently, a register exists for the Commonwealth Environmental Water Office holdings. However, growth in the holdings and volume of water use has led to a need to develop a more sophisticated management system to manage workflows and a broader range of information associated with the holdings. A project is under way to deliver an environmental water management system, incorporating an upgraded environmental water holdings database.

The management system will serve as the user interface for both the upgraded holdings database (information on water holdings) and an environmental asset database (information on environmental assets, water use and environmental outcomes). The system will support data retrieval, customised querying and reporting, tracking of watering actions and comprehensive workflow management.

A scoping and planning phase in 2011–12 resulted in the preliminary design of the management system. Strategic input from subject matter experts and key stakeholders from the Commonwealth Environmental Water Office and departmental corporate areas defined the business requirements and system functionality that are required to meet the operational needs and statutory reporting requirements of the office. The project has progressed into the next phase of development and implementation. In this phase, experienced software development partners and consultants will be engaged to produce the detailed system design, build the information technology solutions and implement the management system. The environmental asset database has been developed by the Commonwealth Environmental Water Office and the Murray-Darling Basin Authority to assist both agencies to store and retrieve the best available, up-to-date information on the environmental assets of the Murray-Darling Basin. The database will support the decisions of each agency by providing information on the management of environmental assets in the Basin and the use of Commonwealth environmental water to protect and restore the health of these assets. The database will also assist both agencies to deliver a consistent and transparent approach to environmental water management, and to identify key data gaps and future information needs. Development of the database was completed during 2011-12 and implementation, including training and data migration, has begun.

Commonwealth environmental water trading framework

The management of Commonwealth environmental water requires ongoing assessment of options, including whether water should be used within the current year or carried over for use in future years, or whether trade (disposal and acquisition) should occur. Under the *Water Act 2007* Commonwealth environmental water can only be traded with the objective of improving environmental outcomes and if it cannot be carried over. Trade has not yet been used to sell Commonwealth environmental water allocations or entitlements.

To help inform the development of water trading arrangements, a discussion paper on trading Commonwealth environmental water (see Resources) was released for consultation between November 2011 and May 2012. The discussion paper sought stakeholder views on the trading of Commonwealth environmental water.

Forty-three submissions were received on the discussion paper from a range of stakeholders, including national and state industry groups, irrigation corporations, state government agencies, water brokers and individuals. The majority of submissions either explicitly supported or

were generally in agreement with trading by Commonwealth Environmental Water Office. Most submissions indicated that the discussion paper was a positive step in developing a trading framework. Copies of the discussion paper and a summary of the submissions on the discussion paper can be found on the Commonwealth Environmental Water Office website.

The Commonwealth Environmental Water Office will release a position paper in 2012 that will include its responses to the issues raised in the submissions. This will be used in the development of operating rules that will establish the general framework within which trade will occur.

Monitoring, evaluating and reporting on the use of Commonwealth environmental water

In May 2012 the Commonwealth Environmental Water Office published a Monitoring, Evaluation, Reporting and Improvement (MERI) Framework (see Resources) which will support the efficient and effective use of Commonwealth environmental water, and demonstrate the achievement of environmental outcomes over the long term. The framework incorporates comments from a range of stakeholders, following the release of a discussion paper in June 2011. It will be amended from time to time to ensure that it remains consistent with the final Basin Plan. Key elements of the framework are already in place, and it will continue to be implemented as more water is delivered. The framework will be implemented to align with the three levels of planning associated with the use of Commonwealth environmental water (Basin Plan, long term portfolio management strategy and annual water use options) and will include operational, intervention and program-level monitoring. The framework outlines an approach that will:

- · support accountability and good governance
- · support adaptive management
- · help build foundational knowledge.

Operational monitoring will continue to be put in place by delivery partners for all Commonwealth environmental watering actions, to ensure that water is delivered as planned and without unintended consequences.

Intervention monitoring, which considers the ecological response to water, has been commissioned by the Commonwealth Environmental Water Office to examine ecological responses to Commonwealth environmental watering actions. Monitoring projects are currently being undertaken in key areas across the Basin, including in the Murrumbidgee, Murray and Goulburn catchments. The key reports from these projects are available from the Commonwealth Environmental Water Office website.

