Why the Mary is at risk from low flows.

Steve Burgess
Mary River Catchment Coordinating Committee

Myth/ unsubstantiated unscientific conclusion 1

- ☑ The Mary River has plenty of flow
- ☑ We are only removing a comparatively small amount
- ☒ Therefore we won't have much adverse impact

Myth/ unsubstantiated unscientific conclusion 2

- ☑ The proposed dam is a long way upstream
- ☑ There are many tributaries and a large catchment downstream
- ☒ Therefore there will be little impact on the lower river

It may seem to some people that because the level of additional urban water being targeted for interbasin transfer from the Mary Catchment is relatively small when compared to the catchment's long-term mean annual outflow, that the environmental impact of taking this water from the system will be low.
This is not the case.

It may seem to some people that because Traveston Crossing is more than 200km from the river mouth and that there are a number of streams which flow into the Mary further downstream, then the proposed dam will have little effect on the environment in the lower part of the river.
This is not the case.

What follows is a brief explanation of why the entire Mary River downstream of Traveston Crossing is at risk from the effects proposed Traveston Crossing Dam and the associate Northern Pipleine Interconnector in times of low flow.

We know that the Mary River is at risk of future environmental damage from low flows, because even under current levels of water extraction we already see a range of serious environmental problems associated with low flows. These unnaturally low flow periods contribute to poor water quality, serious aquatic weed infestations and fishkills throughout the river system.

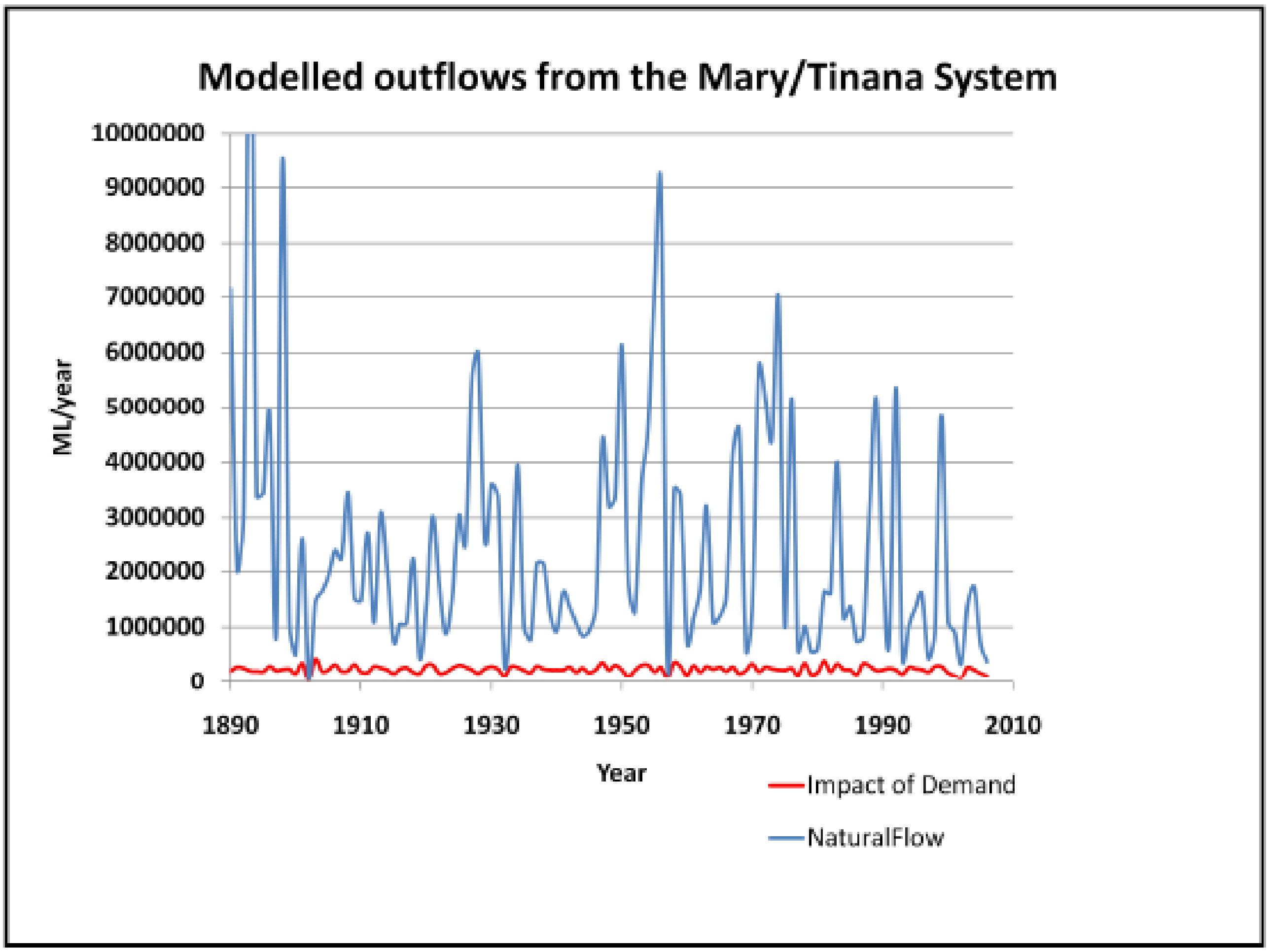
Photo: Fishkill and weed infestation at Widgee Crossing, July 2007

During low flow periods, the Mary often experiences serious infestations of aquatic weeds. These infestations can completely disrupt the dissolved oxygen regime in the river, block out all light, inhibit fish and animal movement and greatly increase evaporative losses. This has adverse impacts on nearly all other aquatic life in the river.

