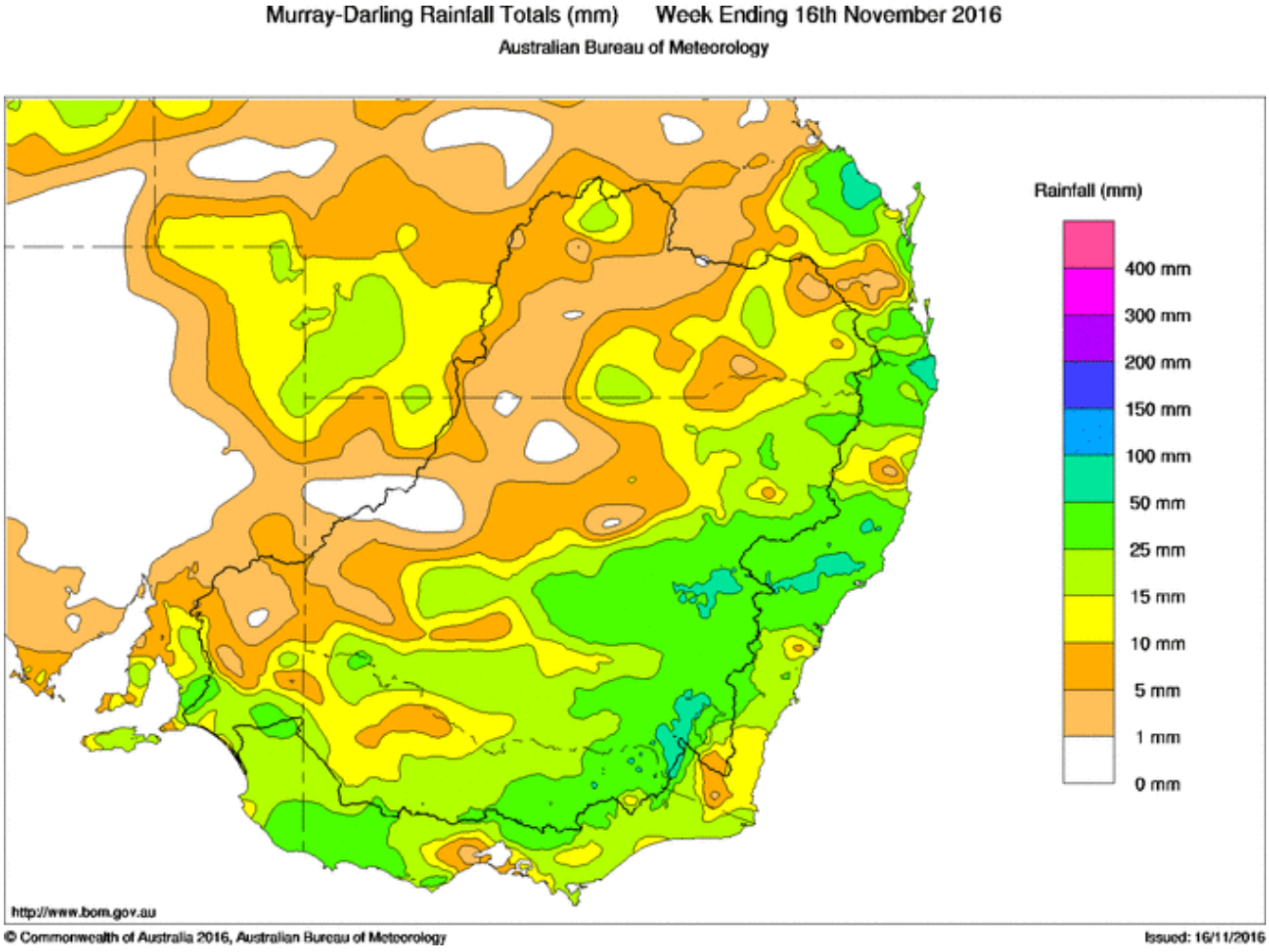
RIVER MURRAY WEEKLY REPORT

FOR THE WEEK ENDING WEDNESDAY, 16 NOVEMBER 2016

Trim Ref: D16/39201

Rainfall and inflows

There was extensive rain across most of the Murray–Darling Basin this week. A low pressure system produced thunderstorms and moderate rainfall in central NSW, southern NSW and north-east Victoria. There was 40 mm of rain recorded at Dartmouth Reservoir, 32 mm at Hume Reservoir, 8 mm at Menindee Lakes and 7 mm at Lake Victoria. Other notable totals included 41 mm at Granite Flat on Snowy Creek, which is upstream of Hume Reservoir, 39 mm at Mongans Bridge on the Kiewa River, 41 mm at Lake Buffalo in the Ovens River catchment, and 31 mm at Mildura.



