



Restoring connectivity – how the Sea to Hume fishways will help achieve the environmental outcomes of the Murray-Darling Basin Plan

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Restoring connectivity

How the Sea to Hume fishways will help achieve the environmental outcomes of the Murray-Darling Basin Plan

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Australian Government



My Co-authors

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The Murray-Darling Basin

>1,000,000 square km (14% of Australian landmass)

Wide climatic variability

Predominantly low-lying

77,000 km of rivers

Darling/Barwon river system (2,740 km)

Murray River (2,530 km)

Murrumbidgee River (1,690 km)

\$22 Billion food & fibre; \$8 Billion tourism



A Working River- the River Murray

- Storages
- Weirs
- Barrages
- Flow regime alteration



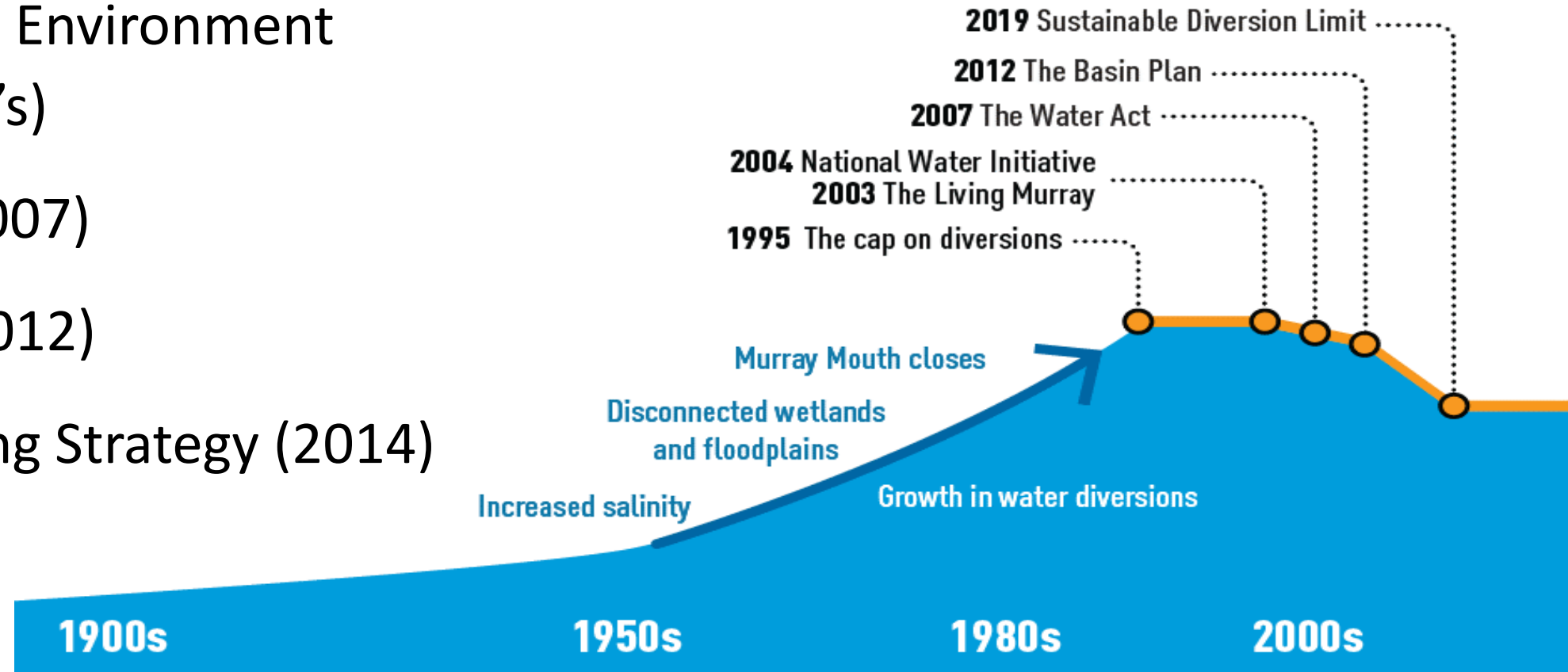
Sea to Hume Fishway Program

- Construction of fishways at 12 weirs and five barrages on the River Murray
- Restored fish passage for 2,250km
- ‘Whole of ecosystem’ approach
- Design criteria determined by a Fish Passage Task Force comprising scientists and engineers



