

South Australia's River Murray Environmental Watering Report

2015-2016



Government of South Australia
Department of Environment,
Water and Natural Resources

Acknowledgement of the Traditional Owners

The Department of Environment, Water and Natural Resources acknowledges and pays respect to the Traditional owners and their Nations, of the Murray-Darling Basin, who have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

Other Acknowledgements

This is the eighth River Murray environmental watering report to be produced by the South Australian Government. It was prepared by staff in the Department of Environment, Water and Natural Resources (DEWNR). The following agencies and organisations are acknowledged for their important role in environmental water management:

Commonwealth Environmental Water Office (CEWO);

Commonwealth Department of the Environment and Energy;

Murray-Darling Basin Authority (MDBA) including The Living Murray (TLM) program;

Natural Resources South Australian Murray-Darling Basin (NR SA MDB);

Local Action Planning Committees (LAP);

Ngarrindjeri Regional Authority;

Nature Foundation South Australia (NFSA).

Photography

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1. Introduction and purpose

The planning, management, delivery, reporting and evaluation of environmental water within the Murray-Darling Basin in South Australia is coordinated within the Department of Environment, Water and Natural Resources (DEWNR) and undertaken in partnership with other government agencies including the Murray-Darling Basin Authority (MDBA) and Commonwealth Environmental Water Office (CEWO), research organisations, non-government organisations and community groups.

Environmental water delivered within South Australia is primarily from two major environmental water holders: the Commonwealth Environmental Water Holder (CEWH) and The Living Murray (TLM) Program of the MDBA. Additional water for use in South Australia is available from the South Australian Minister for Water and the River Murray, non-government organisations, donations from private irrigators and the Victorian Environmental Water Holder (VEWH) in the form of return flows from upstream environmental watering actions.

This report is prepared as a summary document on environmental watering for the River Murray in South Australia during the 2015-16 year. Its primary purpose is to provide an enduring and publicly available record of the volumes and locations of all environmental watering, regardless of water holder or manager, undertaken in the region throughout the water-year. It supplements the detailed and comprehensive reporting required under the Murray-Darling Basin Plan (Basin Plan), which is completed by South Australia on all aspects of Basin Plan implementation including environmental watering.

This report also meets the South Australian Government's commitment to the Council of Australian Governments (COAG) to publish an annual report on River Murray environmental water use in South Australia that provides transparency and accountability for public information sharing (National Water Initiative Policy Guidelines for Water Planning and Management 2010).

Within this document, the following have been provided:

- a brief description of the environmental watering actions that were proposed for 2015-16;
- an overview of the 2015-16 water year;
- a summary of the watering actions that were undertaken including sites, volumes and approximate timing; and
- links to reports that provide more information about monitoring and ecological outcomes.



Sharp-tailed Sandpiper. Photo by Martin Stokes

2. Environmental watering actions proposed for 2015-16

Each year DEWNR develops annual environmental watering priorities (annual priorities) and an annual environmental watering plan (annual plan). All environmental water and site managers in the region are encouraged to participate in this planning process. The annual priorities and annual plan are published on the DEWNR website and indicate the proposed watering actions for the upcoming water year. This information is also provided to the MDBA to assist in the development of the basin-wide annual environmental watering priorities, and to the major environmental water holders (CEWH, TLM).

When completing their planning, environmental managers use a scenario-based approach that takes into account the variety of possible future resource conditions (e.g. climate, storage levels and water availability). The scenarios that were used in the planning for 2015-16 are shown in Figure 1.

The environmental watering sites and actions that were proposed under each scenario for 2015-16 are summarised in Table 1. More detailed information is in the 2015-16 Annual Environmental Watering Plan for the South Australian River Murray available at www.environment.sa.gov.au.

