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Southern Discomfort

Water losses in the southern Murray Darling Basin

Decisions by the Murray Darling Basin Authority (MDBA) to flood the Barmah-Millewa forest and drain Menindee Lakes have reduced water for NSW Murray general security holders, who have zero allocation for 2018-19. We estimate an allocation of between 16% and 61% could have been possible had MDBA complied with its official Objectives and Outcomes.

Maryanne Slattery
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June 2019

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Summary

Decisions by the Murray Darling Basin Authority (MDBA) to flood the Barmah-Millewa forest in 2018-19 and drain Menindee Lakes in 2016-17 have caused environmental damage and reduced the amount of water available to NSW Murray water users. These decisions prioritised South Australia's entitlement and new water demand from corporate nut plantations around the SA border above water holders in the River Murray, including many family farms and environmental water holders.

High demand for water at the SA border has been driven by "insatiable overseas demand for crops like almonds", which has prompted "a flood of investment from local and overseas agribusinesses and pension funds." At the same time, "2018–19 has been a low rainfall year across the southern Basin putting it in the driest 9% of years in the historic record". High demand and low supply of water has driven water prices to record highs and pushing many farm businesses to the financial brink.

The Almond Board of Australia notes that "river managers are experiencing increasing difficulty delivering water to meet increased demand from new horticultural development." In an attempt to meet this demand at the South Australian end of the Murray system, the MDBA released water from the upper Murray that resulted in water exceeding channel capacity at the Barmah-Millewa "choke". The total amount of water that was overbank was between 536 and 847 gigalitres, flooding the Barmah-Millewa forest between August 2018 and January 2019.

Very little of this was environmental water. Summer flooding is unseasonal and can damage harming established red-gums and moira grass plains, which contribute to the forest being listed as an internationally significant wetland under the Ramsar Convention.

The Menindee Lakes were drained by MDBA in 2016-17, at a time when there was flooding in South Australia. If these releases had not been made, Menindee could have contributed to meeting demand at the South Australian border, reducing the need to release water from the upper Murray.

By flooding the forest unseasonally and draining Menindee Lakes, the MDBA has breached its official "Objectives and Outcomes", particularly to:

- Operate the River Murray System efficiently and effectively in order to deliver State water entitlements.

- Maximise the water available to the Southern Basin States, after providing for operating commitments in the River Murray System.
- Conserve water and minimise losses.
- Deliver water within the physical constraints of the River Murray System.

We estimate that these management decisions have reduced water available to NSW Murray users by between 268 GL and 1,027 GL. This range is influenced by decisions around Menindee Lakes, particularly when under NSW control, and the uncertainty around physical constraints in the Murray.

If this water was available to NSW Murray general security licence holders, it could have provided them with between 16% and 61% of their entitlements. Instead these users have zero allocation, causing financial damage to individual businesses and economic losses to the wider regional economy.

Southern Riverina Irrigators, an organisation that contributed to this report, have launched legal action relating to river management in the NSW supreme court.

Introduction

Water has been badly managed in the Murray Darling Basin in recent years. Examples that have made national headlines include the Menindee fish kills, towns trucking in bottled water and the Watergate scandal of the Condamine Balonne.

Less attention has been drawn to the plight of irrigators in the southern Basin, where large numbers of family farms are being driven out of business despite many having state-of-the-art equipment and best practice.[1] Like most problems in the Basin, drought has been a catalyst, but mismanagement by water agencies has been the cause.

The Southern Basin rivers are highly regulated by a series of dams, locks and weirs. The Murray-Darling Basin Authority (MDBA) is responsible for the river operations for the River Murray System, which is the River Murray at all times and Menindee Lakes, except when the lakes fall below a certain level. MDBA operates the River Murray System in accordance with the Murray-Darling Basin Agreement and a set of delegations agreed by the Basin governments.

The Barmah Choke is the narrowest stretch of the Murray River, through the Barmah-Millewa forest. The channel capacity at the Barmah Choke is the smallest in the River Murray and is measured as 9,500ML/day downstream of Yarrawonga Weir, or 7,800ML/day at the Barmah Choke.[2,3] Flows higher than this flood into the Barmah-Milawa forest.

The MDBA made releases from Hume dam that resulted in the River Murray running at minor flood levels for 141 days between August 2018 and January 2019.[4,5] This was water for downstream irrigation, not environmental watering, and it caused environmental damage. It reduced the amount of water available for production,

[1] Dobson and Long (2019) *Climate change and basin plan forces prominent dairy farmer to leave the Murray-Darling Basin,* https://www.abc.net.au/news/2019-05-02/dairy-farmer-moves-from-murray-darling-basin-amid-water-woes/11057982

[2] MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

[3] MDBA (2008) *Barmah Choke Study - Fact Sheet 1: Project Background,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-tlm-reports/2092_Barmah_Choke_factsheet.pdf

[4] MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

[5] WaterNSW (2019) *Real-time data,* https://realtimedata.waternsw.com.au/

leaving NSW general security water users – rice, grain growers and dairy farmers - with zero water allocation in 2018-19. This has had a significant economic cost to those farmers and their dependent communities.