The Commonwealth Environmental Water Office is continuing to work with key partners, including the Murray–Darling Basin Authority, to establish long term monitoring and evaluation in some key areas where Commonwealth environmental water is used.

Environmental water shepherding

Water shepherding relates to the use of Commonwealth environmental water in unregulated catchments. In unregulated catchments, the Commonwealth may 'take' water against its water entitlements by leaving flows instream. These flows may then cause downstream access thresholds to be exceeded, potentially leading to the extraction of Commonwealth environmental water. A key focus of water shepherding is to ensure that third-party interests are neither increased nor diminished. This includes irrigators within a particular catchment and downstream.

New South Wales water shepherding

From 14 May 2012 to 2 July 2012 the New South Wales Office of Water released a report for public comment that presents an analysis of options for water shepherding in unregulated streams in New South Wales. A key principle guiding the development of the water shepherding approach is that third party impacts (including impacts on the rights of other water users) must be avoided, while protecting the passage of environmental water.

Queensland water shepherding

Work to progress the memorandum of understanding for environmental water shepherding in Queensland unregulated streams will accelerate in 2012–13, following on from the development of New South Wales arrangements (referred to above). Although water management approaches differ in Queensland, the project will benefit from and build upon the understanding developed in the New South Wales water shepherding project.

Management of Commonwealth environmental water

Decisions on the use of Commonwealth environmental water are made by the Commonwealth Environmental Water Holder, a statutory position established under the *Water Act 2007.*

Directions given to the Commonwealth Environmental Water Holder

No directions were given in 2011–12 to the Commonwealth Environmental Water Holder by either the minister or the secretary of the department.

Commonwealth environmental water decision-making framework

The use of Commonwealth environmental water is guided by A framework for determining Commonwealth environmental water use (see Resources). 'Best use' of Commonwealth environmental water is decided using a combination of science-based and collaborative approaches:

- In the science-based approach, input is sought from jurisdictions, departmental staff and external experts, including the Commonwealth Environmental Water Scientific Advisory Panel (see Advisory groups).
- In the collaborative approach, proposals are developed with the Commonwealth Environmental Water Office delivery partners, including state governments, catchment management authorities, water management authorities, regional and local land managers, and river operators, who store, manage and deliver water for all water users.

Throughout each year, the Commonwealth Environmental Water Holder decides on the use of Commonwealth environmental water across the Basin. This includes considering options for delivering water to environmental sites within the current year, carrying over water to future years or trading the water. The assessment criteria applied to all environmental watering options are:

- ecological significance of the asset(s)
- · expected ecological outcomes from the proposed watering action
- potential risks of the proposed watering action at the site and at connected locations
- · long-term sustainability of the asset(s), including appropriate management arrangements
- · cost-effectiveness and operational feasibility of undertaking the watering.

As part of the application of these criteria, it is important that the climatic and environmental conditions of the catchment are considered (see Appendix E).

Environmental water delivery documents

Complementing A framework for determining Commonwealth environmental water use, water use documents continued to be developed in 2011–12 for the major catchments of the Basin. These documents aim to provide water use strategies that support efficient water use under different scenarios of water availability and ecological conditions. Informed by proposals provided by delivery partners and others, the documents will be a key input to the development of water use options. The documents are updated as information is received and individual water use proposals are developed.

Active management of Commonwealth environmental water

Commonwealth environmental water is being actively managed so that environmental objectives are met with an efficient use of water. Active management includes using infrastructure to deliver water, working with river operators to better manage environmental flows (including suspending flows when required), and transferring water allocations between catchments to where water is needed most.

Effective management of the Commonwealth environmental water portfolio will continue to improve the capacity to achieve environmental objectives both across years and across catchments within the Basin. Portfolio management also involves making decisions on the appropriate balance between using water, carrying it over for use in future years (when it may be of more environmental benefit), trading it, transferring it and returning it for reallocation.

Annual portfolio management statements will be released on the Commonwealth Environmental Water Office website at the beginning of each water year. These statements will outline potential use, trade and carryover options for each catchment in the Murray–Darling Basin and will be updated during the year as portfolio management options are revised in response to actual catchment conditions.

Managing risks in using Commonwealth environmental water

Development and implementation of a risk management approach supports decision making across Commonwealth environmental watering activities. Managing the risks associated with Commonwealth watering activities helps to ensure:

· minimum unintended impacts

- maximum environmental outcomes
- · efficient and effective use of environmental water
- a high standard of stewardship of Commonwealth assets.