Map 1 - Murray-Darling Basin rainfall week ending 16th November 2016 (Source: Bureau of Meteorology)

Given the relatively dry conditions leading up to this week's rain, the runoff responses in the upper Murray tributaries were modest and short-lived – with streamflows by week's end generally back to the levels seen before the rain.

River operations

- Coordinated response to 'blackwater' event continues
- Hume Dam level expected to peak this coming week
- Flood peak in the River Murray passes Euston

Reaches of the River Murray system between Barmah-Millewa Forest and into South Australia are continuing to experience hypoxic 'blackwater'. Blackwater occurs naturally when there is rapid breakdown of leaf litter from inundated areas. Breakdown of leaf litter is an important ecological process which provides nutrients for the growth of aquatic organisms. However, this process can result in very low levels of dissolved oxygen resulting in fish deaths. The MDBA, together with New South Wales and Victorian agencies, will continue to monitor dissolved oxygen levels.

Many government agencies, research organisations and local community members are working together to provide small areas of oxygenated water which act as a refuge for aquatic life. As the high flows recede, volumes of additional oxygenated water are being delivered to affected reaches of the river to increase the dissolved oxygen levels of the blackwater. Environmental watering actions have been initiated at a number of sites to assist in the management of the blackwater event. These actions include:

- In the lower Broken Creek, dissolved oxygen levels are improving as environmental water is used to deliver dilution flows. Goulburn-Broken CMA are coordinating the delivery of this water in collaboration with the Commonwealth Environmental Water Office, Victorian Environmental Water Holder, Goulburn-Murray Water and the MDBA.
- Higher base flows are being maintained in the lower Goulburn River. These flows, targeting about 940 ML/day at McCoys Bridge over summer, may provide a refuge for fish living in the nearby Murray. This action is being undertaken by the same agencies as for the lower Broken Creek, but also including The Living Murray.
- Commonwealth Environmental Water is providing refuge flows in the Edward-Wakool River system (see photo 1). This operation is being undertaken in collaboration with the NSW Office of Environment and Heritage together with Murray Irrigation Limited, WaterNSW, NSW Fisheries, NSW SES, Murray Local Land Services and others and is being managed to ensure that flooding is not exacerbated.

Photo 1 - Water with high oxygen levels is being delivered to the Wakool River through the Wakool Escape (Photo courtesy: Robyn Watts, Charles Sturt University)

- Releases of environmental water from Burrinjuck Dam to the Murrumbidgee River commenced in late October. This environmental water is aimed at providing dilution flows as the floodwaters recede. At Maude Weir, the dissolved oxygen level has improved from 2.3 mg/L in late October to 7.8 mg/L. At Balranald, dissolved oxygen levels are still low (less than 1 mg/L), but with delivery of environmental water expected to continue at least until the beginning of the new year, these dissolved oxygen levels are expected to improve and eventually assist with dilution in the River Murray downstream of the confluence. This action is being coordinated by NSW Office of Environment and Heritage, in collaboration with Commonwealth Environmental Water Office, MDBA's The Living Murray, WaterNSW and NSW Fisheries.
- In the lower Darling, small releases of environmental water have contributed to a Murray cod breeding event (see attached media release). As the high flows recede in the Murray, additional releases are planned which will support the maturing cod larvae and also provide dilution flows to the Murray downstream of Wentworth. This action is being coordinated by NSW's Office of Environment and Heritage, in collaboration with MDBA's The Living Murray, Commonwealth Environmental Water Office, WaterNSW and MDBA's River Operations.
- SA Water is undertaking additional monitoring of dissolved oxygen levels to provide more information for the management of water quality in South Australia. Releases from Lake Victoria have been increased to provide fish refuge in the Rufus River. It is expected that flow into Lake Victoria (see photo 2) will not negatively impact on the overall lake environment due to dilution and re-aeration, including from wave action. This action is being coordinated by the South Australian Department of Environment, Water and Natural Resources in collaboration with MDBA's River Operations and NSW Fisheries.