Photo: Water quality monitoring under a raft of water hyacinth and salvinia, Mary River Barrage, 2007

During these low flow periods, all connection between the river and the sea is broken by the barrages in the lower river. No fresh water flows over the barrages, and often the fishways are inoperable. The Mary River is the major remaining freshwater and nutrient supply for the Great Sandy Strait, Hervey Bay and the marine areas of Fraser Island.

Photo: Satellite image of Mary River Barrage, 2004. No flow over barrage, no flow through fishway.

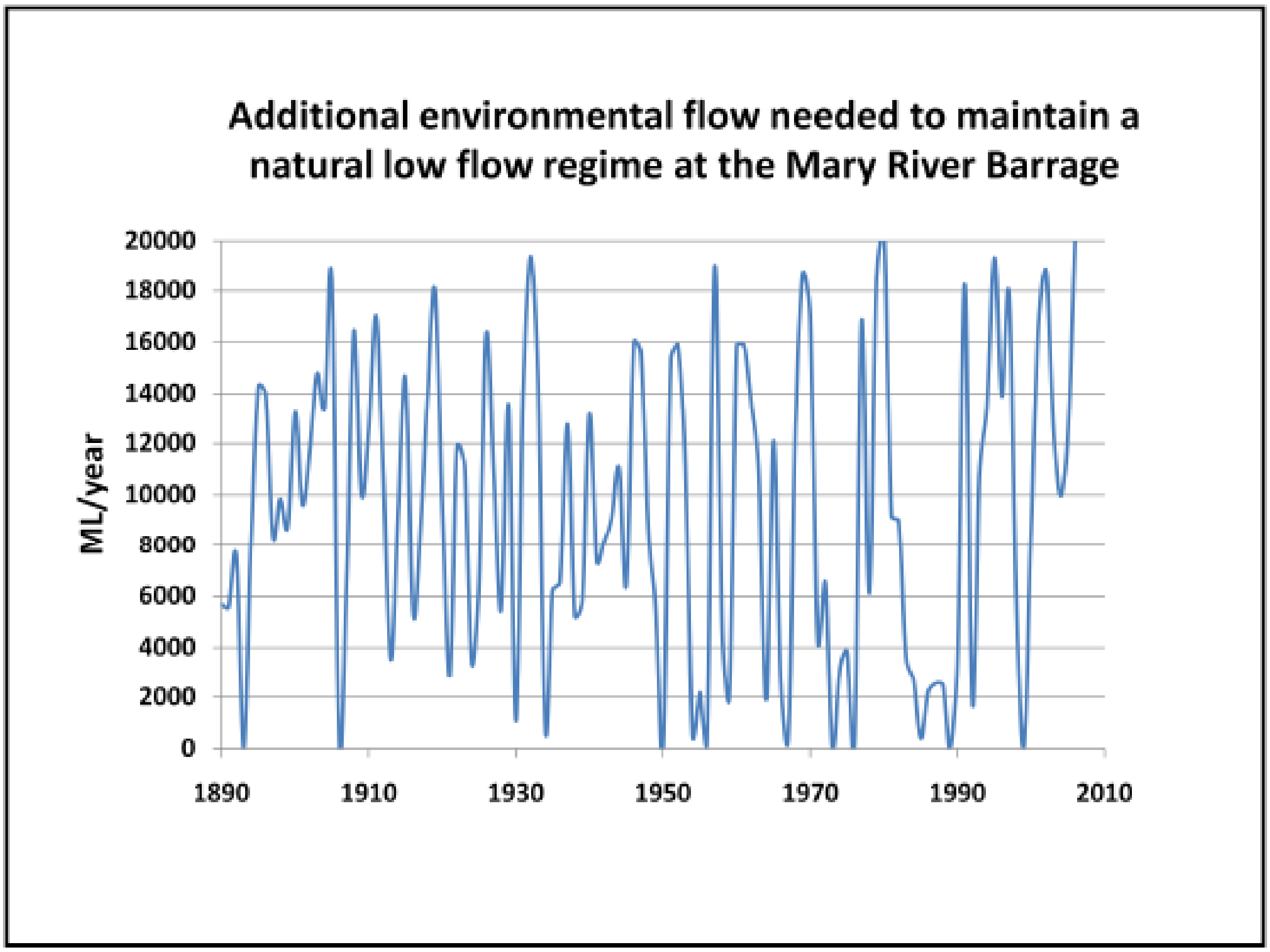


The blue line (top) shows the estimated pre-development outflows from the entire Mary River/Tinana Creek system, as calculated by the IQQM model of the Mary Catchment presented in the EIS for the proposed Traveston Crossing dam. It is obvious that these flows are extremely variable, and in most years outflows are lower than the long-term average outflow.

The bottom (red) line shows the amount of water removed from the end-of-system flows by the water allocation scenario that includes the first stage of the proposed Traveston Crossing Dam and the Northern Pipeline Interconnector, as modelled in the Traveston EIS. It is clear that this "demand", although relatively small on average, is comparatively constant.