A group of NSW Murray irrigators have lodged a class action against the Murray-Darling Basin Authority for negligence, based on its management of the River Murray System between 2016 and 2019.[6] This paper explains how the River Murray System was managed in that period and estimates the amount of water that has been lost to NSW Murray water users – both irrigator and environmental water holders.

[6] Brewster (2019) *Murray-Darling irrigators file class action seeking $750m from basin authority,* https://www.theguardian.com/australia-news/2019/may/14/murray-darling-irrigators-file-class-action-seeking-750m-from-basin-authority

Flooding Barmah-Millewa forest

The Barmah-Millewa forest is an important environmental asset in the River Murray. It has Ramsar listing as a wetland of international significance.[7] It is also one of the six icon sites under The Living Murray program, an ambitious river restoration program that preceded the Murray-Darling Basin Plan.[8] The MDBA describes it as:

> one of the most ecologically valuable sites within the Basin[9]

The regulation of the Murray River has changed its hydrology from naturally higher flows in winter and spring and lower flows in summer and autumn, to higher flows in summer & autumn, to satisfy peak irrigation demand. MDBA explains that the objectives for the Barmah–Millewa forest is to avoid flooding the forest over the summer:

> Winter and spring flooding, caused by the Choke, is critical to the health of the forest. River regulation has reduced the frequency and size of winter and spring floods, and has increased the incidence of unseasonal flooding in summer, leading to a decline in the health of forest ecosystems.
>
> During summer and autumn, river operation aims to keep flows at or below channel capacity to minimise unseasonal flooding of the Barmah-Millewa Forest. This constraint provides challenges in meeting downstream peak water use demands and transferring water to Lake Victoria and South Australia, even in relatively dry years. The constraint has led to a restriction in water trade from areas upstream to downstream of the Barmah Choke.
>
> There are other environmental challenges in river management and the Barmah Choke. Operating the river for long periods at 'top of bank' levels leads to notch erosion and bank instability.[10]

[7] Department of Environment and Energy (2019) *The Ramsar Convention on Wetlands,* https://environment.gov.au/water/wetlands/ramsar

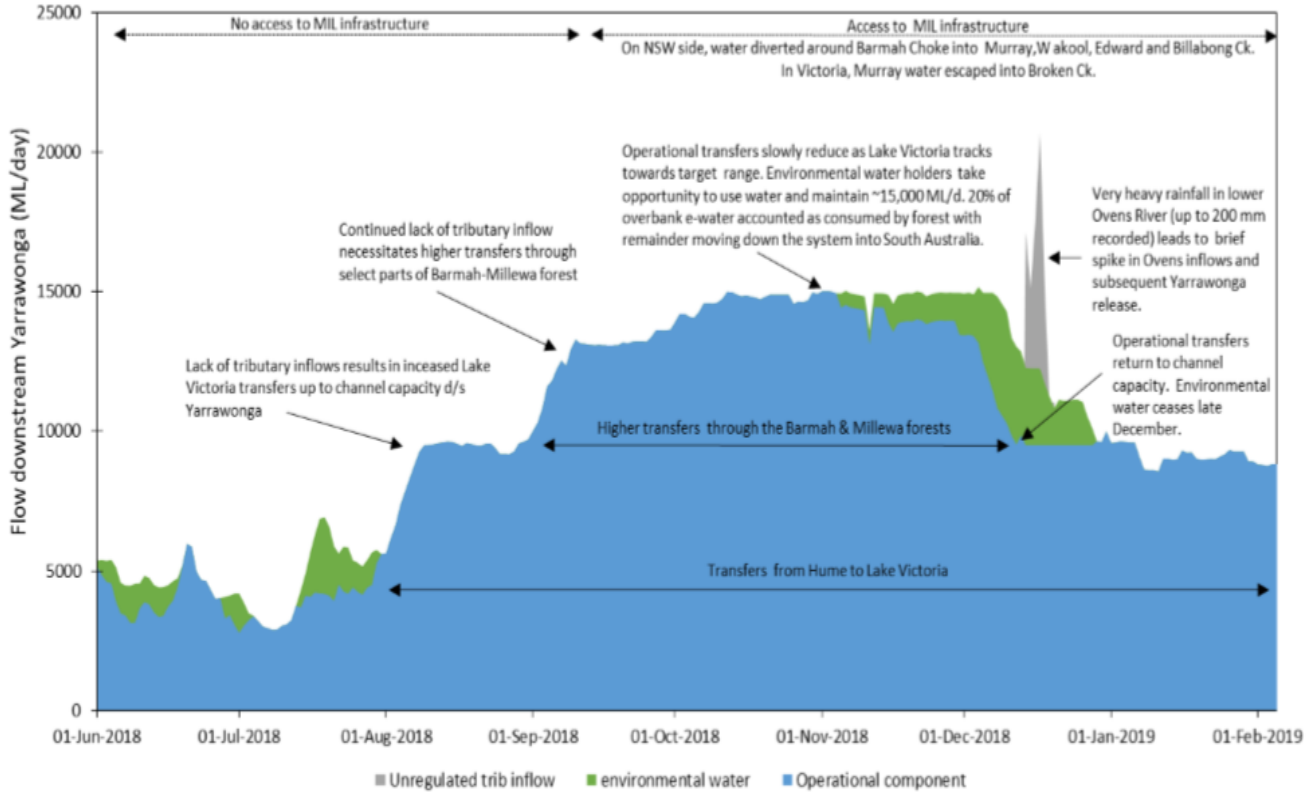
[8] MDBA (2009) *The Living Murray Program,* https://www.mdba.gov.au/publications/brochure/living-murray-program