Photo 2 – Lake Victoria, showing blackwater in the background which is expected to mix with the oxygenated water in the foreground (Photo courtesy: SA Water)

MDBA total storage increased by 184 GL this week, with the active storage now 6,990 GL (81% capacity).

The storage volume at **Dartmouth Reservoir** continues its steady rise, increasing by 20 GL this week to 2,933 GL (76% capacity). Releases remain at the minimum of 200 ML/day at Colemans gauge.

At **Hume Reservoir**, the storage has remained steady at about 2,987 GL (99% capacity). Releases this week were briefly increased to 16,000 ML/day ahead of rain on the weekend. The release has now been reduced to 12,000 ML/day to ensure the reservoir is as full as possible prior to expected higher releases in the next few days in response to forecast increasing demands.

At **Yarrawonga Weir**, the release was also briefly increased to 18,500 ML/day. The release is now 17,300 ML/day and will be gradually reduced to around 15,000 ML/day. Flows in the range 14,000–15,000 ML/day are expected to be maintained at until the end of November. Diversions to Mulwala Canal have averaged around 4,500 ML/day during the week, while Yarrawonga Main Channel has reduced from 1,300 ML/day to just 450 ML/day, but this diversion is expected to increase again soon.

Flows continue receding throughout the **Edward-Wakool River** system. At Stevens Weir, the flow is currently 8,200 ML/day, which is down from 11,200 ML/day last week. On the Wakool River at Stoney Crossing, the flow has receded from 54,900 ML/day last week to 38,500 ML/day. See the latest Flood Warning issued by the Bureau of Meteorology.

In the Barmah-Millewa Forest, the water level at Picnic Point has fallen from 2.9 m (local gauge height) in mid-October down to 2.4 m, which is close to summer regulated levels. Dissolved oxygen levels at Toonalook, downstream of Millewa Forest, have improved from a low of 0.1 mg/L in late October to 4.8 mg/L on 17 November.

At McCoys Bridge on the **Goulburn River**, the flow is 1,500 ML/day and is expected to continue receding to around 950 ML/day by the end of the month. The flow from the Campaspe River to the Murray—resulting from spill at Lake Eppalock—has receded to around 50 ML/day and could cease within the next month or so.

The flow at **Torrumbarry Weir** has been steadily falling since late October and is now 22,800 ML/day. The flow is expected to steady at around 10,000 ML/day by mid-December. With the gates re-instated at the weir last week, the weir pool has been steady at its full supply level of 86.05 m AHD. Diversions into National Channel are expected to continue at close to 2,000 ML/day to meet irrigation demand and environmental orders in Gunbower Creek.

The flow at **Swan Hill** has been slowly receding from a peak of 27,400 ML/day on 25 October to the current flow of 22,800 ML/day. The flow is expected to continue receding until mid-December.

At Balranald, on the **Murrumbidgee River**, the flow has also been slowly receding from a peak of 28,600 ML/day last week. The flow is now 25,700 ML/day. See the latest Flood Warning issued by the Bureau of Meteorology.

At **Euston**, the flow in the River Murray finally peaked on Monday 14 November at around 134,500 ML/day (see photo 3). The flow peak at Euston is expected to be very broad, with flows remaining above 100,000 ML/day for at the least the next week or so.

Photo 3 - Euston Weir has been removed to allow the passage of high flows. (Photo courtesy: Phil Cocks, WaterNSW)

At **Mildura**, the flow is currently around 108,000 ML/day. The Bureau of Meteorology is forecasting that the river will peak within the next week with minor flooding. See the latest Flood Warning issued by the Bureau of Meteorology.

The volume in storage at the **Menindee Lakes** has increased by 145 GL this week to 1,108 GL (64% capacity). The release at Weir 32 remains at around 700–750 ML/day. This release includes a small volume of environmental water to assist with maintenance of a fish-breeding event in the lower Darling River (see attached media release).