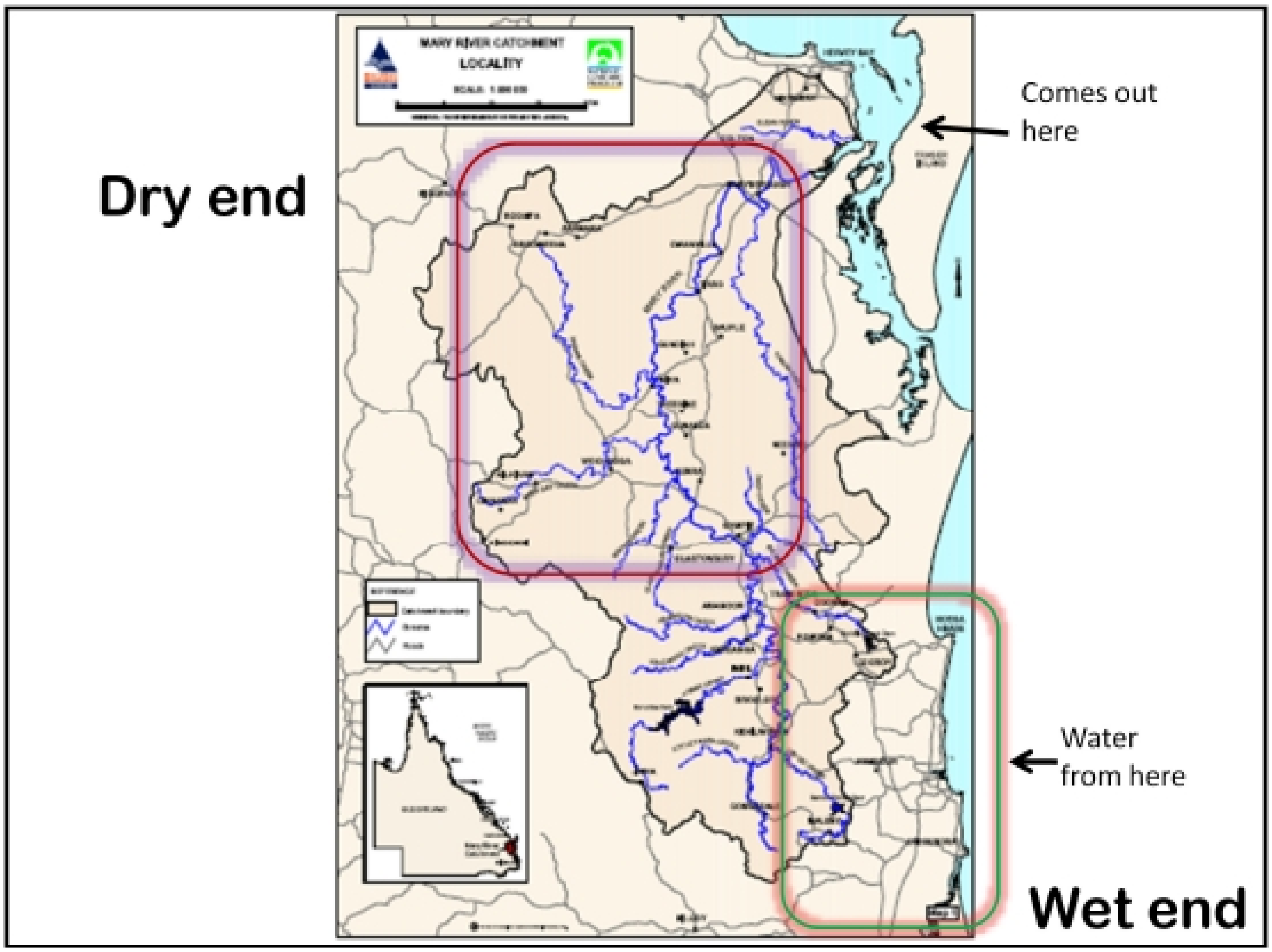
The problems arise in the low-flow years like the early 1900's and 1930's, the mid 1950's and 90's and early 2000's when the expected impact of demand accounts for a high proportion of the total flow for the year (over 60%). It is important to remember that the problems we already see in the river occur at levels of demand much less than those modelled here.

This modelling suggests that such a pattern of "demand" would see the river facing severe low-flow related environmental crises as far downstream as the end-of-system every 10 to 15 years, more severe than is natural, and more severe than those already experienced. In addition, this modelling does not account for any impacts of predicted climate change trends on further reducing stream flows. There is no doubt that increasing the severity and frequency of these low-flow events is detrimental to the survival of populations and ecosystems in the river that are already recognized as threatened.



