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New approaches in modelling Basin-scale connectivity and ecological relevance

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Abstract: Basin-scale connectivity is important for the proper functioning of a river system. It supports abiotic processes, such as moving fluxes of water and sediment driving channel form and water quality. It is also necessary to support complex life cycle histories of many lotic organisms and associated ecosystem functions. In highly modified river systems, these connections have been impacted, and river restorations often seek to re-establish biological and physical connection to improve system health. However, simply restoring connectivity will not necessarily improve ecological outcomes, and a better understanding of how and when connectivity is beneficial is important.

In recent years, novel earth observation data from various satellite and airborne sensors along with new data integration and modelling techniques have vastly improved our ability to generate Basin-scale data layers and monitor changes in connectivity on land and water. In this abstract/talk, we illustrate, with examples from the Murray–Darling Basin (MDB), that while new data layers (from remote sensing and other sensors) and modelling can address critical knowledge gaps in Basin scale connectivity, there are limitations. For example, a bi-monthly dataset of inundation extent and depth over three decades was generated for the first time in the MDB, and while it supports analyses not previously possible, such as temporal and spatial distribution and habitat connectivity, it was found to be inadequate for fish connectivity model. We recommend rigor around suitability of data used for modelling at scale, especially ecological modelling where data can be sparse needing integration from various sources. Finally, incorporating known uncertainty into input parameters and variables to a model can better quantify uncertainty in the resulting model predictions resulting in informed decision making.

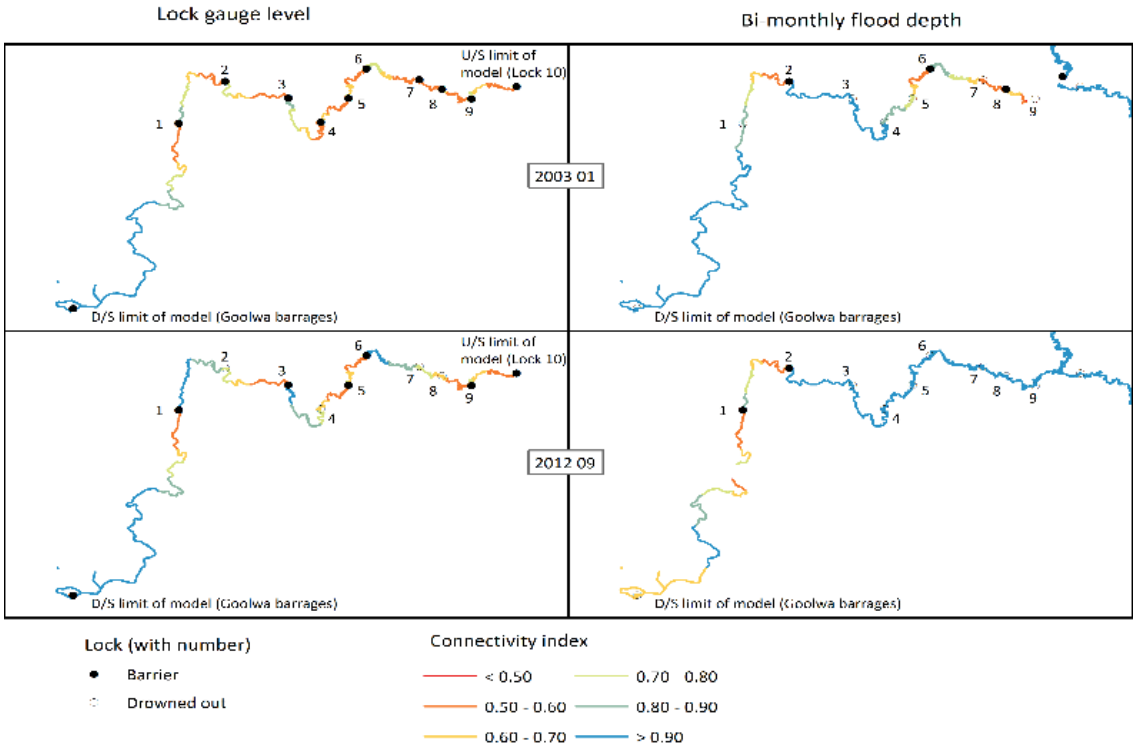

Figure 1. Fish connectivity and barrier interaction with daily gauge data (left panel) and with bi-monthly water depth. In the second panel, persistent drown out of barriers is observed biasing connectivity outcomes

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