



THE UNIVERSITY OF
MELBOURNE

Challenges of Achieving Best Practice River Basin Management

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Rivals

- people who are in conflict or competition over something are rivals
- "Rivalis" (Latin) means "a person using the same stream as another"
- Conflicts of interest in river basins:
 - Upstream vs downstream
 - States or provinces
 - Irrigation vs environment
 - City water supplies vs irrigation
 - Flood control vs water supply

Management Objectives & Decision Making

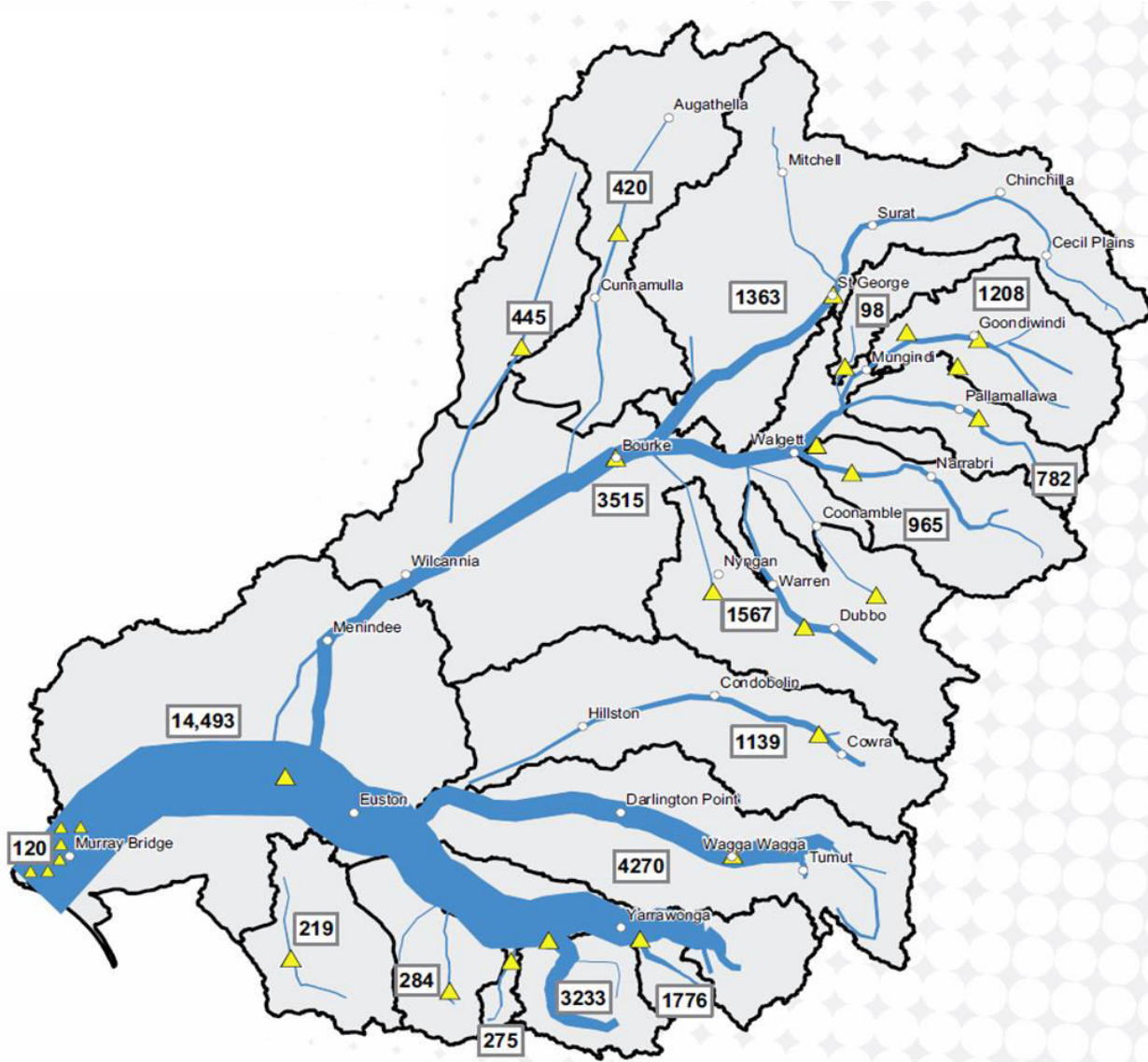
Objective

To manage the river and related resources for the benefit of the whole basin?

- **Challenges:**
 - What is "for the benefit of the whole basin"??
 - Who decides between conflicting interests?