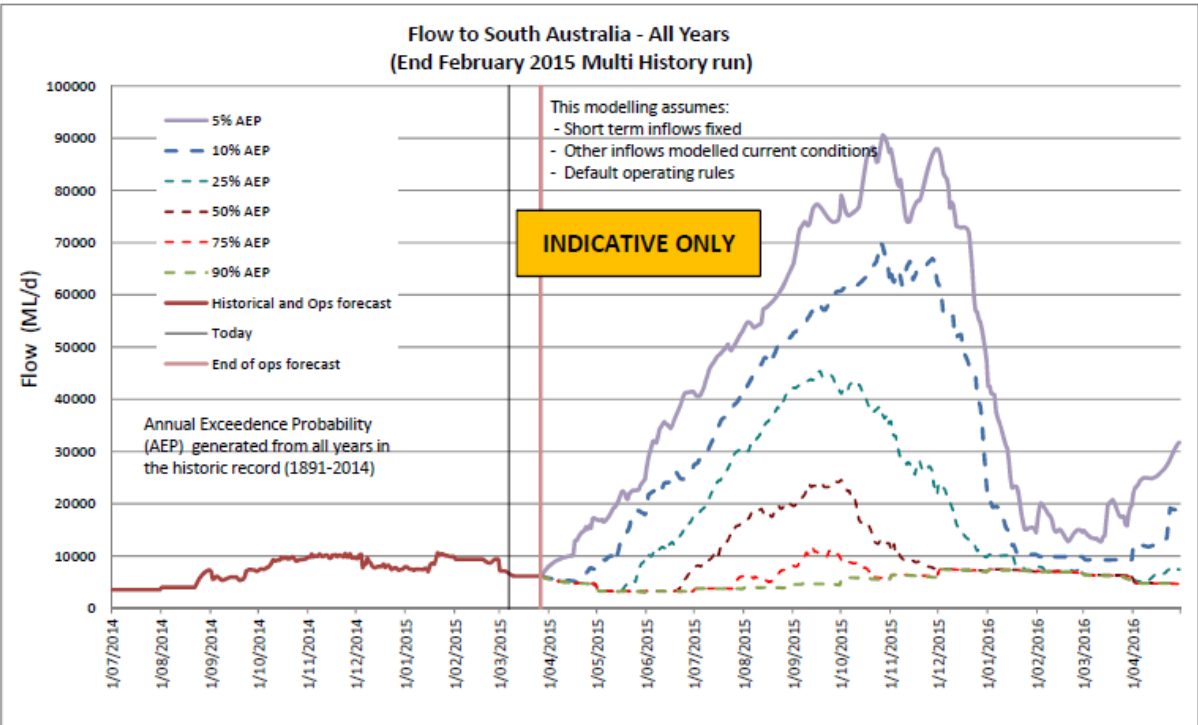


Figure 1. Scenarios used in annual planning for the SA River Murray region in 2015-16

Table 1. 2015-16 Environmental watering priorities for the SA River Murray region

