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SUBMISSION

Independent inquiry into Menindee fish deaths

Office of the NSW Chief Scientist & Engineer

July 2023

Executive Summary

- This fish death event provides an important cause study of the need for water management to look beyond just water quantity, but also to water quality and the necessary complementary measures required to achieve ecological outcomes alongside just water volumes alone.

- The reform in recent decades on 'rebalancing' water volumes and shares has not been met with equal focus, funding or political interest for complementary measures (such as fish passageways and carp control). Neglecting these critically important measures have, in our view, contributed to the magnitude of this fish death event. Further, NSWIC considers that this narrow political focus on water volume (i.e. the "just add water" approach of buybacks), has distracted from providing the necessary investment and attention to complementary measures to make the most of environmental water.

- Large volumes of water were flowing through the river system both during, and preceding, this event. Water diversions for irrigation represent a small proportion of the total water balance, particularly in wet periods such as the recent La Nina years culminating in major flooding before and during the fish deaths event at Menindee.

- NSWIC recommends government funding to implement the NSW Fish Passage Strategy, which provides a coordinated, strategic approach to fish passage remediation to significantly improve native fish access to nearly 9000 km of rivers and off-channel habitats below all major storage dams in the State. Government funding is required for this public good outcome. Current arrangements in IPART pricing determinations to recover costs from water users are prohibitive, and have blocked, hindered and severely limited progression of these measures.

- NSWIC recommends evidence-based measures to address invasive species such as carp, such as expediting the recommendations of the National Carp Control Program. It will be important for the OCSE to investigate the impact carp have had on this fish death event, as the proliferation of carp has sparked a hypothesis that the overwhelming demand on dissolved oxygen was a contributing factor.

- NSWIC is concerned by some commentary attempting to link this event to irrigation or water diversions upstream. Robust data is available from Government agencies to demonstrate: (i) ample water availability during and preceding this event (i.e. it was not due to insufficient water); (ii) that diversions represent a very small proportion of the total water balance; and (iii) significant Held Environmental Water (HEW) is available on this system, particularly below Menindee where environmental water holders own 85% of the Lower Darling's water entitlements.

- NSWIC is concerned by the potential for misinformation to proliferate, and urge this Inquiry remains scientifically robust, undergoes rigorous fact-checking, and verifies data against official sources of information such as government agencies.

Background

This public consultation forms part of the independent review by the NSW Chief Scientist and Engineer into the February-March 2023 fish deaths in the Darling-Baaka River around Menindee.

The event occurred on 17th March 2023, downstream of Lake Pamamaroo and Lake Wetherell, in a 35km stretch of river that extends beyond the Menindee township to the confluence of Menindee Creek.

Reports indicate that an estimated 20 million fish died.

Terms of Reference

In undertaking the Review, the CSE will consider:

1. Likely cause/s of the fish death event, including
    a. Environmental conditions in the lead up to the event
    b. Assessment of relevant monitoring data, including water data, to assist with determining likely causes
    c. Management and sufficiency of water flow at the time of the event

2. Response to the fish death event, including:
    a. Role of the different agencies/departments when responding to the event
    b. Action taken by agencies/departments (including public health response) and others when responding to the event
    c. Role of the State Emergency Management Framework for responding to the event
    d. Communication with the community during the event, including consultation with First Nations people and organisations

3. Recommendations should consider:
    a. Monitoring data and other information that can assist with predicting and responding to fish death events
    b. Appropriateness of the response during the event and potential steps/action that could be taken to enhance the effectiveness of future responses (including preparedness, training, communication and collaboration across groups)
    c. Appropriateness of the State Emergency Management Framework to respond to the event d. Local or other interventions that should be considered to mitigate or avoid future events
    e. Any other matters that the Chief Scientist & Engineer considers relevant

NSW Irrigators' Council

The NSW Irrigators' Council (NSWIC) is the peak body representing irrigation farmers and the irrigation farming industry in NSW. NSWIC has member organisations in every inland valley of NSW, and several coastal valleys. Through our members, NSWIC represents over 12,000 water access licence holders in NSW who access regulated, unregulated and groundwater systems.

NSWIC members include valley water user associations, food and fibre groups, irrigation corporations and commodity groups from the rice, cotton and horticultural industries. NSWIC engages in advocacy and policy development on behalf of the irrigation farming sector. As an apolitical entity, the Council provides advice to all stakeholders and decision makers.

NSWIC welcomes this opportunity to provide a submission to the independent inquiry into Menindee fish deaths.

NSWIC sees this as a valuable opportunity to provide expertise from our membership to inform the response. Each member reserves the right to independent policy on issues that directly relate to their areas of operation, expertise or any other issues that they deem relevant.

Irrigation Farming

Irrigation provides more than 90% of Australia's fruit, nuts and grapes; more than 76% of vegetables; 100% of rice and more than 50% of dairy and sugar (2018-19).

Irrigation farmers in Australia are recognised as world leaders in water efficiency. For example, according to the Australian Government Department of Agriculture, Water and the Environment:

> *"Australian cotton growers are now recognised as the most water-use efficient in the world and three times more efficient than the global average"*[1]

> *"The Australian rice industry leads the world in water use efficiency. From paddock to plate, Australian grown rice uses 50% less water than the global average."*[2]

Our water management legislation prioritises all other users before agriculture (critical human needs, stock and domestic, and the environment with water to keep rivers flowing), meaning our industry only has water access when all other needs are satisfied. Our industry supports and respects this order of prioritisation. Many common crops we produce are annual/seasonal crops that can be grown in wet years, and not grown in dry periods, in tune with Australia's variable climate.