The flow at **Wentworth** is currently 87,000 ML/day and rising. The Bureau of Meteorology forecasts that the river level will keep rising for the next week or so, with moderate flooding. See the latest Flood Warning issued by the Bureau of Meteorology.

The storage in **Lake Victoria** has increased by 16 GL this week to 636 GL (94% capacity). The flow to South Australia during the week has averaged 66,200 ML/day. The peak flow to South Australia is currently forecast to arrive in late November–early December. See DEWNR's latest high flow advice.

The level in the **Lower Lakes** is currently around 0.78 m AHD and barrage releases have average around 36,400 ML/day during the last week.

MDBA is a major sponsor of this year's Massive Murray Paddle and wishes the participants and organisers of a safe and enjoyable event. The Paddle is a 5 day adventure race that raises funds to assist local community-driven programs along the Murray. Participants will paddle 404 km, starting at Yarrawonga on Monday 21 November and finishing at Swan Hill on Friday 25 November. More information relevant to the Paddle is provided at the end of this report.

For media inquiries contact the Media Officer on 02 6279 0141

DAVID DREVERMAN
Executive Director, River Management

Water in Storage

Week ending Wednesday 16 Nov 2016

MDBA Storages	Full Supply Level (m AHD)	Full Supply Volume (GL)	Current Storage Level (m AHD)	Current Storage (GL)	Current Storage %	Dead Storage (GL)	Active Storage (GL)	Change in Total Storage for the Week (GL)
Dartmouth Reservoir	486.00	3 856	470.73	2 933	76%	71	2 862	+20
Hume Reservoir	192.00	3 005	191.91	2 987	99%	23	2 964	+3
Lake Victoria	27.00	677	26.66	636	94%	100	536	+16
Menindee Lakes		1 731*		1 108	64%	(480 #)	628	+145
Total		**9 269**		**7 664**	**83%**	**- -**	**6 990**	**+184**
Total Active MDBA Storage							81% ^	

Major State Storages

Burrinjuck Reservoir	1 026		1 005	98%	3	1 002	+14
Blowering Reservoir	1 631		1 577	97%	24	1 553	+19
Eildon Reservoir	3 334		2 646	79%	100	2 546	+15

* Menindee surcharge capacity – 2050 GL ** All Data is rounded to nearest GL **
# NSW has sole access to water when the storage falls below 480 GL. MDBA regains access to water when the storage next reaches 640 GL.
^ % of total active MDBA storage

Snowy Mountains Scheme

Snowy diversions for week ending 15 Nov 2016

Storage	Active Storage (GL)	Weekly Change (GL)	Diversion (GL)	This Week	From 1 May 2016
Lake Eucumbene - Total	2 241	n/a	Snowy-Murray	+20	701
Snowy-Murray Component	1 002	n/a	Tooma-Tumut	+6	293
Target Storage	1 450		Net Diversion	14	408
			Murray 1 Release	+29	1 054

Major Diversions from Murray and Lower Darling (GL) *

New South Wales	This Week	From 1 July 2016	Victoria	This Week	From 1 July 2016
Murray Irrig. Ltd (Net)	23.2	177	Yarrawonga Main Channel (net)	5.1	28
Wakool Sys Allowance	0.0	0	Torrumbarry System + Nyah (net)	10.9	81
Western Murray Irrigation	0.4	3	Sunraysia Pumped Districts	1.9	15
Licensed Pumps	5.3	39	Licensed pumps - GMW (Nyah+u/s)	0.8	4
Lower Darling	0.1	2	Licensed pumps - LMW	8.4	80
TOTAL	**29.0**	**221**	**TOTAL**	**27.1**	**208**

* Figures are derived from actual and estimates where data is unavailable. Please note that not all data may have been available at the time of creating this report.
** All data above is rounded to nearest 100 ML for weekly data and nearest GL for cumulative data**

Flow to South Australia (GL)

* Flow to SA will be greater than normal entitlement for this month due to unregulated flows.

