Irrigation Demand Management for Improved Seasonality of River Flows

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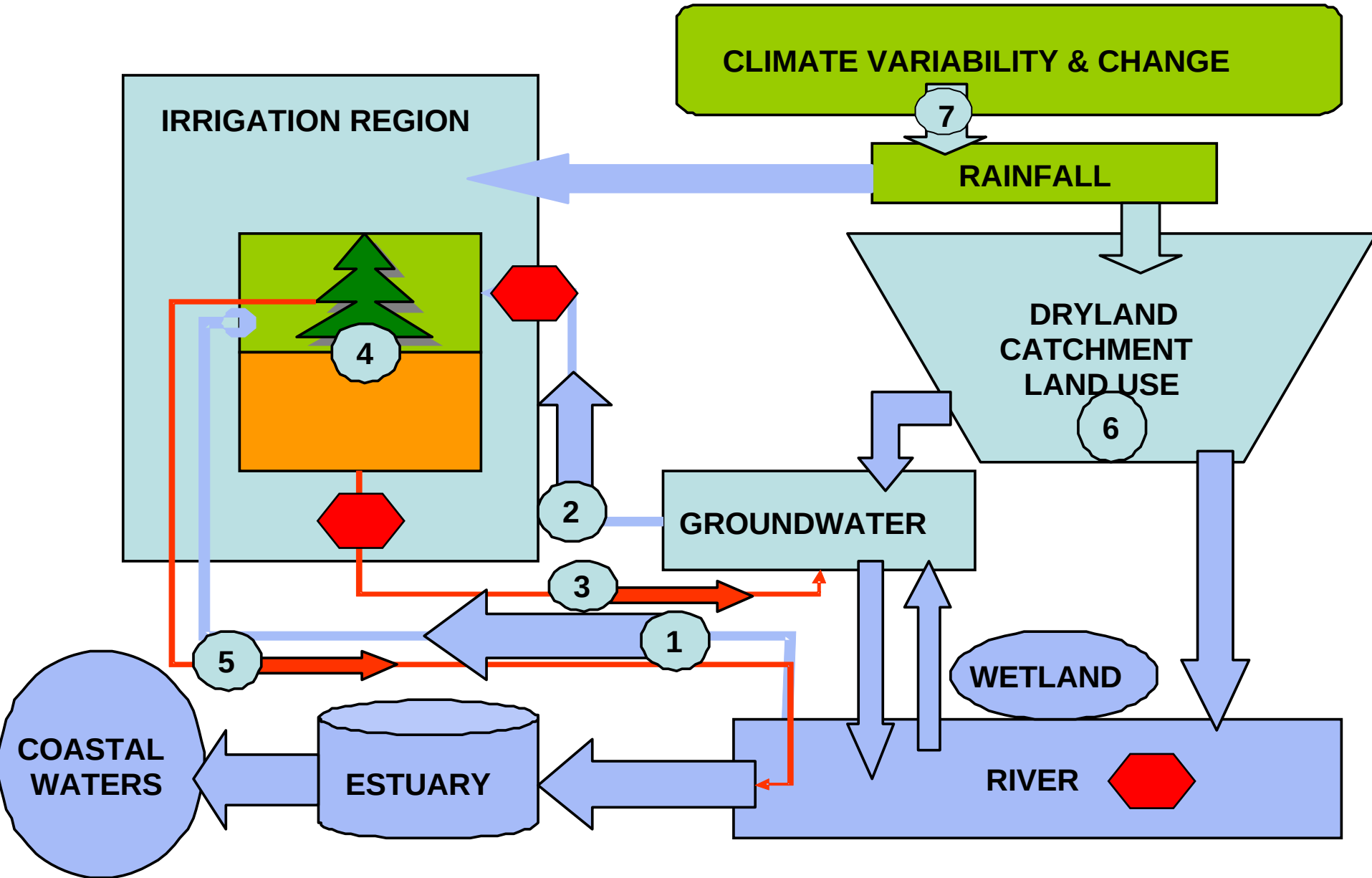
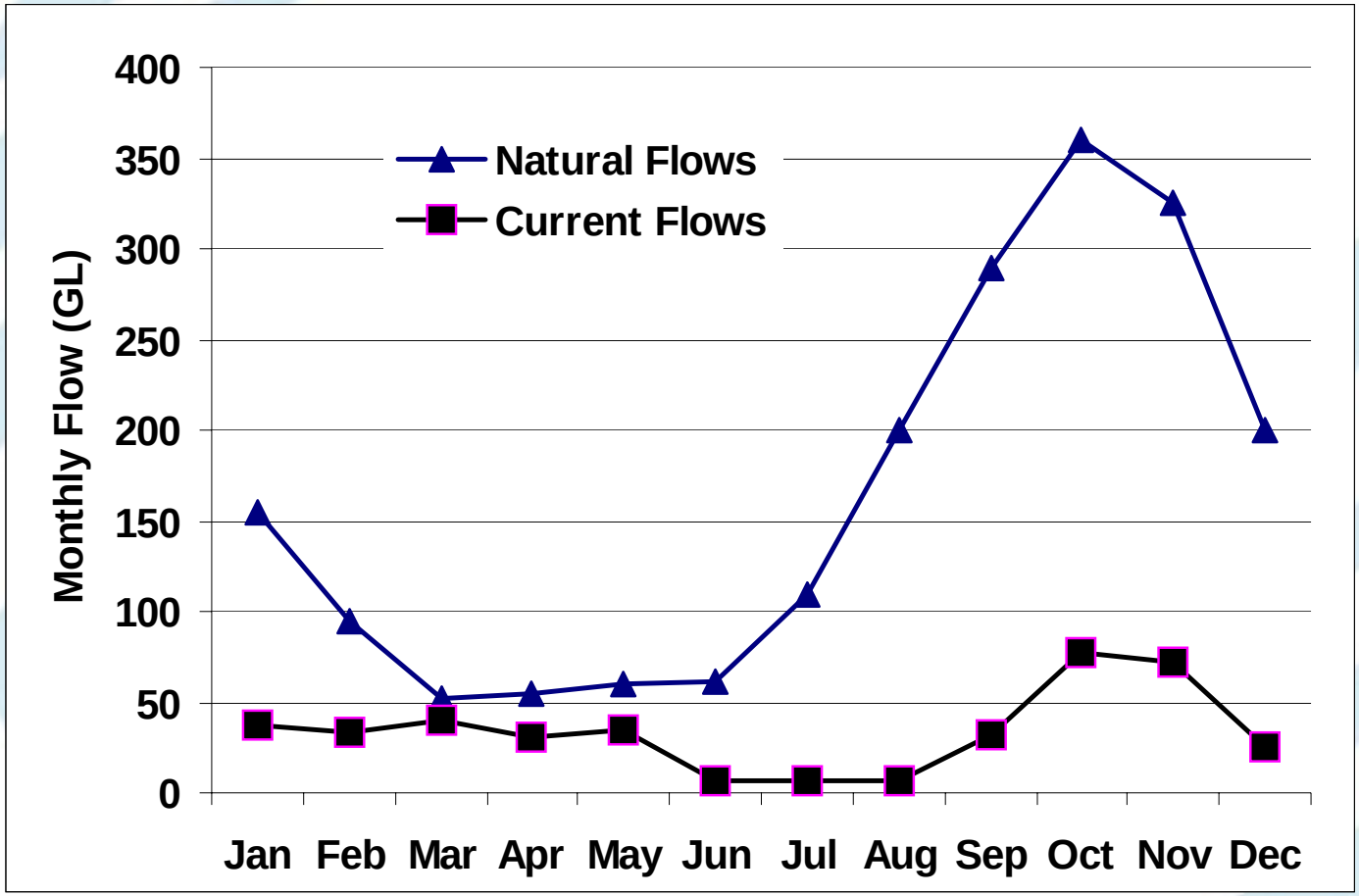
Water Cycle in an Irrigated Catchment