Water Reform

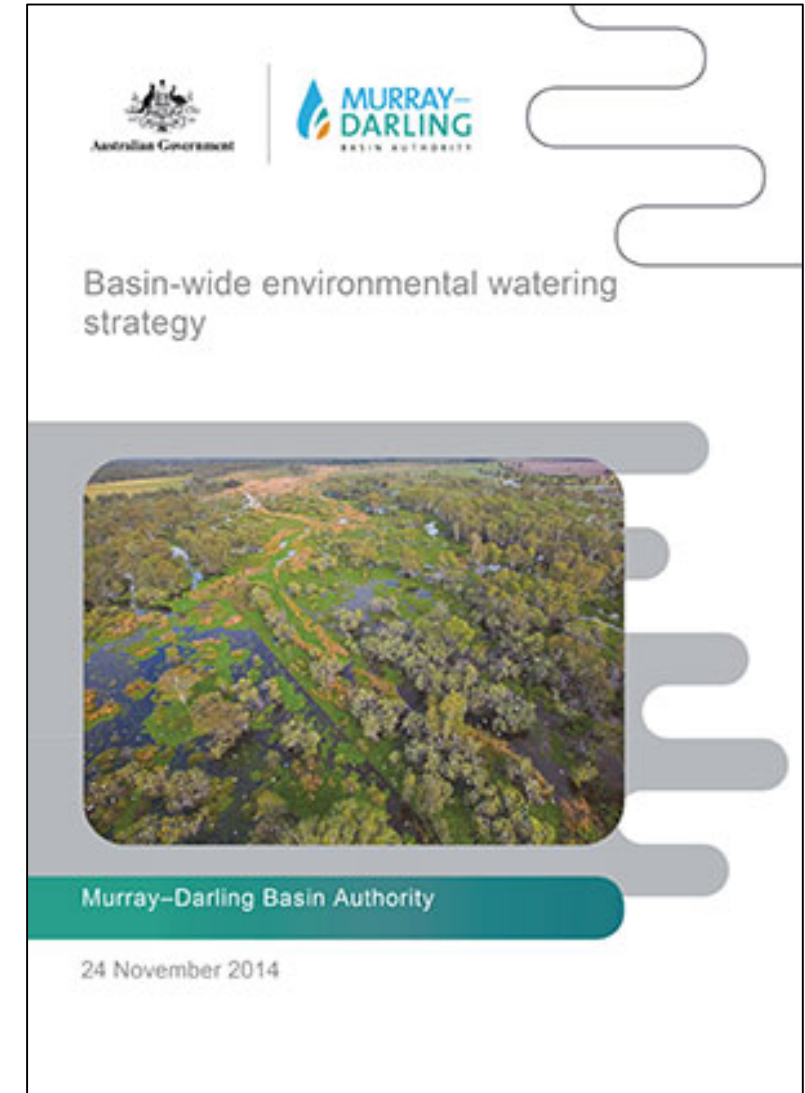
- Water for the Environment (1990's/2000's)
- Water Act (2007)
- Basin Plan (2012)
- Basin Watering Strategy (2014)