Entitlement this month	180.0 *
Flow this week	463.1
Flow so far this month	950.2
Flow last month	1,366.3

(66 200 ML/day)

Salinity (EC) (microSiemens/cm at 25º C)

	Current	Average over the last week	Average since 1 August 2016
Swan Hill	90	110	160
Euston	-	-	-
Red Cliffs	210	190	150
Merbein	200	190	140
Burtundy (Darling)	310	280	810
Lock 9	200	180	150
Lake Victoria	180	200	170
Berri	210	200	170
Waikerie	210	210	200
Morgan	210	200	200
Mannum	210	200	210
Murray Bridge	220	220	230
Milang (Lake Alex.)	370	390	640
Poltalloch (Lake Alex.)	380	350	330
Meningie (Lake Alb.)	1 720	1 730	1 760
Goolwa Barrages	9 530	5 380	1 370

River Levels and Flows

Week ending Wednesday 16 Nov 2016

River Murray	Minor Flood Stage (m)	Gauge Height local (m)	Gauge Height (m AHD)	Flow (ML/day)	Trend	Average Flow this Week (ML/day)	Average Flow last Week (ML/day)
Khancoban	-	-	-	5 380	F	6 130	5 640
Jingellic	4.0	2.48	209.00	11 500	F	10 940	11 590
Tallandoon (Mitta Mitta River)	4.2	1.78	218.67	1 590	F	1 730	1 890
Heywoods	5.5	2.82	156.45	13 000	F	13 730	13 480
Doctors Point	5.5	3.11	151.58	16 790	F	17 740	18 020
Albury	4.3	2.13	149.57	-	-	-	-
Corowa	4.6	3.56	129.58	18 510	F	18 030	21 140
Yarrawonga Weir (d/s)	6.4	2.66	117.70	18 600	R	17 800	22 330
Tocumwal	6.4	3.37	107.21	19 850	S	20 320	27 800
Torrumbarry Weir (d/s)	7.3	5.71	84.26	22 830	F	24 630	31 440
Swan Hill	4.5	3.70	66.62	22 760	F	23 180	24 520
Wakool Junction	8.8	10.25	59.37	79 790	F	91 600	113 510
Euston Weir (d/s)	9.1	9.03	50.87	133 270	S	131 460	103 680
Mildura Weir (d/s)		-	-	107 990	F	96 790	73 380
Wentworth Weir (d/s)	7.3	7.40	32.16	87 060	R	80 270	66 870
Rufus Junction	-	7.64	24.57	74 270	R	66 160	54 900
Blanchetown (Lock 1 d/s)	-	3.07	-	47 300	S	45 430	42 440
Tributaries							
Kiewa at Bandiana	2.8	2.18	155.41	2 330	F	2 500	2 800
Ovens at Wangaratta	11.9	9.35	147.03	4 390	F	4 110	4 830
Goulburn at McCoys Bridge	9.0	1.84	93.26	1 540	R	1 540	2 150
Edward at Stevens Weir (d/s)	5.5	4.52	84.29	8 220	F	9 220	13 680
Edward at Liewah	-	6.40	61.78	12 500	F	13 470	15 750
Wakool at Stoney Crossing	-	7.62	61.11	38 450	F	45 280	61 510
Murrumbidgee at Balranald	5.0	6.84	62.80	25 660	F	26 910	27 030
Barwon at Mungindi	6.1	3.58	-	1 120	F	1 510	2 480
Darling at Bourke	9.0	6.19	-	14 840	F	21 820	34 910
Darling at Burtundy Rocks	-	0.94	-	770	S	770	800

Natural Inflow to Hume	14 660	15 770

(i.e. Pre Dartmouth & Snowy Mountains scheme)

Weirs and Locks Pool levels above or below Full Supply Level (FSL)

Murray	FSL (m AHD)	u/s	d/s		FSL (m AHD)	u/s	d/s
Yarrawonga	124.90	-0.15	-	No. 7 Rufus River	22.10	+2.80	n/a
No. 26 Torrumbarry	86.05	-0.01	-	No. 6 Murtho	19.25	+0.35	+3.15
No. 15 Euston	47.60	+3.32	-	No. 5 Renmark	16.30	-0.01	+2.81
No. 11 Mildura	34.40	+1.48	+5.08	No. 4 Bookpurnong	13.20	+0.63	+3.96
No. 10 Wentworth	30.80	n/a	+4.76	No. 3 Overland Corner	9.80	+0.00	+3.19
No. 9 Kulnine	27.40	n/a	+3.71	No. 2 Waikerie	6.10	+0.51	+3.31
No. 8 Wangumma	24.60	-3.29	n/a	No. 1 Blanchetown	3.20	+0.07	+2.32