[9] MDBA (2012) , *Assessment of environmental water requirements for the proposed Basin Plan: Barmah–Millewa Forest*, https://www.mdba.gov.au/sites/default/files/archived/proposed/EWR_proposed_BP_Barmah_Millewa.pdf

[10] MDBA (2008) *Barmah Choke Study - Fact Sheet 1: Project Background,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-tlm-reports/2092_Barmah_Choke_factsheet.pdf

Despite this, the MDBA made releases from Hume dam that resulted in water exceeding channel capacity at Barmah-Millewa and flooding the forest between August 2018 and February 2019.[11] Importantly, very little of the water was environmental water, shown in Figure 1 below.

Figure 1: Flows downstream of Yarrawonga Weir



Source: MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

Figure 1 shows that environmental water (shown in green) contributed only a small amount of the flooding from November 2018 until January 2019. It is unclear why environmental watering continued into January 2019, because that is unseasonal flooding and is not desirable for the moira grass plains. A Draft Strategic Action Plan for the Protection of floodplain marshes in Barmah National Park and Barmah Forest Ramsar Site states:

[11] WaterNSW (2019) *Real-time data,* https://realtimedata.waternsw.com.au/

> In the Barmah Forest the moira grass plains are now at less than 5% of their original range and are projected to be extinct by 2026 without management intervention.
>
> Current water management practices aim to help mitigate the risks to Moira grass plains from river regulation…by promoting the winter-spring flooding and summer-autumn dry period that this species requires. Late summer-autumn flooding can change the composition of wetland vegetation and needs to be minimised.[12]

Regardless, the total amount of water that was overbank and flooded the forest was between 536 and 847 gigalitres, based on the in-channel capacity of 9,500 or 7,800 ML/day downstream of Yarrawonga.[13]

The flooding was not for environmental watering and instead damaged the environment by the erosional scouring of banks, bank collapses and killing established red-gums.[14]

That is, while NSW Murray irrigators had no water allocation, so much water was pushed down the river that it caused environmental damage.

[12] Victoria Parks (2019) *Strategic Action Plan 2019-2023 (Draft): Protection of floodplain marshes in Barmah National Park and Barmah Forest Ramsar Site,* https://s3.ap-southeast-2.amazonaws.com/hdp.au.prod.app.vic-engage.files/1615/5434/0577/Barmah_FloodplainMarshes_ActionPlan_Overview.pdf

[13] WaterNSW (2019) *Real-time data,* https://realtimedata.waternsw.com.au/

[14] Hunt (2018) Barmah Choke point may foil Murray plan, https://www.weeklytimesnow.com.au/subscribe/news/1/?sourceCode=WTWEB_WRE170_a_GGL&dest=https%3A%2F%2Fwww.weeklytimesnow.com.au%2Fnews%2Fnational%2Fbarmah-choke-point-may-foil-murray-plan%2Fnews-story%2F028bc82f3e138eb3c81977303ab95512&memtype=registered&mode=premium#command-form

Why was the forest flooded?

The reasons why the forest was flooded in 2018-19 can be boiled down simply to high demand, low supply and the inefficient operation of the River Murray System.

HIGH DEMAND

The MDBA is required to deliver a prescribed amount of water to South Australia each month, totalling 1,850GL each year under the Murray-Darling Basin Agreement.[15] That commitment is shared equally between New South Wales and Victoria.

Since the last drought, there has been a significant expansion of nut plantations, particularly in the Sunraysia area on the Murray River, upstream of the South Australian border. An ABC report explains:

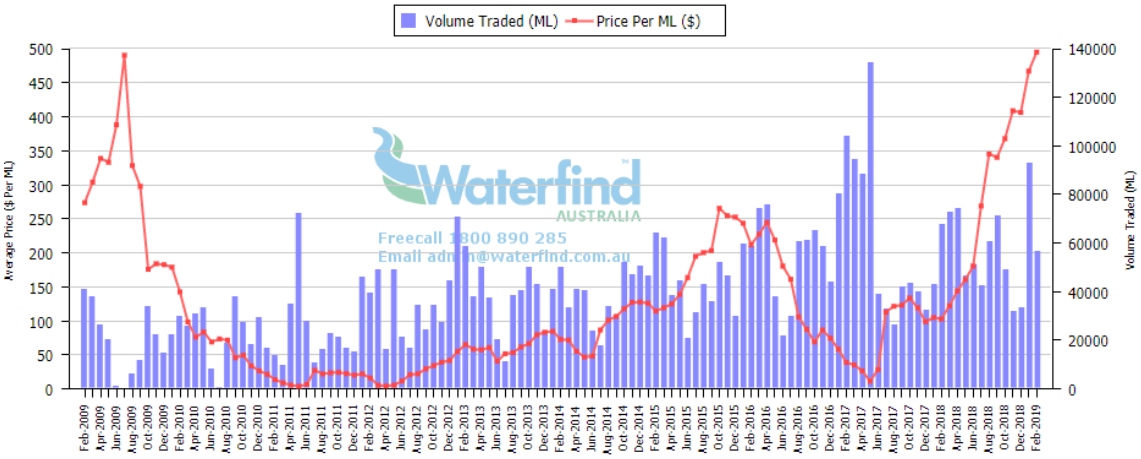
> In recent years, an insatiable overseas demand for crops like almonds, citrus, and table grapes have attracted a flood of investment from local and overseas agribusinesses and pension funds, driving the massive increase in the area devoted to producing them.
>
> The area where almond trees were planted expanded by more than 900 per cent between 2000 and 2016……
>
> With consultancy group Aither projecting a 40 per cent increase in annual water use on permanent plantations between 2006 and 2024, investors have tipped billions of dollars into the horticulture industry and set the stage for intense competition among irrigators along the Murray and Murrumbidgee rivers.[16]

There are no planning or regulatory restrictions on what is grown where in the basin, which is determined mostly by the water market. This drought has seen temporary water prices rise to over $600/ML. Figure 1 shows temporary water prices in the Southern Connected System.

[15] s88 Water Act 2007 Schedule 1: Murray-Darling Basin Agreement, https://www.legislation.gov.au/Details/C2007A00137

[16] Jasper (2018) *Water trading reshapes what foods and fibres are grown along the Murray and Murrumbidgee,* https://www.abc.net.au/news/rural/2018-07-10/water-trading-makes-farmers-adapt/9945688

Figure 2: Temporary water prices in the Southern Connected System



Source: Myer (2019) *Water could be gold for Australian superannuation fund members*, https://thenewdaily.com.au/money/superannuation/2019/03/23/water-seen-as-profit/

Figure 2 shows that temporary water prices reached nearly $500/ML until February this year, record prices not seen for a decade. Prices have increased since this graph was prepared and are now in excess of $600 in both the Murray and Murrumbidgee valleys.[17]

Other crops are not viable at those prices, so the water is traded to Sunraysia and South Australia for use on nuts and grapes, which have a very high yield.[18,19]

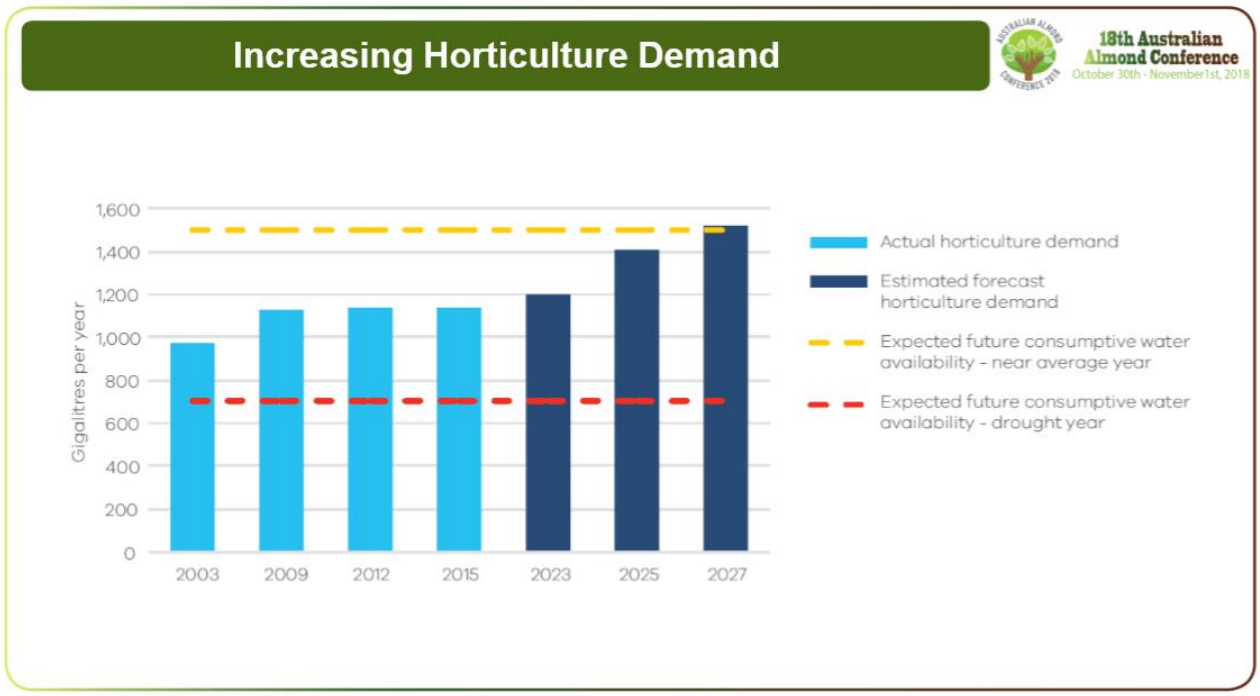
The expansion of nut plantations in the Murray River places considerable pressure on river operations to physically deliver the enough water to meet demand. **Figure 3** shows the increasing water demand created by nut plantations and the estimated water availability.