Australia's Murray Darling Basin

1 million square km



Federation – The First Challenge: The River Murray Waters Agreement 1915

- **Defined a Bulk Water Sharing Formula;**
 - NSW and Victoria could use all the water in their tributaries and share equally the Murray flow at Doctors Point (headwaters) while providing guaranteed minimum flows to SA
- **Established the River Murray Commission** with 4 members representing the Commonwealth, NSW, Vic, & SA Governments
- All Decisions of the Commission had to be Unanimous
- **Authorised the Commission to:**
 - give directions about the construction of dams, locks and weirs to be built by State Constructing Authorities
 - Defined cost sharing for capital and operating costs
 - operate them according to the Agreement

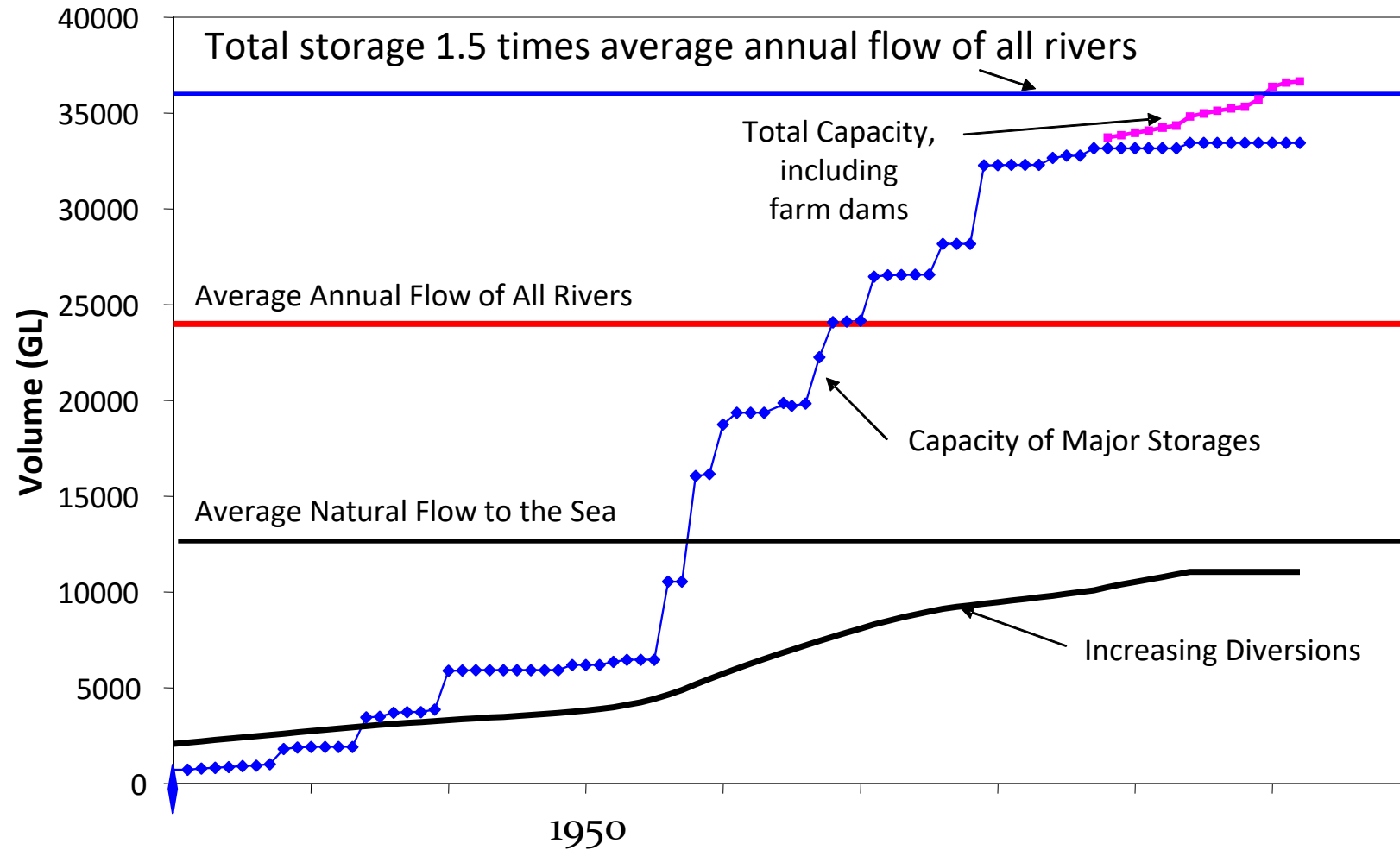
Ronald East Standing astride the Murray River in 1923

- The location was just downstream of Swan Hill
- growth in irrigation with limited storage capacity dried up the River
- If there had been no irrigation he would have been waist deep in water



