

River Murray Sediment Investigations

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24 September 2024



Australian Government



**MURRAY—
DARLING**
BASIN AUTHORITY

Acknowledgement of Country



Overview

- The Barmah-Millewa Reach
- The Barmah-Millewa 'Sand Slug'
- Where did it come from?
- How can it be managed?

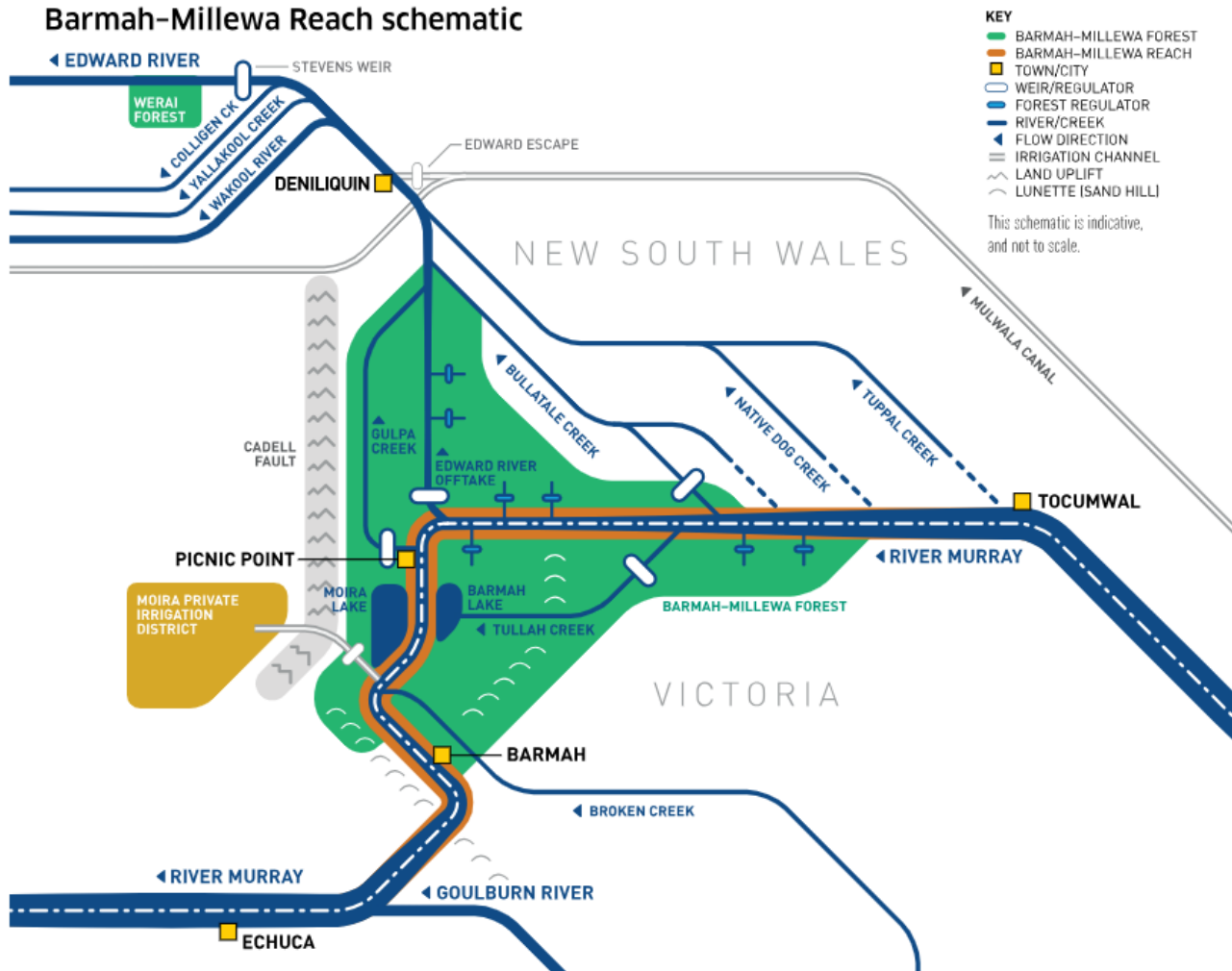
The Barmah-Millewa Reach



River Murray System



Barmah-Millewa Reach



60 km



Barmah-Millewa Forest is a listed **Ramsar Wetland** and one of the **Living Murray Icon Sites**





The BMF is a natural and cultural landscape of great significance to Traditional Owners



Image courtesy of Water Technology 2019

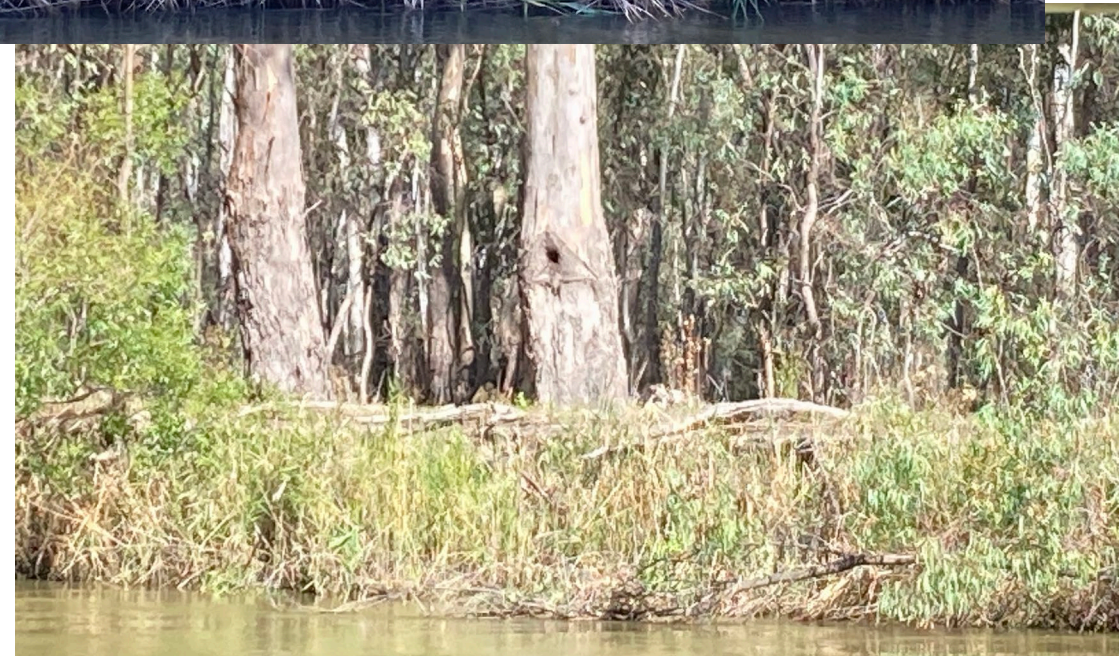
Changes in capacity

- Capacity decline:

