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# The Health and Future of the Murray Darling Basin

Water for a Healthy Country

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National Research  
**FLAGSHIPS**



# Introduction

- Management of the water resources of the MDB is complex
  - Involves economic, environmental and social aspects
  - Necessarily a broad and selective view
- Potted history of progress in environmental water management
  - A relatively recent activity and minefield of debate
- Some crude analyses of the sharing of water resources
  - Sets the context for environmental water allocations
- A situation analysis
  - Current status of environmental water allocation
  - Thoughts on how we need to progress

# Lowland Floodplain Rivers

- Health = structure and function of channel, wetlands and floodplains
- Flood dependent ecosystems reliant on hydrological connectivity

## Channel

- Flow patterns
- Channel morphology
- Habitat

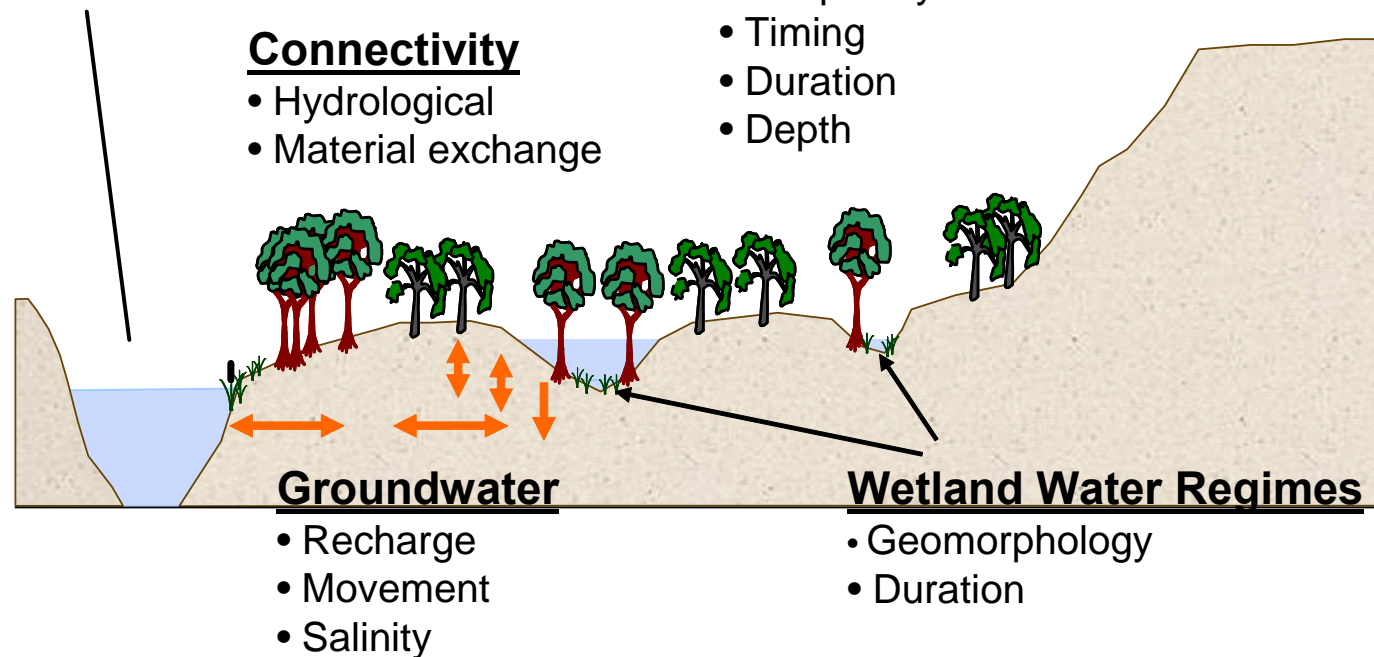
## Connectivity

- Hydrological
- Material exchange

## Floodplain

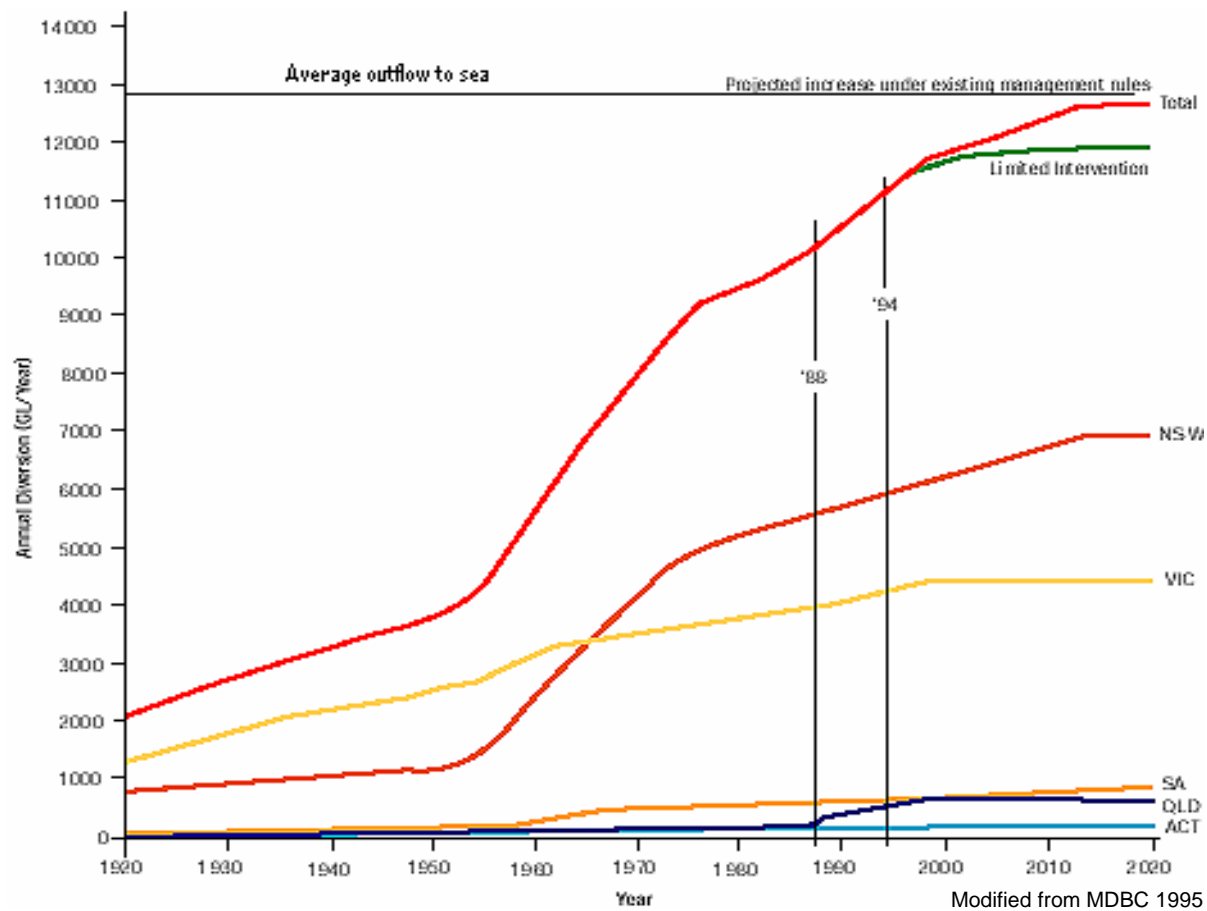
### Water Regime

- Frequency
- Timing
- Duration
- Depth



# Diversions: GL/year 1920-2020(?)

- Rivers of the MDB are over allocated leading to introduction of a permanent cap on diversions in 1997



# Crude water resource analysis

	Natural Conditions (GL/year)	Current Conditions (GL/year)	Δ
Runoff <sub>1</sub>	23,850	23,850	
Inter-Basin Transfers <sub>2</sub>	0	1,200	
Diverted <sub>3</sub>	0	11,580	
Evaporated from Reservoirs <sub>4</sub>	0	1,430	
Consumed by wetlands, floodplains etc	10,960	6,970	-4000
Outflow to Sea <sub>5</sub>	12,890	5,070	-7800
Outflow to Sea as a % of Runoff	54%	21%	

MDBC Water Resources Fact Sheet 2003

- 90-95% of diverted water is for irrigation
- The environmental share reduced by 4000 GL
- Approx 85% diversion by NSW and Vic. in the Murray region
- Average peak flows reduced by >50% eliminating small to medium floods