Irrigation farming in Australia is also subject to strict regulations to ensure sustainable and responsible water use. This includes all extractions being capped at a sustainable level, a hierarchy of water access priorities, and strict measurement requirements.

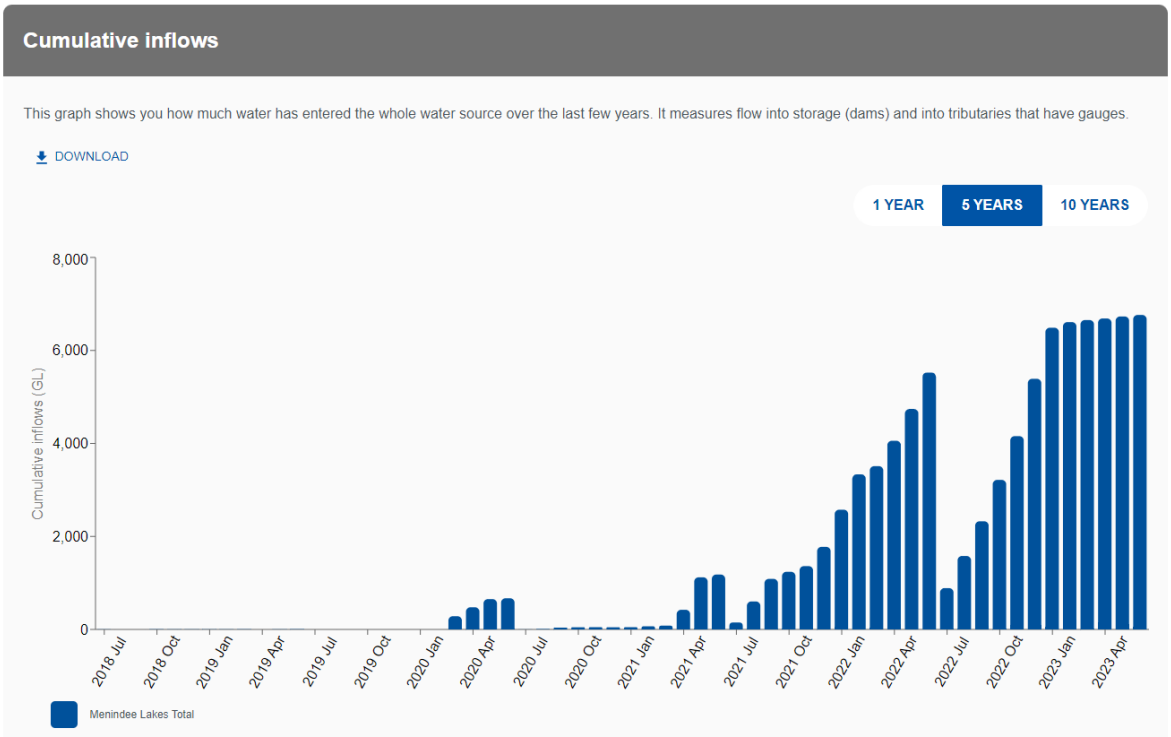
[1] https://www.agriculture.gov.au/ag-farm-food/crops/cotton
[2] https://www.agriculture.gov.au/ag-farm-food/crops/rice

Submission

Significant water availability at the time of, and preceding, the event

La Nina conditions in the last three years resulted in significant rainfall and widespread flooding across the Murray-Darling Basin. There was no shortage of water available, including major flooding and significant flows in both the Barwon-Darling system (flowing into the Menindee Lakes), and in the Lower-Darling.