Asset	90% scenario	75% scenario	50% scenario
Coorong, Lower Lakes, Murray Mouth	Spring delivery for Lower Lakes and fishway releases Flow of > 1 GL/day for barrage releases Pump to Lower Lakes fringing wetlands	Spring delivery for Lower Lakes and fishway releases Pump to Lower Lakes fringing wetlands Extend duration of small spring unregulated event Provide winter pulse through Murray Mouth Flow of 2 GL/day for barrage releases	Spring delivery for Lower Lakes and fishway releases Pumping to Lower Lakes fringing wetlands Provide winter flow pulse through Murray Mouth Provide water for a Lake Level Cycle Flow of 2 GL/day for barrage releases Extend duration of moderate spring unregulated event Extend duration of autumn unregulated event
SA River Murray Channel	Flow pulse of 10,000 ML/day with +/-2,000 ML/day variability and short 15,000 ML/day peak for 60 - 90 days Fill gravity fed wetlands Provide water to threatened fish refuges	Flow pulse of 15,000 ML/day including within event variation generating short-term increases to 20,000 ML/day for 60 - 90 days Fill gravity fed wetlands Provide water to threatened fish refuges	Flow peak of 20,000 ML/day with +/- 5,000 ML/day variability for 60 - 90 days Fill gravity fed wetlands Provide water to threatened fish refuges
SA River Murray Floodplain	Potential further testing of Chowilla regulator Provide flow pulse through Pipeclay and Slaneys weirs Pump to temporary Chowilla wetlands Pump to temporary wetlands – gorge and valley (19 sites) ¹ Weir pool raising (50 cm) at Locks 2 and 5 Pump to temporary depressions adjacent to Regent Parrot colonies	Potential further testing of Chowilla regulator Provide flow pulse through Pipeclay and Slaneys weirs Pump to temporary Chowilla wetlands Pump to temporary wetlands – gorge and valley (19 sites) Weir pool raising (50 cm) at Locks 2 and 5 Pump to temporary depressions adjacent to Regent Parrot colonies	Potential further testing of Chowilla regulator Provide flow pulse through Pipeclay and Slaneys weirs Pump to temporary Chowilla wetlands Pump to temporary wetlands – gorge and valley (16 sites) Weir pool raising (50 cm) at Locks 2 and 5 Pump to temporary depressions adjacent to Regent Parrot colonies

¹ Environmental watering actions planned for 2015-16 by Nature Foundation South Australia (NFSA) were not finalised in time for inclusion in the annual plan and are in addition to those identified in Table 1,

3. Overview of the 2015-16 water-year

South Australia received entitlement flow throughout 2015-16 and there were no unregulated flow events in the water year (Figure 2). These conditions matched the 90% scenario that had been used in environmental water planning (Figure 1), which represent dry to very-dry conditions. The watering actions proposed under this scenario are shown in the second column of Table 1.

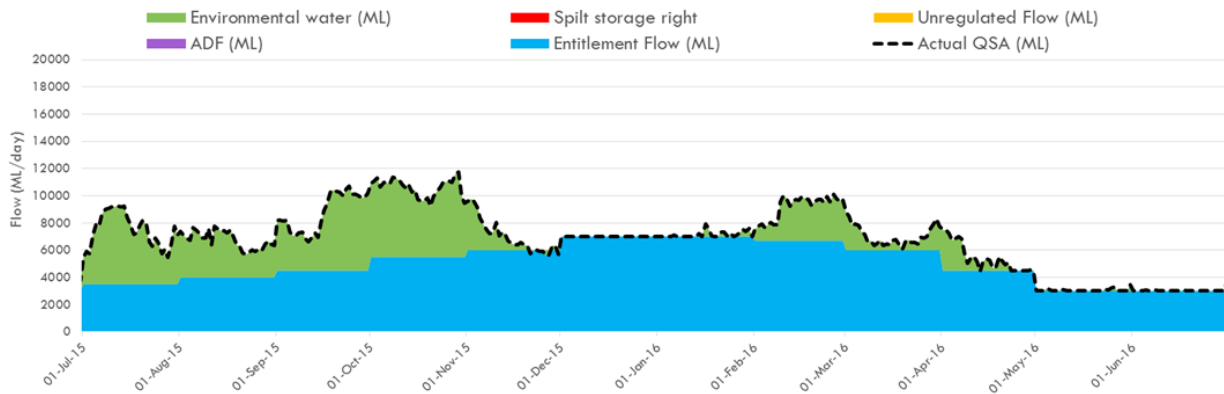


Figure 2. River Murray flows at the South Australian border throughout 2015-16²

Due to the provision of environmental water, actual flow at the South Australian border (QSA) was above entitlement in all months except December 2015, January 2016 and May 2016 (Figure 2). Relatively large volumes of environmental water were delivered throughout July, August, September and October 2015 (Figure 3), with the volumes of environmental water effectively more-than doubling water delivered to the state in three of these months. There were also two smaller peaks in environmental water delivery in February and late March/early April 2016.

