Hydrological connectivity patterns: Assessing the potential impact of water resource development on northern Australian wetlands

<u>L. Merrin</u>

CSIRO Environment, Melbourne, Australia Email: Linda.Merrin@csiro.au

Abstract: Hydrological connectivity between the river channel and floodplain wetlands is a key driver of ecosystem structure and function, including maintaining biodiversity and ecological processes. Floodplain wetlands are a source of organic carbon and other nutrients, which are transported back into the channel during connection events, driving primary and secondary productivity. Connection to the channel also allows for fish and other biota to move onto the floodplain, before returning to the channel to complete their lifecycle. The flow regime parameters that are recognised as being important for connectivity are timing, duration and sequencing (the pattern of connection and disconnection). The magnitude and extent of the flood events are also important.

Climate change and land and water resource developments, including mining and agriculture, have the potential to alter the flow regime. Altering the flow regime can have a huge impact on the connectivity pattern between a river channel and floodplain wetlands, which can alter the ecological processes and species composition of the river-floodplain system. Understanding the potential impacts that climate change or future land and water resource developments have on the flow regime can enable an assessment of the risks and support the implementation of management strategies to minimise potential impacts. Here we analysed the connectivity pattern to assess the likely changes to the flow regime under natural conditions and several water resource development scenarios for the Adelaide River catchment in the Northern Territory in northern Australia.

The floodplain wetland was considered hydrologically connected to the river when the flow reached a threshold value which would cause the river to overbank. A wetland was considered disconnected when the value dropped below this threshold. Modelled hydrological time series data (Hughes et al., 2017) was used and the connectivity metrics were calculated for each location, for each water year (1 September to 31 August) from 1890 to 2015. The connectivity metrics included days above the connection threshold, number of connections and the longest connection duration for each water year. The overbanking threshold was determined using satellite imagery and linking this to observed gauge data for multiple flood events. The water development scenarios assessed include water harvesting (a combination of pump rates and extraction volumes), a dam development, and a future climate scenario. The ecological implications of changes to the connectivity of the floodplain wetlands to the river are discussed.

REFERENCES

Hughes J, Yang A, Wang B, Marvanek S, Carlin L, Seo L, Petheram C, Vaze J (2017) Calibration of river system and landscape models for the Fitzroy, Darwin and Mitchell catchments. A technical report from the CSIRO Northern Australia Water Resource Assessment to the Government of Australia. CSIRO, Australia.

Keywords: Connectivity, wetlands, water resource development, Adelaide River, northern Australia