Lower Lakes FSL = 0.75 m AHD

Lake Alexandrina average level for the past 5 days (m AHD)	0.78

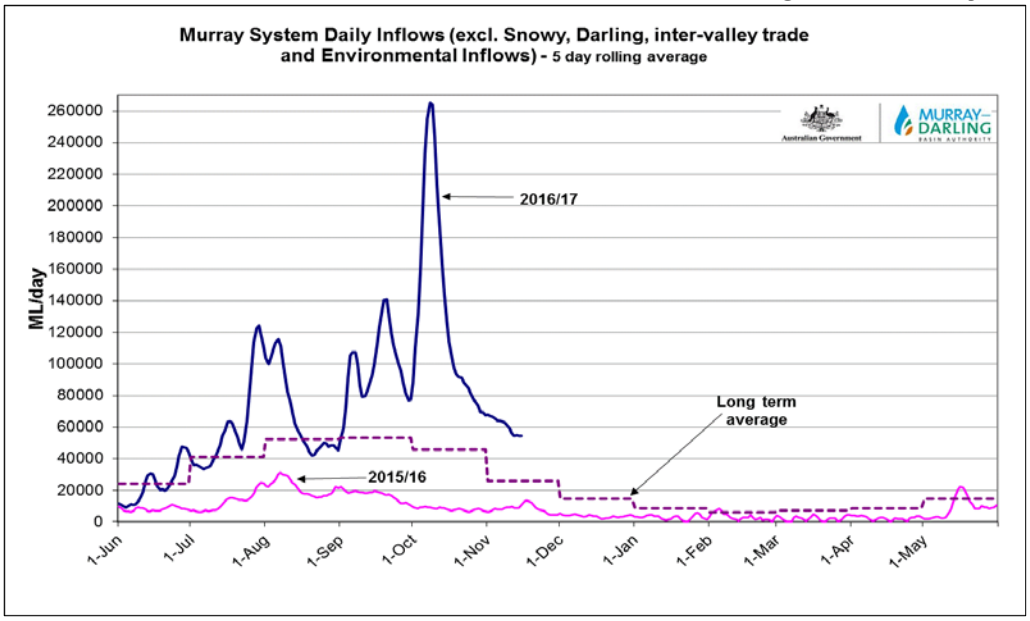
Barrages

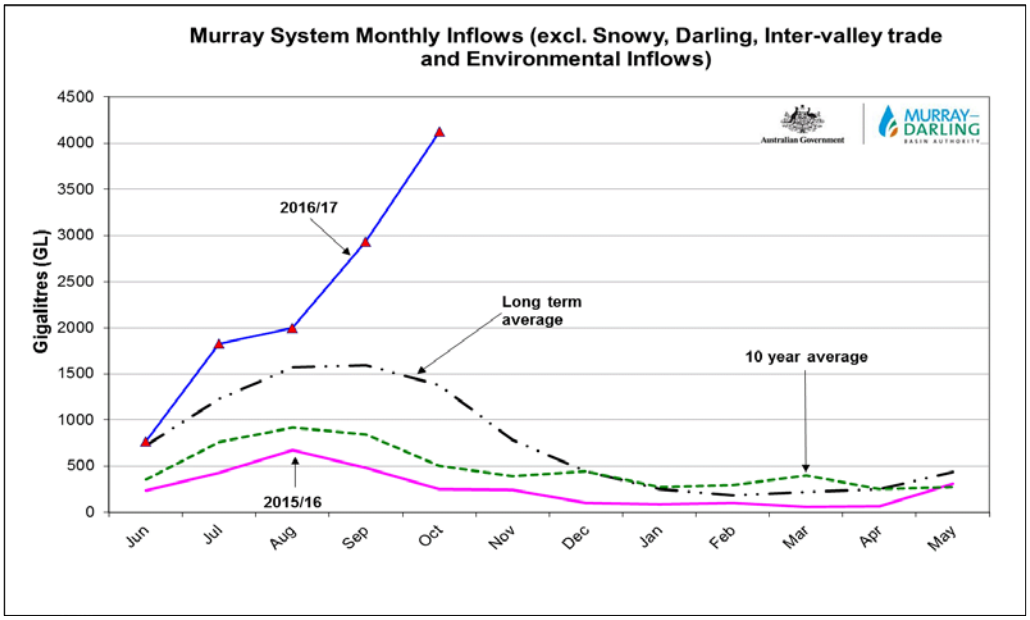
Fishways at Barrages

	Openings	Level (m AHD)	No. Open	Rock Ramp	Vertical Slot 1	Vertical Slot 2	Dual Vertical Slots
Goolwa	128 openings	0.77	40	-	Open	Open	-
Mundoo	26 openings	0.77	6	-	-	-	Open
Hunters Creek	-	-	-	-	Open	-	-
Boundary Creek	6 openings	-	All closed	-	Open	-	-
Ewe Island	111 gates	-	57	-	-	-	Open
Tauwitchere	322 gates	0.84	182	Open	Open	Open	-

AHD = Level relative to Australian Height Datum, i.e. height above sea level

Week ending Wednesday 16 Nov 2016





State Allocations (as at 16 Nov 2016)

NSW - Murray Valley

High security	100%
General security	100%

Victorian - Murray Valley

High reliability	100%
Low reliability	0%

NSW – Murrumbidgee Valley

High security	100%
General security	100%

Victorian - Goulburn Valley

High reliability	100%
Low reliability	0%

NSW - Lower Darling

High security	100%
General security	100%

South Australia – Murray Valley

High security	100%

NSW : http://www.water.nsw.gov.au/water-management/water-availability
VIC : http://nvrm.net.au/seasonal-determinations/current
SA : http://www.environment.sa.gov.au/managing-natural-resources/river-murray

MEDIA RELEASE

Australian Government

MURRAY–DARLING BASIN AUTHORITY

16 November 2016

Lower Darling breeding bonanza biggest in 20 years

The most impressive Murray cod breeding in 20 years is under way in the Lower Darling River as a result of environmental watering.

The Murray–Darling Basin Authority (MDBA) head of environmental management Carl Binning said the news affirmed the need to use environmental water strategically at the time and volume that provided the greatest benefit.

“Forty-eight gigalitres of The Living Murray (TLM) water allocations began to be released from the Menindee Lakes into the Lower Darling about six weeks ago,” Mr Binning said.