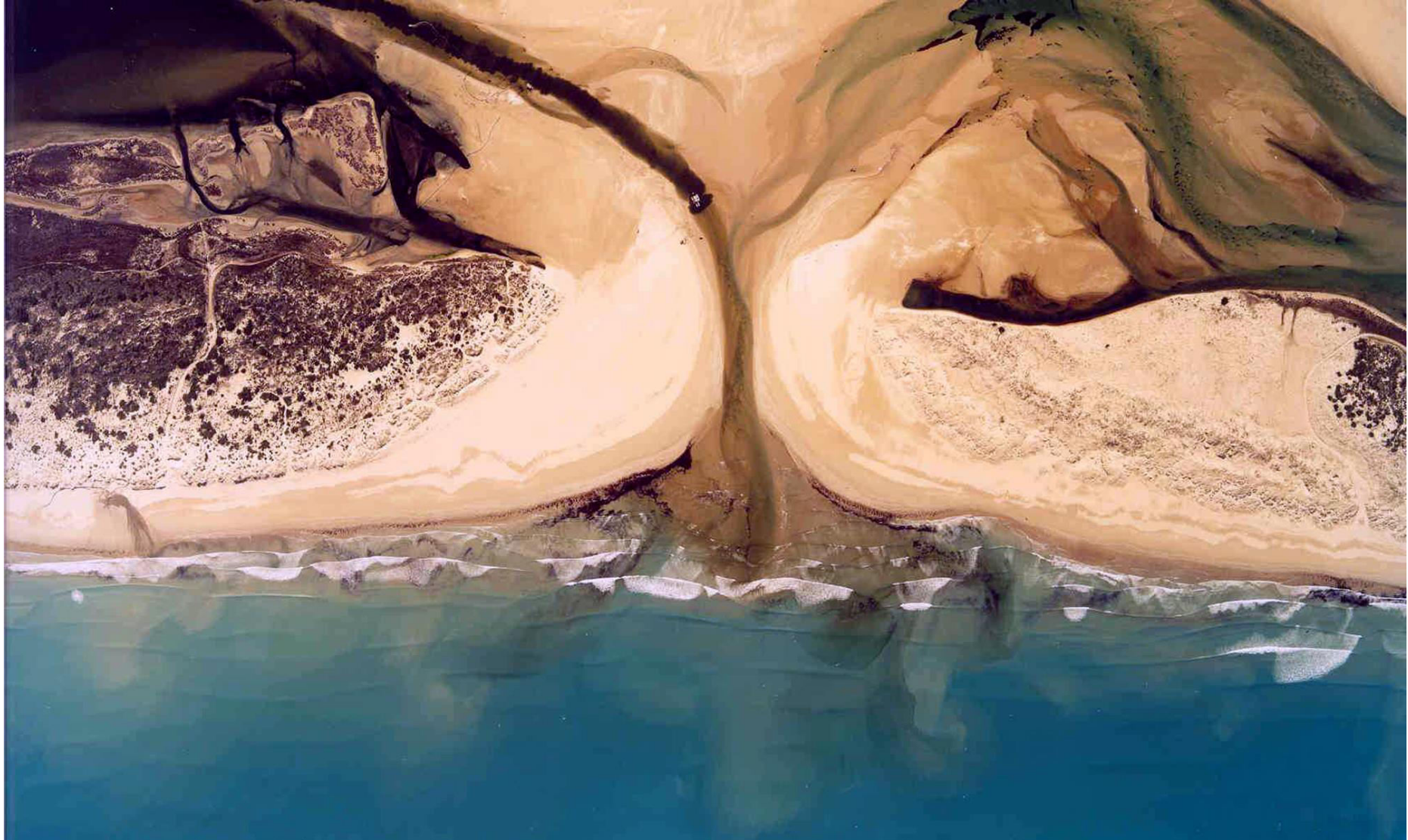


Increasing Storage Capacity & Diversions



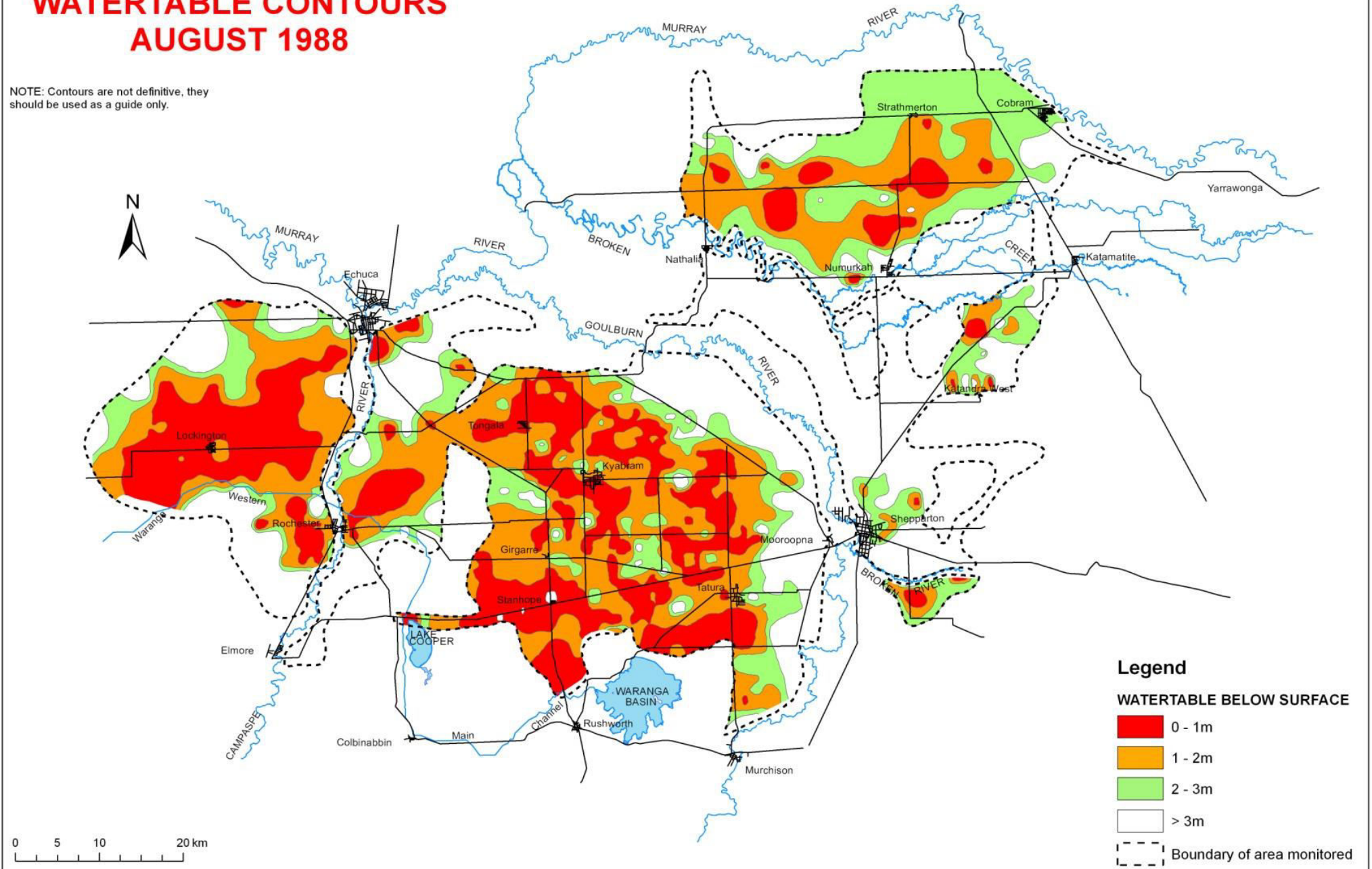


The Murray Mouth closed during the drought of 1982



SHEPPARTON REGION WATERTABLE CONTOURS AUGUST 1988

NOTE: Contours are not definitive, they should be used as a guide only.



