

Recovering Water for the Environment – *Scoping study of operational changes to reduce river and storage losses along the River Murray system*

This project was funded by the Murray-Darling Basin Commission to identify further opportunities for water recovery under the Living Murray Program. This summary provides an overview of the above project.

Water Loss from the River Murray System

The purpose of this scoping study was to identify potential opportunities to reduce losses of water from the River Murray and storages. Losses are defined as volumes of water that having entered the river system at one point do not re-enter the river downstream. Water pumped or diverted from the river for productive use and water providing environmental benefits to riverine systems were not considered losses in this study. Reduction of losses would create an opportunity to realise an economic and/or an environmental benefit.

The outcomes of this study may input into more detailed studies to measure the potential for water savings associated with reduced losses.



Figure 1. Sections of River Murray system considered as part of this project (highlighted in red).

Operation of the River Murray System

The processes of water loss from the River Murray are distinctly different during the three different operating modes:

- *Spill mode* is when flow in the river is more than can be used and cannot be stored anywhere in the system (i.e. “surplus” water). Surplus water generally corresponds to high flows after rainfall, when the river may overtop its banks and flow into floodplain wetlands.
- *Storage mode* generally occurs during the winter months when water is not needed for irrigation and is being collected in the headwater storages. Storage mode coincides with the cooler months when evaporation rates and losses are very low. At this time, river flows are over most of the system are low and the river is at its smallest surface area (also, overbank losses are minimal). Losses are not a major concern during storage mode.
- *Supply mode* corresponds to the irrigation period when the river flow is highly regulated to meet consumer demands, to meet environmental flow requirements, and to minimise losses. Losses are a significant consideration during supply mode, because lost water may not be providing high value environmental services and it is not available for consumption at the time of highest demand. If saved, these losses can be stored and used for another purpose. Therefore, in this study, the emphasis was on reduction in losses during supply mode conditions.

Estimating the volume of water lost

Losses were determined using three different methods. Further detail of the methods is available in the accompanying technical report. The average losses for sections of the River Murray System are shown in Figure 2. Figure 2 shows the difference in the loss estimates for the three methods.

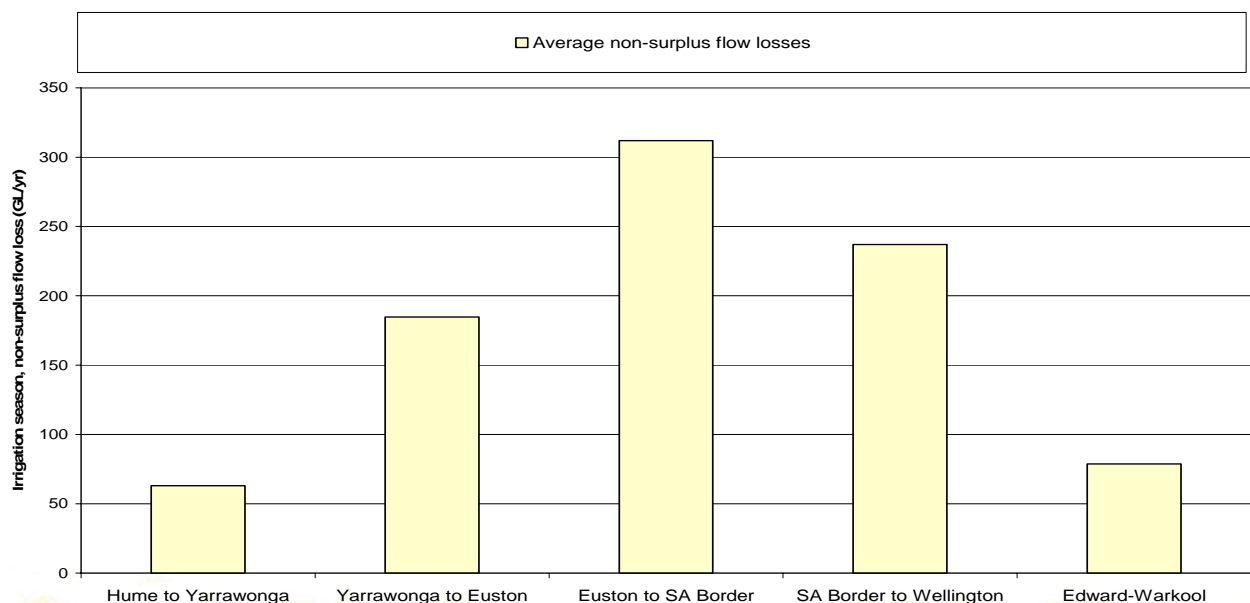


Figure 2. Comparison of average irrigation season flow losses estimated for the River Murray from Hume Dam to the South Australian border.