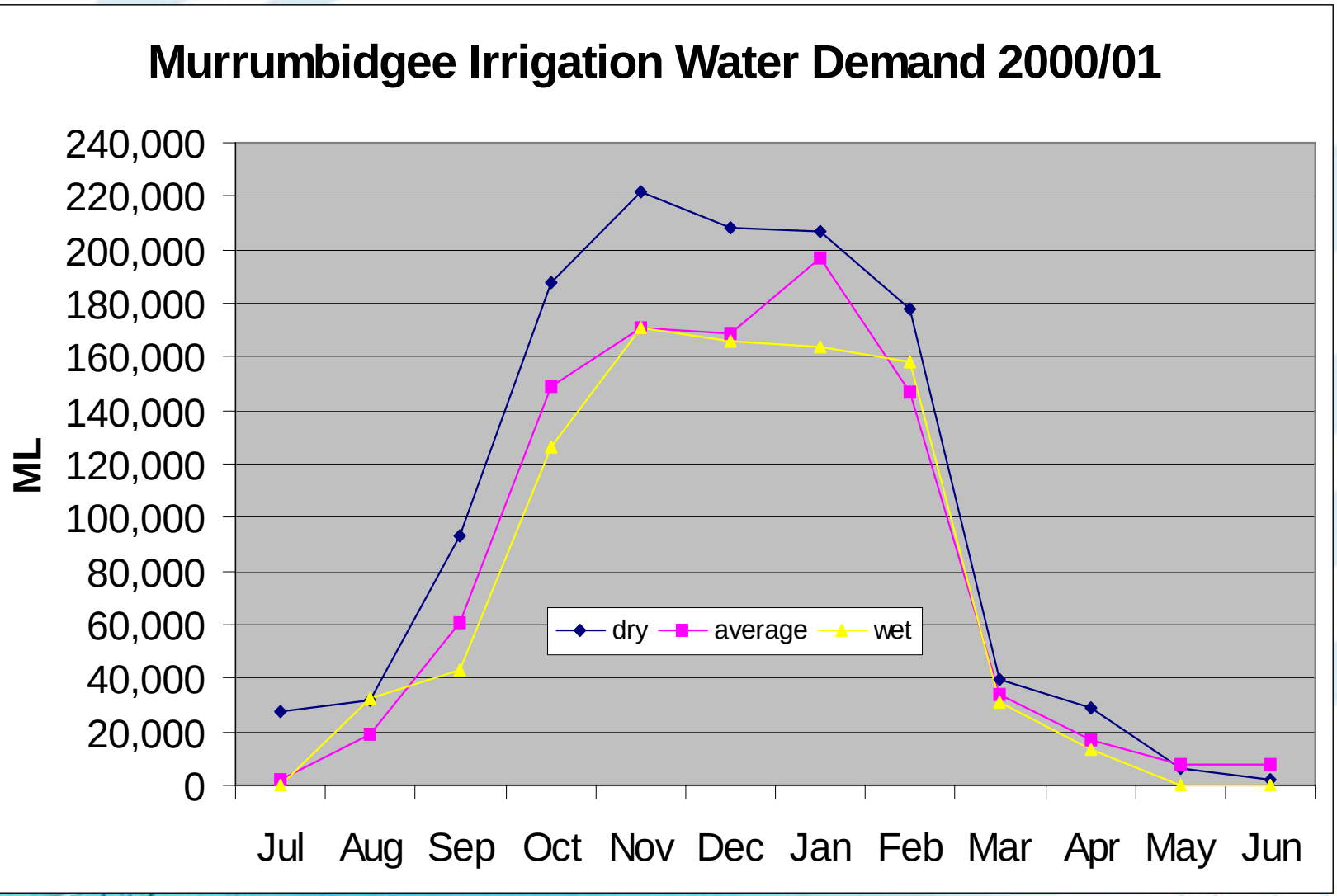
Location of the Study Area

Altered River Flows at Balranald

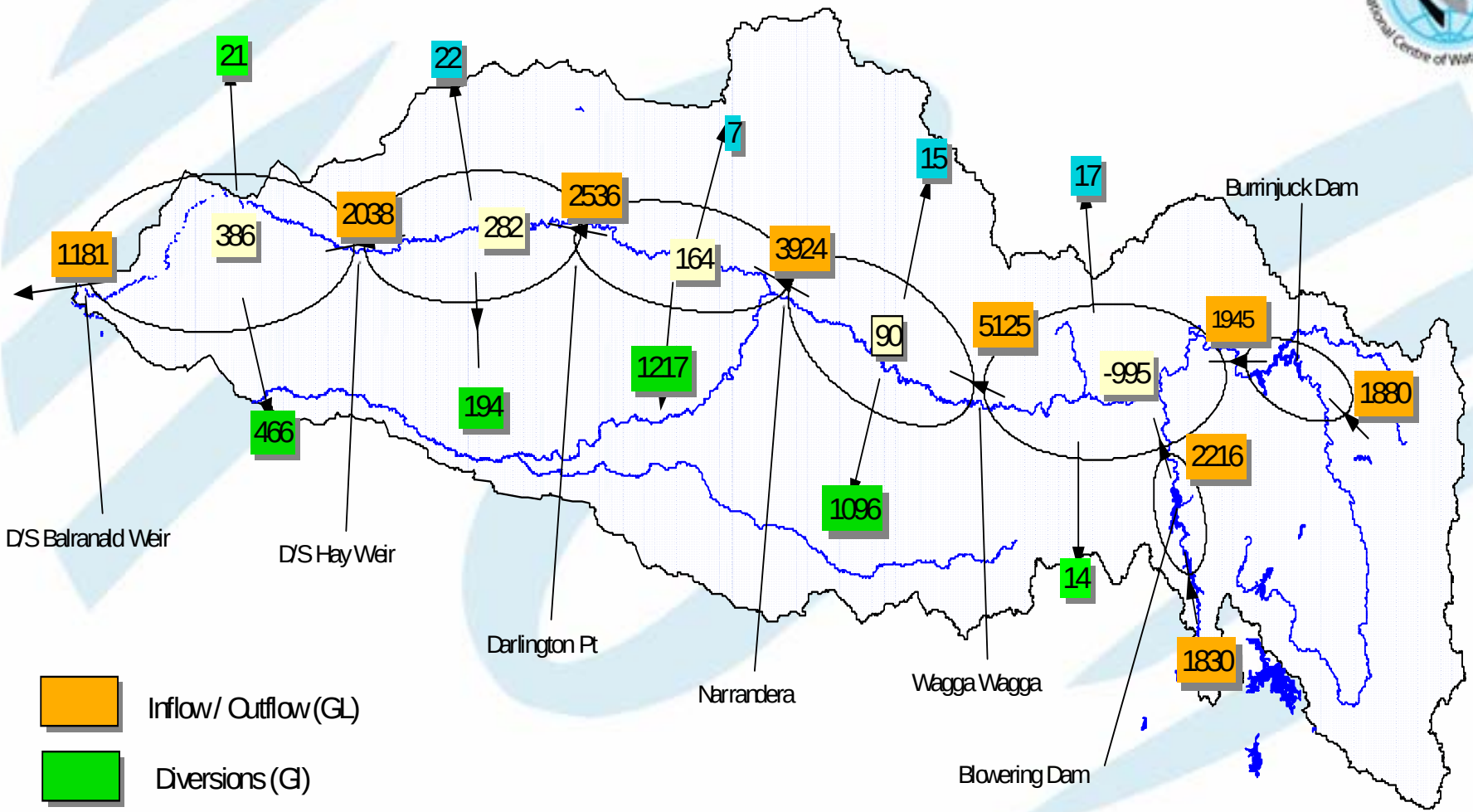


During winter current flows decrease from May to July whereas the natural flows would be increasing during this period