Before the use of any water, the Commonwealth Environmental Water Office undertakes appropriate risk identification, assessment and management to ensure that all risks are appropriately identified, assessed, treated and mitigated. The approach is in accordance with the Australian standard for risk management (AS/NZS ISO 31000) and takes into account information from a range of sources, including delivery partners, on-ground delivery officers and the local community. Risk assessments are updated regularly as new information arises or situations change.

As a result of the high rainfall and wet catchment conditions, the risk of adding to damage from flooding was a major consideration in making decisions on the use of Commonwealth environmental water in 2011–12 (see Commonwealth environmental water in 2011–12).

During 2011–12 the Commonwealth Environmental Water Office has continued to refine its internal guidelines for assessing and managing the risks associated with environmental watering. Additionally a comprehensive review of potential legal and strategic risks associated with the management of environmental water has been carried out. This review will lead to the development and implementation of a revised risk mitigation and treatment plan for the Commonwealth Environmental Water Office in 2012–13.

Transparency and accountability in the use of Commonwealth environmental water

The Commonwealth Environmental Water Office was established to improve accountability and stakeholder engagement in environmental water management (see Establishment of the Commonwealth Environmental Water Office). The office works with local communities, catchment managers, state governments and its advisory groups to ensure that water is used efficiently and effectively to meet local and Basin-wide needs (see Working with others). This includes numerous face-to-face meetings between staff from the Commonwealth Environmental Water Office and stakeholders in Basin catchments to discuss environmental water use.

As noted in the Australian Government's response to the inquiry into the impact of the guide to the Murray–Darling Basin Plan in regional Australia (see Resources), the Commonwealth Environmental Water Office remains committed to releasing publications and engaging in targeted consultation on the approach to key strategic issues. During 2011–12 these issues included trade, water shepherding, carryover, and monitoring and evaluation. These issues are addressed in detail elsewhere in this report (see Priorities for 2011–12).

Commonwealth environmental water reporting

The Commonwealth Environmental Water Office produces a range of reports that are available to stakeholders and the general public.

Details of all Commonwealth environmental watering actions are made available on the Commonwealth Environmental Water Office website <www.environment.gov.au/ewater/index. html>.

- An annual report is provided to parliament and published each financial year, outlining how Commonwealth environmental water has been used.
- An outcomes report is published each financial year, summarising the ecological outcomes from Commonwealth environmental watering.
- Results from all monitoring and evaluation projects commissioned by the Commonwealth Environmental Water Office are published on the office website.

Environmental Water Holdings Special Account 2011–12

The Environmental Water Holdings Special Account is established under Section 111 of the *Water Act 2007* for the payment of costs, expenses and other obligations incurred in managing Commonwealth environmental water holdings.

At the start of 2011–12 the Special Account balance was \$23.5 million. Funding of \$21 million was credited from the Sustainable Rural Water Use and Infrastructure Program to the account during the financial year, and \$7.4 million was expended on annual water entitlement fees, allocation trading and delivery costs. At 30 June 2012 the Special Account balance was \$36 million (of which \$13.8 million has been committed for environmental watering actions and other projects). The key expenditure in 2011–12 are shown in Table 1.

Table 1: Environmental Water Holdings Special Account expenditure

CATEGORY OF EXPENSE	TOTAL COSTS (\$)
Fees and charges for holdings and allocations and for maintaining and providing for the replacement of rural water infrastructure ¹	7.422 million
Monitoring and evaluation	0.546 million
Development of environmental registers and other systems ²	0.399 million
Total	8.367 million

Notes:

1 Fees and charges include \$5.790 million for annual water entitlement fees and \$1.632 million for allocation use fees. No pumping was required to deliver environmental water in 2011–12.

2 The Commonwealth received a contribution of \$0.051 million from the Murray–Darling Basin Authority towards the expenditure of \$0.399 million on the development of environmental registers and other systems.