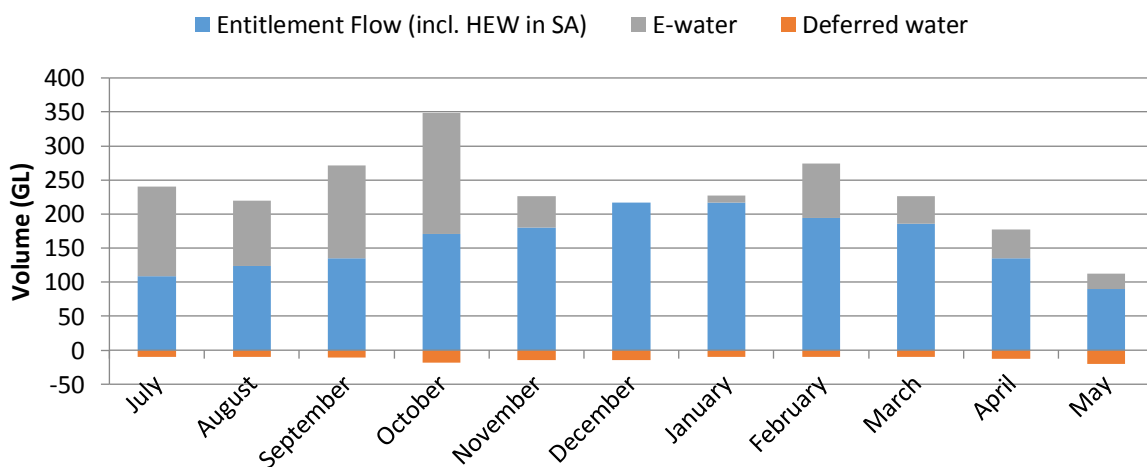


Figure 3. Monthly volumes of water delivered to South Australia in 2015-16 ²

² South Australia’s entitlement flow includes approximately 225 GL of held environmental water (HEW), including 134 GL of Commonwealth environmental water, 45 GL of TLM water and 46 GL of environmental water held by the SA Minister for Water and the River Murray

4. Environmental water delivery in 2015-16

A total of 1,028,760 ML of environmental water was delivered to priority sites in 2015-16 (Table 2), of which 819,322 ML was Commonwealth environmental water (CEW) and 146,087 ML was provided by TLM. South Australia also received 15,164 ML from the VEWH in the form of return flows from upstream watering actions.



Regent Parrot. Photo by Helga Kieskamp

A total of 45,692 ML of water held on the SA Minister's licences was delivered for environmental outcomes, of which 34,782 ML was Class 9 wetland water. This water entitlement class is established under rules in the Water Allocation Plan for the River Murray Prescribed Watercourse and is specifically for the management of pool-connected wetlands. Banrock Station also used 2,495 ML of Class 9 water which is held on a separate licence for the management of the Banrock Station pool-connected wetland.

Table 2. Volume of environmental water used from different providers in 2015-16

Provider	Volume in ML ³
Commonwealth Environmental Water Holder (CEWH)	819,322
The Living Murray (TLM)	146,087
SA Minister for Water and the River Murray (including Class 9 wetland water)	45,692
Victorian Environmental Water Holder (VEWH) return flows	15,164
Banrock Station Class 9 (wetland) water	2,495
Total	1,028,760

³ The volumes presented in this report are based on volumes traded to South Australia for environmental watering in the 2015-16 water year and may differ from figures that are reported elsewhere and are based on calculations of volumes that were physically delivered across the South Australian border in the water-year.