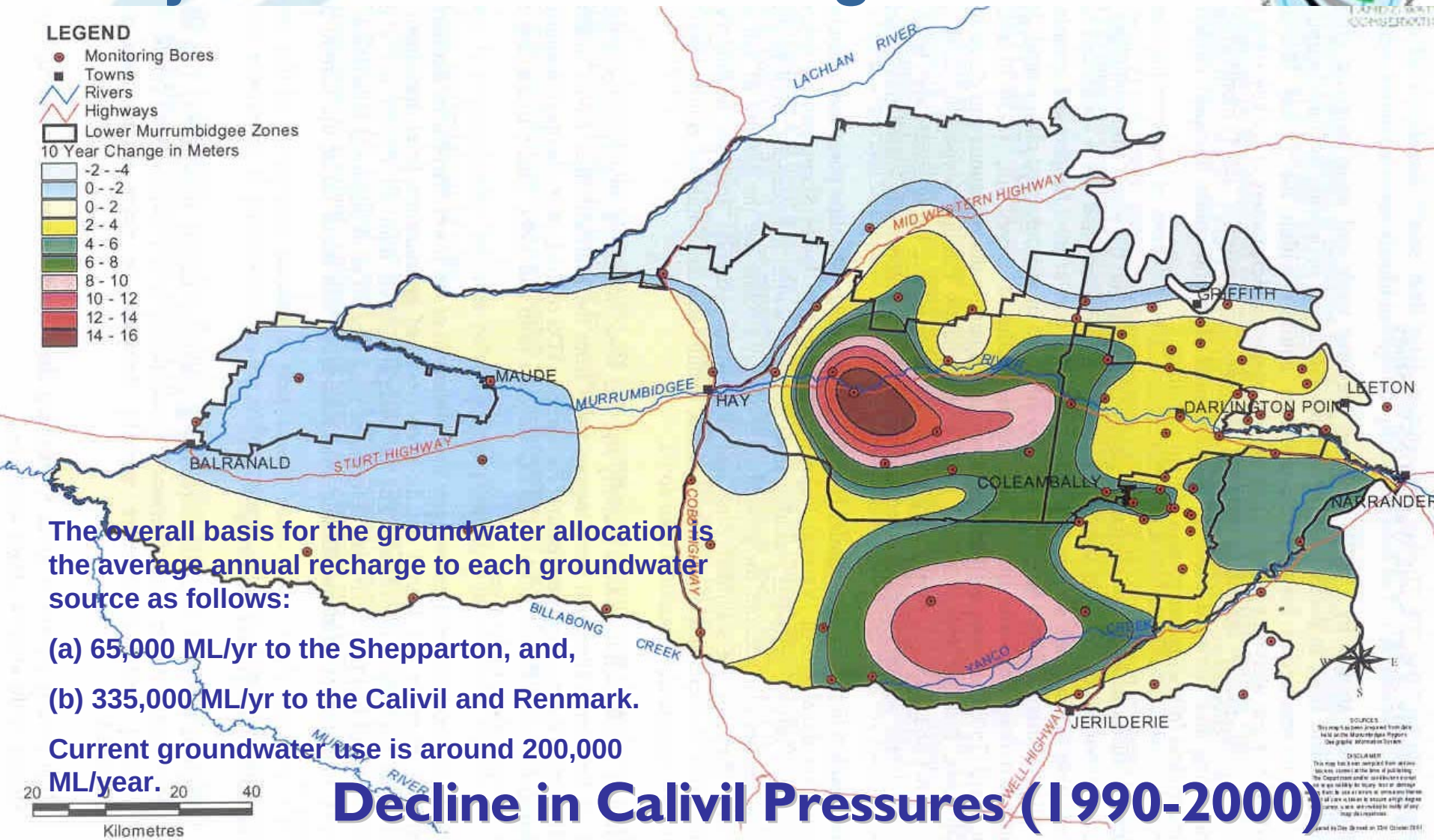
MIA Monthly Water Demand



Understanding Spatial Water Demand is Critical



Understanding Groundwater for Conjunctive Water Management



The overall basis for the groundwater allocation is the average annual recharge to each groundwater source as follows:

(a) 65,000 ML/yr to the Shepparton, and,

(b) 335,000 ML/yr to the Calivil and Renmark.

Current groundwater use is around 200,000 ML/year.

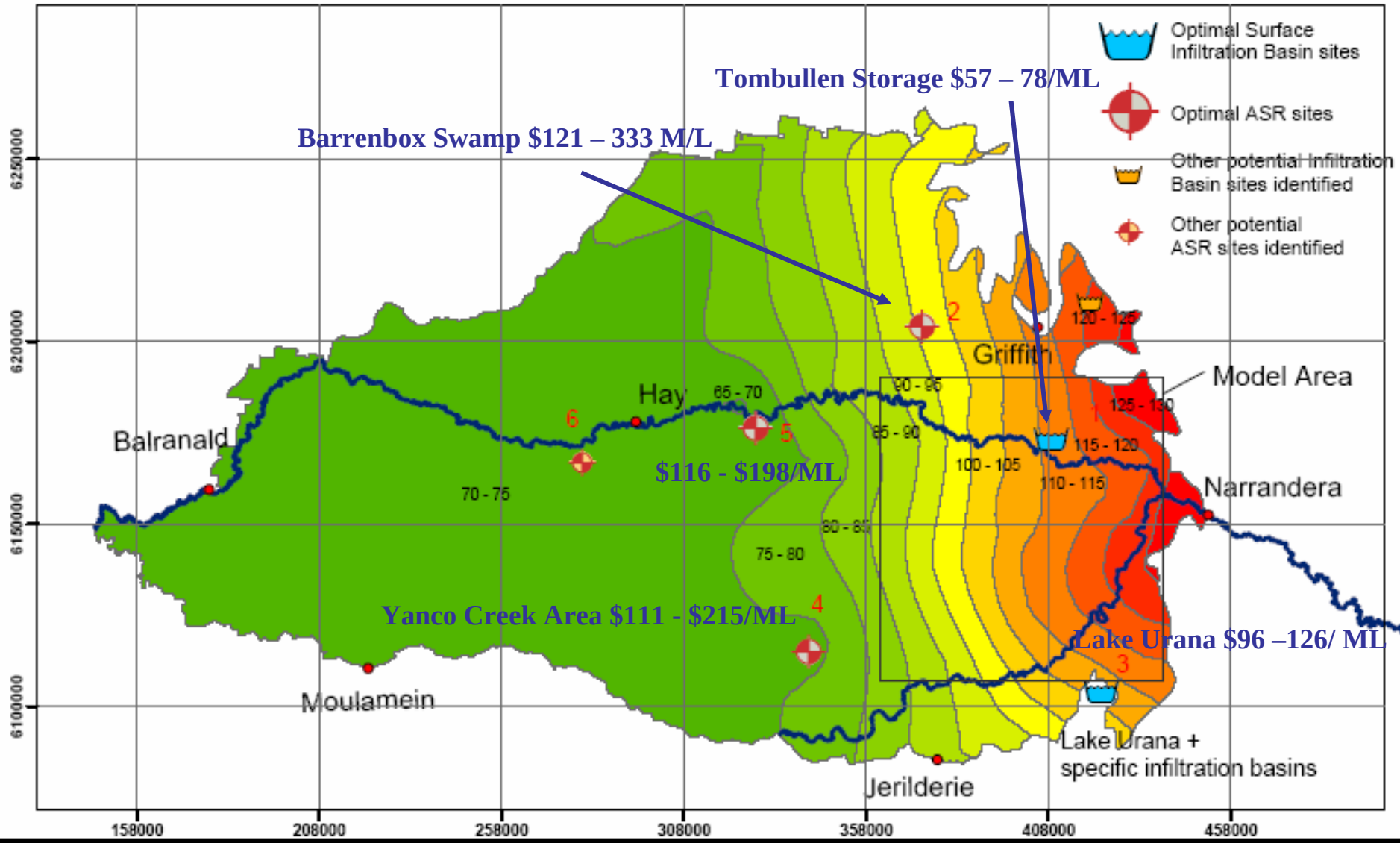
Decline in Calivil Pressures (1990-2000)