Appendix A—Commonwealth Environmental Water Office holdings in the Murray–Darling Basin

 Table A1: Commonwealth Environmental Water Office holdings in the Murray–Darling

 Basin (at 30 June 2012)

CATCHMENT/ WATER SYSTEM SOURCE	SECURITY/ RELIABILITY	REGISTERED ENTITLEMENTS VOLUME (ML ¹)	LONG-TERM AVERAGE ANNUAL YIELD (ML)
Murray	High (Class 1)	43	39
	High (Classes 3 and 9)	99 870	89 883
Murray	High	226 603	215 272
	Low	11 285	2708
Loddon	High	2746	2608
	Low	527	142
Campaspe	High	6425	6104
	Low	395	194
Campaspe (Coliban)	High	30	27
Goulburn	High	187 058	177 705
	Low	10 759	3766
Broken	High	47	45
	Low	4	3
Ovens	High	70	67
	CATCHMENT/ WATER SYSTEM SOURCE Murray Murray Loddon Campaspe (Coliban) Goulburn Broken Ovens	CATCHMENT/ WATER SYSTEM SOURCESECURITY/ RELIABILITYMurrayHigh (Class 1)High (Classes 3 and 9)High (Classes 3 and 9)MurrayHigh LowLoddonHigh LowLoddonHigh LowCampaspeHigh LowCampaspeHigh LowCampaspeHigh LowBrokenHigh LowOvensHigh High	CATCHMENT/ WATER SYSTEM SOURCESECURITY/ RELIABILITYREGISTERED ENTITLEMENTS VOLUME (ML')MurrayHigh (Class 1)43High (Classes)99 8703 and 9)39870MurrayHigh (Classes)99 870MurrayHigh226 603Low11 285LoddonHigh2746Low527CampaspeHigh6425Low395CampaspeHigh30(Coliban)High187 058Low10 759BrokenHigh47Low4OvensHigh70

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Table A1: Commonwealth Environmental Water Office holdings in the Murray–DarlingBasin (at 30 June 2012) (continued)

STATE	CATCHMENT/ WATER SYSTEM SOURCE	SECURITY/ RELIABILITY	REGISTERED ENTITLEMENTS VOLUME (ML ¹)	LONG-TERM AVERAGE ANNUAL YIELD (ML)
	Murray	High	2636	2504
		General	97 979	79 363
		Groundwater	99	99
	Murray Irrigation Limited (MIL)	General A	136 777	110 789
	Lower Darling	General	492	399
	Murrumbidgee	High	1605	1525
		General	161 426	103 313
		Conveyance	5727	5441
		Supplementary	20 820	2915
New South Wales	Barwon– Darling	Unregulated	14 603	14 603
Traibe	Lachlan	High	733	733
		General	86 199	36 204
	Macquarie and	General	98 004	41 162
	Cudgegong	Supplementary	1888	397
	Namoi (upper)	General	105	81
	Namoi (lower)	General	6098	4695
	Gwydir	High	375	375
		General	89 525	32 229
		Supplementary	19 100	3 629
	Border Rivers	General B	269	108
	Warrego	Unregulated	8106	8106

Table A1: Commonwealth Environmental Water Office holdings in the Murray–Darling Basin (at 30 June 2012) (continued)

STATE	CATCHMENT/ WATER SYSTEM SOURCE	SECURITY/ RELIABILITY	REGISTERED ENTITLEMENTS VOLUME (ML ¹)	LONG-TERM AVERAGE ANNUAL YIELD (ML)
	Border Rivers	Medium	10 403	3433
		Unsupplemented	1000	484
Queensland	Border Rivers (Macintyre Brook)	Medium	207	182
	Lower Balonne	Unsupplemented	34 804	22 895
	Moonie	Unsupplemented	1415	1100
	Nebine	Unsupplemented	5920	1000
	Warrego	Unsupplemented	16 050	8 000
Total ²			1 368 228	984 324

1 1 gigalitre equals 1000 megalitres. Some volumes may differ marginally from 30 June 2012 figures posted on the Commonwealth Environmental Water website due to accounting adjustments made after 30 June 2012.

2 The volume of water currently in the holdings is less than the volume secured under Water for the Future, which includes water entitlements secured under contract but not yet formally transferred to the Commonwealth.