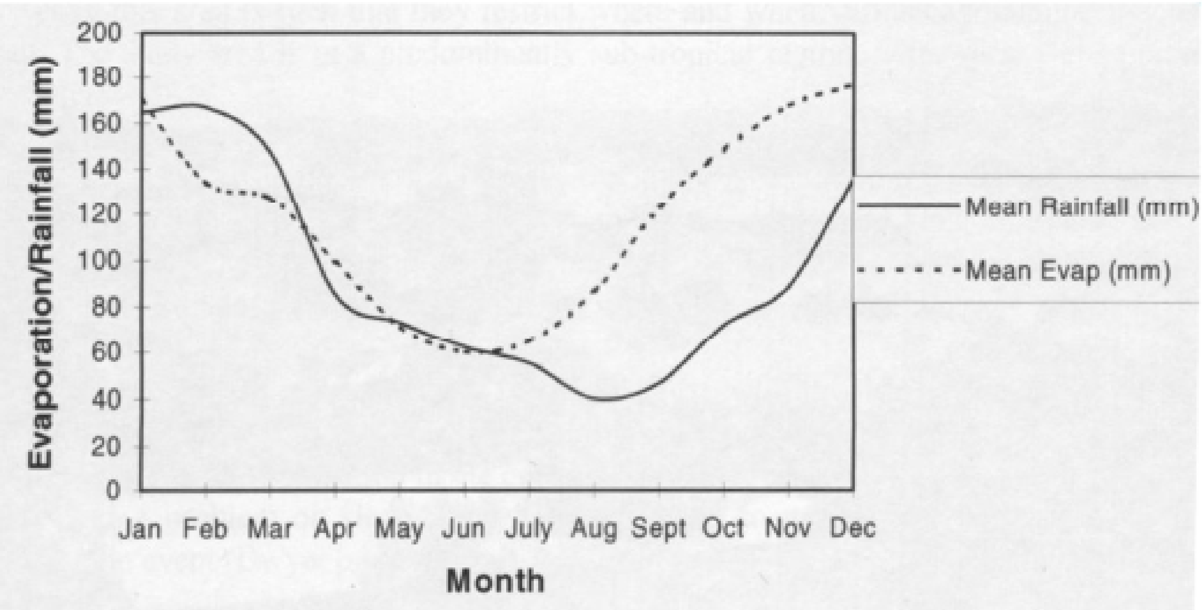
The IQQM catchment modelling presented in the EIS was used to calculate the "shortfall" in daily flows between the natural low-flow regime and the flows resulting from the water use scenario which includes stage 1 of the Traveston Crossing dam. At most points in the river, 'low flow' was defined as less than 30cm above cease-to-flow. At the barrage, it was defined as flows below 135ML per day. This is very modest when compared with the 250ML per day low-flow bypass at the Traveston dam site that was originally used in the IQQM modelling for the Mary Basin Water Resource Plan.

This graph shows the amount of additional water that would be required to be delivered annually at the barrage to preserve the low-flow regime to the estuary. If these additional flows at the barrage were supplied by environmental flow releases from the Traveston Crossing Dam, the releases would need to be much larger to allow for approximately 150km of transmission losses. Note that this does not make any provision for any additional flushing flows needed to maintain normal estuarine flow signals.



Catchment map showing simplistic climate summary. The catchment gets progressively drier as you move downstream from the headwaters to the Mary River barrage. The orange (wet) area receives approximately twice the rainfall as the pink (dry) area. However, in terms of streamflow, the difference between the wet and dry areas is much more accentuated, particularly in dry seasons.

Gympie Climate (Bureau of Meteorology 1997)



In the ‘wet’ upper catchment, rainfall greatly exceeds evaporation.

However, by the time you move downstream as far as Gympie (midcatchment), annual evaporation exceeds rainfall. The effect is particularly marked in the months from July to November (nicknamed the JASON months)

Theebine Climate (Bureau of Meteorology 1997)