# Unsustainable flood dependent environments

- Examples from the Murray River

- Floodplain River Redgums

- Large decline in tree condition over last 20 years consistent with a decline in flooding frequency
- In a recent analysis only 30% of stands on Victorian Murray Floodplain were in good condition (Cunningham et al. 2007)

- Wetlands

- 7,000 wetlands covering 220,000 hectares
- approximately 40% lost as functioning wetlands
- of remainder 50% now permanently flooded
- Of remainder their water regimes and condition largely unknown

# The Living Murray 2002

- The Living Murray Program established in response to evidence showing the declining health of the River Murray system
  - A Scientific Reference Panel suggested that a significant allocation of water would be required to secure a healthy working Murray River system
    - Predicted that substantial whole-of river benefits would only start to appear with a 750 GL allocation, occur more generally with 1500 GL and continue to increase with further allocations.
    - Based largely on expert opinion which was challenged

# The Intergovernmental Agreement 2004

- Addressing Water Over- Allocation and Achieving Environmental Objectives in the Murray-Darling Basin
  - Gave effect to the 2003 decision by the MDB jurisdictions to commit \$500 million over five years to address water over-allocation in the Murray River through the Living Murray Program
  - The First Step for 2004–09 is to recover on average 500 GL of water per year for the Murray River
  - Recovered water is specifically for improving the environment at six icon sites along the Murray River to enhance floodplain vegetation, bird and fish populations
  - An EWP is to match the available water against individual Icon Site watering needs and recommend application regimes that achieve ecological outcomes across all six Icon Sites using available water
  - Adaptive management approach

# SIX SIGNIFICANT ECOLOGICAL ASSETS



Based on MDBC Web site: Ministerial Council Communique Nov 2003

# Independent Audit Group 2005-06

- Review of the Living Murray Implementation, May 2007
  - Zero water has yet been recovered.
  - Volume listed on eligible measures register 240 GL (*now 380*)
- Concluded:
  - It will be difficult to achieve original targets unless more emphasis is given to strategic large scale water recovery, including market based measures.
  - Concerned that the hydrologic modelling platform required to better understand the relationship between hydrology and environmental outcomes still to be enhanced.

# Existing environmental allocations

- Most small but important
- Only become available if certain irrigation entitlements reached
- Living Murray “new water” additional to these
- Maximum amounts:

	GL/year
• Barmah Millewa Forest	150*
• Lower Darling River	30
• NSW Adaptive Env Water	30
• Moira Lake Savings	2
• Murrumbidgee EWA	25
(to 200GL if 80-100% irrigation allocation)	
• Murray additional	5.4
• Victorian Murray Wetlands	27.6

- BMF important as it can be accumulated, sold, borrowed.

# Independent Audit Group 2005-06

- **Environmental water allocations:**

- A release of 5 times the accumulated BMF EWA (510GL) watered ca. 10% of total area of all icon sites and <1% floodplain

- Environmental waterings at Chowilla in 2005/06 were effective, but the significant volumes and investment likely to be required to achieve the identified environmental objectives appear to be very substantial.

- **Concluded**

- When combined with the wider context and risks to water resource availability, the Chowilla observation creates doubt about the achievability of the environmental objectives for all icon sites and The Living Murray overall.

- In this context, the environmental objectives may need to be reviewed and adjusted.

## Comments:

- The water resource allocations proposed are insufficient to sustain even the icon sites.
- Struggling to recover 500GL by gathering remnants
- Using the adaptive management approach it is appropriate that the Living Murray strategy is adjusted and either new targets identified, or increased volumes of environmental water allocated or both.
- A key step is to determine scale of environmental allocations