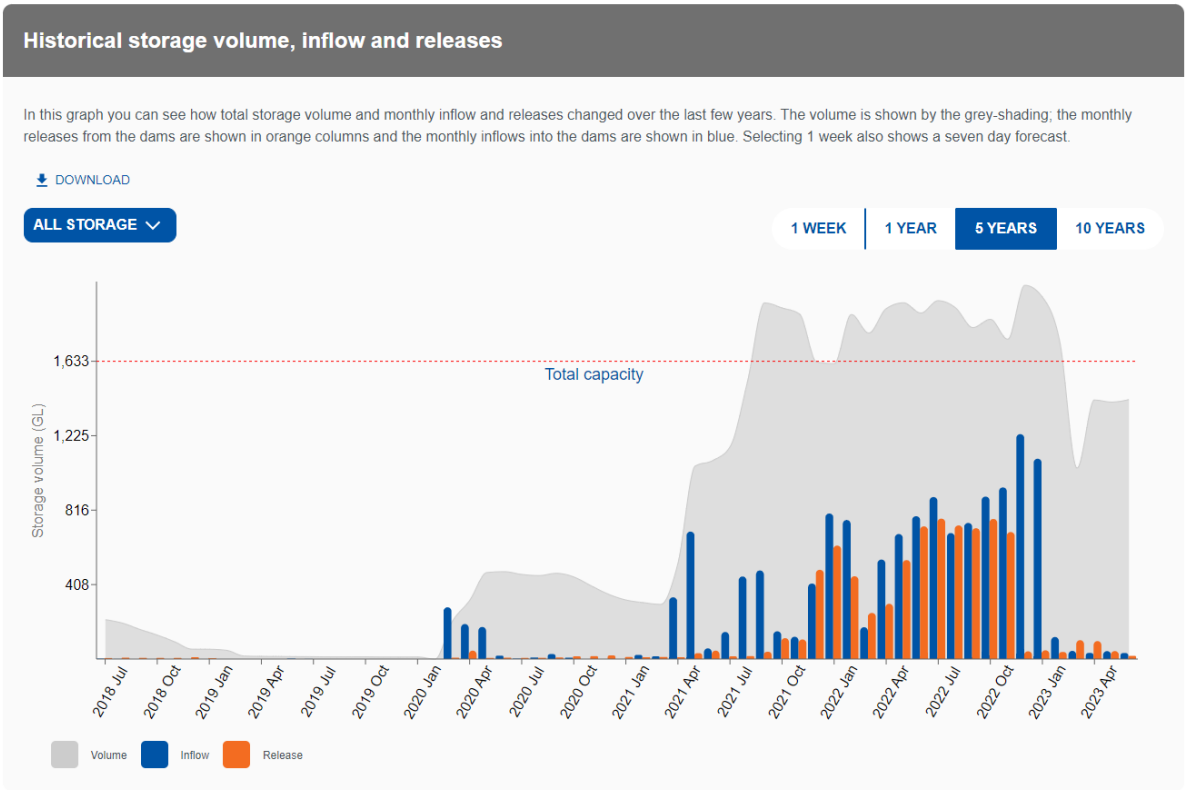
Data from the WaterNSW Water Insights website (below diagram) shows the cumulative inflows into the Lower-Darling in the last five years.



As the above graph shows, following the record drought period with El Nino conditions in 2018/19/20, the swing back to La Nina from early 2021 generated significant inflows that have persisted to current times.

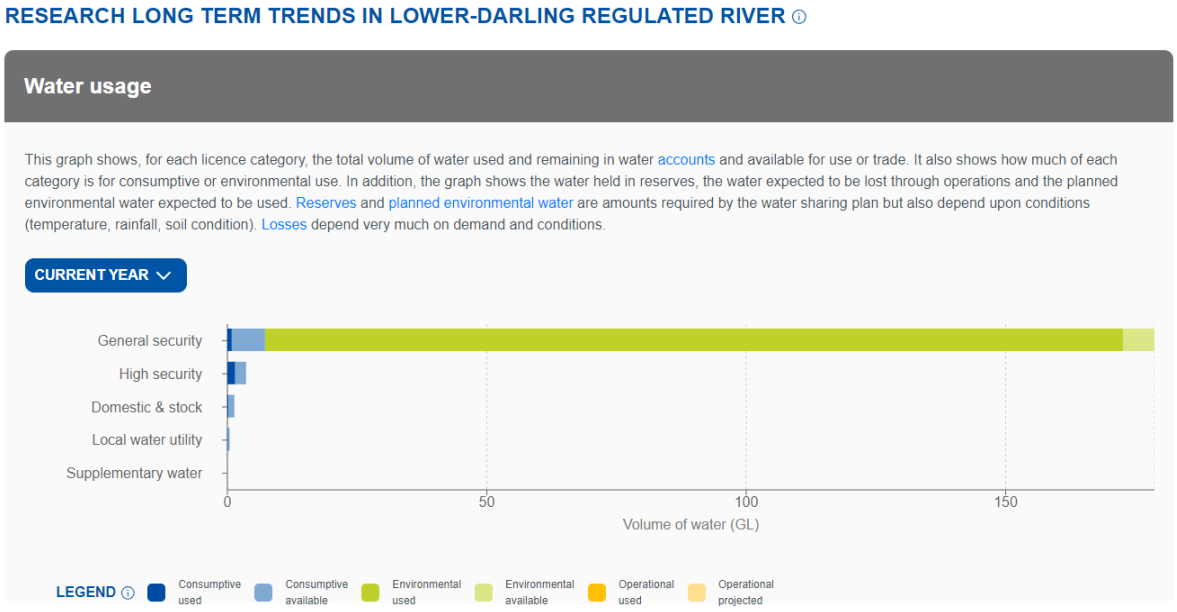
In addition, and as a result of these inflows, the Menindee Lakes have been full, or very high.

Further data from Water Insights (below diagram) shows significant inflows, with the volume of water in storage (grey shaded area) exceeding the total Menindee Lakes' capacity for much of recent times.



[Most water licences on the Lower-Darling are environmental]

In the Lower-Darling water source, 85% of water licences are now owned by State and Commonwealth environmental water holders. This follows water reforms in recent decades where these licences have been bought back from irrigators. This is evident in the below diagram from WaterInsights, where consumptive water is shown in blue, and environmental water in green.



Upstream water use is a very small portion of the total water balance

The vast majority of water remains in rivers and is not diverted.

The purpose of this section is to counter misinformed claims of over-extraction in the Northern Basin.