Basin-wide Watering Strategy

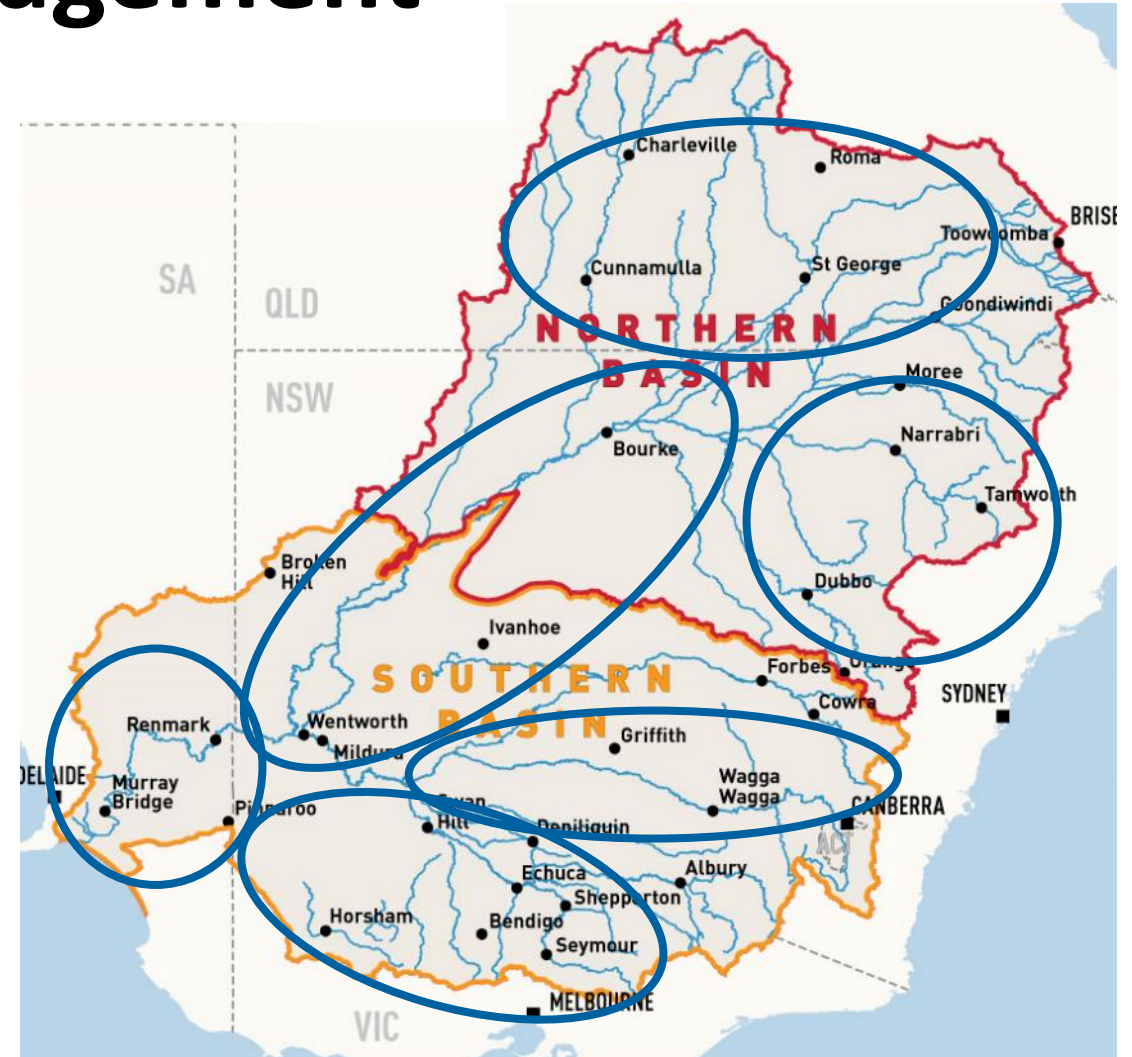
Expected Ecological Outcomes – Fish

- No loss of native species
- Improved population structure
- Increased movement
- Expanded distributions