- 1980's 11,300 ML/d
- >1996 10,600 ML/d
- >2019 9,200 ML/d

Release from Yarrawonga Weir for 2.6m
water level at Picnic Point

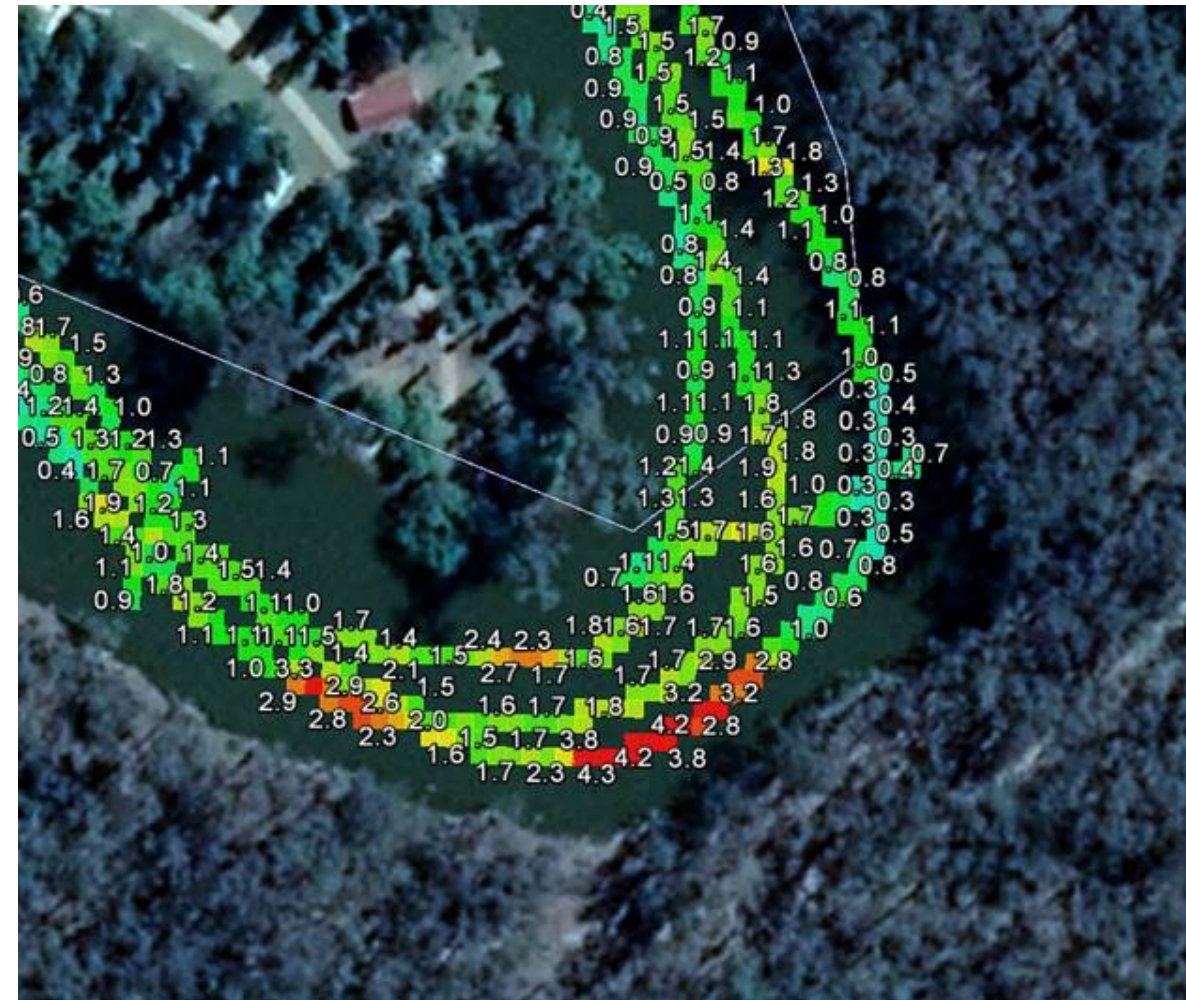
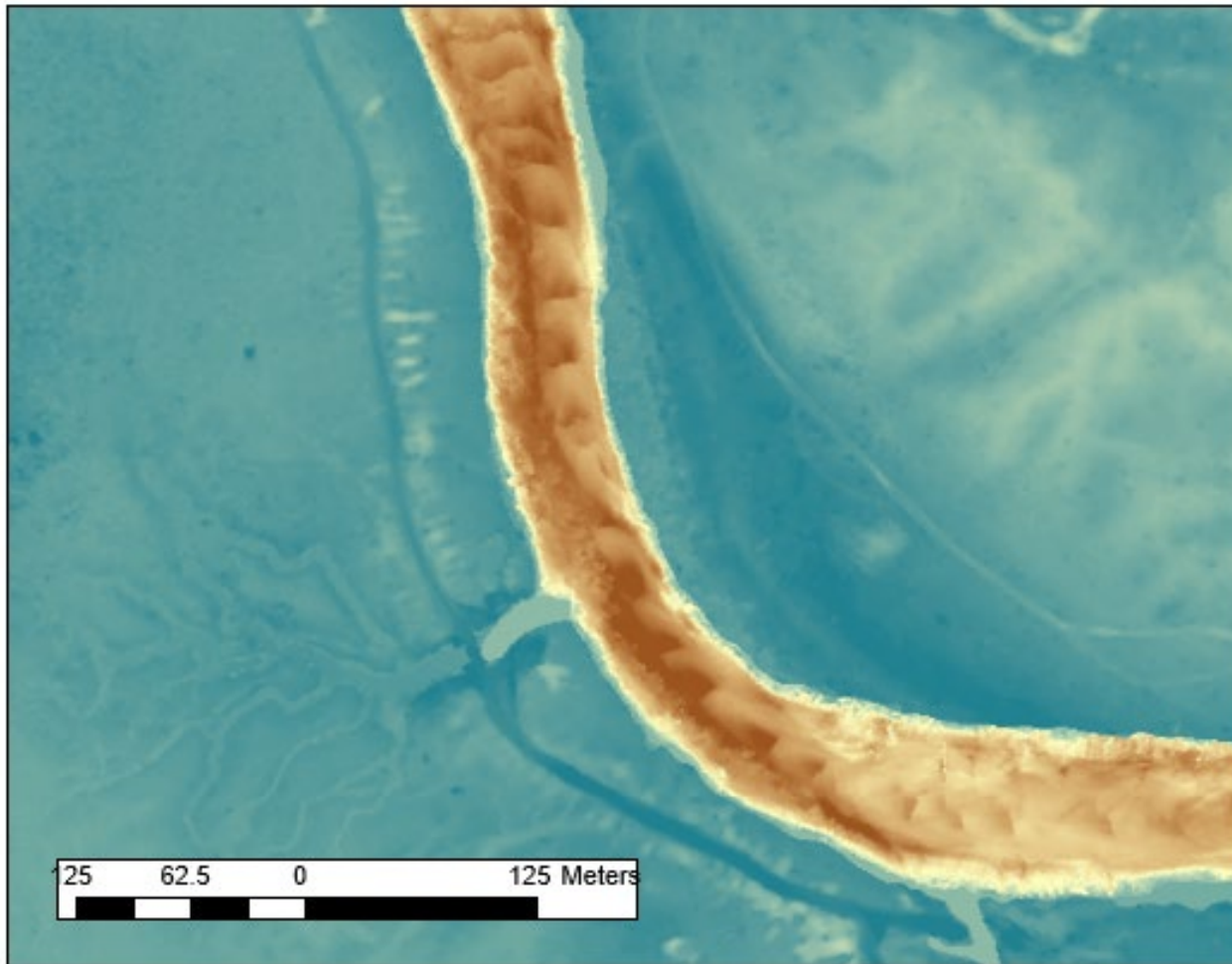
- Cross sections every 10 years
from 1976 – no clear answer



The Barmah-Millewa 'sand slug'