Appendix B—Commonwealth environmental water delivered in the Murray–Darling Basin in 2011–12

Table A2: Summary of the volume of Commonwealth environmental water delivered in the Murray–Darling Basin in 2011–12

CATCHMENT	WATER DELIVERED (GL)	ACTIONS
Murray	343.4	Edward–Wakool/Colligen Creek—two actions, Jimaringle/Cockran, Murray River—fish refuge flows, lower Murray and lower lakes
Loddon	1.6	Instream flows
Campaspe	6.5	Instream flows
Goulburn	133.9	Instream flows
Broken River	0.05	Instream flows
Lower Broken Creek	10.4	Instream flows
Ovens	0.07	Instream flows
Murrumbidgee	83	North Redbank and Murrumbidgee channel
Lachlan	20.2	Muggabah Creek, Merrowie Creek (including Murphys Lake), Merrimajeel
Macquarie	40	Macquarie Marshes
Gwydir	1.2	Gwydir Wetlands
Queensland (lower Balonne)	3.1	Instream flows
Queensland (Nebine, Moonie, Severn)	2.5	Instream flows
Warrego	33.8	Instream flows
Total	680	

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Appendix C—Basin catchment summaries of Commonwealth environmental water use in 2011–12

Table A3: Commonwealth environmental watering actions for the Border Rivers catchment in 2011–12

LOCATION OF WATERING AG	= CTION	TYPE OF	ACTION		OBJECTIVE OF WATERING ACTION	WATER DEI	IVERED (MEG	àALITRES)	
COMPLEX	SITE	RIVER	INUN	IDATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND	FLOODPLAIN					
Severn River	Severn River	•			Support natural flows that promote native fish movement, and maintain high-value waterholes and riparian vegetation within the Sundown National Park.	December 2011- February 2012	1000		1000

COMPLEX SITE Balonne Lower		ACTION		OBJECTIVE OF WATERING ACTION	WALER DEI			
Balonne Lower	RIVER	NUNI	IDATION		TIMING	C'WEALTH	PARTNER	TOTAL
Balonne Lower	FLOWS	WETLAND	FLOODPLAIN					
Balonne V	Val			Provide natural instream flows to support aquatic ecosystems and habitats.	December 2011–April 2012	307		307
Balonne Lower Balonne M	Val			Provide natural instream flows to support aquatic ecosystems and habitats.	December 2011–April 2012	2743		2743
Balonne Lower Balonne M	Val			Provide natural instream flows to support aquatic ecosystems and habitats.	March– April 2012	4		4
Nebine Cr Creek	eek			Provide natural instream flows to support aquatic ecosystems and habitats.	February 2012	62		62

Table A4: Commonwealth environmental watering actions for the Condamine-Balonne catchment in 2011–12

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LOCATION WATERING	OF ACTION	ТҮРЕ ОF	ACTION	OBJECTIVE OF WATERING ACTION	WATER DE	LIVERED (MEG	SALITRES)	
COMPLEX	SITE	RIVER	INUNDATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND FLOODPLAIN					
Gwydir	Lower Gwydir			Support the initial	October	1206		1206
Wetlands	and Gingham			inundation	2011			
	watercourses			of core wetland				
				vegetation in the				
				Gwydir Wetlands to				
				promote the recovery				
				of wetland vegetation				
				and maintain habitat				

Table A5: Commonwealth environmental watering actions for the Gwydir catchment in 2011–12

for threatened and migratory species.

WATERING) WATERING) COMPLEX Booligal Wetlands	ACTION SITE Merrimajeel Creek	TYPE OF RIVER FLOWS	ACTION INUNDATION WETLAND FLOODPLAIN	OBJECTIVE OF WATERING ACTION Inundate Merrimajeel Creek, Murrumbidgil Swamp and Lake Merrimajeel; improve the health of wetland vegetation, including	WATER DELI TIMING June- September 2011	VERED (MEGA C'WEALTH 5006	PARTNER 1835	6841
Booligal Wetlands	Muggabah Creek	•	•	river red gums; and provide habitat for water-dependent fauna. Provide system connectivity within Muggabah Creek and trial a watering of Lower Gum Swamp.	August– October 2011	3585	1314	4899

Table A6: Commonwealth environmental watering actions for the Lachlan catchment in 2011–12

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Table A6: Commonwealth environmental watering actions for the Lachlan catchment in 2011–12 (continued)