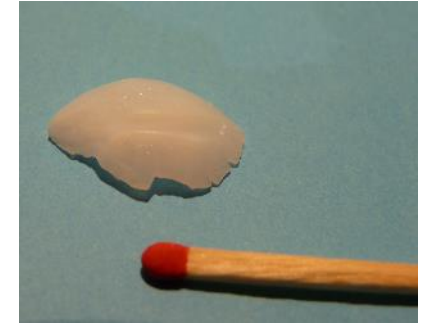
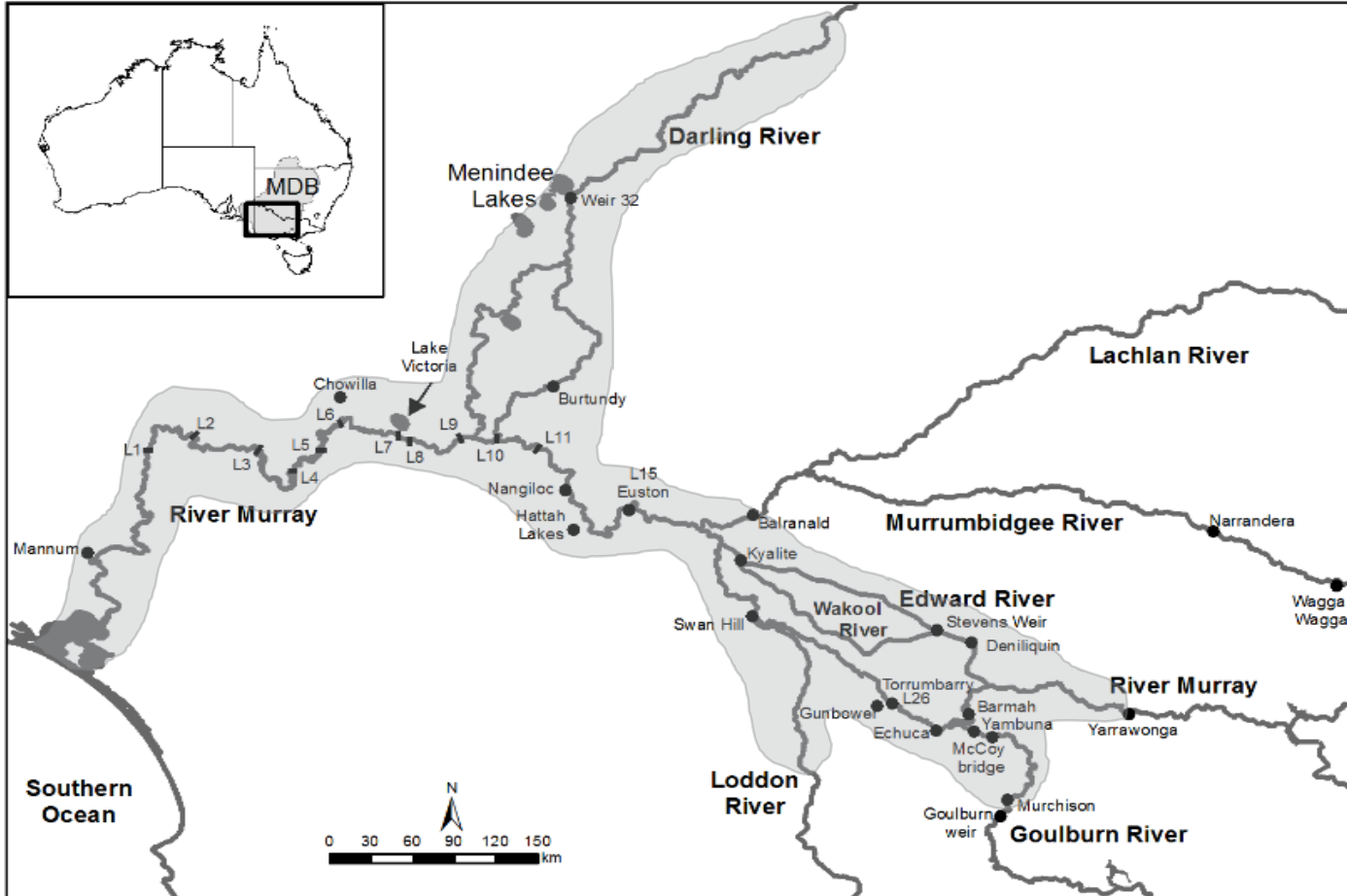


Pre-Basin Plan water management for Fish

- Location based management
- State based decision making
- Minimal/No coordination
- Fish just need water



Otolith microchemistry



Zampatti, B.P., Wilson, P.J., Baumgartner, L., Koster, W., Livore, J.P., McCasker, N., Thiem, J., Tonkin, Z. And Ye, Q. (2015). *Reproduction and recruitment of golden perch (Macquaria ambigua ambigua) in the southern Murray-Darling basin in 2013-14: an exploration of river-scale response, connectivity and population dynamics*. SARDI Research Report Series No. 820. 61 pp.