“What we’re now witnessing is a large ecological response that would help to re-establish healthy fish populations throughout the southern basin, including the Murray and its tributaries, beyond the next decade.

“Murray cod can live for an amazing 70 years, so the breeding event we are supporting now would continue to benefit the system for many years to come. It is likely to also support recovery from the losses caused by the blackwater event that has followed the flooding in some southern basin rivers.”

Mr Binning said that until recently this part of the Darling had been without flow for many months, due to record low inflows to the Menindee Lakes from the north.

“Since Darling River flood waters have been steadily replenishing the Menindee Lakes, we have carefully timed the use of environmental water allocations to extend those benefits downstream into the Lower Darling.

“The releases are low, averaging 500 megalitres per day, and neither affect the security of water in the lakes’ top two storages, which are important reserves for Broken Hill, Menindee and Lower Darling communities, nor exacerbate flooding in the Murray.

“Local landholders have welcomed the boost to water quality and river health provided by the extra flows. It is a good demonstration of the Basin Plan in action,” Mr Binning said.

To make the most of the major spawning event, a larger pulse using Commonwealth environmental water is being considered to provide essential food and shelter to help the maturing cod larvae to survive. The additional flow would be carefully timed to coincide with the recession of the flood in the River Murray.

The environmental watering event has been a collaborative effort between several government agencies, with water supplied by TLM and delivery coordinated by the NSW Office of Environment and Heritage.

The Living Murray is a joint initiative funded by the NSW, Victorian, South Australian, ACT and Commonwealth governments, and coordinated by the MDBA.