Stakeholder Perspectives for Irrigation Demand Management

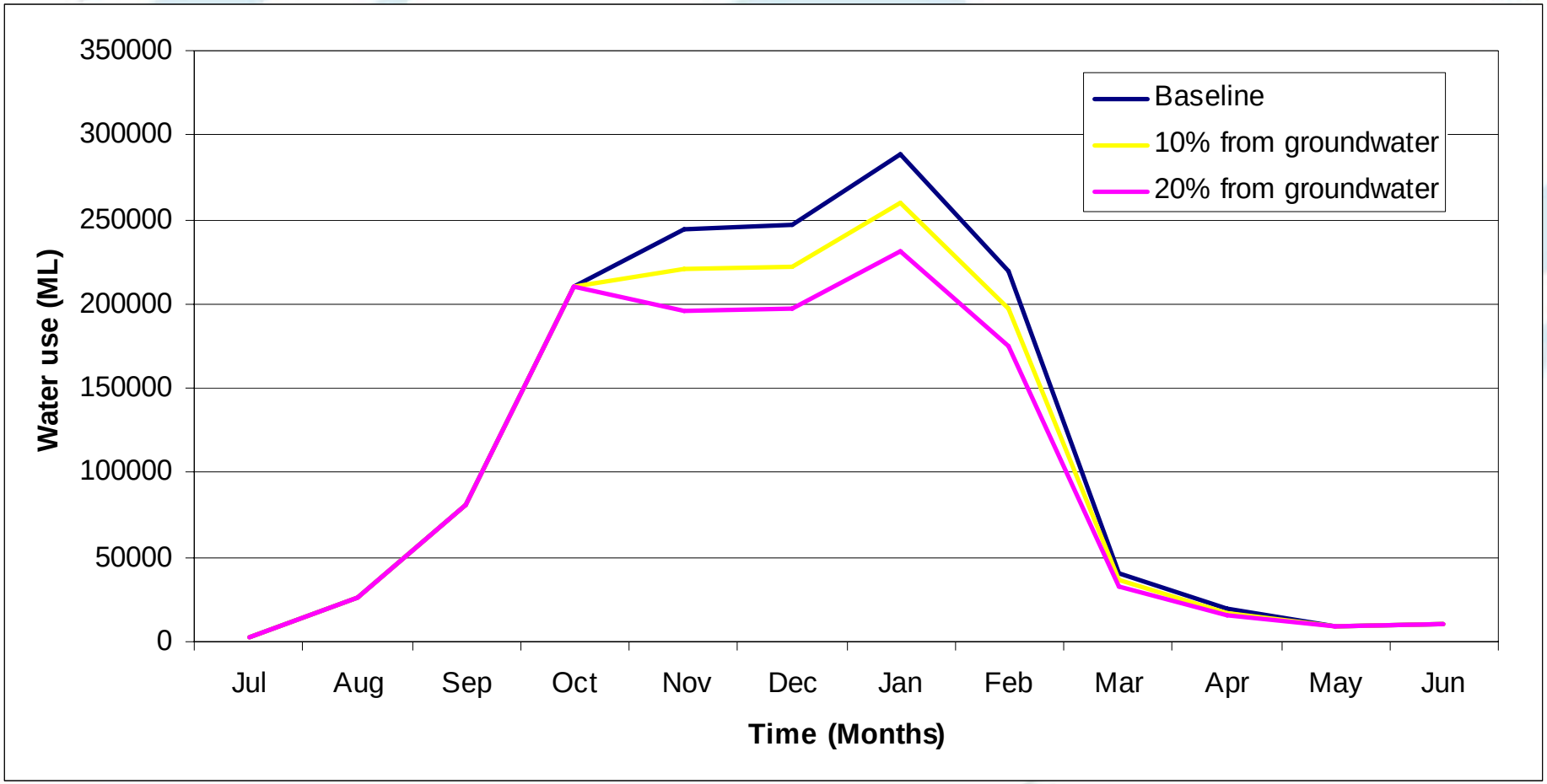
- Change of Cropping Pattern
- On and off-farm water savings
- Conjunctive use
- Selling water as an environmental service