2018 Barmah–Millewa channel survey

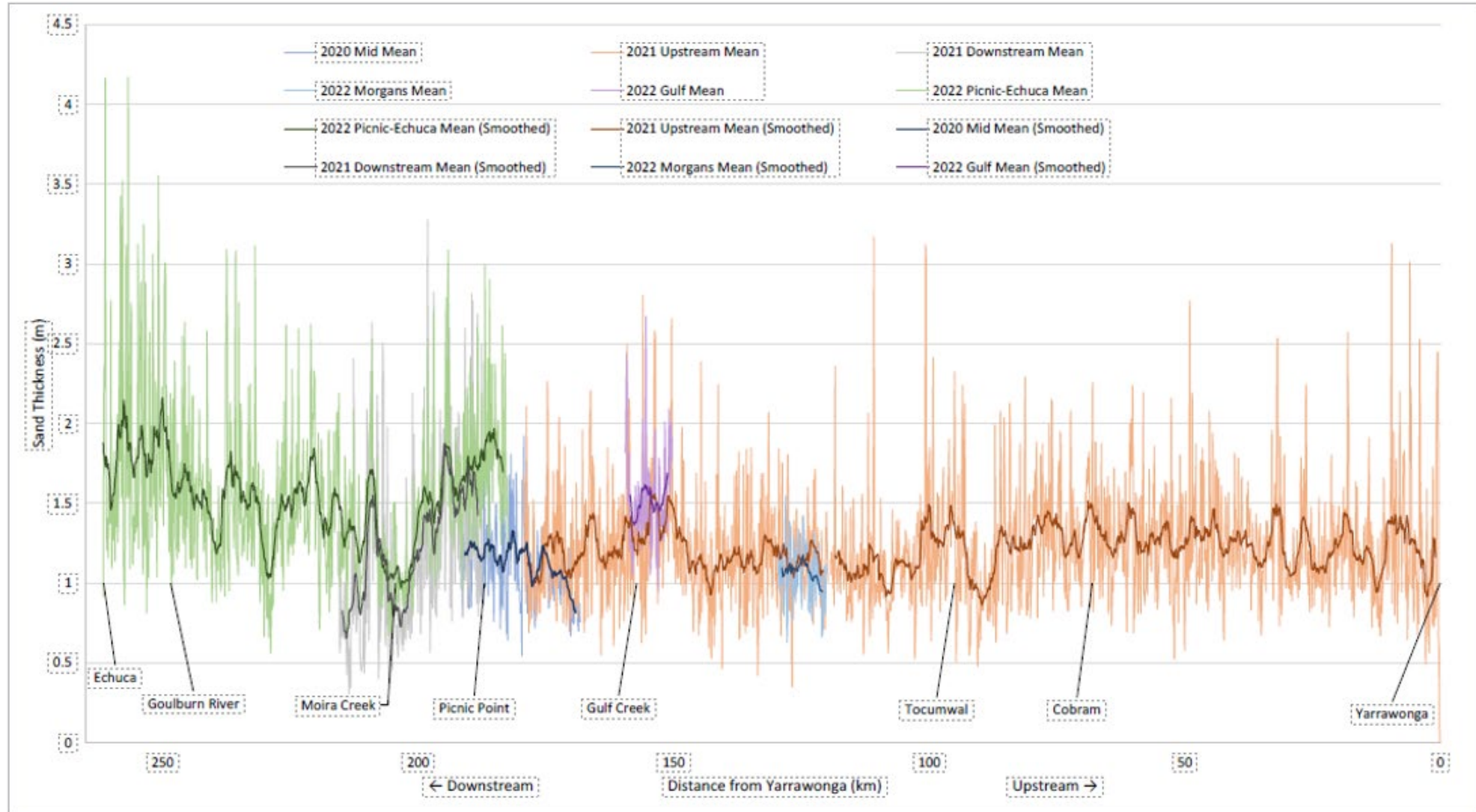


Barmah to Echuca – Sand Tickness

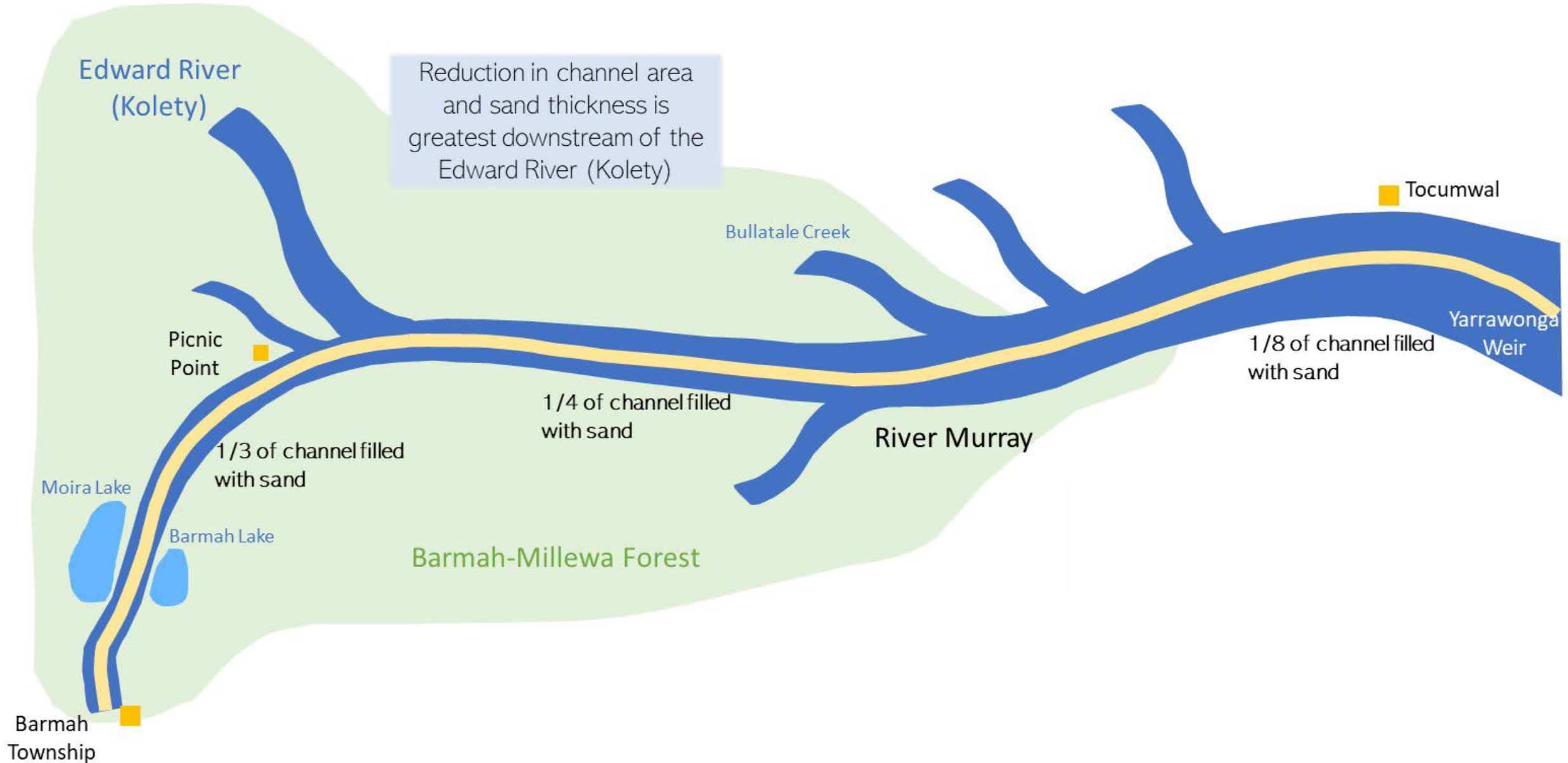
Sand depths consistent with previous survey