Actual water usage data

We refer the OCSE to Water Insights (by WaterNSW), particularly the 'comparing water usage in prior years' diagrams for each water source, which show the composition of the full water balance. In these diagrams:

- Blue = Diversions (such as Basic Landholder Rights, Stock & Domestic, General Security, High Security, Local Water Utility, Supplementary Water)
- Green = Environmental (including Planned Environment Water in light green, and Held Environmental Water in darker green)
- Orange = Operational (Storage net evaporation, other outflow, losses).

Border Rivers

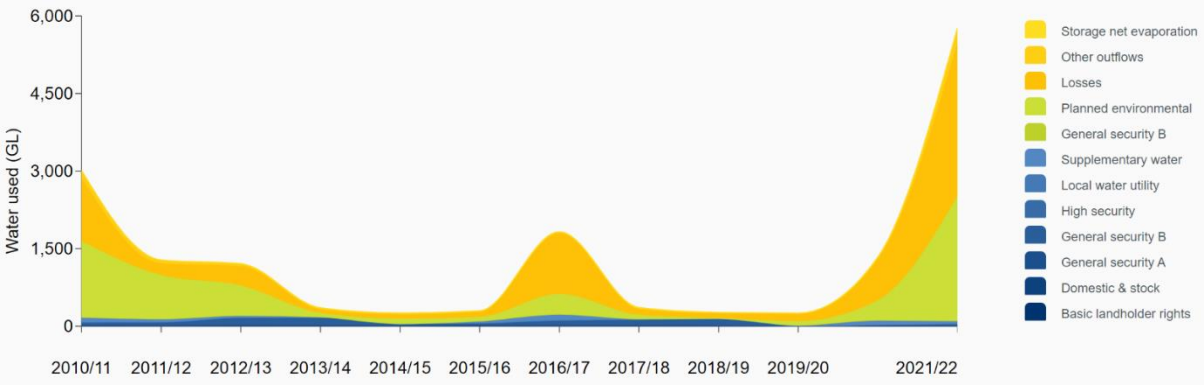


Figure 3: Water usage from 2010/11 to 2021/22 in the Border Rivers regulated River. (Green indicates non-diverted water. Orange and blue indicate diverted water).

Gwydir

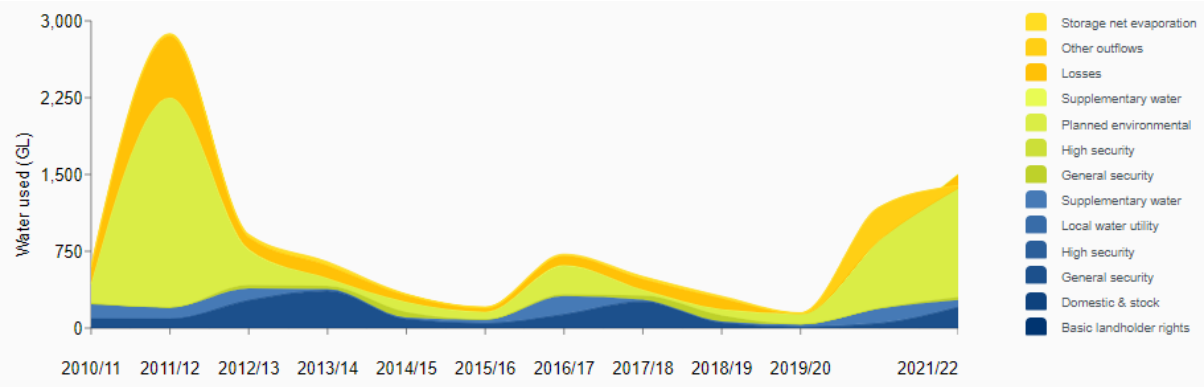
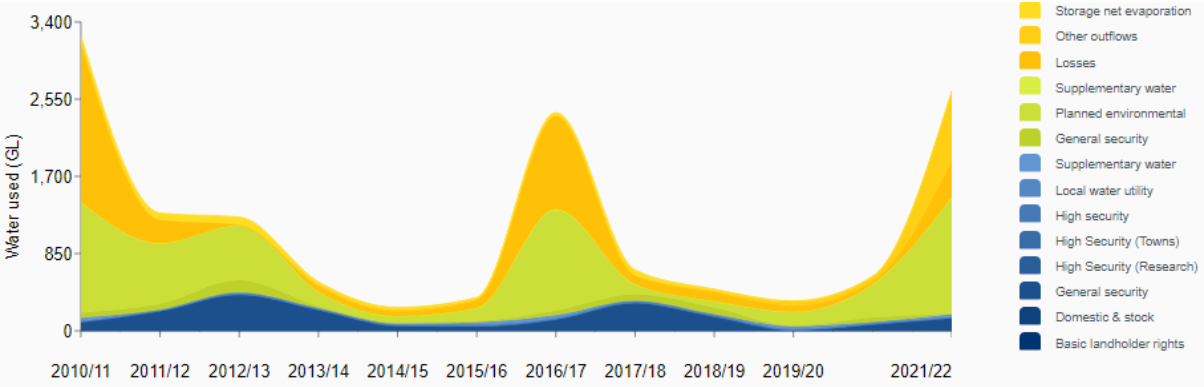
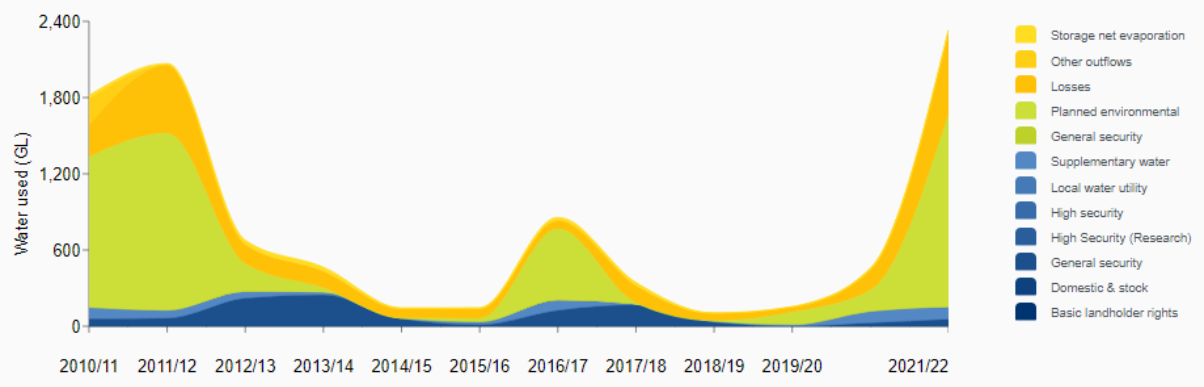