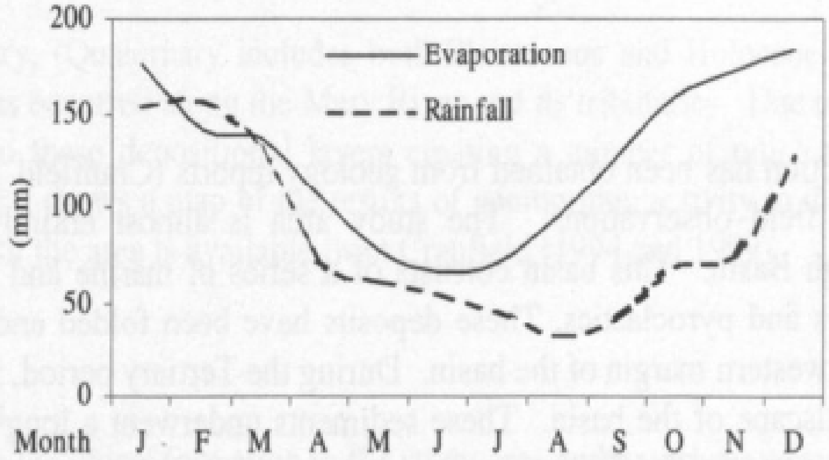
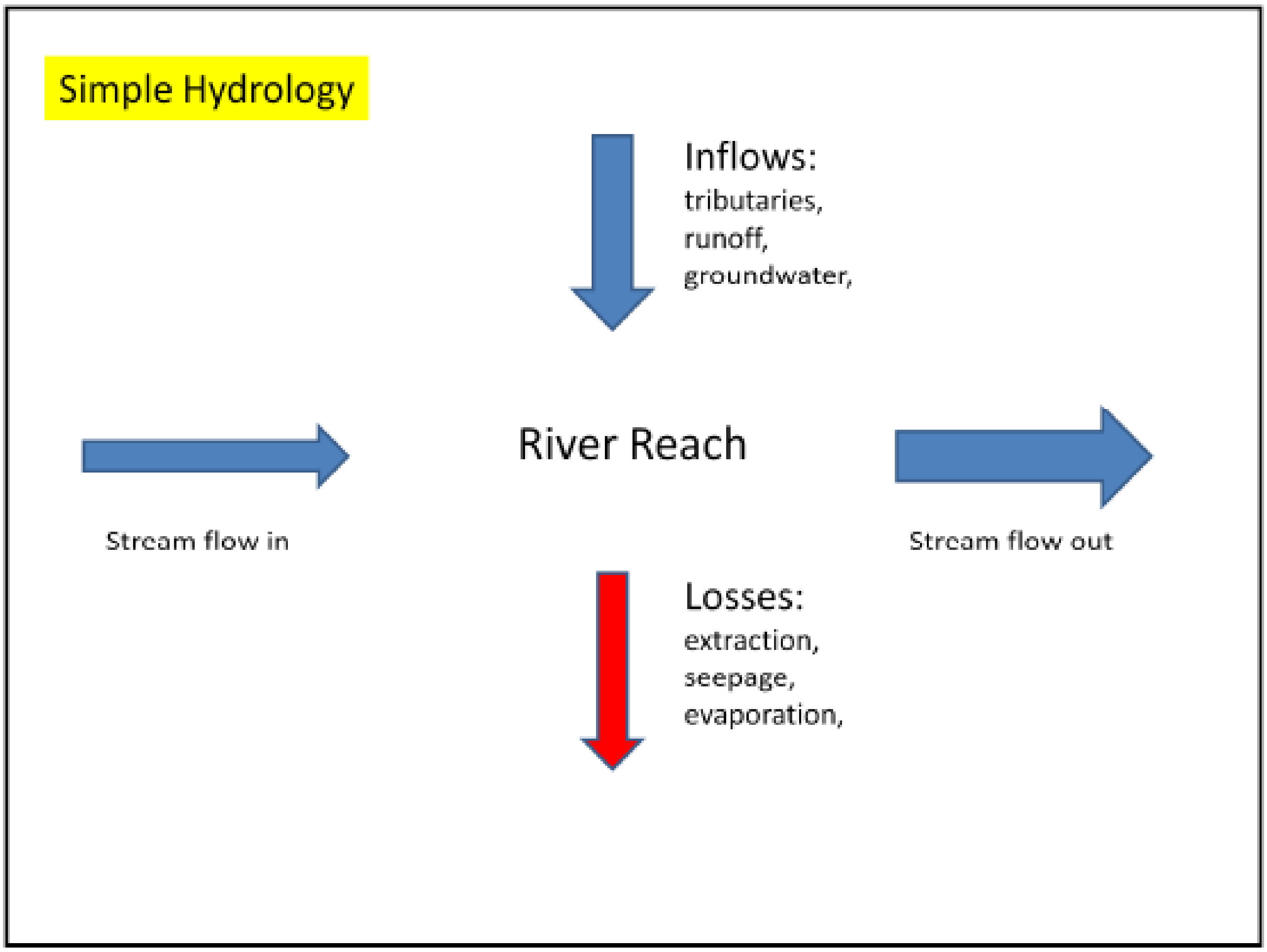
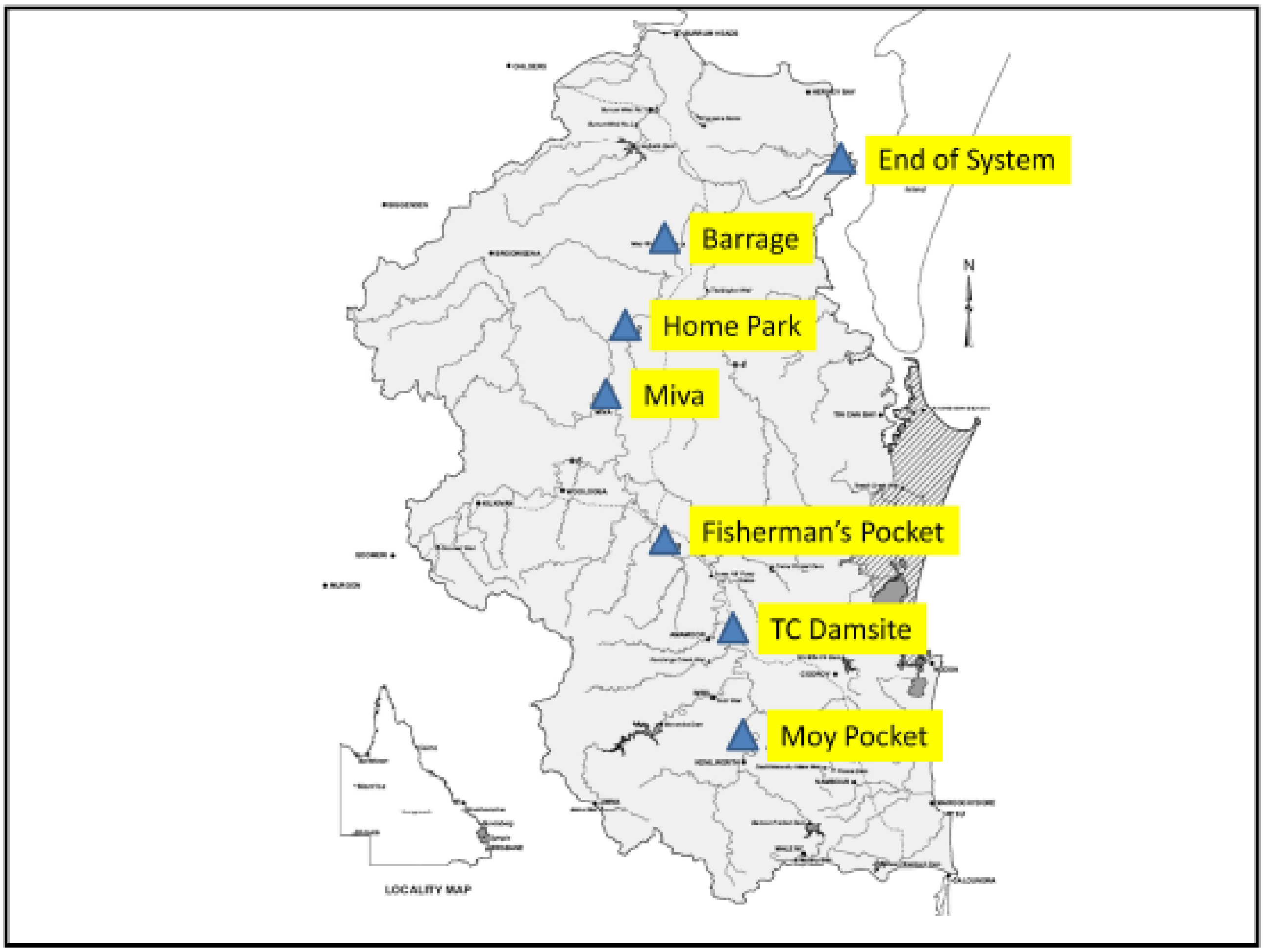