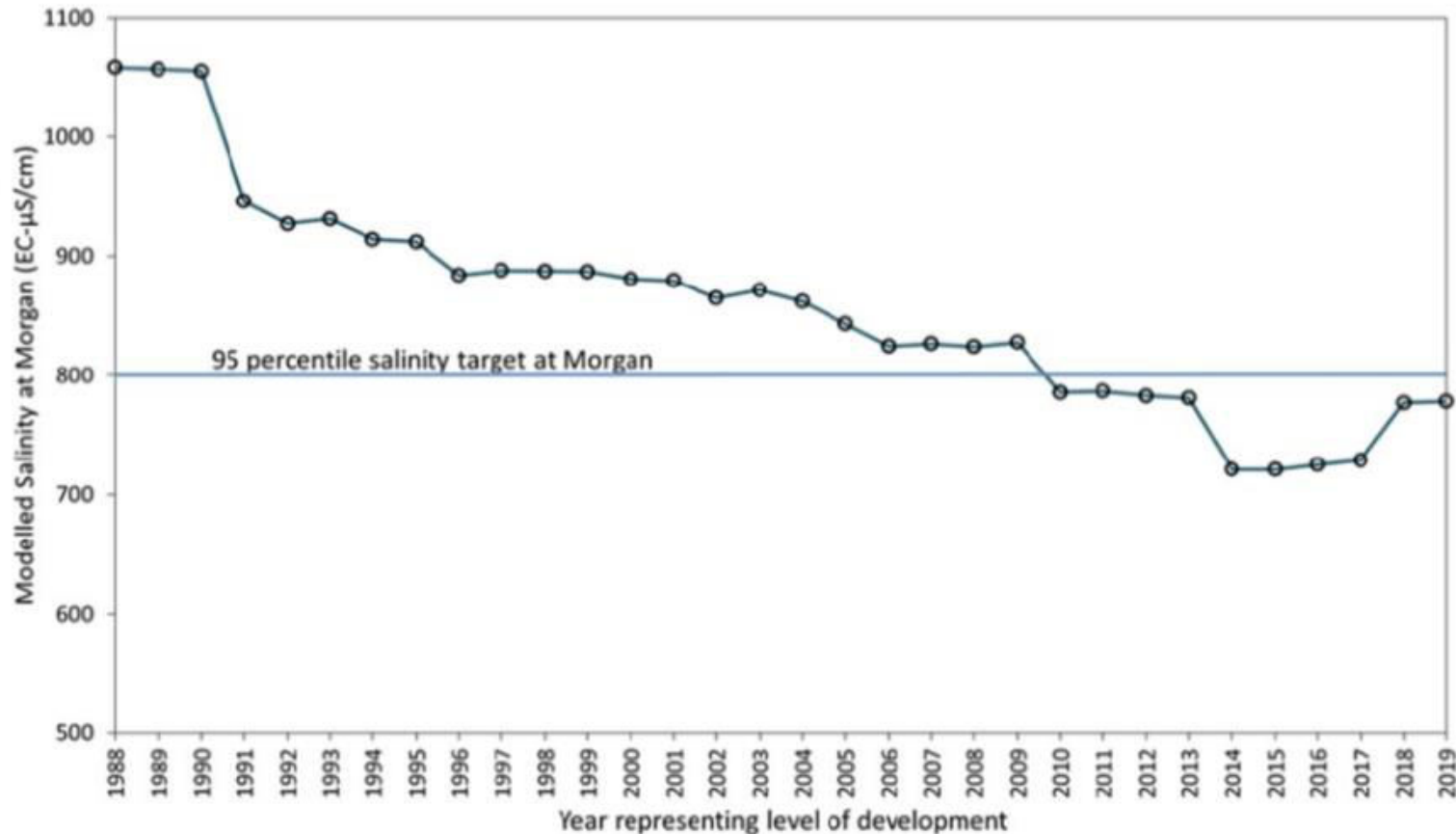


Salinity: the Second Challenge

Creation of the Murray Darling Basin Commission (MDBC)

- The River Murray Commission, an organisation focussed on water quantity, and confined to managing the river, proved incapable of managing the salinity challenge.
- **Murray Darling Basin Commission** was created in 1987, as a river basin authority responsible for water quantity, quality & natural resources
- **3 Commissioners** with water, environment & agricultural expertise represented each of the 4 governments
- **Consensus principle retained**
- Commission reported to a Ministerial Council
- **Community Advisory Committee** reported to the Council

Success of the MDBBC Salinity and Drainage Strategy



- A target of salt concentration was set at the 95th percentile of 800 EC Units in the River at Morgan in South Australia