Connectivity for population processes



Golden perch
Macquaria ambigua



Pouched Lamprey
Geotria australis



Silver perch
Bidyanus bidyanus



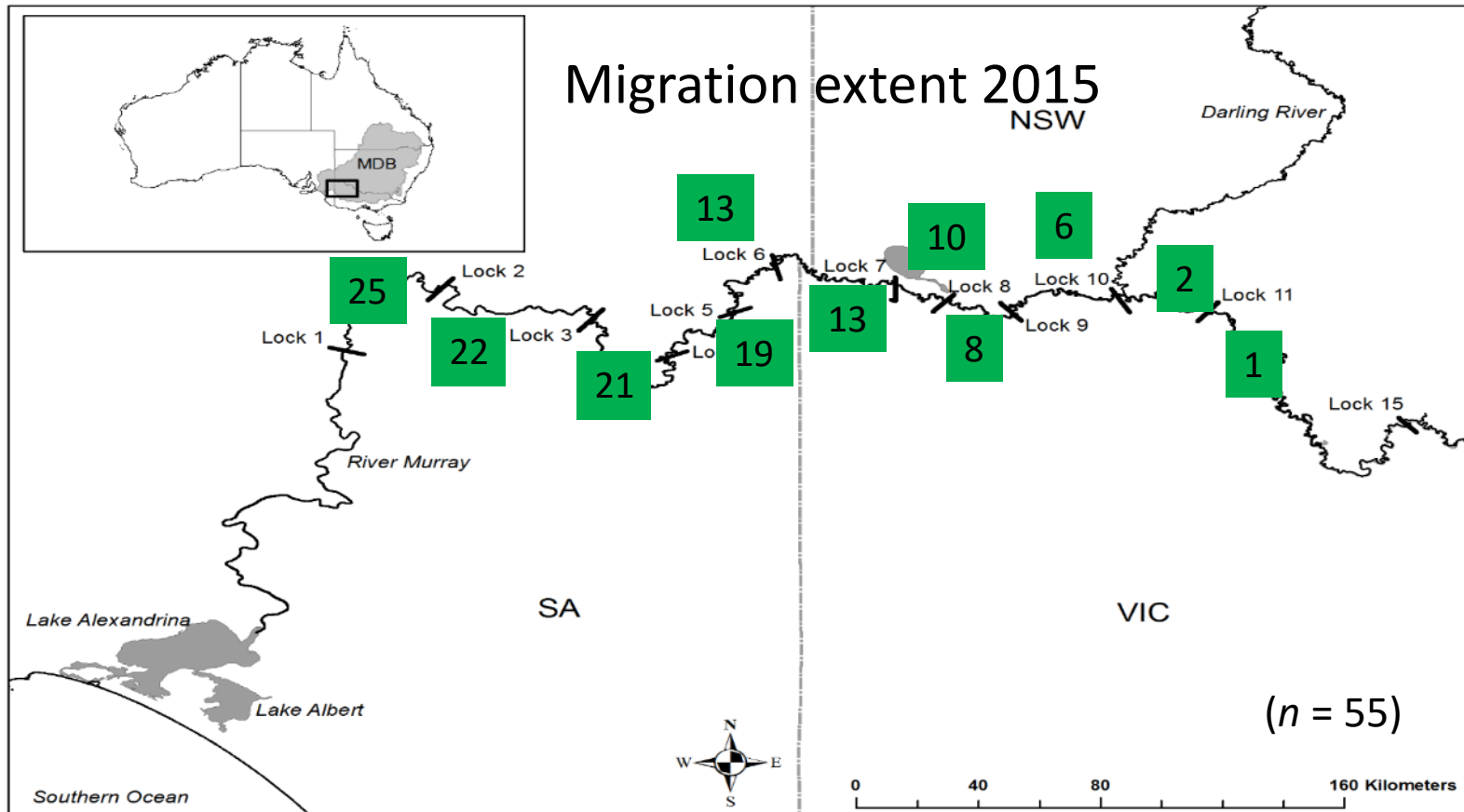
Short-headed Lamprey
Mordacia mordax

System-scale thinking for Fish

- Connectivity is important
- Productivity is important
- Winter flows are important
- Dispersal is important