ITRES)	PARTNER TOTAL		4242 15 810
IVERED (MEGAL	C'WEALTH F		11 568
WATER DEL	TIMING		July- October 2011
OBJECTIVE OF WATERING ACTION			Provide wetland habitat for nesting birds, support breeding of Sloane's froglet near Toms Lake, and prolong the inundation of Lake Tarwong to improve the health of wetland vegetation.
ACTION	INUNDATION	WETLAND FLOODPLAIN	•
TYPE OF /	RIVER	FLOWS	•
DF ACTION	SITE		Merrowie Creek (Tarwong Lakes)
LOCATION WATERING	COMPLEX		Lachlan

		TOTAL		148 440	5000
	ALITRES)	PARTNER		113 440	5000
	VERED (MEG.	C'WEALTH		35 000	
	WATER DELI	TIMING		September 2011– January 2012	December 2011– January 2012
	OBJECTIVE OF WATERING ACTION			Inundate the majority of core semi-permanent aquatic vegetation communities throughout the Macquarie Marshes.	Support the action above (35 000 megalitres) to ensure success of bird breeding colonies.
		IDATION	FLOODPLAIN		
)	ACTION	NUN	WETLAND	•	•
	TYPE OF	RIVER	FLOWS		
	DF ACTION	SITE		Macquarie Marshes	Macquarie Marshes
	LOCATION C WATERING	COMPLEX		Macquarie	Macquarie

Table A7: Commonwealth environmental watering actions for the Macquarie-Castlereagh catchment in 2011–12

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Table A8: Coi	mmonwealth er	nvironment	al watering a	ctions for the Mc	oonie catchment in 2011	I-12			
LOCATION C WATERING	DF ACTION	ТҮРЕ ОF	ACTION		OBJECTIVE OF WATERING ACTION	WATER DEL	IVERED (MEG	ALITRES)	
COMPLEX	SITE	RIVER	INUN	IDATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND	FLOODPLAIN					
Moonie River	- Moonie River	•			Support the first significant post- winter flow event in the system and associated migration and spawning cues for native fish.	December 2011	1415		1415
Table A9: Coi	mmonwealth er	wironment	al watering a	ctions for the Wé	arrego catchment in 201	11–12			
LOCATION C WATERING	DF ACTION	TYPE OF	ACTION		OBJECTIVE OF WATERING ACTION	WATER DEL	IVERED (MEG	ALITRES)	
COMPLEX	SITE	RIVER	INUN	IDATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS							

6050

6050

December 2011–April 2012

Support natural flow events to reconnect

Upper Warrego

Warrego

cue for the migration

waterholes and provide a strong

and spawning of

native fish.

ITRES)	ARTNER TOTAL		10 000	8106	9720
IVERED (MEGALI	C'WEALTH P/		10 000	8106	9720
WATER DEL	TIMING		December 2011– February 2012	January– February 2012	January- February 2012
OBJECTIVE OF WATERING ACTION			Support natural flow events, including the first inflow connecting the main river to waterbird breeding and feeding habitat in the Cuttaburra Basin.	Support instream flows and connectivity along the Warrego and Darling rivers.	Provide waterbird habitat and inundate key floodplain vegetation on the Western Floodplain of Toorale.
F ACTION	INUNDATION	WETLAND FLOODPLAIN			•
ТҮРЕ О	RIVER	FLOWS	•	•	
OF ACTION	SITE		Lower Warrego	Lower Warrego (Toorale)	Lower Warrego Western Floodplain (Toorale)
LOCATION WATERING	COMPLEX		Warrego	Warrego	Warrego

Table A9: Commonwealth environmental watering actions for the Warrego catchment in 2011–12 (continued)

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10 366 2 TOTAL 5 PARTNER WATER DELIVERED (MEGALITRES) C'WEALTH 10 366 2 2 2012 (action suspended December April 2012 2011-May May 2012 Februaryearly May TIMING 2012) late Supplement instream WATERING ACTION Supplement natural will support native baseflows in lower Broken Creek that **OBJECTIVE OF** summer-autumn Provide elevated or baseflows in autumn-winter. fresh flows in fish habitat. flows. FLOODPLAIN INUNDATION WETLAND **TYPE OF ACTION RIVER** FLOWS **Broken River Ovens River** Broken Creek WATERING ACTION SITE LOCATION OF COMPLEX Goulburn-Goulburn-Broken Broken Ovens