The environmental water delivered to South Australia was used to undertake a variety of watering actions throughout the year (Table 3). Approximately 95% of the total volume (971,841 ML) was delivered to the Coorong, Lower Lakes and Murray Mouth (CLLMM) and contributed to the manipulation of water levels in the Lower Lakes, and barrage and fishway releases. Water delivered to the CLLMM also provides benefits to the River Murray channel *en route*, particularly through increased flow rates. Other watering actions undertaken in 2015-16 included:

- operation of the Chowilla regulator and ancillary structures to generate an in-channel rise between October and mid-December (2,939 ML);
- raising of Weir 2 by 50 cm and Weir 5 by 45 cm in spring (5,084 ML);
- inundation of over 40 temporary wetland and floodplain areas (including wetlands on Chowilla Floodplain, sites managed by Natural Resources SA MDB and sites managed by Nature Foundation South Australia) via pumping or irrigation (9,629 ML); and
- wetting and drying of pool-connected (Class 9) wetlands (37,277 ML).

Appendices 1 and 2 provide details of the wetlands that received Class 9 and other environmental water, respectively.

Table 3. Volume of environmental water used to undertake different types of actions in 2015-16

Watering site	Volume (ML)	Water provider(s)
Coorong, Lower Lakes, Murray Mouth - Lake level management, and fishway and barrage releases	971,841	CEWH, TLM, VEWH, SA Minister for Water and the River Murray
Pool-connected (Class 9) wetland management	37,277	SA Minister for Water and the River Murray, Banrock Station
Other (non-Class 9) wetland management	11,619	CEWH, TLM, SA Minister for Water and the River Murray
Weir pool raising at Locks 2 and 5	5,084	CEWH
Chowilla Regulator operation	2,939	TLM
Total	1,028,760	

5. Monitoring and outcomes reports

Information on the response to environmental watering is gathered through a number of existing monitoring programs, including:

- The CEWO Long Term Intervention Monitoring Project, which was established in 2014 and collects data along the SA River Murray Channel;
- Condition and intervention monitoring at the Chowilla and CLLMM icon sites through the MDBA's Living Murray Program;
- The Coorong Lower Lakes and Murray Mouth Recovery Project, which is funded by the South Australian Government's Murray Futures program and the Australian Government;
- Monitoring associated with weir pool raising, which is coordinated by DEWNR and funded by the Australian Government; and
- Ongoing monitoring of selected South Australian River Murray wetlands and floodplain areas, which is undertaken by the wetlands and floodplain team of Natural Resources SA Murray-Darling Basin (SAMDB) in partnership with local action planning associations, Landcare associations and community groups.

Monitoring reports are produced for each of these projects and Appendix 3 provides a list of the reports that are available for 2015-16. Monitoring synthesis reports are generally published for the weir pool raising project and for TLM icon sites and, once completed, these reports are published on WaterConnect (www.waterconnect.sa.gov.au) and the MDBA website (www.mdba.gov.au/publications), respectively. Reports for the CEWO Long Term Intervention Monitoring Project are published at <https://www.environment.gov.au/water/cewo/catchment/lower-murray-darling/monitoring>.

Initial observations of key ecological outcomes from the environmental watering actions undertaken in 2015-16 were:

- improved in-stream productivity;
- improved condition of riparian vegetation communities;
- enhanced survival of seedlings and saplings of native floodplain tree species that germinated during previous high flow and managed inundation events;
- frog breeding, including successful metamorphosis of southern bell frogs;
- fishway and barrage outflows throughout the year providing continuous connectivity between the River and its estuary;
- significant diadromous fish migration, including winter migration by pouched lampreys, and evidence of recruitment; and
- large numbers of colonial waterbirds nesting at two Lower Lakes colonies.

6. Summary

This report summarises the volumes and timing of environmental water delivered for environmental watering actions along the River Murray in South Australia during the 2015-16 water year and highlights some of the successful environmental outcomes achieved through that delivery.

Maintaining high water levels in the Lower Lakes through spring and early summer was a key objective. This keeps fringing wetlands around the Lower Lakes inundated throughout the breeding season for EPBC listed species such as the Southern bell frog, Yarra pygmy perch and Murray hardyhead. Achieving continuous barrage flows to the Coorong was also a key objective. Along with creating suitable estuarine habitat in the North Lagoon for native fish and migratory waders, continuous flows through barrage fishways provide movement and recruitment opportunities for native diadromous fishes such as congolli and common galaxias.