- Set up Salinity Credits and Debits
- Jointly funded alt interception schemes
- **The Target was achieved in 2010**

The third Challenge: Overcoming the rigidity of water allocation: Creation of Water Markets

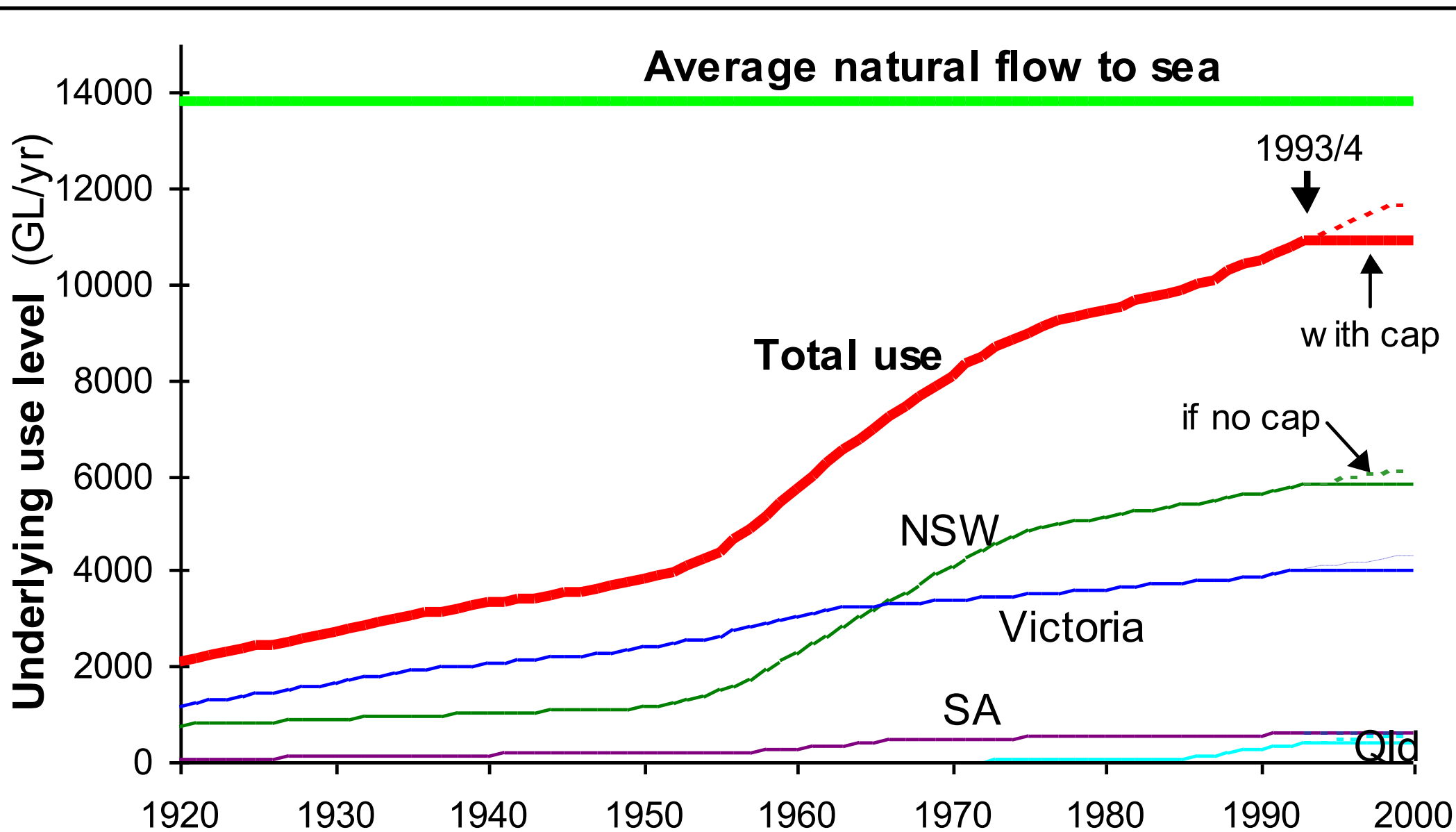
- Irrigators water entitlements were **legally tied to specific areas of land** within defined Irrigation Districts to promote the social objective of closer settlement
- When dam construction stopped in the early 1980s new irrigation enterprises found it difficult to get access to water, and it was impossible to move water off degraded or unsuitable land
- Markets in water entitlements (permanent sale) and Seasonal Allocations (leasing access to irrigation water for one season)
- The Council of Australian Governments Reform Agenda of 1994 promoted continued development of water markets