Figure 4: Water usage from 2010/11 to 2021/22 in the Gwydir regulated River. (Green indicates non-diverted water. Orange and blue indicate diverted water).

Macquarie



Lower Namoi



Note – data is not presented in this format for the Barwon-Darling water source as it is an unregulated system. However, the Long-Term Annual Average Extraction Limit (LTAAEL) for the Barwon-Darling is just 6% of the long-term average annual flow, thereby protecting 94% of flows (more on this below).

The key point shown in these diagrams is that water diversions (blue) are a very small proportion of the total water balance. Peaks in diversions in these diagrams show water being drawn down from public storages filled in earlier flood periods, reducing pressure on rivers in low flow periods. The vast majority of water (green and orange) is not diverted. As a further point, this is even more stark in wet years (in which the 2022/23 water year is a wet year).

Water Sharing Plan Extraction Limits

In addition to the actual data shown above, Water Sharing Plans (WSPs) set the Long-Term Annual Average Extraction Limit (LTAAEL) for the water source, which reserves the vast majority of water to be protected from diversion. We refer the OCSE to the respective WSPs for this information on each water source. Three case studies are included below (for an unregulated, regulated-connected, and regulated semi-terminal system), showing the LTAAEL in the WSP, the long-term average annual flow not extracted, and the percentage of long-term average annual flow not extracted.

Table 1: Percentage of water above LTAAELs as explicitly specified in WSPs – 3 case studies.

Water Source	Long-term Average Annual Extraction Limit (megalitres/year)	Long-term average annual flow not extracted	% of long-term average annual flow not extracted
Barwon-Darling[3]	214,000	2,607,000	94%
Macquarie[4]	391,900	1,448,000	73%
Namoi[5]	238,000	870,000	73%

Note (i): This table is simply to show the extent of water above the LTAAEL in each valley. It is not reflective of the full extent of environmental measures in each valley.

Note (ii): The volume of water which can be extracted varies each year based on water availability, subject to a formulaic calculation.

Note (iii): The modelled volumetric calculation of LTAAEL is not explicitly written in a few WSPs (and were thus excluded as case studies above), but this information is held by the Department.

Connectivity

Given the significant water availability and extensive flooding, it is clear that connectivity was not a factor in the fish death event.

However, this section addresses connectivity in anticipation that the issue may be raised.

A significant number of connectivity measures are in place in the northern Basin. These are outlined in the "*Stocktake of northern Basin connectivity water management rules*", from the DPE. These include (but are not limited to):

- Long-term average annual flow, environmental water allowances.
- Held environmental water (and its active management).
- End of system flow rules.
- Flow classes and cease to pump rules.
- Supplementary water sharing.
- The Interim Unregulated Flow Management Plan for the North West (IUFMPNW).

In addition, since this document was developed, additional connectivity rules have been introduced (such as Individual Daily Extraction Components or IDECs, and the Resumption of Flow Rule in the Barwon-Darling). More measures may be considered following reviews mandated in amendment clauses in WSPs.

To use the Border Rivers WSP as an example, there is now an amendment clause relating to flow targets – involving an assessment of critical needs, and the adequacy of existing targets – including an expert panel's recommendations (see image below).

While these rules assist to achieve connectivity in dry periods to meet critical needs, the ephemeral nature of the Barwon-Darling River system must also be acknowledged: it does at

[3] https://legislation.nsw.gov.au/view/whole/html/inforce/2018-11-01/sl-2012-0488 or https://legislation.nsw.gov.au/view/whole/html/inforce/current/sl-2012-0488

[4] https://legislation.nsw.gov.au/view/html/inforce/current/sl-2015-0630#sec.13

[5] https://legislation.nsw.gov.au/view/whole/html/inforce/current/sl-2015-0631

times dry up and cease to flow. We reiterate that connectivity measures for droughts have little relevance to this Inquiry, which is looking into an event that occurred during a sustained wet period. Nevertheless, we want to highlight these measures.