An unexpected outcome was the return of pouched lampreys to the Lower River Murray (a rare and primitive fish-like animal). Winter water delivery to the Lower Lakes and Coorong triggered upstream migration, with 57 pouched lamprey captured at the barrage fishways, and fitted with PIT tags. One individual has been logged moving through the fishway at Lock 10.

Impressive colonies of pied cormorants and straw-necked ibis were established in the Lower Lakes. These were particularly important given the small amount of breeding in the Murray-Darling Basin. Most of the breeding sites were on reed islands of typha/schoenoplectus.

Continued recovery of the River Murray in South Australia is dependent on ongoing provision of environmental water at the right ecological time and duration.



Colonial nesting birds on Lake Alexandrina. Photo: Adrienne Rumbelow

7. References

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Department of Environment, Water and Natural Resources (2015). 2015-16 Annual Environmental Watering Plan for the South Australian River Murray and Supporting Information, Government of South Australia, South Australia.

South Australian Murray-Darling Basin Natural Resources Management Board (2002). *Water Allocation Plan for the River Murray Prescribed Watercourse (As amended January 2011)*. Murray Bridge : South Australian Murray-Darling Basin Natural Resources Management Board, 2002.

Appendix 1. Managed wetlands that received class 9 water

Banrock Station Wetland
Brenda Park Wetland
Little Duck, Winding Creek
Devon Downs South
Hart Lagoon
Lake Merreti
Lake Woolpolool
Loveday Mussel Lagoons
Martins Bend
Morgan Lagoon CP
Morgans Lagoon LM
Murkbo South
Narrung
Nelwart
Nigra Creek, Schillers Lagoon
Noonawirra
North Purnong
Paiwalla
Pilby Lagoon
Pipeclay Billabong
Ramco Lagoon
Riverglades
Spectacle Lakes, Beldora Complex
Sugar Shack
Teringie
Waltowa
Wongulla
Kroehns
Yatco North Lagoon

Appendix 2. Other (non-Class 9) wetlands that received environmental water in 2015-16

Site	Grand Total (ML)	Delivery time	Water Source	Action
Banrock Eastern Lagoon	1,343.8	Jul-Jun	CEWH (via Banrock)	pumped
Banrock's Bend	15.5	Jul-Jun	CEWH (via Banrock)	pumped
Berri Evaporation Basin	1,326.8	Jul-Jun	SA Minister's licence; CEWH (via NR SAMDB)	gravity
Bookmark Creek	448.5	Jul-Jun	SA Minister's licence; CEWH (via NR SAMDB)	gravity
Brandy Bottle Wetland	214.4	Nov-Dec; Jun	TLM	pumped
Calperum Station	837.2	Nov-June	CEWH (via NFSA)	pumped
Carpark Lagoons	229.4	Oct-Jan	CEWH (via NR SAMDB)	pumped
Clark's Floodplain	105.5	Aug-Mar	CEWH (via NFSA)	pumped
Duck Hole	271.0	Oct-Nov	CEWH (via NFSA)	pumped
Gerard Floodplain - Black Box	0.7	Jul-Jun	SA Ministers Licence	sprinkler
Gerard Lignum Swamp	70.1	Feb-Apr	SA Ministers Licence	pumped
Greenways	38.6	Feb-Mar	CEWH (via NFSA)	pumped
Greigers at SugarShack	58.6	Dec-Apr	CEWH (via NFSA)	pumped
Hérons Bend	20.4	Jul-Jun	CEWH (via Banrock)	pumped
Hogwash Bend North	27.9	Jan-Apr	CEWH (via NR SAMDB)	pumped
Hogwash Bend South	420.0	Jan-Feb	CEWH (via NR SAMDB)	pumped
Inner Mundic Creek	42.0	Nov	CEWH (via NFSA)	pumped
Johnson's Waterhole	116.5	Sept-Apr	CEWH (via NFSA)	pumped
Lescheid - Pikes	19.0	Dec	CEWH (via NFSA)	pumped
Loxton Riverfront Reserve	18.8	Aug-May	CEWH (via NFSA)	pumped
Lyrup Lagoon	284.1	Sept-Jan	CEWH (via NFSA)	pumped
Maize Island CP	213.1	Feb-Apr	CEWH (via NR SAMDB)	pumped
Markaranka Black Box Watering Trial	25.9	Nov-Apr	SA Ministers Licence	pumped
Martin Bend - Temporary	55.7	Aug-Sept	CEWH (via NR SAMDB)	pumped
Molo Flat (western and eastern channels)	104.6	Dec-Mar	CEWH (via NR SAMDB)	pumped
Morgan CP Bird & Meeting Lagoons	305.6	Nov-Mar	CEWH (via NR SAMDB)	pumped
Morgan East Wetland	199.6	Nov-Feb	CEWH (via NR SAMDB)	pumped
Mundic Wetland	104.0	Oct-Nov	CEWH (via NFSA)	pumped
Old Loxton Road	25.0	Oct-Jan	SA Ministers licence	pumped
Old Parcoola Wetland	353.2	Sept-Nov	CEWH (via NR SAMDB)	pumped
Piggy Creek	201.5	Nov	CEWH (via NR SAMDB)	pumped
Pike and Katarapko Floodplains	0.8	Nov-Dec	SA Ministers licence	Sprinkler and pumped