Possibility of ASR through Leaky Channels

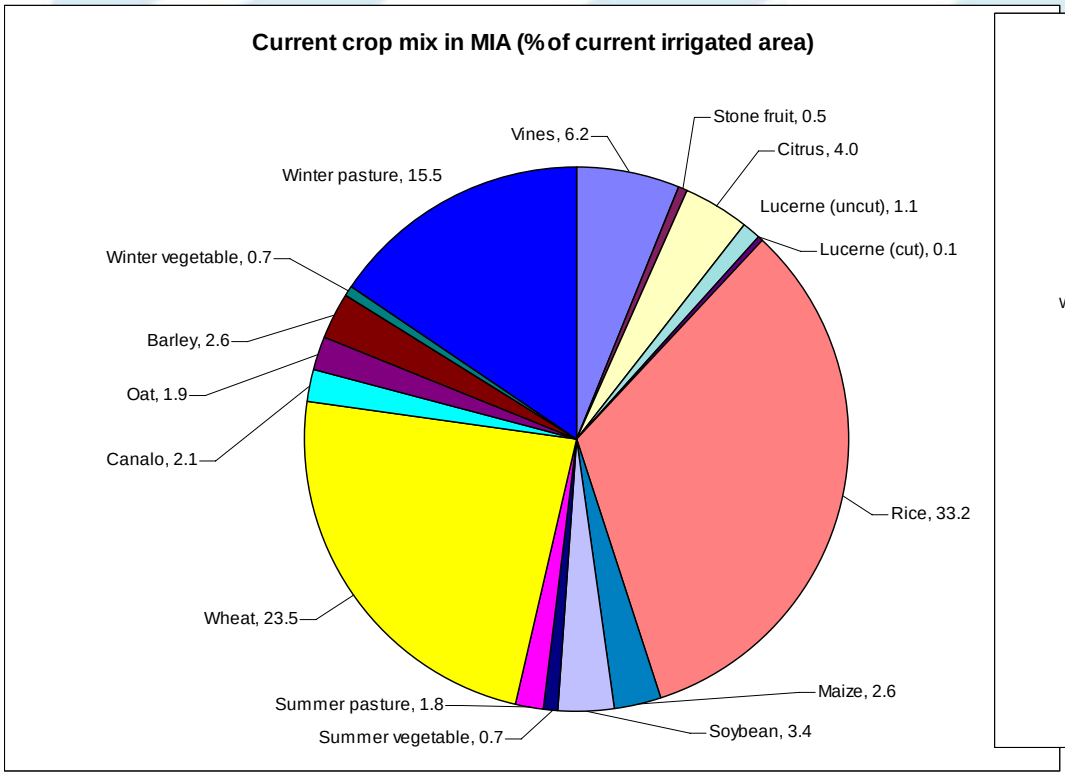
Aquifer Storage and Recovery Options

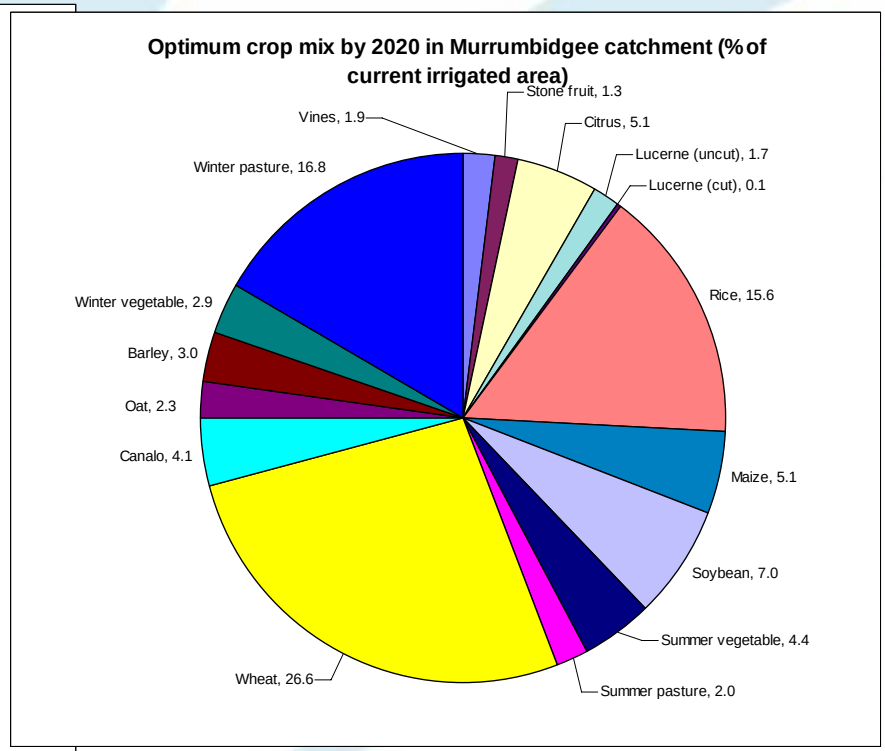


Substitute Surface Water with Groundwater (MAR+SAR+Conjunctive Water Use)