> (1) The Minister may amend Schedule 1 to add, modify or remove flow targets as reasonably necessary to ensure the taking of water under supplementary water access licences does not jeopardise the critical needs of the environment, basic landholder rights, domestic and stock access licence holders and local water utility access licence holders in the Barwon-Darling River.
>
> (2) Before making any amendment under subclause (1) and before 1 July 2023, the Minister will:
>
> (a) undertake an assessment of:
>
> (i) the critical needs of the environment, basic landholder rights, domestic and stock access licence holders and local water utility access licence holders in the Barwon-Darling River,
>
> (ii) the adequacy of the existing flow targets to meet those needs,
>
> (iii) any changes to the flow targets that would be required to meet those needs, and
>
> (iv) the impact of those changes to flow targets on the long-term average annual total amount of water able to be extracted under supplementary water access licences in the water source,
>
> (b) seek and consider recommendations from an independent expert panel on:
>
> (i) the adequacy of the assessment in (a), and
>
> (ii) any changes to the flow targets in (a)(iii) required to meet the critical needs of the environment, basic landholder rights, domestic and stock access licence holders and local water utility access licence holders in the Barwon-Darling River, and
>
> (c) consider the views of stakeholders and other community members on the expert panel's recommendations.

Lack of political focus on complementary measures such as fishways or invasive species control

Water reform in the Murray-Darling Basin this century has focused primarily on addressing over-extraction, which was considered the biggest issue of the 1990s and early 2000s.

Since then, the Murray-Darling Basin Plan has recovered more than 2100 GL of water from the irrigation pool (more than four Sydney Harbours), for the environment.[6] To put this into perspective, this has removed one in three litres of irrigation water (when combined with the 875 GL recovered in pre-Basin Plan water reforms[7]). This is in addition to a host of rule changes, which have all changed water use patterns and volumes.

[6] https://www.mdba.gov.au/progress-water-recovery

[7] https://www.mdba.gov.au/sites/default/files/docs/Pre-2009-water-recovery-table-2017.pdf

As a result, total diversions for irrigation, towns and industry have reduced to just 28% of inflows.[8] This is now well within globally accepted standards for water diversions,[9] and has been a significant change.

However, while significant environmental gains have been achieved, just adding more water from farmers alone can only go so far. Scientists have rightly pointed out that:

"While recovering water will provide good outcomes, as a sole intervention, it is not enough to deliver the desired environmental benefits…

… recovering water is not enough to deliver all the anticipated environmental benefits. In a highly modified system, equal attention should be given to addressing other threats that water delivery alone cannot ameliorate."[10]

Now, the biggest environmental degradation drivers in the Murray-Darling Basin include:

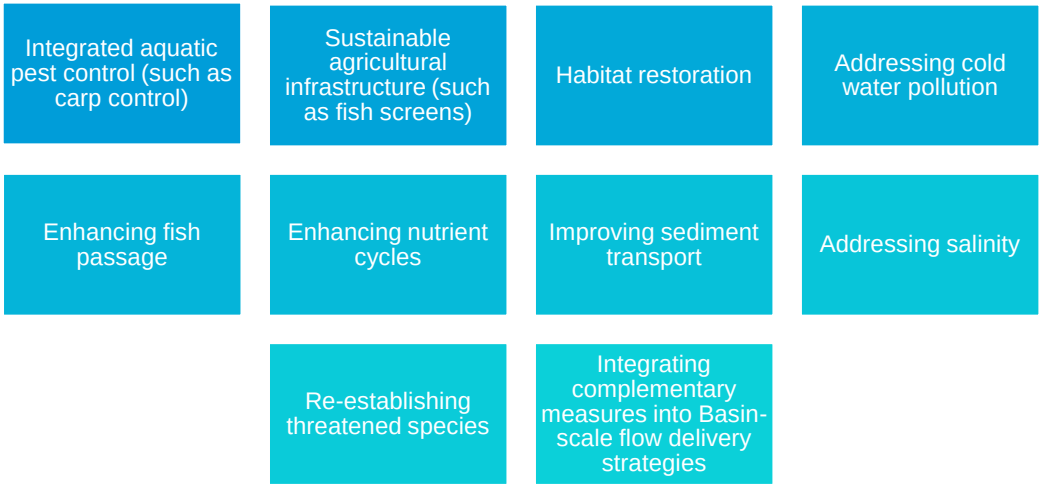
- Invasive species (i.e., carp now make up 90% of fish biomass in some areas, damaging habitat and riverbanks, and causing poor water quality).
- Habitat degradation for native species.
- Barriers to fish passage (such as weirs), and lack of fish screens on pumps.
- Poor water quality (i.e., blackwater events) and cold-water pollution.

Addressing these drivers requires moving beyond just water sharing, to other levers (i.e., complementary measures).

NSWIC is deeply concerned that the focus on "just adding water", with a political fixation on recovery volumes, has distracted political will and financial investment from the very measures that are deeply needed to address these key ecological challenges.

Scientists have already identified the types of measures that should be used to complement environmental watering and river flows in the Basin.