Site	Grand Total (ML)	Delivery time	Water Source	Action
Punkah Creek Depression	44.3	Nov; Jun	TLM	pumped
Punkah Creek Floodrunner	61.6	Nov	TLM	pumped
Rilli - Stanitzkis	27.2	Nov-May	CEWH (via NFSA)	Sprinkler and pumped
Rilli Reserve	2.2	Aug-Sept	CEWH (via NFSA)	sprinkler
Riversleigh	568.9	Jan-Jun	CEWH (via NFSA)	pumped
South Teringie	79.5	Dec-May	CEWH (via NFSA)	pumped
Thiele's Flat	42.9	Aug-Mar	CEWH (via NFSA)	sprinkler
Tolderol Wetland	361.0	Oct-Jun	SA Ministers Licence	pumped
Waikerie Ferry Site	5.6	Dec-Jan	CEWH (via NFSA)	sprinkler
Warnochlescheid	32.1	Feb	CEWH (via NFSA)	pumped
Weila Wetland	374.5	Nov-Feb	CEWH (via NR SAMDB)	pumped
Westbrooks	13.7	Oct-Apr	CEWH (via NFSA)	sprinkler
Wigley Reach Central Channel	52.5	Jul-Jun	CEWH (via Banrock)	pumped
Wigley Reach Depression	571.9	Jul-Jun	CEWH (via Banrock)	pumped
Yabby Creek	1,290.0	Jul-Jun	CEWH (via NR SAMDB)	gravity
Yarra Creek	593.2	Oct-Jan	CEWH (via NFSA)	pumped
Total	11,618.9			

Appendix 3. List of monitoring reports

Bice, C. M., Zampatti, B. P. and Fredberg, J. (2016). Fish assemblage structure, movement and recruitment in the Coorong and Lower Lakes in 2015/16. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000186-6. SARDI Research Report Series No. 921. 77pp.

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Wedderburn, S. and Barnes, T. (2016). Condition Monitoring of Threatened Fish Populations in Lake Alexandrina and Lake Albert. The University of Adelaide, Adelaide.

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Ye, Q., Bucater, L. and Short, D. (2016). Coorong fish condition monitoring 2015/16: Black bream (*Acanthopagrus butcheri*), greenback flounder (*Rhombosolea tapirina*) and smallmouthed hardyhead (*Atherinosoma microstoma*) populations. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2011/000471-4. SARDI Research Report Series No. 836. 105pp.