[17] WaterNSW (2019) *NSW Water Register,* https://waterregister.waternsw.com.au/water-register-frame

[18] Dairy Australia (2019) *Future Focus: Dairy Industry Strategy Murray Region 2019,* https://www.dairyaustralia.com.au/news-listing/future-focus-regional-dairy-industry-strategy?id=910D7B881ED94B50B3B8DEBF77041C57

[19] Kinbacher and Calver (20019) The human toll of Murray-Darling Basin water reform, https://www.farmonline.com.au/story/6106960/the-human-toll-of-murray-darling-basin-water-reform/

Figure 3: Increasing Horticulture Demand



Source: Goulburn Murray Water (2018) *Choke or Bottleneck on Development,* https://2q1ee4456oc52trll42uctl1-wpengine.netdna-ssl.com/wp-content/uploads/2018/11/M-Bailey.pdf

Figure 3 shows that future demand could double water availability in drought years.

The almond industry has acknowledged that the system has exceeded its physical limitations and has called for a moratorium on new nut plantations:

> State river managers are experiencing increasing difficulty delivering water to meet increased demand from new horticultural development.
>
> The change in the location and demand for water is increasing conveyance losses during dry seasons, potentially reducing the water available for allocation. An increase in the volume and duration of transfers through the Barmah-Millewa Forest and the Goulburn is causing environmental damage.
>
> Victoria, NSW and South Australia should impose a moratorium on new water use or extraction licences pending review whether the system can support additional development. In the meantime, trade in licenced extraction rights (Cap and Trade system) to support new development should be considered.[20]

[20] Almond Board of Australia (2019) *Murray-Darling Basin: Water Policy Position,* https://industry.australianalmonds.com.au/wp-content/uploads/2019/05/Almond-Board-water-policy-position-paper-version-7.pdf

The former Chair of the MDBA, Neil Andrew, warned irrigators they bear the risk of non-delivery when the system cannot physically meet demand:

> Another area where all jurisdictions should redouble their efforts is to work together to manage the ongoing risk of water delivery shortfall in the River Murray System.
>
> A water delivery shortfall can happen when demand exceeds the physical capacity of rivers to carry the water, or when demands for water spike and there's not enough time to release more.
>
> Factors like changes in land use, changes in climate and extreme heat, and changes in water use can all effect the risk.
>
> The Authority urges all water users along the River Murray, especially downstream of the Barmah Choke, to understand the risk of water delivery shortfall and take it into account in their business planning and investment decisions.[21]

Despite Mr Andrew's warning, the MDBA did meet the downstream water demand for nut plantations in 2018-19, which prioritised those water users above the water users upstream in the River Murray.

LOW SUPPLY

There were low inflows into the Murray and its tributaries in 2018 -19.

> So far, 2018–19 has been a low rainfall year across the southern Basin putting it in the driest 9% of years in the historic record. Of the rain that has fallen, most has been in the Victorian Alps contributing to low but sustained Victorian tributary inflows. Inflows from New South Wales tributaries are in the lowest 6% while Victorian inflows are in the lowest 14%. This results in New South Wales receiving only 40% of the total inflow compared to 60% for Victoria.[22]

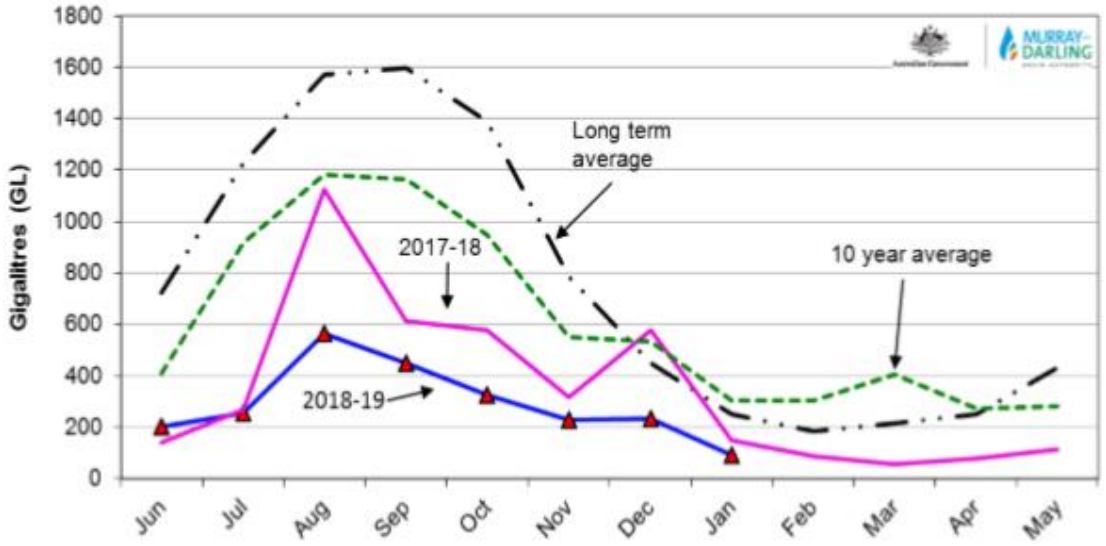
Historically, MDBA relies on inflows from the Murrumbidgee River and Billabong Creek in New South Wales and the Ovens, Goulburn, Broken, Campaspe and Lodden rivers in Victoria. In 2018-19 there was very little inflows from the Murrumbidgee River and