Figure 1. Monthly rainfall and evaporation for Theebine derived from SILO Patched Point Dataset supplied by Natural Resources and Mines, 2002.

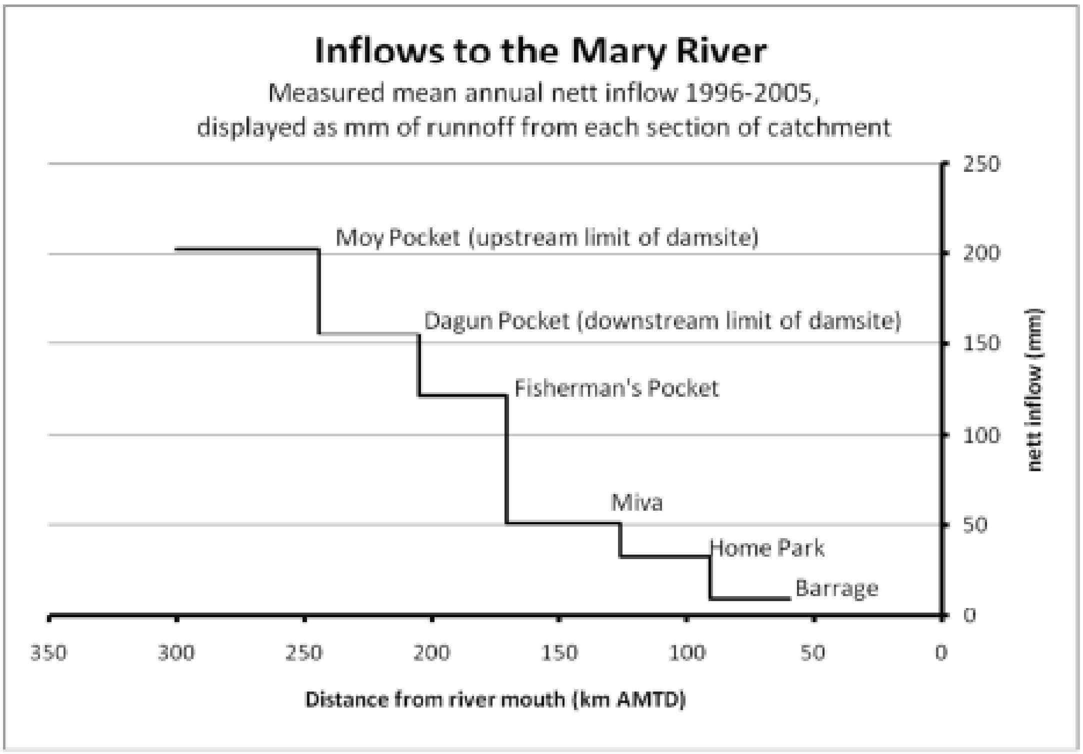
The seasonal pattern of water deficit during the JASON months is accentuated as you move further down the catchment. Not surprisingly, these months also coincide with the peak demand for irrigation water from the river throughout the middle part of the catchment.



To investigate what happens to water resources in the river as we move downstream, it is useful to work with a simple conceptual model. The amount of water flowing in the river is measured at gauging stations at intervals along the main trunk of the river. Between one gauging station and the next, some water flows into the river from the surrounding catchment, and some is lost from the river. If more water enters than is lost, then the flow at the next gauging station is greater. This is the ‘usual’ situation as we move downstream, particularly if we are looking at flows on an annual basis, or averaged over a long period of time.