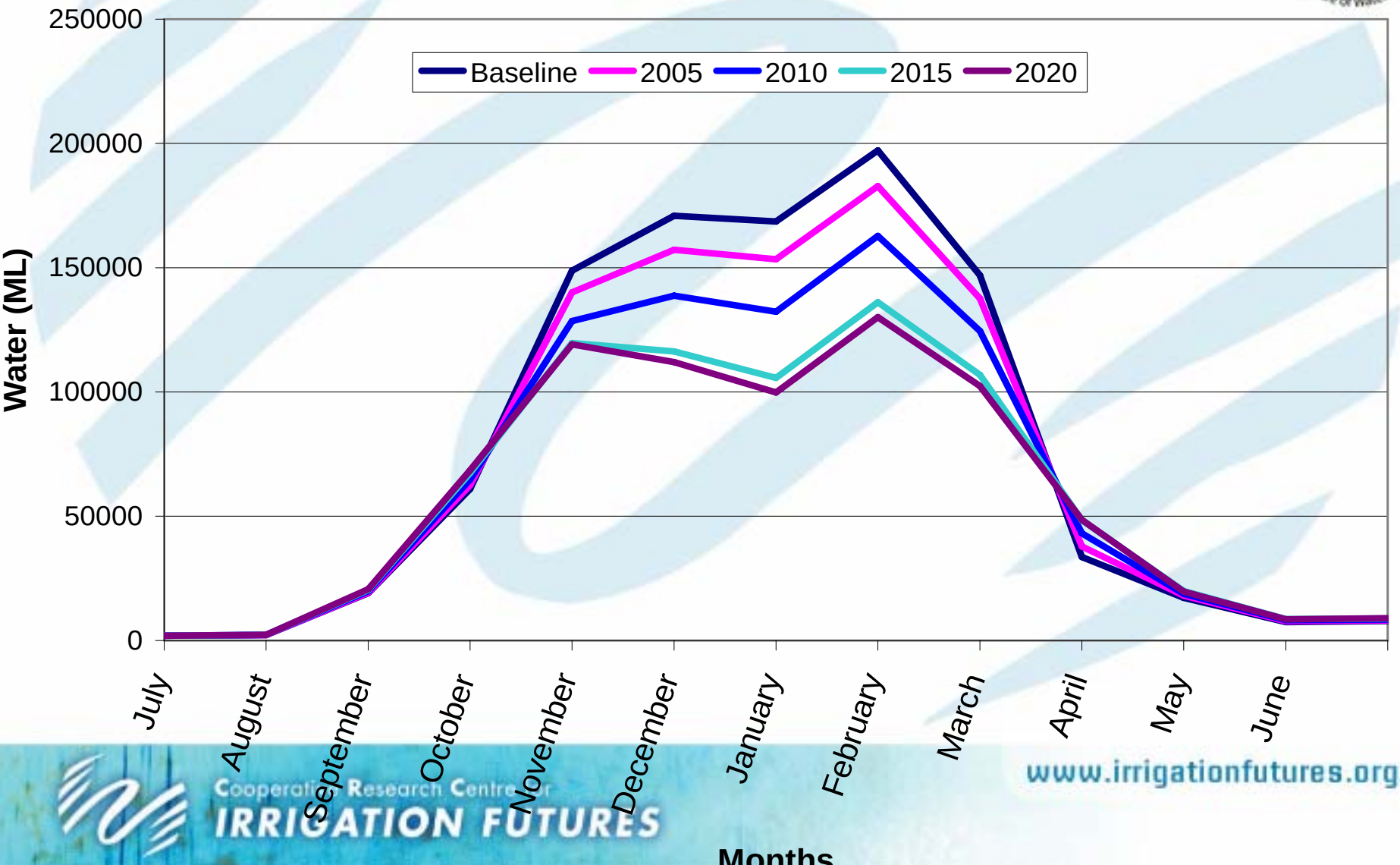


Optimizing summer-winter cropping mix (for 20% water saving)

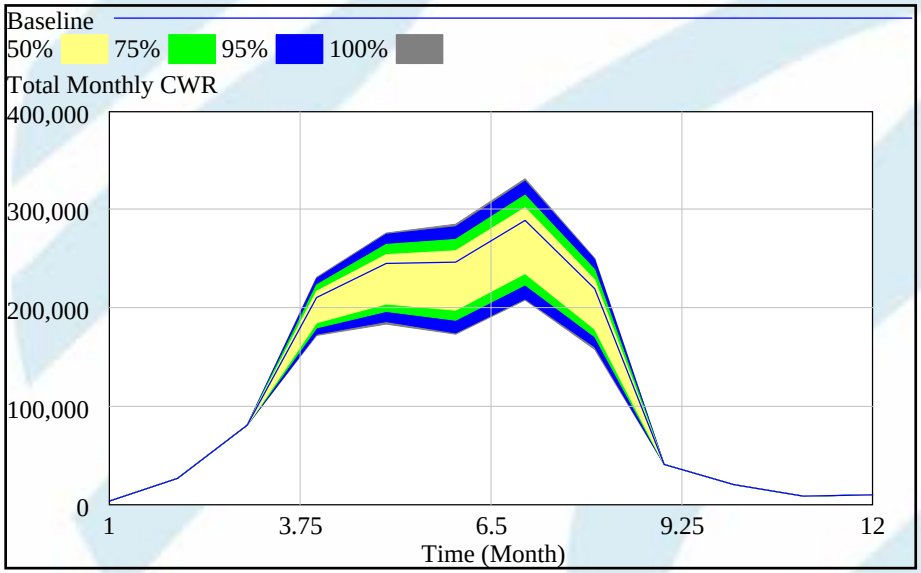




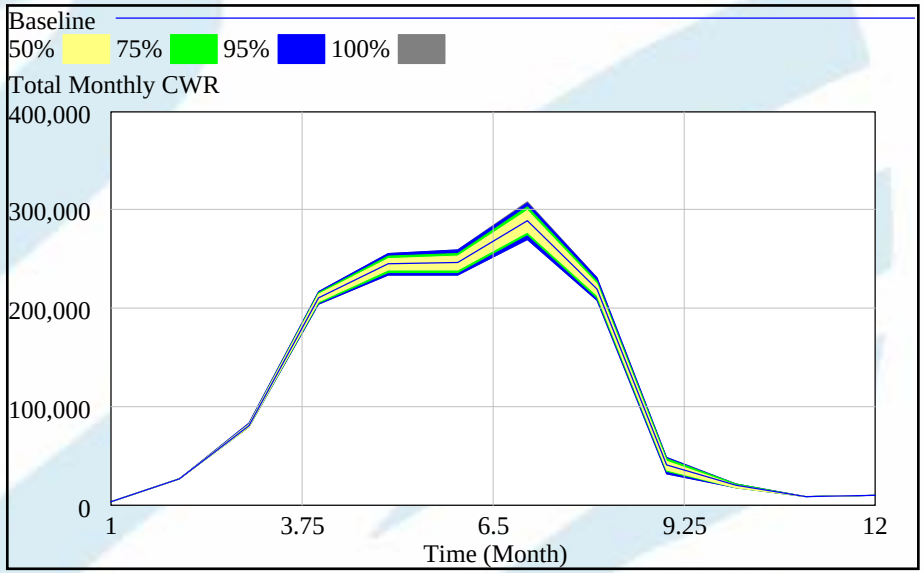
Adoption of new crop mix in MIA (with 20% reduction in summer demand)