Table 1 shows the distribution of losses over an average year.

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Table 1. Estimated mean annual losses of non-surplus flows from the River Murray System (excluding the South Australian section of the River Murray)

	Irrigation season loss (GL)	Non-irrigation season loss (GL)	Total annual non surplus flow loss (GL)
Average modelled loss	590	70	660

Opportunities to reduce losses

The project identified a number of opportunities to reduce loss in the system. While these are presented along with the reasons in more detail in the project report, a summary table has been included here as Table 2. This table shows only the highest priority opportunities to reduce river and storage losses from the system identified by the project.

Table 2. Highest priority opportunities for reducing river and storage losses

Opportunity	Description	Potential for savings
Expand projects seeking to isolate wetlands connected at regulated flow level	The principle behind this option is to reduce the surface area of wetlands connected to the river during the irrigation season regulated flow period, thereby recovering water that would be otherwise evaporated from wetlands	Low – moderate. Practical considerations will set an upper limit of savings. If 30% of all losses can be saved, the savings are around 50 – 60 GL/yr from Hume-SA, and 20 – 30 GL/yr in SA (these are rough estimates only). This action also has environmental benefits for wetlands
Formalise and document the practice of running the river with a higher risk profile	The main way to reduce losses from the way the river is run is to hold water higher (upstream) in the system for longer. This generates savings by reducing overall evaporation. The drawback with delaying water transfers is that there is an increased risk that downstream demands will not be met	The savings potential of this practice has not been modelled but is likely to be low to moderate.
Weir pool drawdown projects to also quantify savings potential	Weir pool manipulation is under investigation as part of The Living Murray initiative. Weir pool drawdown will reduce water surface area, thereby reducing evaporative losses. These projects should be encouraged to report on prospects for achieving water savings	The savings potential of this practice has not been modelled but is likely to be low to moderate.
Scoping study of aquifer storage and recovery (ASR)	ASR is the procedure of storing available surface water in existing aquifers and then when needed, water is recovered from the same aquifer. In general, ASR offers lower capital costs compared to surface dams, smaller storages located close to the water source and demand points are economic, there are no losses from evaporation, and in a confined aquifer there is minimal leakage. It is even possible to store freshwater within saline aquifers	The savings potential of aquifer storage and recovery in the Murray is unknown, but will be limited by the storage capacity. This option probably offers low to moderate savings at best.

Additional Recommendations

This study found that there was significant uncertainty associated with loss estimates. Some of this uncertainty could be reduced through additional research and modelling efforts. These areas are further discussed below.

- *Measurement and modelling of the magnitude, and identification of the sources, of loss*

Following the data analysis undertaken for this project it is apparent that the magnitude of losses often falls within the measurement error. This is not to say that the losses are small, but conversely that the measurement error could be improved. Improved measurement will not result in water savings, but will allow verification of modelled savings, and may help identify reaches or system components to target for water savings.
- *Improved operations planning tools*

The current operations planning tools could be considered coarse, and there may be scope to develop more refined tools that use a daily time step and include the major tributaries. These tools could include expert systems that optimize decision making in relation to river operations. They would also capture and make available all knowledge regarding operation of the river.
- *Improved modelling of initial losses*

Modelling of initial losses in the river system should be improved so that the impact of more variable flow regimes on this form of loss can be quantified.
- *Improved modelling of wetland losses*

Modelling of losses using improved evaporation estimates and more accurate estimates of surface areas will enable more accurate quantification of evaporative losses from wetlands.

Where to from here

Of the options for further investigation identified in this project, the four highest priority options identified for further investigation, based on consideration of resources required and likely water recovery outcome, are:

- Expand projects seeking to isolate wetlands connected at regulated flow level
- Formalise and document the opportunity for and the impacts of running the river with a higher risk profile
- Commence weir pool drawdown projects
- Scope aquifer storage and recovery opportunities

The Murray-Darling Basin Commission and partner governments may choose to investigate these opportunities further through feasibility assessments or other projects.

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