[21] Goulburn Murray Water (2018) *Choke or Bottleneck on Development,* https://2q1ee4456oc52trll42uctl1-wpengine.netdna-ssl.com/wp-content/uploads/2018/11/M-Bailey.pdf

[22] MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

Billabong Creek. There were higher inflows from Victoria, but there was a notable decrease in inflows from the Ovens River.[23] **Figure 4** below shows the Murray System Inflows (excl. Snowy, Darling, inter-valley trade and environmental flows).

Figure 4: Murray System monthly inflows (excluding Snowy, Darling, inter-valley trade and environmental flows)



Source: MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

Figure 4 shows that the 2018-19 inflows were significantly lower than the 2017-18, the ten-year and long-term averages. However, low inflows do not alone explain why it was necessary to flood the Barmah-Millewa forest.

INEFFICIENT OPERATIONS

The Murray-Darling Basin Authority is responsible for operating the River Murray System on behalf of the New South Wales, Victorian and South Australian governments. The legal powers to operate the system come from the Murray-Darling Basin Agreement (signed by first Ministers) and the *Objectives and Outcomes for the River Operations in the River Murray System* (Objectives and Outcomes).[24]

[23] MDBA (2019) *Losses in the River Murray System 2018-19,* https://www.mdba.gov.au/sites/default/files/pubs/River-murray-system-losses-report.pdf

[24] MDBA (2014) *Objectives and Outcomes for River Operations in the River Murray System*, https://www.mdba.gov.au/publications/mdba-reports/objectives-outcomes-river-operations-river-murray-system

The Objectives and Outcomes are:

Objectives

i. To operate the River Murray System efficiently and effectively in order to deliver State water entitlements.

ii. To maximise the water available to the Southern Basin States, after providing for operating commitments in the River Murray System.

Outcomes

i. The conservation of water and minimisation of losses.

ii. The accurate and timely preparation, delivery, review and, where necessary, amendment of water accounts and water resource assessments, in accordance with this document.

iii. The delivery to the Southern Basin States of their authorised water orders (including water traded under Schedule D of the Agreement), unless physical constraints of the River Murray System prevent this from occurring.

The operation of the River Murray has not complied with the Objectives and Outcomes in flooding the Barmah-Millewa Forest and also in draining Menindee Lakes

Objectives and Outcomes and Barmah-Millewa

The physical constraint for the Barmah-Millewa Forest is defined by the MDBA as 10,400ML a day downstream of Yarrawonga (Picnic Point).[25] Silting due to high river flows has decreased the channel capacity in recent years. MDBA have publicly reported the constraint as 9,500 ML/day downstream of Yarrawonga and stated in public meetings that the constraint is as low as 7,800ML a day at the Barmah-Choke, although this has never been published as far as we are aware.[26]

[25] MDBA (2012) *Assessment of environmental water requirements for the proposed Basin Plan: Barmah–Millewa Forest*, https://www.mdba.gov.au/sites/default/files/archived/proposed/EWR_proposed_BP_Barmah_Millewa.pdf

[26] Murray Darling Basin Commission, (2008) *Barmah Choke Commission,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-tlm-reports/2092_Barmah_Choke_factsheet.pdf

The delivery of water to meet downstream demand above channel capacity at the Barmah Choke is outside the delegation under the Objectives and Outcomes as it is not "operating the River Murray System efficiently and effectively in order to deliver State water entitlements" and nor does it "maximise the water available to the Southern Basin States, after providing for operating commitments in the River Murray System." The MDBA did not have a delegation under the Objectives and Outcomes document, because it is only required to meet State water orders within the physical constraints (that is, between 7,800 and 9,500 ML/day) downstream of Yarrawonga.