Further accumulation around Picnic Point

Sand extends to Echuca

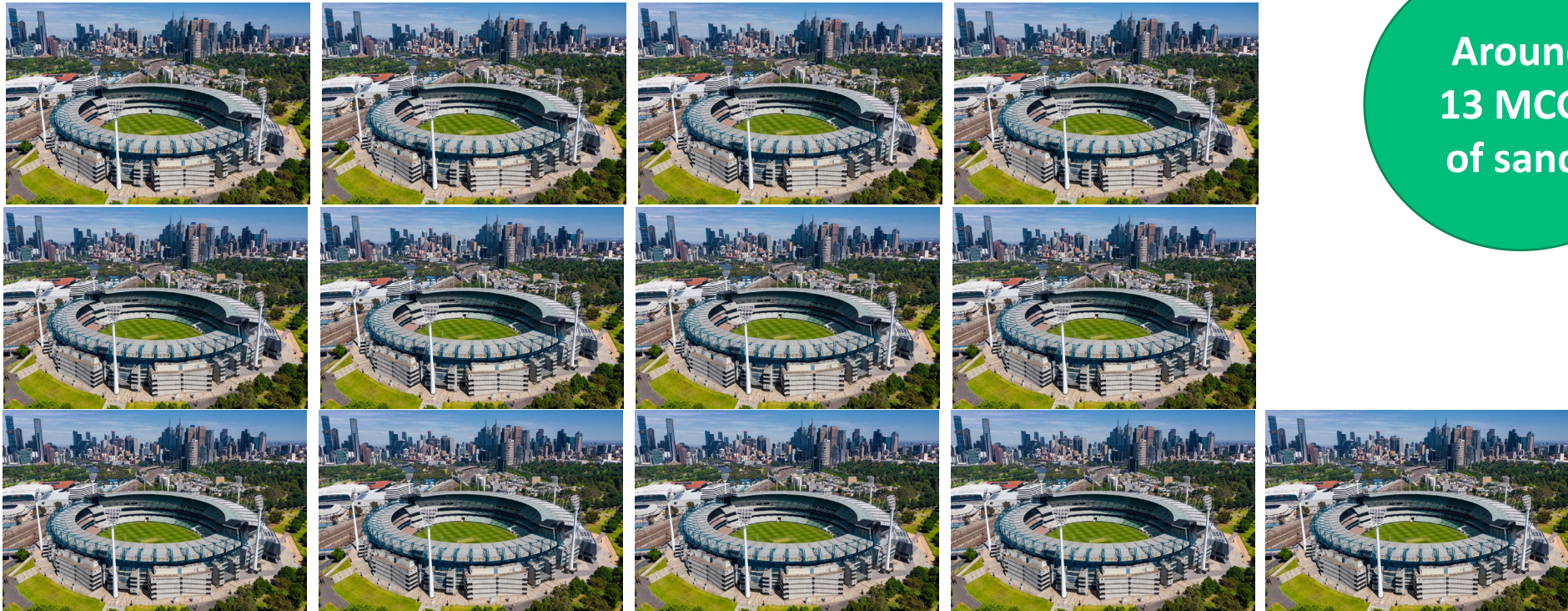


Reduction in channel area



Sand slug size

- Volume of sand in the channel from Yarrowonga to Picnic Point is in excess of 20 Million m³



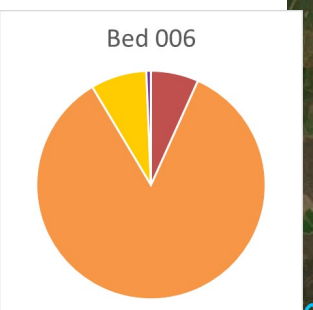
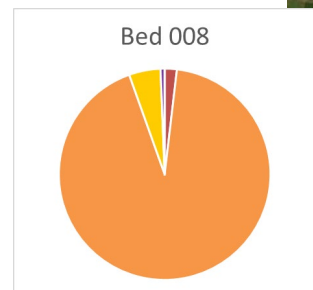
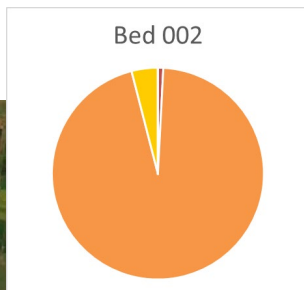
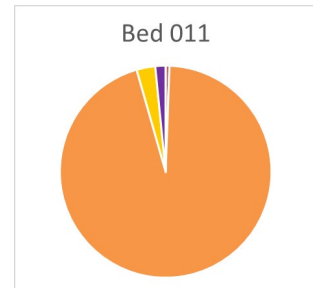
Around
13 MCGs
of sand!

**Where did it come
from?**

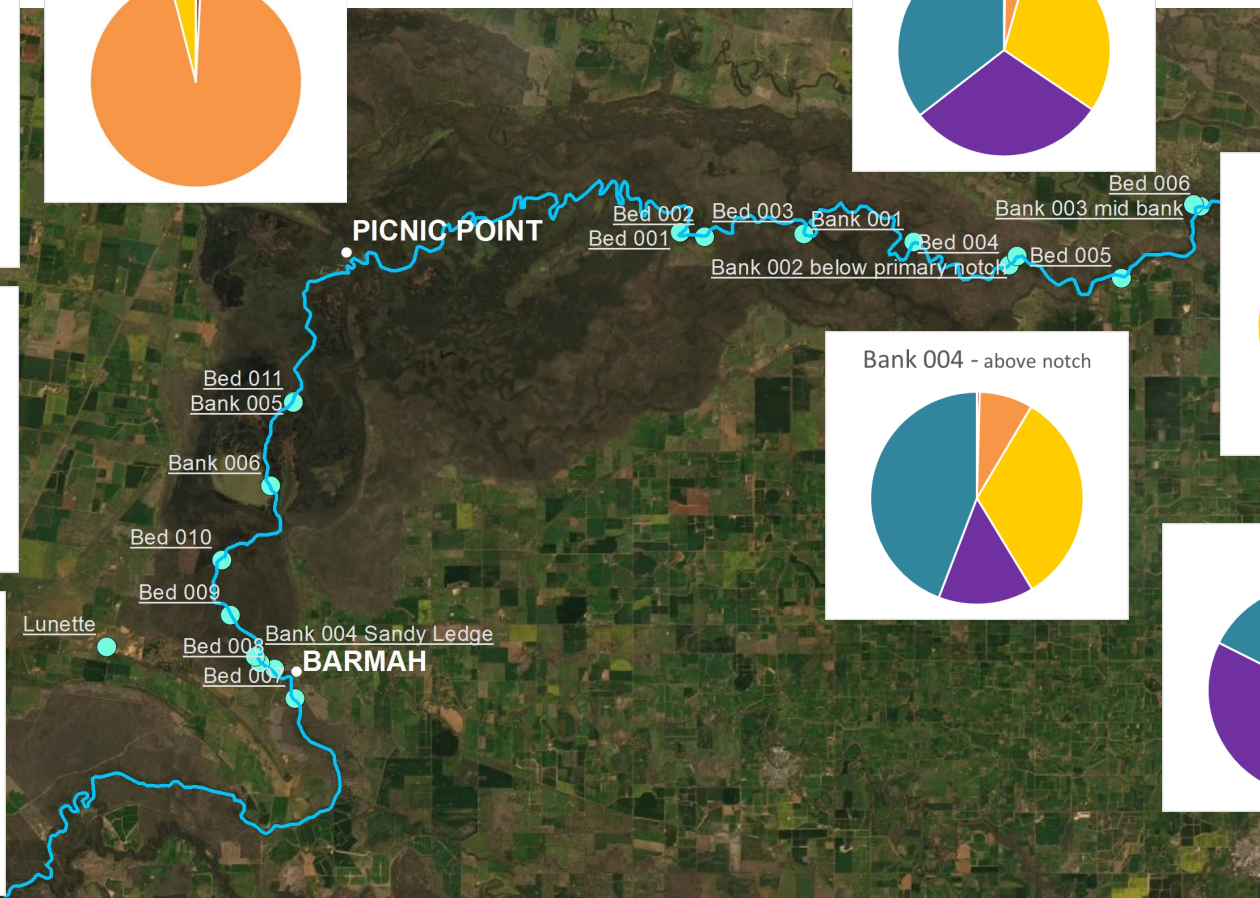
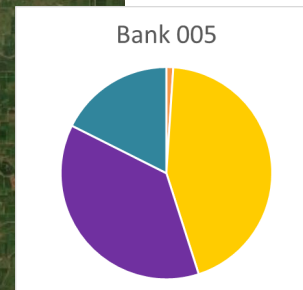
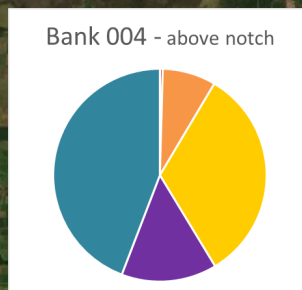
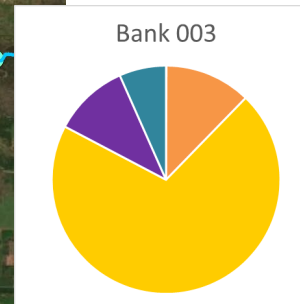
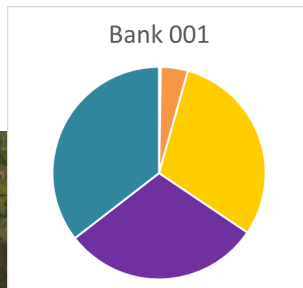