END

For more information, contact the MDBA Media office at media@mdba.gov.au or 02 6279 0141

Points of Interest for Massive Murray Paddlers

Whilst Hume Dam is upstream of Yarrawonga, it is mentioned here because it's the main supply storage and is one of the two major headwater storages for the River Murray system. Construction of Hume Dam started in 1919 and it was officially opened in 1936. The reservoir was enlarged from 1950-1961 to its present capacity of 3,005 GL at full supply level of 192 m AHD. It is located about 10 km east of Albury and around 300 km downstream from where the Murray rises on the Great Dividing Range. The dam's location means that flows from the upper Murray, Mitta Mitta (Dartmouth Reservoir is upstream of Hume on the Mitta Mitta River) and water from the Snowy Scheme are regulated to meet downstream needs. Two significant tributaries – the Kiewa and Ovens Rivers – contribute largely natural inflows to the Murray before flowing down to Yarrawonga.

Day 1 of the Massive Murray Paddle will begin downstream of Yarrawonga Weir. The lake formed by the weir—Lake Mulwala—has become the focus of a valuable tourist and recreation industry for the area, with sailing, water skiing and fishing all popular activities.

Lake Mulwala is the point of the greatest diversion of water from the River Murray. The two main irrigation channels from the lake are the Mulwala Canal and the Yarrawonga Main Channel. Mulwala Canal, on the New South Wales side, has a capacity of about 10,000 ML/day with Yarrawonga Main Channel, on the Victorian side, able to divert up to 3,200 ML/day. These two channels serve a total area of more than 800,000 km² of irrigable land across the two states.

The purpose of the Yarrawonga Weir is to:

- Raise the water level in the River Murray so that water can be diverted via channels to irrigate land in both New South Wales and Victoria; and
- Regulate flows downstream, including the river reaches through the Barmah–Millewa Forest and Echuca.

Since its construction, Lake Mulwala has become increasingly popular for water-based recreation.

Lake Mulwala has a full supply level of 124.90 m AHD and a capacity of around 118 GL. Although a significant storage, its capacity is about 25 times smaller than Hume Reservoir. Most of this volume is 'dead' storage as the lake needs to be maintained near full supply level to allow gravity diversions into the irrigation channels.

On Day 3, the paddle will begin near Picnic Point which is between Edward River and Gulpa Creek Offtakes on the River Murray. These offtakes regulate water passing into the Edward River and Gulpa Creek to meet demands in the Edward–Wakool River system—an anabranch system which re-joins the Murray between Swan Hill and Euston. Picnic Point is within Barmah-Millewa Forest, which is a large, continuous stand of river red gum forest.

This part of the Murray system formed approximately 8,000–50,000 years ago as a result of a slight uplift of land between Deniliquin and Echuca, called the Cadell Tilt Block. The uplift is orientated north–south for at least 50 km with maximum height of around 13 m. This effectively dammed the River Murray, blocking its flow westward and changing its course for 500 km.

For most of the post-Cadell fault time, the Murray flowed north around the Cadell fault but has more recently (geologically speaking) created a new channel flowing south across Moira Lake. The Murray now occupies the former channel of the Goulburn River some 8.5 km upstream of the current confluence. This newer Murray channel course is much narrower than the rest of the River Murray, which results in the restriction of flow through this part of the system, known as the 'Barmah Choke'. The limited flow capacity means freshes and flood flows regularly inundate the surrounding country – creating an expansive habitat of wetlands and red gum forests.

Downstream of the fault, the previous course of the River Murray parallels the present and provides an alternative course when the Murray floods. In fact, more water flows north through the Edward–Wakool system than the Murray during flood periods such as those seen this year.

At the end of Day 4 of the paddle you will be close to Torrumbarry Weir.

The primary objective of Torrumbarry Weir is to maintain a stable upstream pool level to allow gravity diversion of water into the Torrumbarry Irrigation Area in Victoria via the National Channel. This channel is also used to deliver environmental water to Gunbower Creek and Gunbower Forest. On the NSW side, just upstream of Torrumbarry Weir, inflows can be diverted into Koondrook-Perricoota forests via the Torrumbarry Cutting.

However, with large flooding this year, no environmental water was used in Gunbower or Koondrook-Perricoota Forests. Small volumes have been diverted into Gunbower Creek to support Murray cod populations this year.

Torrumbarry Weir is also a significant regional tourism and recreational facility.

If you have any questions, feel free to ask MDBA paddle members on the trip.