Outcomes - Lamprey movement

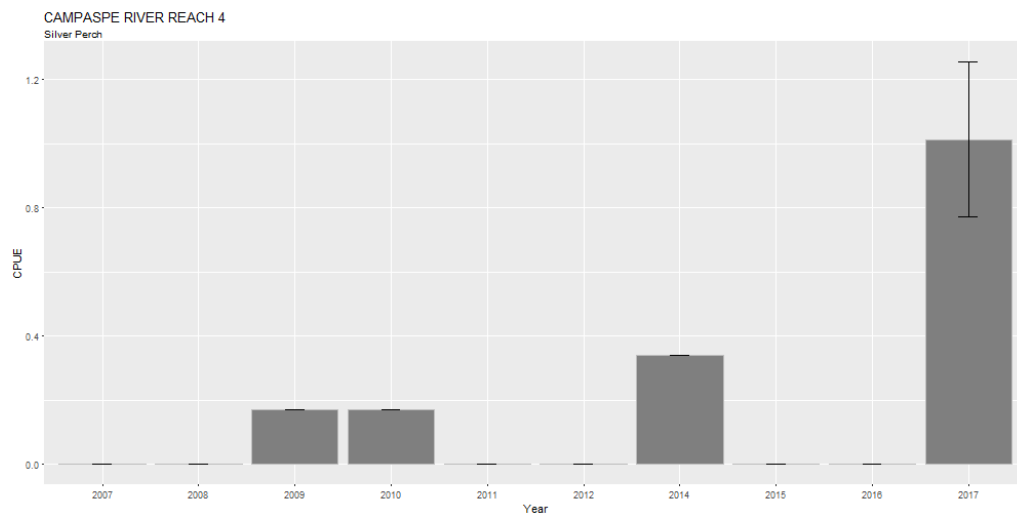
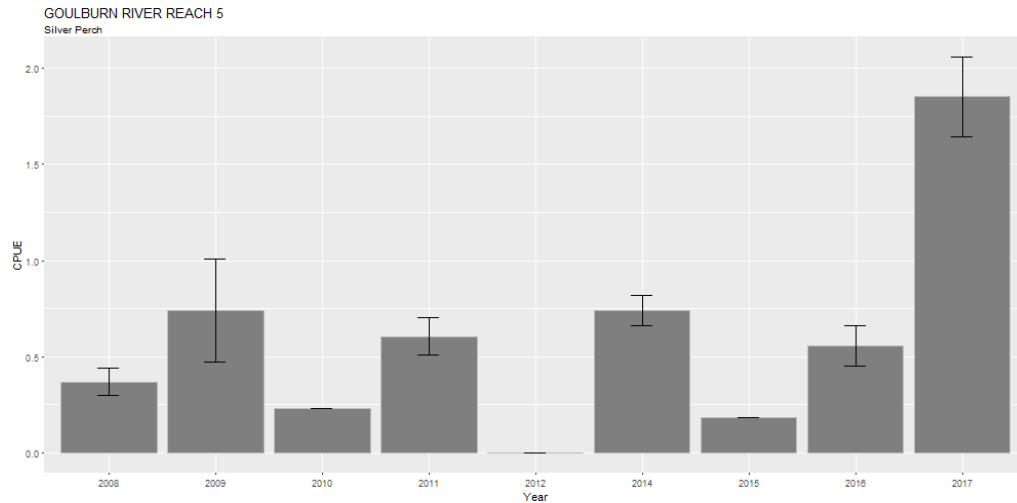


Lampreys an indicator of system-scale connectivity

Long-distance migration from sea to freshwater

Bice, C. Zampatti, B., Koster, W. (2018) *Migration ecology of pouched lamprey in the River Murray*. Presentation to Australian Soc. Fish Biol.

Outcomes - Movements of silver perch



Silver perch and golden perch movement into tributaries during flows

Populations in tributaries increasing following flows

Koster, W., Stuart, I., Dawson, D. (2017)
Do environmental flows promote immigration of native fish into tributaries of the Murray River? Presentation to Native Fish Forum 2017.

No loss of species (BWS)

Improved population structure with regular recruitment

Increased Movement

Expanded distributions in north and south

Improved Population Structure

Increased legal take Murray cod & golden perch

increased movement 2014-19 to 2019-2024

Movement (all species, life stages)

Double distn nth key species

Increased distribution

Short-lived: restored distribution to pre-2007 levels

Improved population structure – mulloway

Maintain CPUE prey species (sprat & hardyhead)

Bi-directional movements

Fresh Water

Diadromous

Improved population structure – mulloway

Maintain CPUE prey species (sprat & hardyhead)

Bi-directional movements

Detect all estuarine dependent families between 2014 and 2024

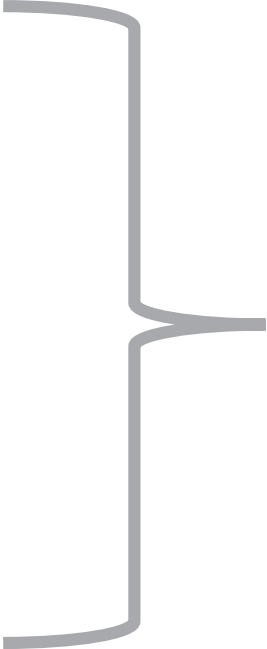
Distribution black bream and flounder

Estuarine

Basin-wide Watering Strategy

Expected Ecological Outcomes – Fish

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Sea to Hume
fishways and
fish passage
contribute to all
of these
objectives

Key Message

Flow management and use of environmental water has facilitated movement, spawning and dispersal of key species

but

this isn't possible in the River Murray without the Sea to Hume fishways.