'Sediment slug' grainsize

Bed samples



Bank samples



- Gravel (2.00-4.75 mm)
- Coarse Sand (0.2-2.0 mm)
- Fine Sand (0.02-0.2 mm)
- Silt (2-20 μm)
- Clay (< 2 μm)



Sand slug likely sources

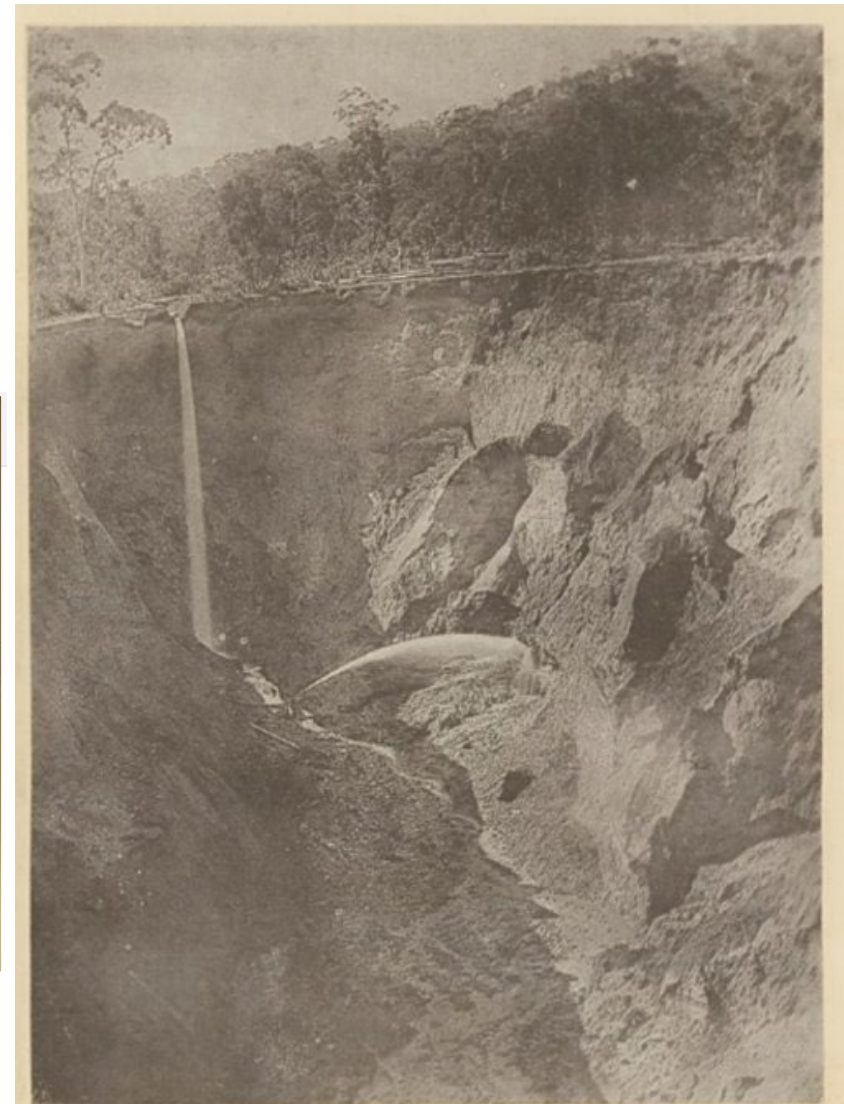
Sediment Source	Volume Mobilised (approx.)
Gold mining (1859-1891)	>100 Million m ³
Post-European land use change (1859-1891)	~15 Million m ³
Bank erosion (1876 - ongoing)	~2.5 Million m ³
Point bar erosion (1940 - ongoing)	~1.5 Million m ³

Less than a quarter of the sand in the reach

Land clearing and gold mining



Beechworth and
Mitta Mitta gold
mining



UNION CO.'S CLAIM, MITTA MITTA, WITH 3" NOZZLE AT WORK.

Changes to the landscape

Dredging



De-snagging

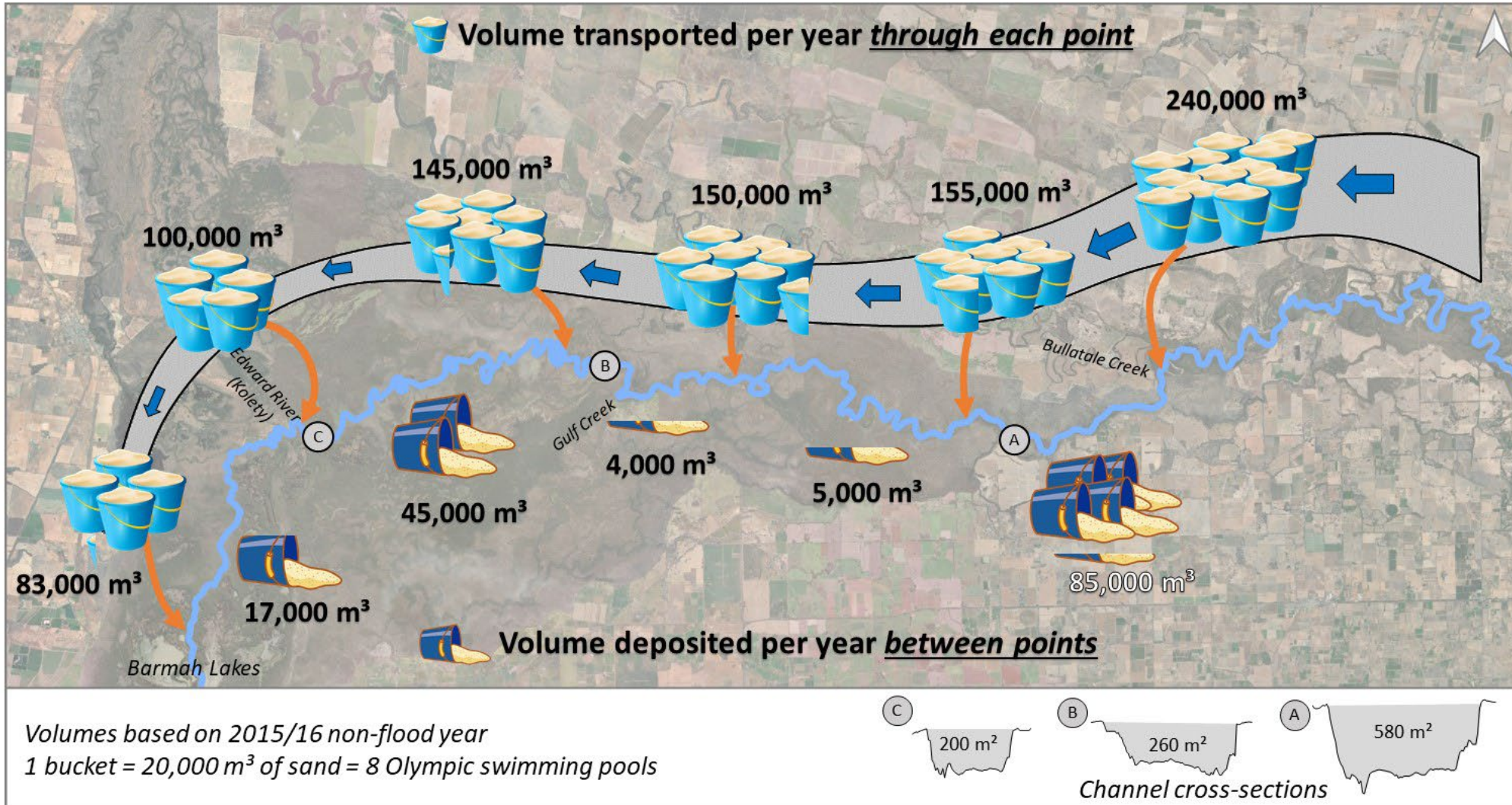


B 419

**How can it be
managed?**



Could we flush the sediment through?