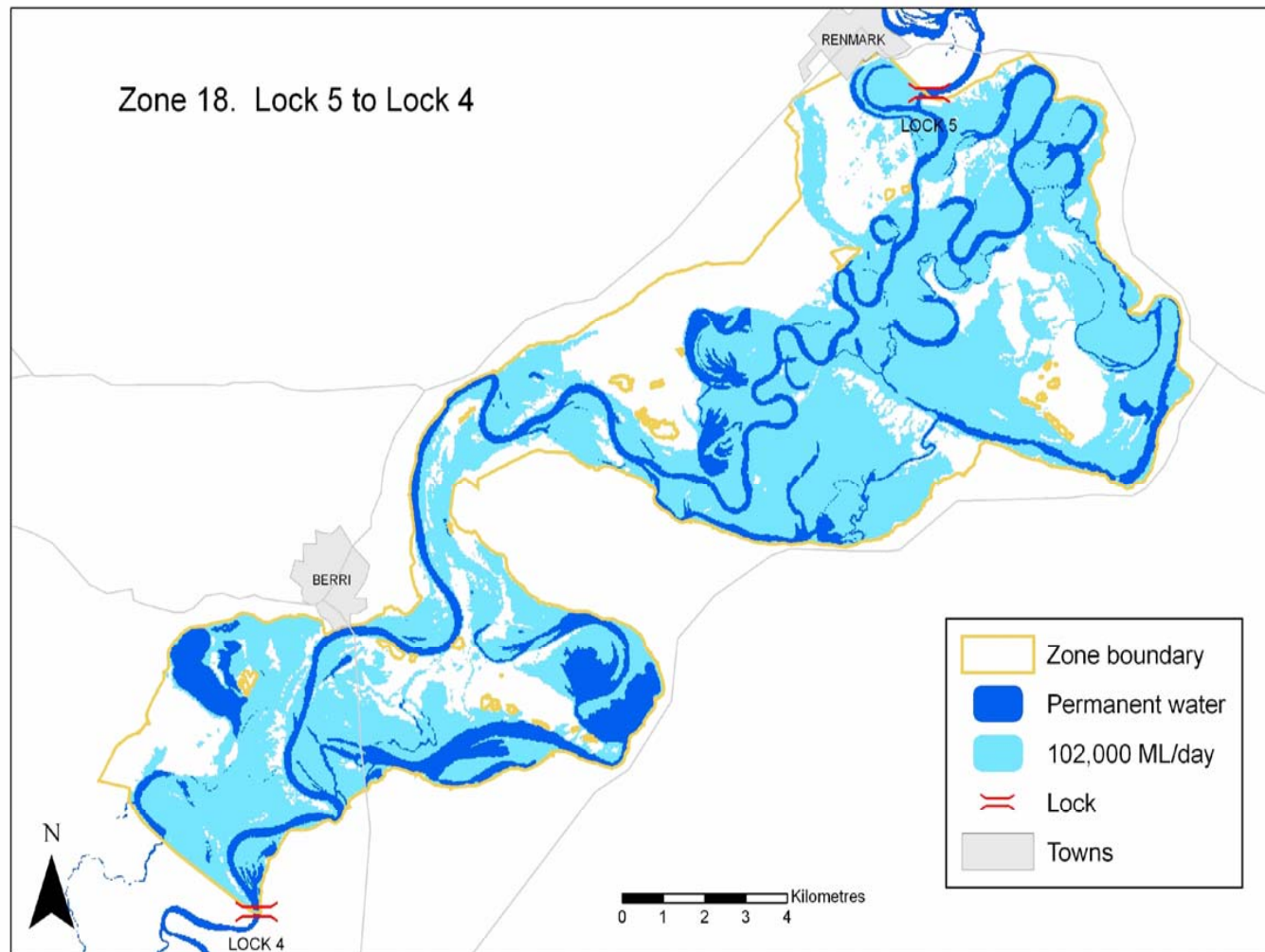
# The National Water Initiative: COAG 2004

- National imperative of increasing the productivity and efficiency of Australia's water use and to ensure the health of river and groundwater systems.
  - The NWI requires a determination of the sustainable level of extraction of water as the first step in water planning.
  - This requires an assessment of the water requirements of the environment.