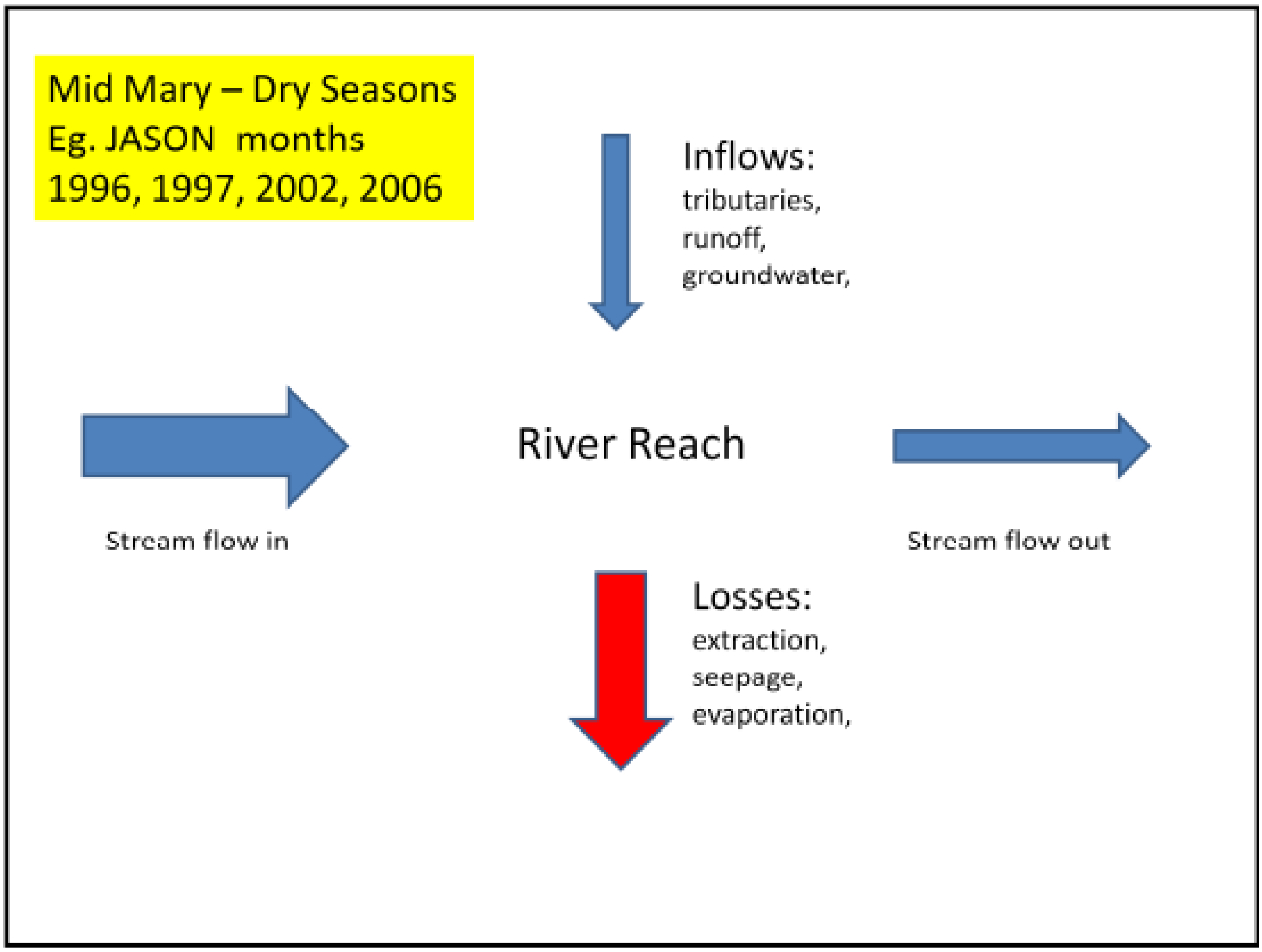


Daily flows from 1996 to 2005 from a series of gauging stations along the main trunk of the Mary were analysed to help understand the current state of the surface water resource in the Mary River. This time period included major flood events and low flow events, there were no changes in water infrastructure in the catchment during this time and levels of water allocation and patterns of agricultural use were fairly stable.