100+ years

Impact of 2022 flood on sand movement

Repeat bathymetry in 2023

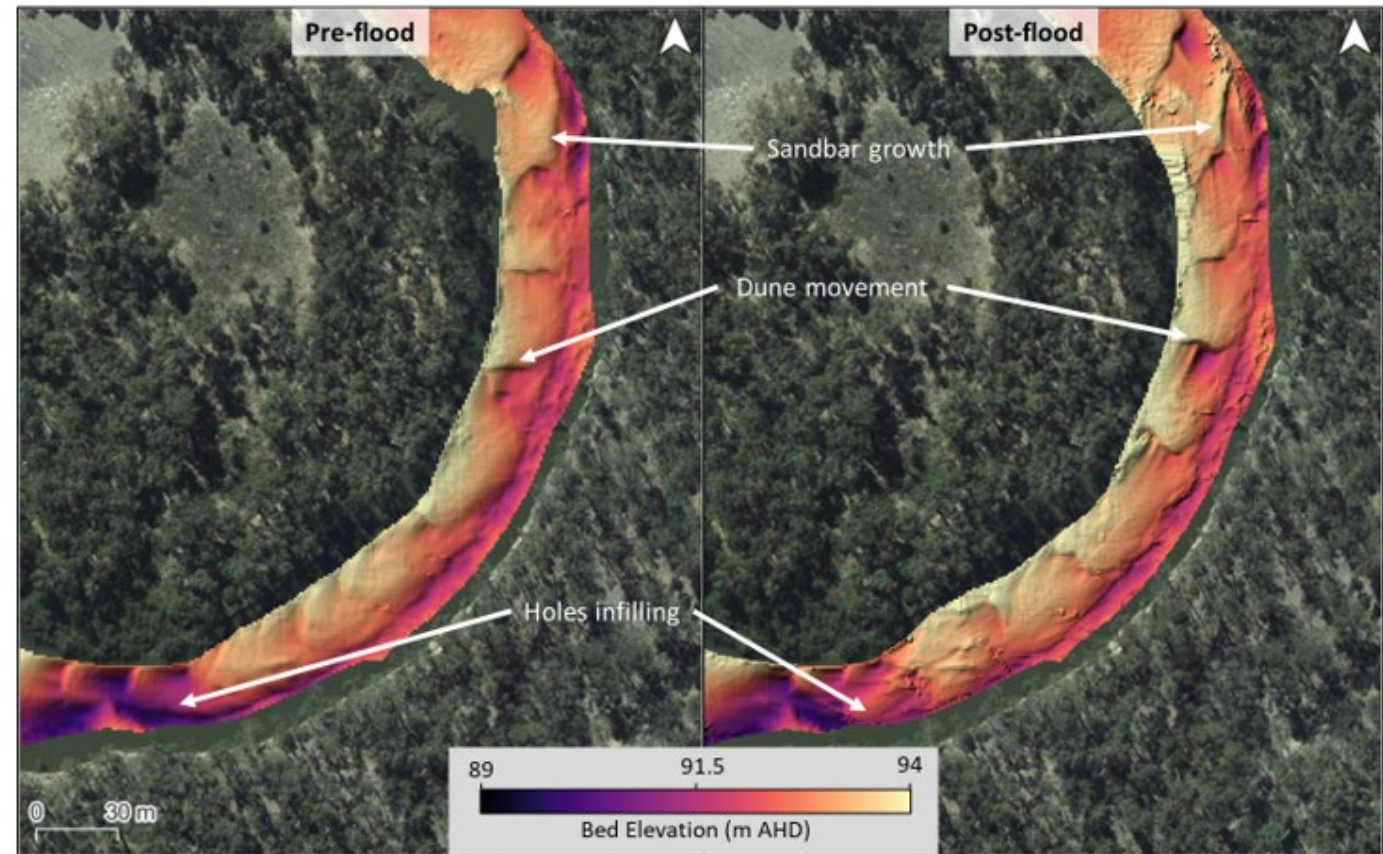
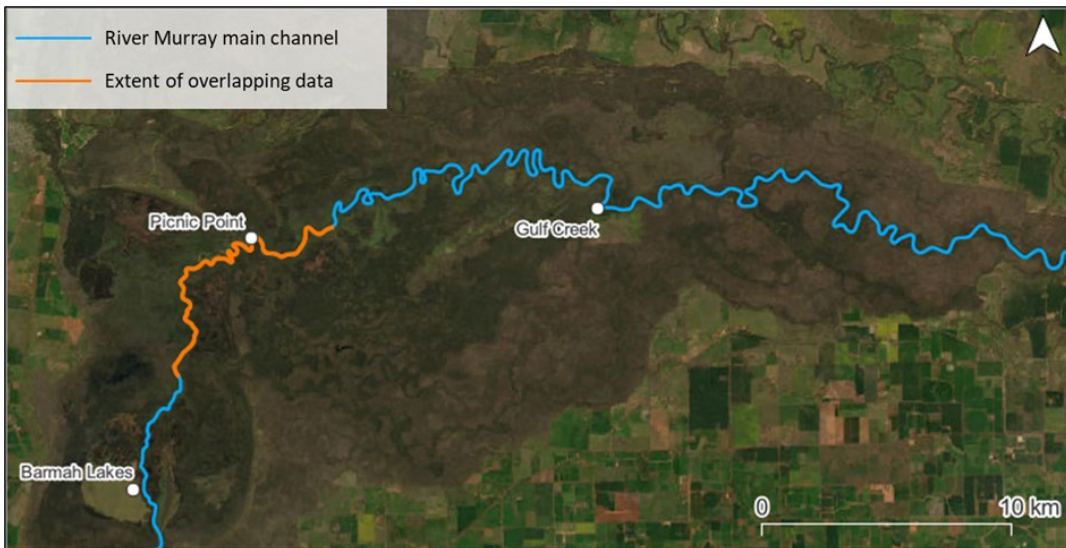
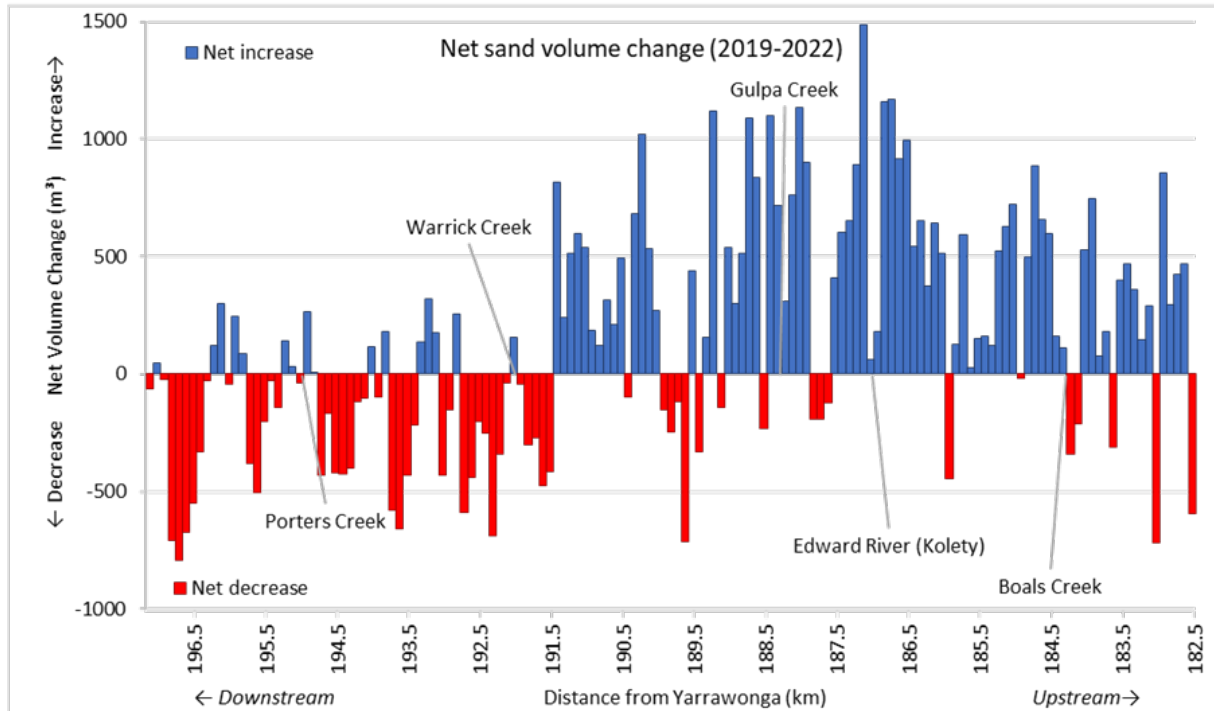