Appendix 4. Glossary

Term	Meaning
ADF – Additional Dilution Flow	Flow provided in addition to Entitlement Flow to help manage salinity in the River Murray
AHD - Australian Height Datum	Height above sea level
Annual exceedance probabilities (AEP)	A 90% AEP reflects that 90% of the historical records for annual river flow indicate that this flow rate was achieved; therefore there is a 90% chance of receiving at least this flow in any year
BWEWS	Basin Wide Environmental Watering Strategy
CEW	Commonwealth Environmental Water
CEWH	Commonwealth Environmental Water Holder
CEWO	Commonwealth Environmental Water Office
CLLMM	Coorong Lower Lakes and Murray Mouth
DEWNR	SA Department of Environment, Water and Natural Resources
EC	A measure of water salinity
ECD	Ecological Character Description
EF – Entitlement Flow	The flow South Australia is entitled to receive under the Murray-Darling Basin Agreement
EPBC Act	Environmental Protection and Biodiversity Conservation Act (Commonwealth) 1999
EWR	Environmental water requirement - the water regime needed to sustain the ecological values of aquatic ecosystems and biological diversity at a low level of risk.
FPRMM	First Peoples of the River Murray and Mallee Region - native title holders in the Riverland, South Australia, including areas of the River Murray around Renmark, Berri, Barmera, Waikerie and Morgan.
GL	Gigalitres – a measure of volume, where a gigalitre equals 1,000 megalitres or 1,000,000,000 litres.
HEW	Held environmental water – defined within Section 4 of the <i>Water Act 2007</i> .
KNYA	Kungun Ngarrindjeri Yunnan Agreement.
Longitudinal connectivity	Water is allowed to travel the full length of the river and is not captured in storages – this allows distribution of seeds, fish and nutrients down the length of the river
LTIM	Long Term Intervention Monitoring
Lower Lakes	Lakes Alexandrina and Albert
LTWP	Long Term Environmental Watering Plan (Basin Plan Chapter 8 requirement)
MDBA	Murray Darling Basin Authority
ML/d	Megalitres per day

Term	Meaning
NRA	Ngarrindjeri Regional Authority - the peak regional organisation of the Ngarrindjeri people, descendants of the original indigenous inhabitants of the lands and waters of the Murray River, Lower Lakes and Coorong and adjacent areas.
PEW	Planned Environmental Water
Pool connected wetland	A wetland that can be connected to the main River channel when South Australia is receiving its Entitlement and normal operating pool levels are being maintained.
PPM	Pre-requisite policy measure - constraints that coincide with the unimplemented policy measures identified in s7.15 of the Basin Plan.
QSA	Flow at the South Australian border. Unless otherwise stated, flow rates (or discharges) are expressed with respect to flow at the South Australian border.
Ramsar Convention	An international convention that recognises important wetlands that meet defined criteria
SCBEWC	Southern Connected Basin Environmental Watering Committee - a multi-jurisdictional committee that provides advice on the coordinated delivery of environmental water.
SDL	Sustainable diversion limit – defined in the Basin Plan as the long-term average sustainable diversion limit.
Tailwater	Water located immediately downstream from a hydraulic structure, such as a dam (excluding minimum release such as for fish water), bridge or culvert.
Temporary wetland	A wetland basin that is not connected to the main River channel when South Australia is receiving its Entitlement flows and normal operating pool levels are being maintained.
TLM	The Living Murray Program – a long-running collaborative programme between the Murray-Darling Basin Authority and partner governments aimed at restoring the health of the River Murray system by recovering 500 gigalitres of water and constructing major water management structures at six environmental icon sites.
Unregulated flow	Water received in South Australia above legislative requirement and not traded
VEWH	Victorian Environmental Water Holder.
WRP Area	Water Resource Plan Area – water planning units identified for the purpose of implementing the Basin Plan. The water resource plan areas are listed in Chapter 3 of the Basin Plan.