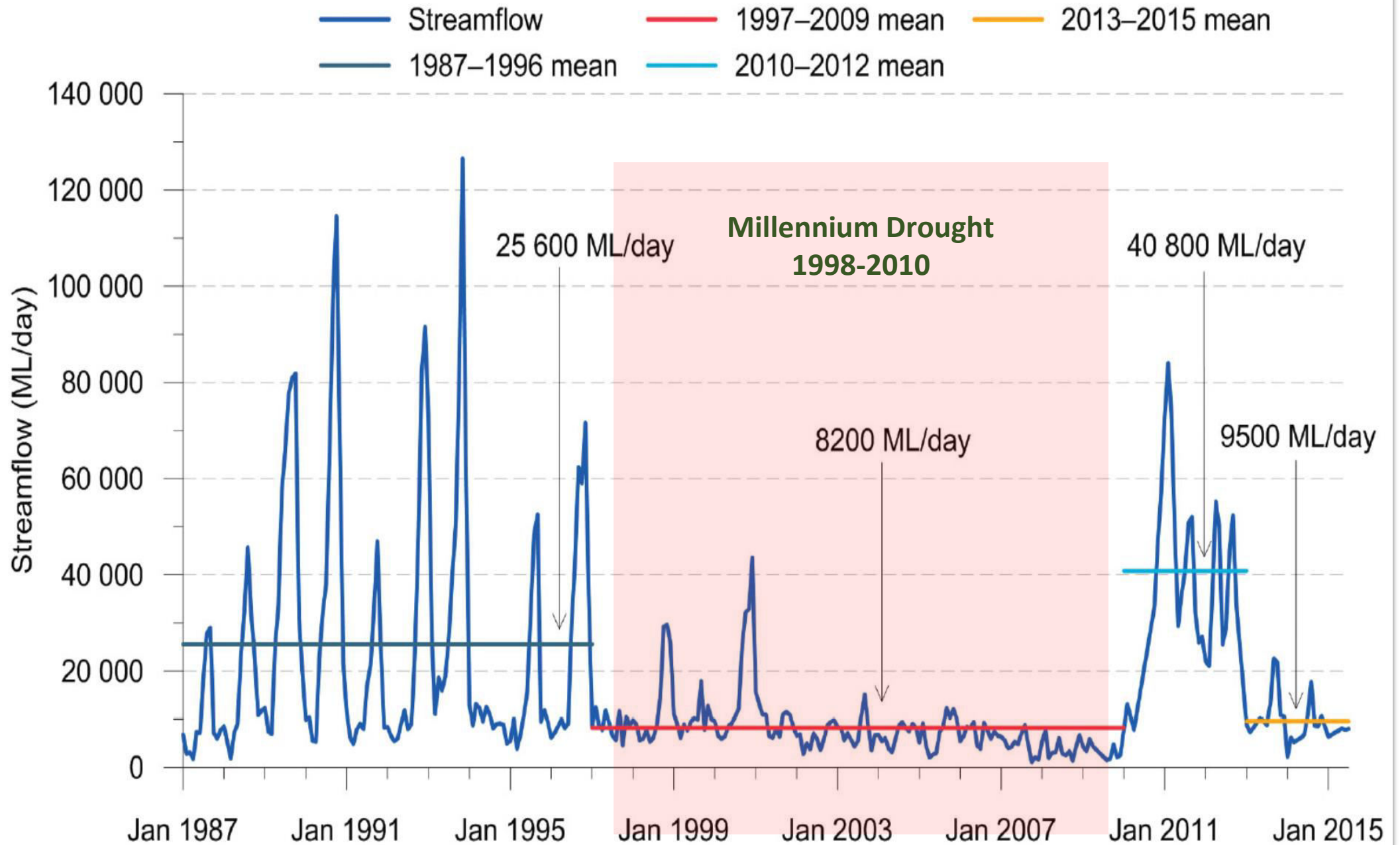
The Fourth Challenge: Overallocation of Water: Introduction of a Cap on Diversions