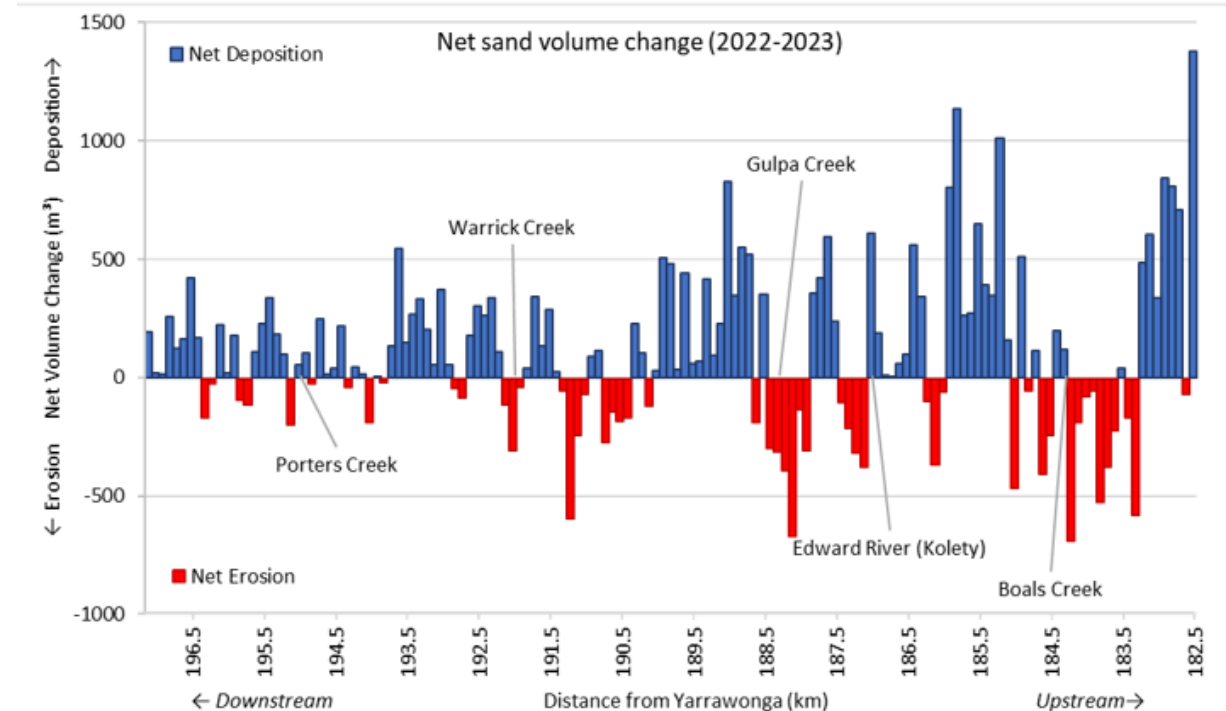
Figure 3. Bed elevation maps from pre- and post-flood showing changes to bedforms.

Net change in volume of sand (100 m sections)

2019 -> 2022



2022 -> 2023



- Continued overall movement of sand from upstream to downstream into the narrow section of the reach
- Increase in bed level at key section for hydrological control around Picnic Point
- Flow gaugings indicated reduction of capacity d/s Yarrawonga from ~9,200 to ~8,300 ML/day

What if we do nothing to manage the sand?

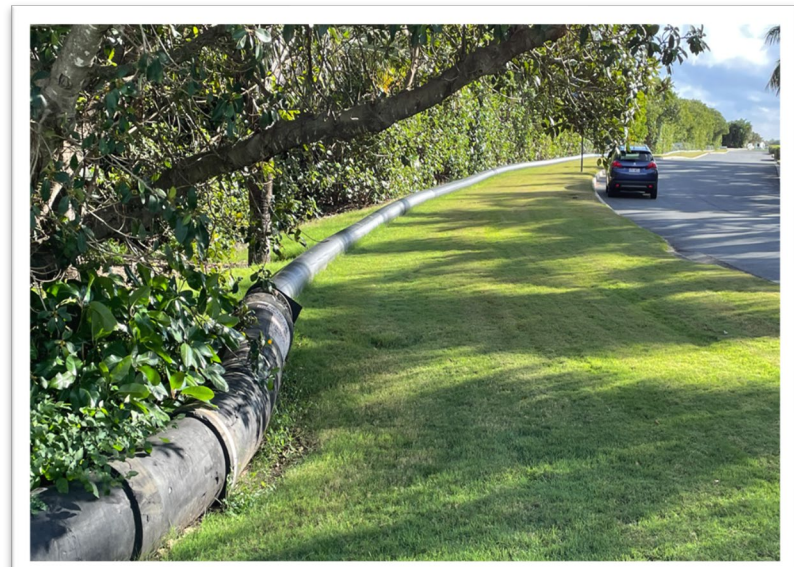


The ongoing build-up of sand on the riverbed has significant implications for communities and impacts to environmental, cultural, social and economic values, including:

- Accelerated bank erosion and potential break outs into the forest – unseasonal watering and losses
- Increased risk of not being able to deliver water demand to downstream communities
- Loss of ecological diversity and habitat
- Loss of cultural and social values through the reach
- Changing the river path over time
- 80GL shortfall in next 10 years (\$230 million agricultural production per year cost)

Is sand removal an option?

- Stage 2 of sediment project looked at:
 - How much would need to be removed and where?
 - Methods and technical feasibility
 - What do we do with the sand?
 - Environmental Impacts
 - Cultural heritage
 - Costs
- Technically feasible, but realistically possible?