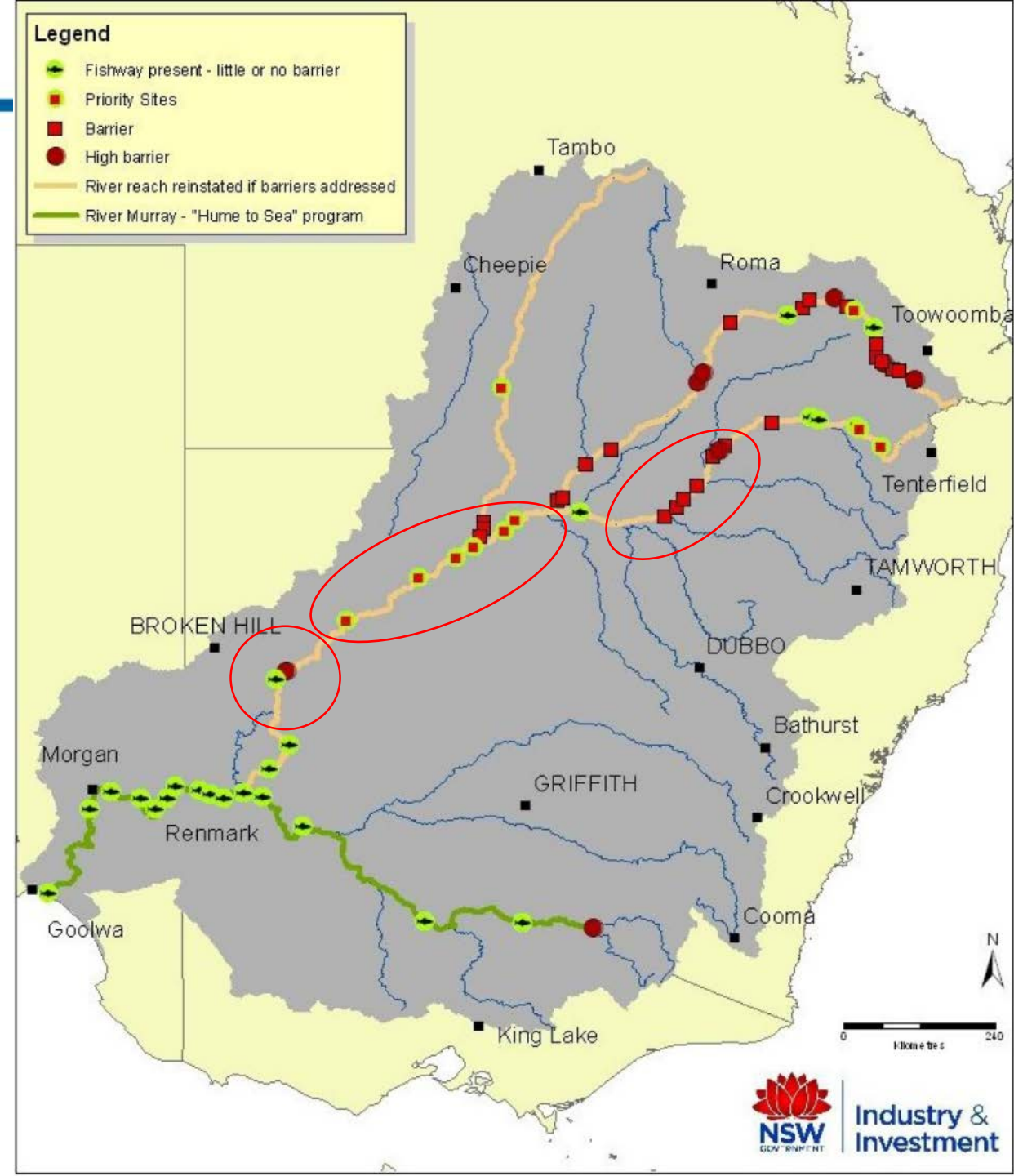
What's next?

Highest priority:

- Menindee Main Weir

Then:

- The Barwon-Darling
- 14 major barriers



Thank you

Office locations

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Australian Government