- An **Audit of Water Use** in the Murray Darling Basin highlighted the unsustainable diversion of water for irrigation.
- The long term average discharge of the Murray River to the sea **14,500 GL/year**
- The Audit defined a **drought threshold of 5,000 GL/year**
- The high percentage of time the lower Murray was in severe drought conditions persuaded the MDBC Ministerial Council to impose a **Cap at the 1994 level of diversions**

Level of water Diversion from the Rivers in the Basin	% of Time Flows less than the Drought Threshold
No Diversions (Natural Conditions)	5%
1994 level of diversions	64%
Full development of all water entitlements issued	74%

The Cap on Diversions at the 1994 Level





Water Markets Improved the Resilience of Irrigated Agriculture during severe droughts and climate change

- **Market was critical**
- Utilisation increased
 - >30% water allocated each year sold since 2007
- Water went to highest value use
 - Support high value horticulture
- Production became more efficient
- More irrigators survived
- **Lack of Market regulation allowed too much water transferred downstream**

	Water applied (estimate, GL)		Revenue* (\$m, real)	
2005-06	7,370 (6.0 MAF)	53 %	5,522	21 %
2008-09	3,492 (2.9 MAF)		4,349	

* Gross value of irrigated agricultural production

Water Recovery Targets and Likely Achievements by 1 July 2024



All figures are long term averages in GL/year	Targets	Achievable by 1 July 2024
Purchase water entitlements from Irrigators		1231
Efficiency Measures		876
Subtotal	2100	2107
Environmental Works & Measures	580	219
On Farm Efficiencies	450	24
Total	3130	2350 (75%)

Environmental Degradation - Millennium Drought



Acidification

Loss of Flood Plain Inundation



Algal blooms



Black Water Events



The Sixth Challenge: Reversing the Environmental Degradation: The Water Act (2007)

The Commonwealth takes over – consensus principle abandoned and invested \$15 billion+

Murray Darling Basin Authority created as a Commonwealth agency

Commonwealth Environmental Water Holder created to manage environmental water

Basin Plan with Legislated Sustainable Diversion Limits (**SDL**)

Funds \$ used for for **buy backs** from irrigators , **efficiency measures** and **Environmental Works** and Measures