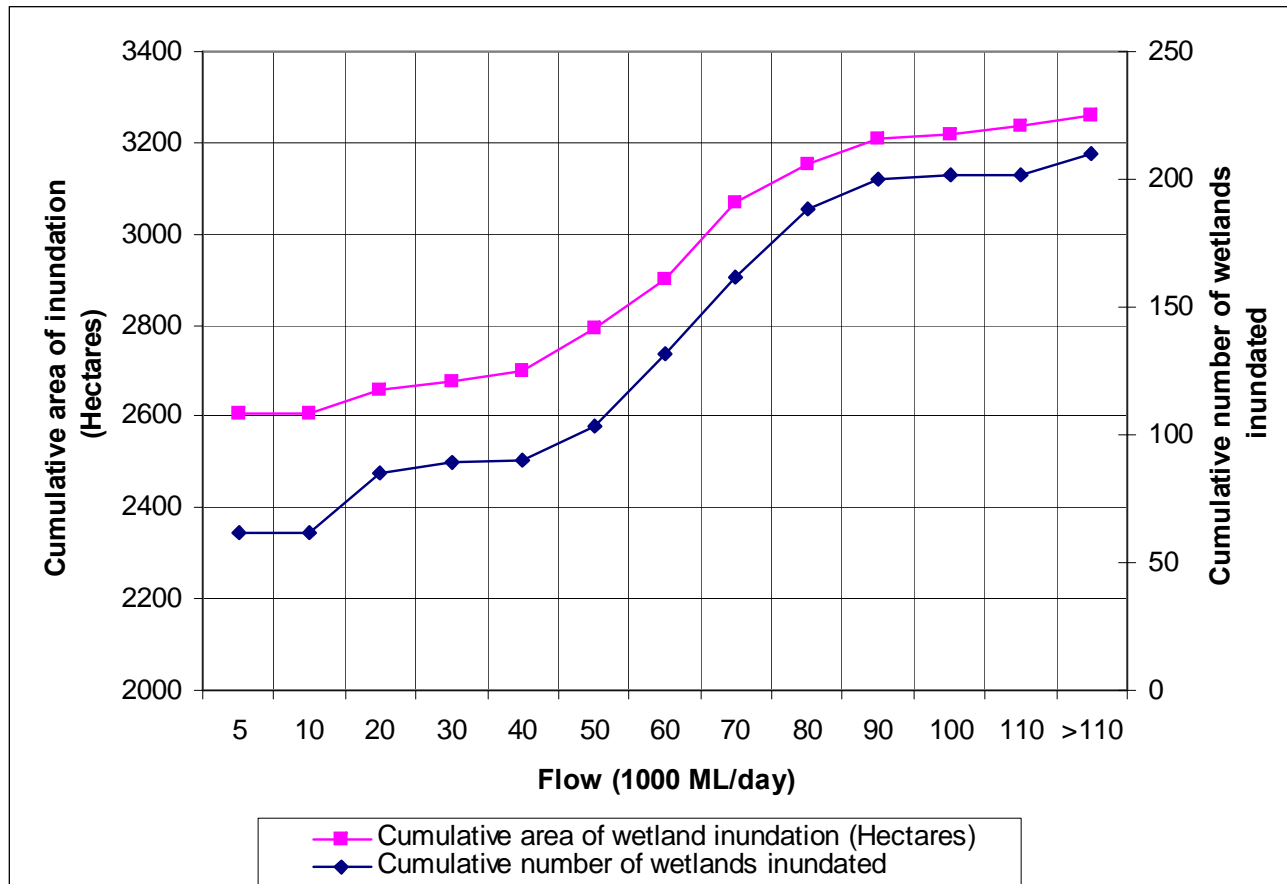
# Making an example of the Murray River

- The water requirements of flood dependent ecosystems cannot be assessed without knowledge of flooding characteristics and flood extents
  - CSIRO River Murray Floodplain inundation model (RiM FIM) (Overton, Penton, Gallant)
  - MWWG Wetland Commence to Flow database
  - Provide means for assessing floodplain inundation patterns and watering of flood dependent ecosystems
  - When combined with information on floodplain biota or ecological responses to flooding then benefits of water allocation can be assessed.