There is a Specific Objective and Outcomes for the management of the Barmah-Millewa Forest, which says:

> The Barmah-Millewa Forest regulators are operated in a collaborative approach with relevant stakeholders to facilitate desirable watering and to prevent, as far as possible, undesirable watering of the Barmah-Millewa Forest.
>
> The Committee advises that the Authority should continue to consult, as appropriate, with relevant stakeholders such as Barmah-Millewa Forest land managers, New South Wales and Victorian Constructing Authorities and local landholders to facilitate desirable watering of the Forest, and to minimise as far as possible undesirable watering of the forest and avoid uncontrolled overtopping of levees.[27]

The MDBA prioritised the delivery to water users below the Barmah Choke in 2018/19, above "the conservation of water and minimisation of losses", and as a result have impacted on the water available to general security water holders in the Murray River.

Objectives and Outcomes and Menindee Lakes

Water into the lower Murray and South Australia can be met out of the Menindee Lakes or the Murray River. The Goulburn and Murrumbidgee rivers flow into the Murray, so they also have contributed historically to demand at Sunraysia and South Australia (lower Murray).

Menindee Lakes historically made a significant contribution to the SA entitlement:

[27] Murray-Darling Basin Officials Committee (2019) *Objectives and outcomes for river operations in the River Murray System,* https://www.mdba.gov.au/sites/default/files/pubs/Objectives-and-outcomes-for-river-operations-in-the-RMS-2019.PDF

> Since development of the Menindee Lakes Scheme, the lakes have supplied 39% of the annual entitlement flows to South Australia (Thoms et al. 2000),28 leading to a constant flow regime.[29]

The Menindee Lakes were nearly full in late 2016 and early 2017. The MDBA drained the lakes, starting in late 2016 and the lakes were empty before the start of the 2018/19 water year. The Australia Institute research *A fish kill QandA* explains the draining of the lakes and we believe that there are many unanswered questions around the releases from the lakes.[30] In particular, why releases were made from the lakes when there was flooding at the South Australia border.

That is, releases were made unnecessarily and could otherwise have been used to meet the South Australia commitment at a later time. Menindee lakes did not receive any notable inflows after 2017.

An independent assessment of the 2018-19 fish deaths in the Lower-Darling estimated that the Lakes would have had water in January 2019, if the Lakes had not been drained.

> The panel learned that an initial assessment by the MDBA of the impact of varied water release strategies during the period from January 2017 to January 2019 indicated that a zero-release strategy would have resulted in 414 GL addition volume in the lakes as of January 2019. Minimum releases from Menindee from January 2017 would have resulted in 244 GL additional volume in the Lakes as of January 2019. [31]

[28] Thoms et al (2000) *River Murray - Dartmouth to Wellington and the Lower Darling River,* River Murray Scientific Panel on Environmental Flows

[29] Murray-Darling Basin Commission (2004) *The Living Murray Information Paper no. 10: Menindee lakes, the Lower Darling River and Darling Anabranch,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-tlm-reports/525_menindeelakesdarling.pdf

[30] Slattery and Campbell (2019) *A fish kill QandA,* http://www.tai.org.au/sites/default/files/P665%20-%20A%20Fish%20Kill%20QandA%20%255bWEB%255d.pdf

[31] Vertessy and Barma (2019) *Independent Assessment of the 2018-19 Fish Deaths in the Lower Darling Interim Report, with Provisional Findings and Recommendations*, https://www.mdba.gov.au/sites/default/files/pubs/Independent-assessment-2018-19-fish-deaths-interim-report.PDF

Impact on allocation

The operation of the River Murray System between 2016 and 2019 outside the Objectives and Outcomes has resulted in less water in storages for water users, both irrigators and environmental water holders.

Table 1 shows a low and high estimate of the water that would be in Menindee Lakes and available to NSW water users, if the Lakes were managed consistently with the Objectives and Outcomes. The low estimate assumes that NSW would not make any water in the Lakes available to meet the South Australian entitlement, when the Lakes are under NSW control (when volumes are below 480,000ML).[32] The high estimate assumes that NSW would make all of the water in the Lakes available to meet the South Australian entitlement, when the Lakes are under NSW control.

[32] s99 Schedule 1: Murray -Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

Table 1: Estimated Water in Menindee Lakes

	Low estimate ML	High Estimate ML
Actual volume in Menindee Lakes 1 July 2016[33]		54,385
Actual inflows 1 July 2016 to 30 June 2018[36]		2,155,270
Operational releases[34]		(191,200)
Actual environmental releases for the Lower Darling[35]		(91,959)
Estimated evaporation[36,37,38]		(840,000)
Additional Dilution Flows (3,000ML/day when Lakes exceed 1,300,000ML) [39]		(360,000)
Estimated Total Water in Menindee 30 June 2018	**244,000**[40]	**726,496**
Victorian share of Menindee Lakes (50% of total volume in excess of 480GL)	-	123,248
NSW share of Menindee Lakes available to meet South Australian entitlement	**-**	**603,248**

Sources: See footnotes

Table 1 shows that the low estimate of water in Menindee available to NSW Murray water users is nothing, and the high estimate is 603GL, based on the actual opening balance, inflows and Lower Darling environmental releases. The operational releases are calculated according to the Lower Darling Water Sharing Plan. Releases for