Table A10: Commonwealth environmental watering actions for the Broken, Campaspe, Goulburn, Loddon and Ovens catchments in 2011–12

	(man)							
LOCATION	OF ACTION	TYPE OF	ACTION	OBJECTIVE OF WATERING ACTION	WATER DELIV	ERED (MEGALI'	TRES)	
COMPLEX	SITE	RIVER	INUNDATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND FLOODPLAIN					
Goulburn– Broken	Goulburn River	•		Complement natural flows and provide refuge to aquatic animals in the Murray River that are at risk from hypoxic blackwater entering the system from the Murrumbidgee River.	November 2011–May 2012	96 900		006 96
Goulburn– Broken	Goulburn River	•		As per action above (96 900 megalitres).	May–June 2012	37 039		37 039
Campaspe	Campaspe River	•		Provide connectivity to allow fish movement, promoting river red gum recruitment and support aquatic habitat for macroinvertebrates.	June 2011– June 2012	6532		6532
Loddon	Loddon River	•		Support vegetation health and maintain water quality.	June- October 2011	1564		1564
						COME 4	OUTO	

Table A10: Commonwealth environmental watering actions for the Broken, Campaspe, Goulburn, Loddon and Ovens catchments in 2011–12 (continued)

LOCATION WATERING	DF ACTION	TYPE OF	ACTION		OBJECTIVE OF WATERING ACTION	WATER DELIVE	RED (MEGALI	rres)	
COMPLEX	SITE	RIVER	INUNI	DATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND	FLOODPLAIN					
Edward – Wakool	Colligen Creek	•			Provide a spring pulse flow for native fish in Colligen Creek.	November- December 2011	5500	1717	7217
Edward – Wakool	Wakool River and Colligen Creek	•			Provide a late summer pulse for riverine and riparian vegetation and small- bodied fish.	February – March 2012	7500	6881	14 381
Edward – Wakool	Edward –Wakool system with releases from the Edward and Wakool Escapes	•			Provide refuge for fish from hypoxic blackwater.	April-May 2012	39 445	291	39 736

convironmental watering actions for the Murray catchment in 2011–13 d+leown Table A11. Commo

TERNOLATION MATERING ACTION MATERING ACTION MPLEX BIF RIVEN INUNDATION IMING PATING IMING	CATION O	ų	TYPE OF	ACTION	OBJECTIVE OF	WATER DELIVE		TRES)	
MDLEX SITE RVEAL ININDATION TONIO CWEALIA RATUEN TONIO and Jumaringle VELLAN LOONS KeLLAN MONDATION MONDATION </th <th>TERING A</th> <th>CTION</th> <th></th> <th></th> <th>WATERING ACTION</th> <th></th> <th></th> <th></th> <th></th>	TERING A	CTION			WATERING ACTION				
FLOWS WETLAND FLOODPLAIN vard - Jimaringle March-April 300 3227 6227 kool and continue to 2012 300 3227 6227 kool and continue to improve water quality March-April 300 3227 6227 kool cockrain improve the health of improve the health of 2012 300 3227 6237 cockrain creeks and continue to good 2012 300 3227 6237 reeks cockrain the realth of improve the health of improve the health of 300 3237 6237 reeks cockrain improve the health of improve the health of improve the health of 300 3237 6203 reeks mad fringing river red goun and finging river red goun and	MPLEX	SITE	RIVER	INUNDATION		TIMING	C'WEALTH	PARTNER	TOTAL
vard- Jimaringle March-April 3000 3227 6227 kool and continue to and continue to cockran 2012 3010 327 6237 kool and continue to improve the health of the vegetation in the system—in particular, aquatic vegetation and finging river red gum and black box 2012 92 93 ray Mid-Murray Mid-Murray Provide and maintain April-May 92 92 ray Mid-Murray Oxygenated refuge 2012 92 92 93 ray Mid-Murray Mid-Murray 92 92 93 92			FLOWS	WETLAND FLOODPLAIN					
rray Mid-Murray er Mabitats for aquatic animals along the main stem of the Murray River.	ward – Ikool	Jimaringle and Cockran creeks	•		Improve water quality and continue to improve the health of the vegetation in the system—in particular, aquatic vegetation and fringing river red gum and black box communities.	March–April 2012	3000	3227	6227
	irray ker	Mid-Murray	•		Provide and maintain oxygenated refuge habitats for aquatic animals along the main stem of the Murray River.	April-May 2012	92 093		92 093