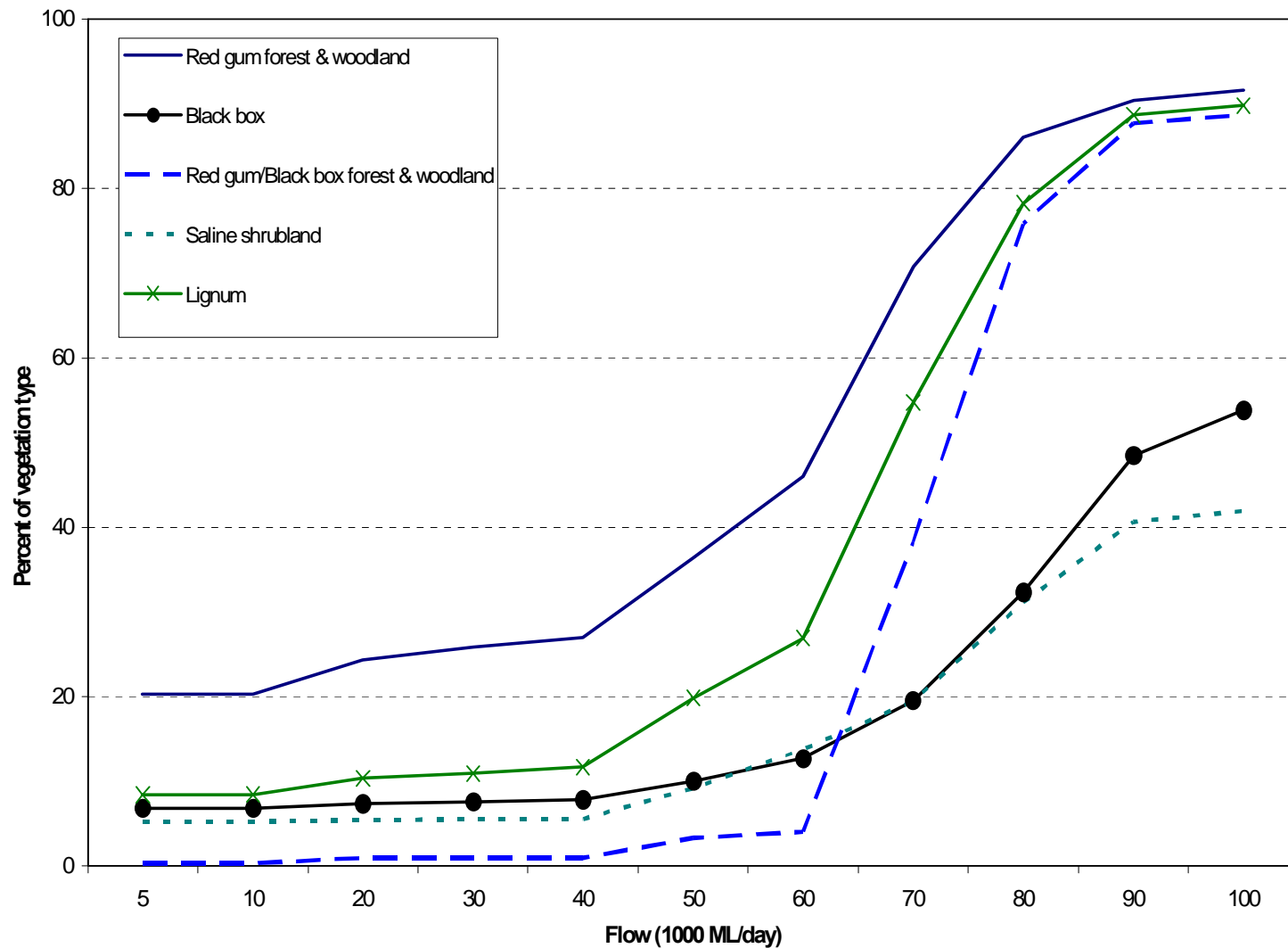
# Floodplain inundation map



# Wetland connectivity



# Floodplain Vegetation connectivity



# Water requirements of floodplain ecosystems

- Recent studies using flood inundation information:
  - Wetland plant response data (White and Ganf, Adelaide University)
  - VEACC Redgum flooding study (Overton, CSIRO)
- Both studies have estimated environmental allocations of ca. 2000 GL pa to sustain the wetland and floodplain habitats of the Murray River.
- This would mean a reduction in diversions of ca. 17%

# Drought and Climate change

- The drought is proving difficult for all: agriculture, urban, industry and environment
- Demonstrates that there is insufficient supplementary capacity to sustain core activities through extended droughts.
- It would be disappointing if following the drought we returned to the current, unsustainable situation especially in view of climate change predictions.
- Perhaps an opportunity to re-assess water allocations and set in train more balanced water resource usage based on best available information.
- An environmental allocation may provide the supplementary water required in dry times as the natural environment can tolerate some drought provided it has been well maintained in the intervening period to maximise its resilience.

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Thank you

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