Sensitivity Analysis
Total Crop Water Requirement

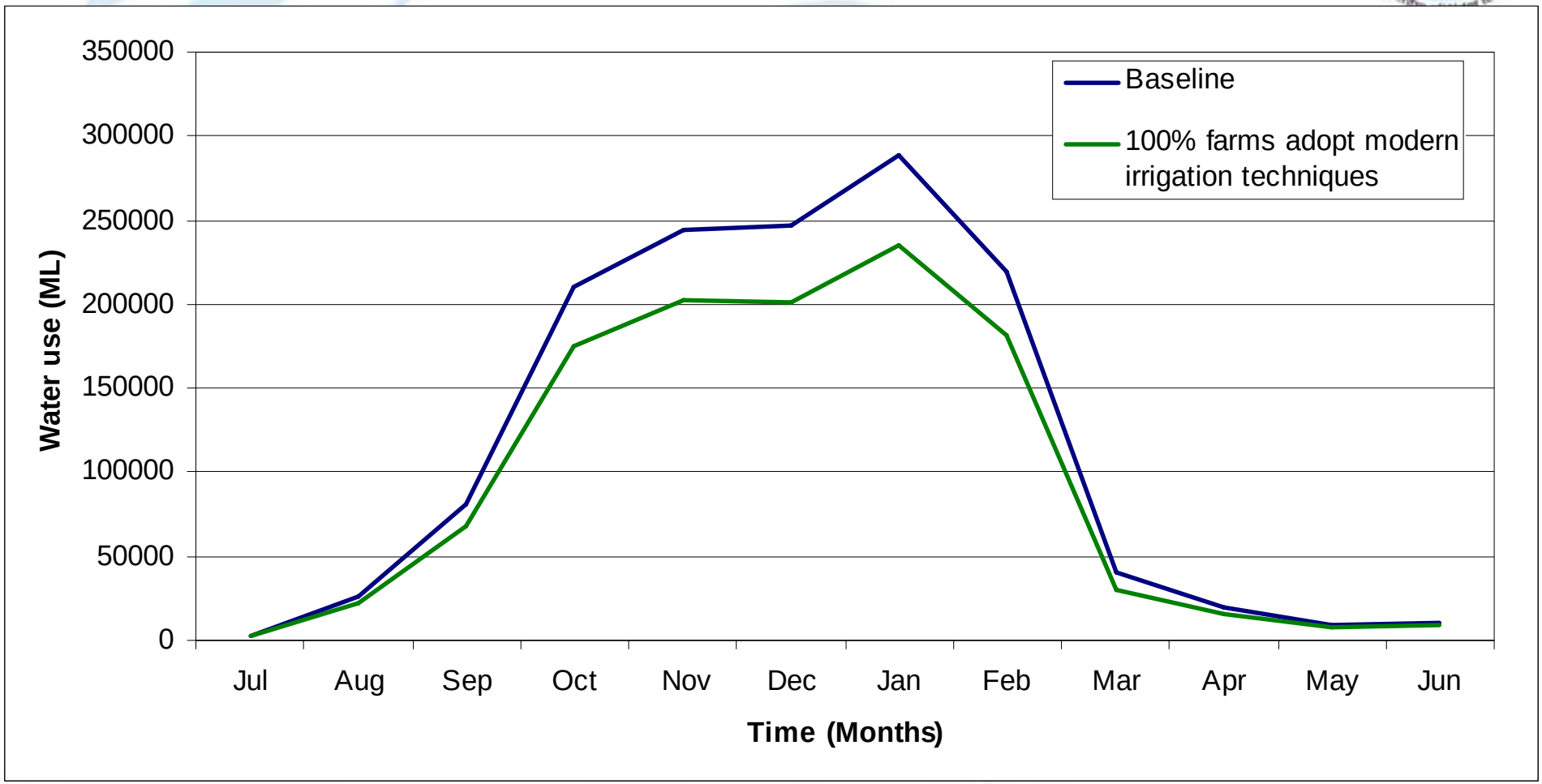


Sensitivity of total CWR in Murrumbidgee catchment for 15% change in **Rice** area within 50%, 75%, 95% and 100% confidence bound



Sensitivity of total CWR in Murrumbidgee catchment for 15% change in **Vines** area within 50%, 75%, 95% and 100% confidence bound

Increased On-farm Water Use Efficiency



Comparison of Costs and Benefits (for 20% reduction in summer water demand)

Scenarios	Gross return (million $)	Benefit or loss to agriculture (million $)	Construction costs (million $)	Other cost* (million $)	Surface water use (GL)	Groundwater use (GL)	Total water use (GL)	Surface Water Available (GL)
Baseline	292.30	0.00	0.00	0.00	1,399.26	0.00	1,399.26	0.00
Marker based reduction in surface water demand	255.47	-36.82	0.00	0.00	1,183.03	0.00	1,183.03	216.24
Conjunctive water use (MAR or ASR)	289.07	-3.23	11	0.00	1,183.03	216.24	1,399.26	-
Spreading water demand with improved cropping mix	291.38	-0.92	0.00	0.00	1,102.75	0.00	1,102.75	296.52
Increase system efficiency	292.30	0.00	35.68	7.35	1,399.26	0.00	1,399.26	216.24
Increase end use efficiency	280.69	-11.61	0.00	0.00	1,155.92	0.00	1,155.92	243.35
Substitute water use (En-route storages)	292.30	0.00	4.27	1.00	1,399.26	0.00	1,399.26	215.00

Conclusions

- Securing 215GL of water through new cropping mix required $1-2 million/year from agricultural return as compared with canal lining which required $35.68 million/year (over $200/ML/yr) of investment per year.

- Channel lining for water saving may be an attractive option due to easier adoption at the system level.

- Reduction in high water duty crops is essential to reduce peak water demand

Challenges

- Appropriate structural adjustment for alternative crop mixes?
- For conjunctive water use through ASR what is the most appropriate institutional structure?
- Increasing on-farm efficiency might be in the farmer's economic self-interest, but it will also help improve stream flows. *Who pays and owns the savings?*
- *A combination of appropriate options is required*

THANK YOU

PARTNER ORGANISATIONS

Victorian Department of Primary Industries
University of Western Sydney
University of Southern Queensland
University of South Australia
University of New England
University of Melbourne
Sun Water
South Australian Research and Development Institute
South Australian Department of Water, Land and Biodiversity Conservation
Queensland Department of Natural Resources, Mines and Water
New South Wales Department of Primary Industries
Goulburn-Murray Water
CSIRO
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