For example, Baumgartner et al (2019)[11] identify 10 complementary measures to assist with environmental watering programs in the Basin. These are:



[8] Calculated based on figures in the Basin Plan (2012) legislation of average annual inflows of 32,533 GL, and watercourse diversions (pre–Basin Plan) of 10,890 GL, minus the 2,100 GL recovered through the Basin Plan and the 875 GL recovered pre-Basin Plan.
[9] N. Leroy Poff et. al (2009) "The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards": https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2427.2009.02204.x
[10] Lee J. Baumgartner, P Gell, J D Thiem, C Finlayson, N Ning (2019) "Ten complementary measures to assist with environmental watering programs in the Murray–Darling river system, Australia": https://onlinelibrary.wiley.com/doi/abs/10.1002/rra.3438
[11] https://onlinelibrary.wiley.com/doi/abs/10.1002/rra.3438

Further information on each of these can be found in the peer-reviewed journal article by Baumgartner et al, and in the NSWIC Beyond Buybacks campaign.[12]

Particular case studies are highlighted below.

Fish Passage

Fish passage is important to enable native fish to migrate, which is important for key life stages.

Barriers – such as the more than 2000 dams and weirs in NSW – physically restrict this migration, and with it, access to spawning grounds, nurseries and preferred habitats.

NSWIC recommends the OCSE investigates what role improved fish passageways could have played to mitigate this event, as well as the need for improvements to fish passage generally to boost native fish population health.

NSWIC notes that an NSW Fish Passage Strategy has been developed by the NSW Ministerial Task Force on Fish Passage to deliver a coordinated, strategic approach to fish passage remediation. The strategy is a 20-year plan to restore unimpeded fish passage to 165 high priority weirs, which will significantly improve native fish access to nearly 9000 km of mainstream rivers and key off-channel habitats below all major storage dams in the state.[13]

NSWIC is concerned that insufficient government funding has been provided to fund the strategy, and what this means for project delivery.

Without State or federal government funding, progress on fish passage works depends on funding through IPART water user charges. Under that pricing framework, farmers pay 80% of these charges for what is an environmental strategy in the public interest.

This cost-recovery framework (based on the impactor-pays principle) is regarded as outdated, and not consistent with the National Water Initiative user-pays principle. This framework is unable to capture or value public-interest items such as fish passageways. And in practice, with farmers' water charges already very high and rising every year to cover a wide range of operational and infrastructure costs linked to water management, the bottom line is these important environmental projects will never be sufficiently funded under this framework.

NSWIC recommends that State and federal Governments fully fund the NSW Fish Passage Strategy) if they are serious about addressing degradation drivers contributing to fish death events.

Invasive species – carp

Carp (cyprinus carpio) are described as "*one of the worst introduced pest species in Australia*"[14], and now accounts for up to 90% of fish biomass in some areas of the Basin.[15]

Following recent widespread flooding, many irrigators and landholders reported seeing a significant boom in carp numbers. For example, the below footage from near Moulamein in the NSW Murray valley earlier this year shows booming carp numbers causing the water to bubble in appearance.

[12] https://mcusercontent.com/c6e5c2d75b14461767c095feb/files/a5b591bb-6d1a-9475-a5e5-119d75679d5d/2023_01_31_Beyond_buybacks_Campaign.pdf
[13] https://www.dpie.nsw.gov.au/water/plans-and-programs/nsw-water-strategy/toward-2050/priority-3
[14] https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/pest-animals-and-weeds/national-carp-control-plan
[15] https://www.dcceew.gov.au/water/cewo/carp-murray-darling-basin

The DCCEEW outlines how carp contribute to environmental degradation in the Basin, with reported impacts including:

- reduced water quality;
- river-bank damage;
- contributing to algae blooms; and,
- impact on freshwater habitat at the expense of native fish species and aquatic vegetation.[16]

NSWIC has heard reports that booming carp numbers caused a spike in oxygen demand, contributing to the Menindee fish death event. This hypothesis is important for the OCSE to investigate. Further, NSWIC recommends the OCSE also investigate how the proliferation of carp throughout the system has more broadly contributed to fish death events elsewhere, such as through worsening water quality, contributing to algae blooms, habitat destruction and impacts on the food chain.

As above, while a lot of government focus and funding has gone towards water recovery from farmers to increase environmental flows, the same sense of urgency, financial investment and political attention has not gone towards carp control measures.

NSWIC recommends the OCSE considers recommending expediting the National Carp Control Program.

Misinformation must be corrected, and cannot interfere with this the robustness of this Inquiry

NSWIC is concerned about misinformation surrounding the fish deaths, particularly relating to water management, diversions and irrigation. It is critical that this Inquiry is scientifically robust, evidence-based and informed.

NSWIC would like to bring attention to two common misconceptions.

1) Water allocations

In an article authored by Richard Kingsford and published in The Conversation on March 20th, it was claimed (without context):

"Just last week, before news of the fish kills at Menindee, water allocations announced by the NSW Government in the Namoi and Gwydir Rivers were at 113% and 275% respectively."

Water allocations in wet years must be understood in the context of continuous accounting used in these valleys. This method produces apparent cumulative allocations that do not reflect the actual water individual farmers can access and limits on water in their accounts.

Continuous accounting enables irrigators to manage their allocations through wet and dry sequences, allowing them to store water when it rains to use when it doesn't. Put simply, while water continues to be allocated reflecting inflows, when an irrigator's account is full (i.e.

