

Are flow thresholds and observed hydrological data enough to evaluate the effect of environmental watering?

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Abstract: Environmental water delivery is critical for the management of environmental assets in the Murray-Darling Basin (MDB), to provide a suitable hydrological regime for ecosystem functions like waterbird breeding, inundation of vegetation, and spawning of fish. To evaluate environmental water delivery, we need to understand how the environmental water portion of the hydrograph changes from the point of release to the point of delivery. The release of environmental water in the MDB can take different forms depending on where the water comes from and the jurisdiction that manages the water. Commonly, water is released from storages, then delivered to ecological assets, typically hundreds of kilometres downstream. In other situations, environmental water is protected in the river, based on flow rules, and actions are taken to ensure it reaches the desired asset. For example, in the Condamine-Balonne catchment, a flow rule is triggered at St. George (QLD) to supply Narran Lakes (NSW) with environmental water when a flow threshold is met in St. George. However, the water's hydrological signature, observed at the point of release to satisfy the environmental requirements downstream (duration, magnitude, frequency of flow), often changes due to losses or additions during transmission and river operations.

When assessing the effect of environmental water on the hydrological regime, we rely on observed data (flow at gauges and satellite imagery) to establish the ecologically relevant flow component at the point of measurement or release. This has led us to ask whether the point data (gauge observations or accounting modelling) and discrete observations (satellite imagery in 5-10 day timesteps) are sufficient to identify changes in the hydrological signatures, and whether the observed data can ultimately be used to evaluate outcomes on the hydrological regime from environmental watering? Or are more sophisticated modelling techniques necessary to assess the environmental water's effect?

Here, we present a case study using observed data in the Condamine-Balonne, where environmental water is delivered to Narran Lakes (NSW) from St. George (QLD), and untangle the hydrological signatures along multiple gauging points in the tributary river system ("Intersecting Streams"). We use the long-term observed signal along with satellite imagery of the Narran Lakes to establish whether flow, above a threshold upstream, can consistently be observed downstream and at the ecological asset receiving the water.

Keywords: *Environmental water management, hydrological signatures, Murray-Darling Basin, flow thresholds*