Table A11: Commonwealth environmental watering actions for the Murray catchment in 2011–12 (continued)

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	DELIVERED (MEGALITRES)	C'WEALTH PARTNER TOTAL		69 300	126 600 126 600			
	WATER D	TIMING		February- June 2013	January	suspende	February	
	OBJECTIVE OF WATERING ACTION			Support the management and improvement of aquatic habitat in the Murray River channel, Lower Lakes and Coorong, with increased flows provided through to the Murray Mouth.	As per action above	(du duu iiiegaiiiea).		
	ACTION	INUNDATION	WETLAND FLOODPLAIN	•	•			
	TYPE OF /	RIVER	FLOWS	•	•			
)	OF ACTION	SITE		Lower Lakes	Lower	Lakes		
	LOCATION WATERING	COMPLEX		Lower Lakes, Coorong and Murray Mouth	Lower	Lakes, Coorong	and Murray	

Table A11: Commonwealth environmental watering actions for the Murray catchment in 2011–12 (continued)

LOCATION OF WATERING ACT	NOI	TYPE OF,	ACTION		OBJECTIVE OF WATERING ACTION	WATER DELIV	'ERED (MEGAL	ITRES)	
COMPLEX	SITE	RIVER	NUN	DATION		TIMING	C'WEALTH	PARTNER	TOTAL
		FLOWS	WETLAND	FLOODPLAIN					
Lower Murrumbidgee	Lowbidgee– North Redbank		•		Support wetland habitat and water- dependent species.	November 2011– February 2012	17 800	2 400	20 200
Lower Murrumbidgee	Lowbidgee– North Redbank Wetlands and Murrumbidgee channel	•	•		Increase connectivity between the North Redbank Wetland and the Murrumbidgee River channel and promote spawning opportunities for small-bodied fish.	February– June 2012 (action suspended late February– mid-May 2012)	65 200	1 700	006 99

Table A12: Commonwealth environmental watering actions for the Murrumbidgee catchment in 2011–12

Appendix D—Commonwealth environmental water carryover into 2012–13

Table A13: Summary of Commonwealth environmental water carryover into 2012–13

WATER SOURCE	CARRYOVER (GIGALITRES)
Victorian Murray	163
Goulburn	11
Campaspe	0
New South Wales Murray	33
Murrumbidgee	42
Lachlan	116
Macquarie and Cudgegong	94
Gwydir	134
Namoi	12
Border Rivers	9
Total	615
	WATER SOURCE Victorian Murray Goulburn Campaspe New South Wales Murray Murrumbidgee Lachlan Macquarie and Cudgegong Gwydir Namoi Border Rivers Total

OUTCOME 4

Appendix E—Ecological and management objectives for environmental water use under different water availability scenarios

Table A14: Ecological and management objectives for environmental water use under different water availability scenarios

	EXTREME DRY	DRY	MODERATE	WET	VERY WET ¹
Ecological watering objectives	Avoid damage to key environmental assets.	Ensure ecological capacity for recovery.	Maintain ecological health and resilience.	Improve the health and resilience of aquatic ecosystems.	Build future capacity to support ecological health and resilience.
Management objectives	Avoid critical loss of threatened species, communities and ecosystems. Maintain key refuges. Avoid irretrievable damage or catastrophic events.	Support the survival and growth of threatened species and communities, including limited small-scale recruitment. Maintain diverse habitats. Maintain low-flow river and floodplain functional processes in sites and reaches of priority assets.	Enable growth, reproduction and small-scale recruitment for a diverse range of flora and fauna. Promote low-lying floodplain–river connectivity. Support medium-flow river and floodplain functional processes.	Enable growth, reproduction and large- scale recruitment for a diverse range of flora and fauna. Promote higher floodplain–river connectivity. Support high-flow river and floodplain functional processes.	Support growth, reproduction and large- scale recruitment for a diverse range of flora and fauna. Sustain higher floodplain–river connectivity. Support high-flow river and floodplain functional processes.

Table A14: Commonwealth environmental watering actions for the Murray catchment in 2011–12 (continued)

OUTCOME 4