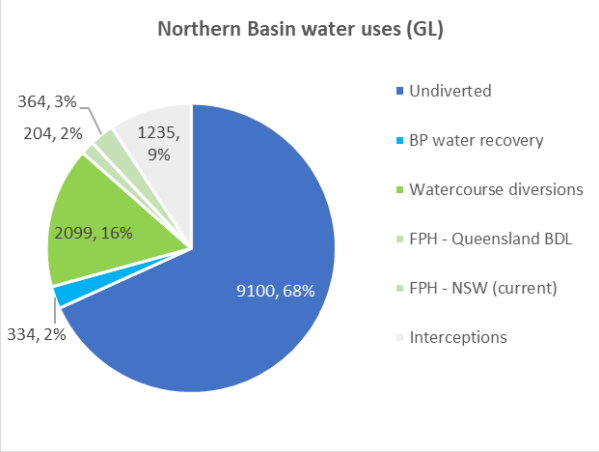
[16] https://www.dcceew.gov.au/water/cewo/carp-murray-darling-basin

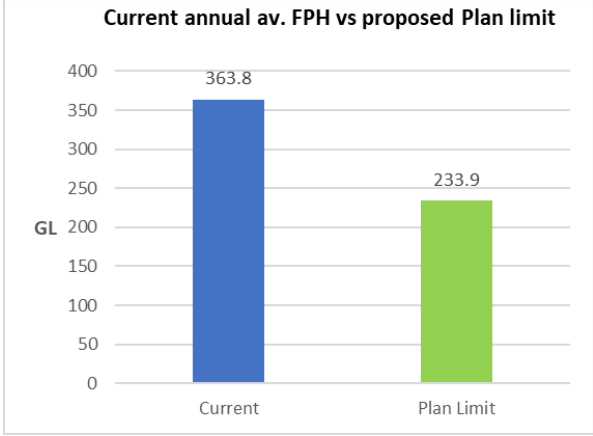
reached íts limit) that irrigator forfeits any additional water allocated, which goes to other irrigators who still have room in their account. This does not mean a greater share of flows is diverted, rather it redistributes the consumptive share amongst irrigators with capacity left in their accounts.

2) Floodplain Harvesting

NSWIC has heard some (unsubstantiated) commentary attributing Floodplain Harvesting (FPH) to the fish deaths. These comments are misinformed and require careful scrutiny.

Firstly, FPH represents a small proportion of the total water balance, which is being made even smaller as a result of the FPH reform. As shown below, FPH in NSW comprises just 3% of the total water balance, and in QLD just 2% of the total water balance (prior to regulation). The reform to FPH has seen a reduction to volumes of FPH by about one-third, to ensure total water take complies with the SDLs under the Basin Plan.





For further information on FPH reform, see the NSW DPE Healthy Floodplains Library with extensive resources including myth busting documents [HERE]. Additionally, NSWIC myth busting resources can be found [HERE].

Secondly, NSWIC notes little FPH occurred in the floods around the time of this event, largely because most on-farm storages were already full from earlier widespread flooding events before the flooding event that immediately preceded the March fish deaths are Menindee. This anecdotal account can be verified with data from NRAR and DPE.

3) Runoff

NSWIC notes concerns/hypothesis relating to potential pollutants entering the waterways, such as from agriculture. Whilst this must be thoroughly investigated, NSWIC notes that it is a legal condition for any water from an irrigation property to be held on-farm, and not re-enter natural waterways, due to the risk of it being potentially contaminated.

4) Ephemeral River System

NSWIC is concerned by public misunderstanding of the ephemeral nature of this river system, undermining confidence in the management of this system. DPE has a range of resources to try and improve public water literacy on this, for example:

"A constantly flowing river is not normal for the Barwon-Darling region. The river stopped flowing for extended periods even before there were large dams and significant agricultural water use upstream. There is a relationship between the river drying and dry climatic periods. When we don't get a lot of rain, the river is more likely to stop flowing."[17]

The technical reports for the Western Regional Water Strategy also go into this, saying:

> *"During dry periods, restricting upstream access is not effective because there is no water to protect"*[18]
>
> *"Placing restrictions on low priority licences upstream – such as supplementary, floodplain harvesting, B-Class and C-Class licences – is unlikely to result in significant changes in flow downstream or at the end of the system during droughts and is unlikely to slow the depletion of water in Menindee Lakes during droughts. This is because these licences rely on large natural flow which often do not occur during droughts."*[19]
>
> *"Longer cease to-flow events are more likely to be driven by the climate, rather than irrigation development because very little inflow occurs during these extended dry events."*[20]
>
> *"Even at the turn of last century, when there was little agricultural development upstream, there were long periods when the river did not flow."*[21]
>
> *"Figure 1 demonstrates that during critically dry periods, restricting upstream access would not have significantly stopped or slowed the depletion of Menindee Lakes regardless of implementing a 195 GL total, 195 GL active, or 480 GL trigger. This is because during the last drought there were limited flows upstream to restrict."*[22]

It will be critical in the OCSE Inquiry that these facts are presented to correct misinformed public perception.

Conclusion

NSWIC is available to discuss any of the matters raised in this submission further.

Kind regards,

NSW Irrigators' Council.

[17] https://www.industry.nsw.gov.au/__data/assets/pdf_file/0010/404668/river-flows-and-climate-over-time.pdf

[18] https://www.dpie.nsw.gov.au/__data/assets/pdf_file/0003/548202/western-regional-water-strategy.pdf [P 91].

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