Barmah-Millewa Feasibility Study

- The Murray-Darling Basin Ministerial Council initiated a study to investigate options to maintain and, if possible, restore the amount of water that could be delivered downstream of the Barmah-Millewa Reach
- Six Options:
 - Targeted **river works** to stabilise banks and avoid new breakaways into the surround forest.
 - Selectively **removing sand** from the riverbed.
 - Changing the **timing of transfers** of water to Tar-Ru (Lake Victoria).
 - Optimising **use of the Murray Irrigation Limited** system to **bypass the reach**.
 - Using existing or new **infrastructure in Victoria** to bypass the reach and mitigate the risk of delivery shortfalls.
 - Transferring River Murray releases from the **Snowy-Hydro Scheme** to the Murrumbidgee River for delivery to water users downstream of the Barmah–Millewa Reach.
- The study was completed end of December 2022



Water Delivery Optimisation Program

- Ministerial Council adopted a suite of options to progress to the next stage.
- Four of these options are being developed into full projects under the Water Delivery Optimisation Program.
- BOC will review the projects at key stages or “gateways”
- Projects are being run by the states and MDBA

Murray Irrigation Limited

Using existing infrastructure to bypass the Barmah-Millewa Reach

Upgrade or build new infrastructure to bypass the Barmah-Millewa Reach

Tar-Ru Transfers

Changes to the timing of transfers from Hume to Tar-Ru (Lake Victoria) and greater harmony with environmental flows

Victorian Mid Murray Storages

Use existing storages below the Barmah-Millewa Reach to meet peak irrigation demand

Murrumbidgee Weirs

Investigate potential to draw water from Murrumbidgee weirs to mitigate a shortfall on the River Murray

Re-scoping of local options

- In response to feedback from First Nations, National Parks and other stakeholders regarding the cultural and environmental significance of the Reach, a decision was made in 2023 to rescope the 2 instream options
- Environmental Impact Assessment to better understand the impacts of the sand, as well as impacts of targeted sand removal
- Ongoing monitoring of the sand

Riverworks

Bank protection works
within the
Barmah-Millewa Reach

Sediment Removal

Scope options for
mitigating local impacts
of sediment and
removing sediment from
within the
Barmah-Millewa Reach

Further information available at:

Barmah-Millewa Sediment Investigation

- Overview: [Barmah–Millewa Reach sediment investigations | Murray–Darling Basin Authority \(mdba.gov.au\)](#)
- Reports: [Barmah–Millewa Reach sediment investigation reports | Murray–Darling Basin Authority \(mdba.gov.au\)](#)

Barmah-Millewa Feasibility Study

- Overview: [Barmah–Millewa Feasibility Study | Murray–Darling Basin Authority \(mdba.gov.au\)](#)
- Reports: [Barmah–Millewa Program reports and publications | Murray–Darling Basin Authority \(mdba.gov.au\)](#)

Delivery risks in River Murray System

- Overview & reports: [Managing water delivery shortfall risks | Murray–Darling Basin Authority \(mdba.gov.au\)](#)
- Summary report: [Managing Delivery Risks in the River Murray System \(mdba.gov.au\)](#)

Questions and comments



Thank you.

Office locations

Adelaide
Albury-Wodonga
Canberra
Goondiwindi

Griffith
Mildura
Murray Bridge
Toowoomba

 mdba.gov.au  1800 630 114

 engagement@mdba.gov.au



Australian Government



Good morning Hydrologists,

Thank you for all the discussions and interest in the topic last week.

Just one more email from me, as I thought it worthwhile to respond to Bob last questions below (on demands through the Choke and operating at capacity) and provide some links to further information, for those interested.

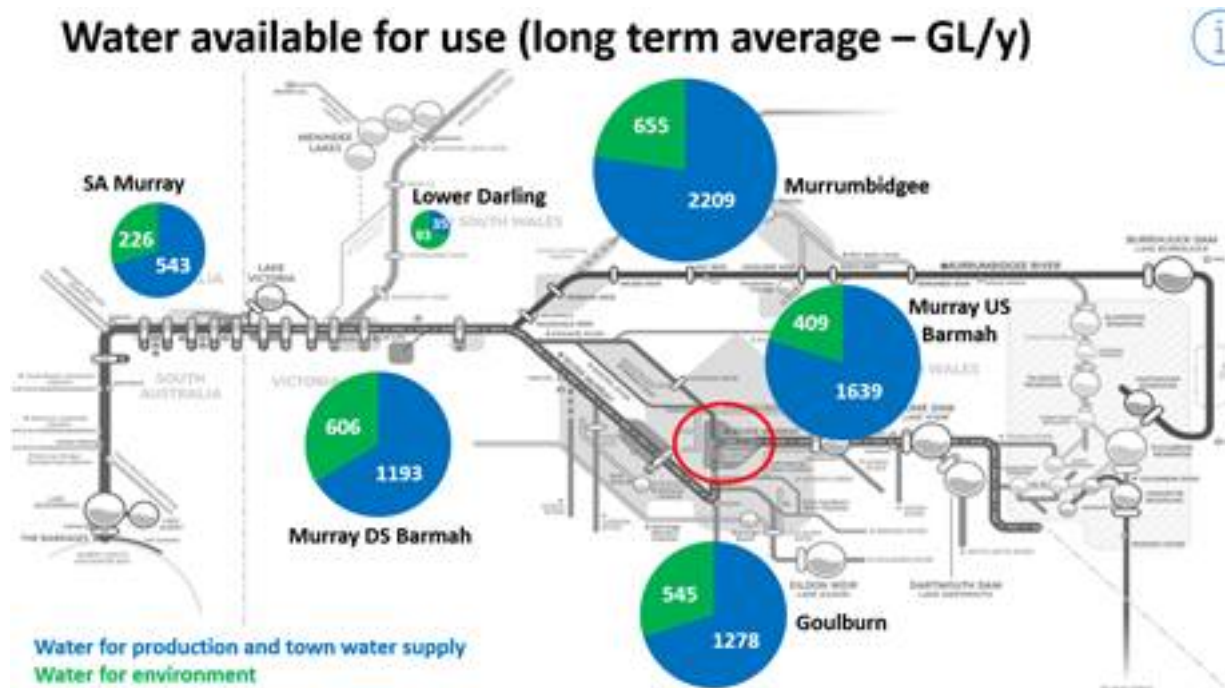
We have done a number of studies to better understand the risk of shortfall in the River Murray, summarised here:

Overview page: [Managing water delivery shortfall risks | Murray–Darling Basin Authority \(mdba.gov.au\)](https://www.mdba.gov.au/managing-water-delivery-shortfall-risks)

Summary report: [Managing Delivery Risks in the River Murray System \(mdba.gov.au\)](https://www.mdba.gov.au/managing-delivery-risks-in-the-river-murray-system)

This showed that demands in the system are changing, but the total demand downstream of Barmah has not increased overall, as a result off the Cap on diversions and SDLs, and a Trade rule that does not allows nett trade from upstream to downstream of the Barmah Choke. Water for the horticultural developments in Sunraysia comes from trade from the Torrumbarry area and the tributaries (downstream of the Choke). Further info can be found in: [HARC 2020 Historical Use Report \(mdba.gov.au\)](https://www.mdba.gov.au/harc-2020-historical-use-report)

Also, much more environmental water has been recovered from the Murray *downstream* of the Barmah-Millewa Reach than from upstream of the reach. The water recovered from above Barmah-Millewa is generally used in winter-spring to water the forest.



The pressure on the Barmah-Millewa Reach (and our ability to fill and maintain storage levels at Lake Victoria) is mostly affected by the decreasing channel capacity through the BM reach, and changes (reductions) in inflows from tributaries, including the Darling. [Review of impacts of system-wide drivers on Tar-Ru - Scoping report - Stage 1 \(mdba.gov.au\)](https://www.mdba.gov.au/review-of-impacts-of-system-wide-drivers-on-tar-ru-scoping-report-stage-1)

HARC (2021) looked at historical flows in the system and found that while we do operate the River Murray at channel capacity for extended periods, we haven't done this *more* in recent years.

[Historical flows in the southern connected Murray–Darling Basin \(mdba.gov.au\)](https://www.mdba.gov.au/historical-flows-in-the-southern-connected-murray-darling-basin)

However, we'd expect that increasing loss of capacity, would put more pressure on the reach in the future.

A few more websites of interest:

Barmah-Millewa Feasibility Study

Overview: [Barmah–Millewa Feasibility Study | Murray–Darling Basin Authority \(mdba.gov.au\)](https://www.mdba.gov.au/barmah-millewa-feasibility-study)

Reports: [Barmah–Millewa Program reports and publications | Murray–Darling Basin Authority \(mdba.gov.au\)](https://www.mdba.gov.au/barmah-millewa-program-reports-and-publications)

Barmah-Millewa Sediment Investigation

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Reports: [Barmah–Millewa Reach sediment investigation reports | Murray–Darling Basin Authority \(mdba.gov.au\)](https://www.mdba.gov.au/barmah-millewa-reach-sediment-investigation-reports)

Hope this may be of interest.

Kind regards, Ingrid