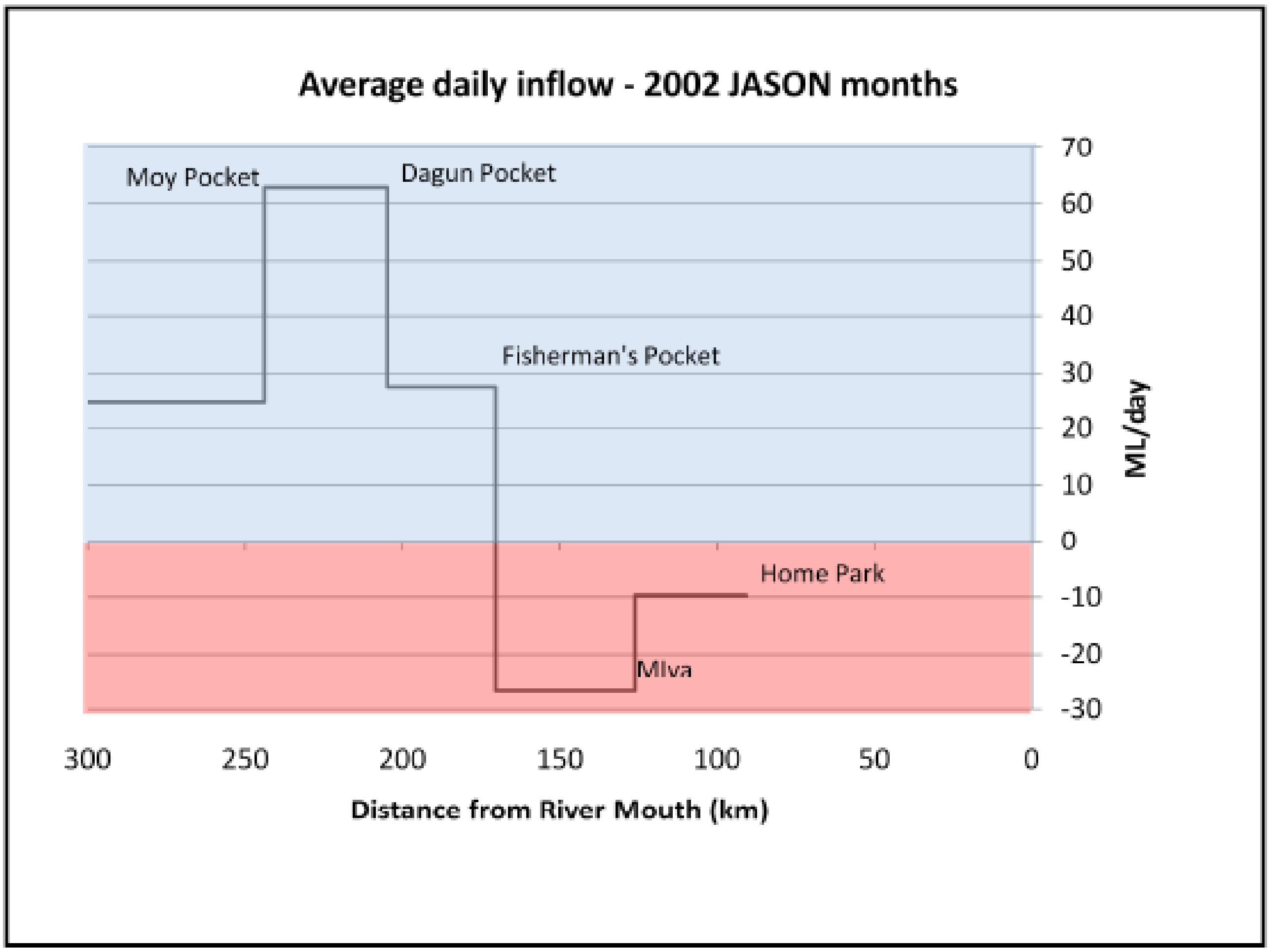


In terms of the overall picture, mean nett inflows throughout this time period show that the upper catchment contributes considerably more stream flow to the river per square kilometre of catchment than the lower. The upper catchment produced in excess of 200 mm depth of runoff (or ML/square kilometre) per annum, and the catchment contribution fell steadily towards the mouth. The catchment surrounding the reach of the river between Home Park and the Barrage only produced 10mm depth of nett runoff per year. This is due to the change in evaporation and rainfall, and the generally high level of water extraction in the lower river.

Even including the effects of major flooding events like the 1999 flood, these data suggest that the land in the lower catchment contributes considerably less to the flows in the river than the land in the upper catchment



Most of the major low flow stresses in the river are felt in the low flow (JASON) months. During these times, the amount of water flowing in the river often actually decreases as you move downstream. In this case, the catchment area surrounding a particular reach in the river removes more water from the river than what it contributes. This may be a short term situation, or in some years this effect is evident in the total flow figures for the entire JASON period. This was the case in the lower and mid Mary for 1996, 1997, 2002 and 2006 (4 years out of 10). In this situation, the downstream catchment cannot compensate for any reduction in flows that would result from additional water infrastructure in the upper catchment, it can only make the impacts worse.



2002 is used as an example of how the catchment behaves in a dry time. The catchment upstream of Moy Pocket (including Obi Obi Ck/Baroon Pocket Dam) contributed an average of about 25 ML/day flow over the JASON months. The catchment between Moy Pocket and Dagun Pocket (which includes releases from Yabba Ck/Borumba Dam) contributing a further 62 ML/day. The reach between Dagun Pocket and Fishermans Pocket (which includes contributions from Six Mile Creek/Lake Macdonald and Deep Creek/Cedar Pocket Dam) contributed about 28 ML/day. The reach from Fishermans Pocket to Miva then reduced flows in the river by an average of 27ML/day and the reach from Miva to Home Park further reduced flows by another 10ML/day on average.

Future infrastructure plans for the upper catchment have the combined effect of directly diverting flows from Lake Baroon, Lake MacDonald and Lake Burumba into the SEQ water grid in dry times, and damming and diverting flows at Traveston Crossing (upstream of Dagun Pocket). In light of our understanding of how the river functions in dry times like the 2002 JASON months, the potential impacts of these developments on the mid and lower Mary catchment in dry seasons are frightening

This satellite photo shows the Mary River just downstream of the Gympie town water offtake in August 2002. Even at current levels of extraction, the river already ceases to flow during these low flow events. These events are not accurately reflected in the IQQM modelling of the catchment

Low flows periods are associated with major water quality problems and severe ecological problems. Widgee Crossing, July 2006. We already see these problems.

The Mary River already experiences major problems in times of low flows

Proposed infrastructure plans are likely to make these problems worse

Protecting the low-flow regime would require significant environmental flow releases

This would reduce the economic viability of new infrastructure

There are better urban water supply options