[33] WaterNSW (2019) *Real Time Data,* https://realtimedata.waternsw.com.au/

[34] WaterNSW (2018) *Lower-Darling Operations Plan,* https://www.waternsw.com.au/__data/assets/pdf_file/0007/138094/Lower-Darling-Operations-Plan-November-2018.pdf

[35] MDBA (2017) *2016-17 Water Use Acquittal Report – Lower Murray and CLLM Flows – Approved – Appendix B – MDBA QSA Accounting – Excel* (unpublished)

[36] Murray-Darling Basin Commission (2007) *State of the Darling: Interim Hydrology Report,* https://www.mdba.gov.au/sites/default/files/archived/mdbc-SW-reports/17_State_of_the_Darling_Interim_Hydrology_Report_2007.pdf

[37] Blackwatch Consulting (2017) *Menindee Lakes Water Savings Project: Phase 2 Business Case,* https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22publications/tabledpapers/c2508f17-13bd-49a9-85eb-6f0436b70763%22

[38] NSW Department of Primary Industry (2019) *Water Management Fact Sheet: Measurement and comparison of evaporation in water storages,* https://www.industry.nsw.gov.au/__data/assets/pdf_file/0006/218391/Menindee-Lakes-evaporation-fact-sheet.pdf

[39] Murray-Darling Basin Commission (2000) *The Dummies Guide to Sharing the River Murray, http://www.myoung.net.au/water/policies/MDBC_Dummies_Guide_to_Accounting.pdf*

[40] Vertessy and Barma (2019) *Independent Assessment of the 2018-19 Fish Deaths in the Lower Darling Interim Report, with Provisional Findings and Recommendations*, https://www.mdba.gov.au/sites/default/files/pubs/Independent-assessment-2018-19-fish-deaths-interim-report.PDF

Additional Dilution Flows are 3,000ML per day when the Lakes exceed 1,300,000ML and a notional Lakes balance calculated when those releases should have been made. Annual evaporation is based on three government sources that estimate evaporation between 393 and 420GL per annum.

Estimates of the additional amount of water available for NSW Murray water users, if the River Murray System was managed in accordance with the Objectives and Outcomes is shown at **Table 2**.

Table 2: Estimated water available for NSW Murray water users

	Low estimate ML	High Estimate ML
Water flooding in Barmah-Millewa forest[41]	536,152	847,469
50% water availability for New South Wales and Victoria[42]	**268,076**	**423,735**
Water Available for NSW from Menindee Lakes (Refer Table 1)	**-**	**603,248**
Additional Water Available for NSW	**268,076**	**1,026,982**
NSW Murray General Security water shares[43]	1,674,096	1,674,096
Potential NSW Murray General Security allocation	16%	61%

Table 2 shows that if the MDBA operated the River Murray System in accordance with its Objectives and Outcomes, there could have been water available to NSW Murray General Security water users between 268 and 1,027GL, or an allocation of between 16% and 61%.

Southern Basin irrigators had zero allocation in 2018-19 and this is directly attributable to the draining of Menindee Lakes in 2016-17 and the unseasonal flooding of the Barmah-Milawa Forest in 2018-19. This has had a significant economic impact on those growers directly, but also their communities and dry land farmers that have faced record prices for fodder for livestock since 2017, due to the drought.[44]

[41] Based on flow constraints of 9,500ML/day and 7,800ML/day

[42] s94 Schedule 1: Murray -Darling Basin Agreement of the Water Act (Commonwealth) 2007, https://www.legislation.gov.au/Details/C2017C00151

[43] WaterNSW (2019) *NSW Water Register*, https://waterregister.waternsw.com.au/water-register-frame

[44] Thorne and Smith (2019) *Hay shortage prompts farmers to pay big money at clearing sales,* https://www.abc.net.au/news/rural/2019-06-11/hay-prices-hit-record-highs-as-demand-increases-clearing-sales/11199414

Conclusion

The water market has facilitated a significant shift in water ownership in the Southern Connected system. The policy intent of the water market was to move water to its highest value use, which is nuts in the Southern Basin. However, there has been no regulation on the number of permanent plantations being developed, which have been allowed to expand beyond the physical capacity of the system.

The MDBA Chair warned the nut industry that water delivery cannot be guaranteed, and that the industry should be aware of the risks associated with the inability to deliver water to the end of the River Murray. Despite this warning, the MDBA prioritised the end of system demand in the Murray, created by nut plantations and the South Australian entitlement, over the conservation of water upstream that would otherwise have been available to water holders in 2018-19.

In doing so, the MDBA has operated outside its delegation set out under the Murray-Darling Basin Agreement and the partner government's Objectives and Outcomes for operating the River Murray System. This has caused significant ecological damage to the important Ramsar listed Barmah-Millewa Forest and has also left the NSW General Security water holders with zero allocation. If the MDBA had managed the River Murray System within its Objectives and Outcomes between 2016 and 2019, NSW General Security water holders could have received an allocation of up to 61%, or more than 1,000ML of water for production and the environment. This has had a significant economic impact on those growers directly, but also their communities and dry land farmers that have faced record prices for fodder for livestock since 2017, due to the drought.