Efficiency GAINS: Modernisation of the Network



Improved Measurement: Off-Take: Slip Gate and Slip Meter

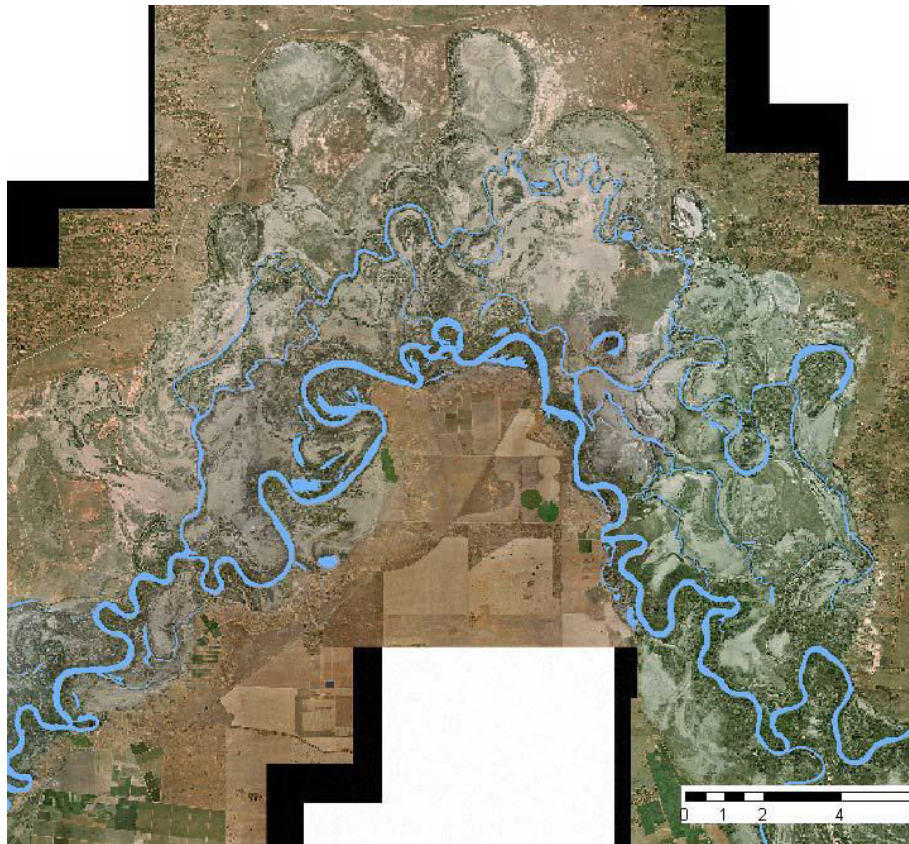


- Accurate flow regulator from 0.1 to 1m³/s with < 1l/s error (<1% across range)
- Self calibrating, 22 ultrasonic transducers, travel time measurement (Time resolution <0.1ns !)
- Solar powered, GPS, radio based internet
- 60 alarmed variables
- **Communicates by “exception”**

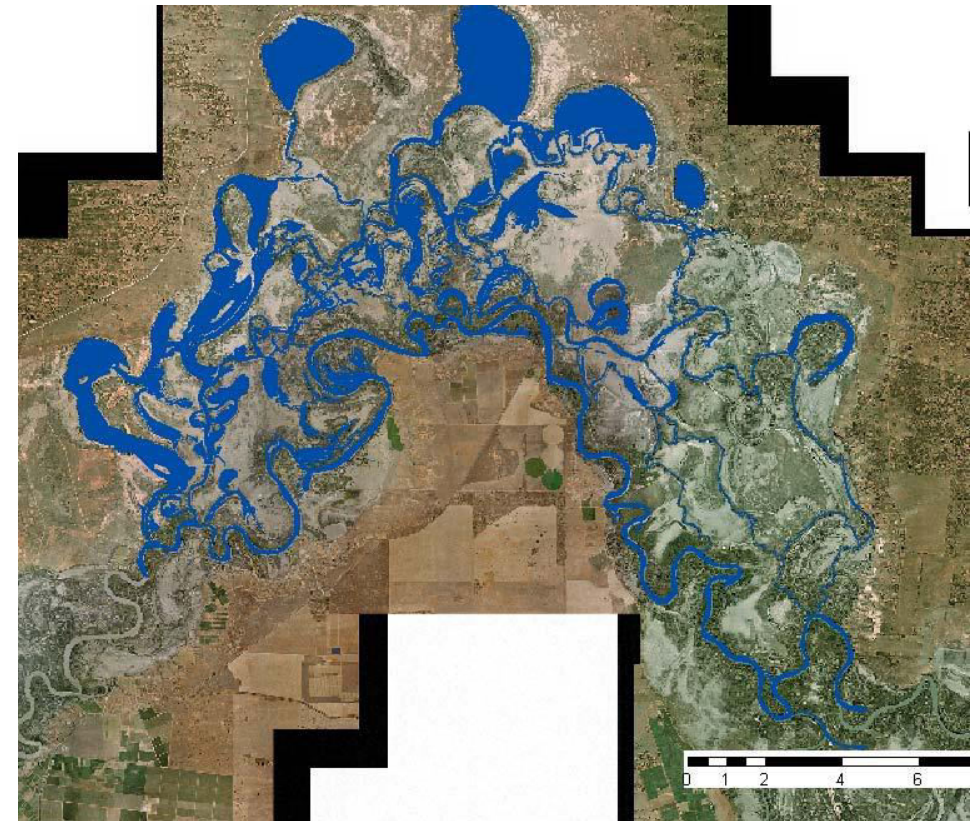


An Environmental Work

Without works



Inundation enhanced by works



Chowilla Creek inundation – 10,000 ML/day

Basin Plan - Sustainable Diversion Limits

Figures are long term averages in GL/Year	2019	2024
Purchase Water Entitlements & Invest in efficiency improvements in delivery systems	2100	2100
Environmental Works and Measures	580	580
Invest in on- farm efficiency improvements		450
Sustainable Diversion Limit	2680	3130

The Sustainable Diversion Limits in Context

All figures are long term averages	Volume GL/Year
Flow in all the Basin Rivers	25,000
Flow to the sea	14,500
Diversions allowed by the Cap	13,623
Diversions allowed under the 2019 SDL	10,943 (- 20 %)
Diversions Allowed under the 2024 SDL	10,493 (- 23%)

River Basin Management: A “never ending” series of Challenges

1. Federation of the States: The River Murray Water Agreement 1915
2. Salinity: creation of a Basin authority & a salinity strategy
3. Overcoming rigidity of water allocation- creation of water markets
4. Addressing overallocation of water: the Cap
5. The “Millennium Drought” & climate change
6. Reversing environmental degradation: the Basin Plan & SDLs
7. What is next??