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Using hydraulic heads, geochemistry and 3H to understand river bank infiltration; an example from the Ovens Valley, southeast Australia

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Defining the relationship between the river and its river bank is important in constraining baseflow to a river and enhancing our ability in protecting water resources and riparian ecology.

Hydraulic heads, geochemistry and 3H were measured in river banks along the Ovens River, southeast Australia. The Ovens River is characterised by the transition from a single channel river residing within a mountain valley to a multi-channel meandering river on broad alluvial plains in the lower catchment. The 3H concentrations of most near-river groundwater (less than 10 m from river channel) and bank water (10 – 30 m from the river channel) in the valley range between 1.93 and 2.52 TU. They are similar to those of the river, which are between 2.37 and 2.24 TU. These groundwater also have a Na/Cl ratio of 2.7 – 4.7 and are close to the river Na/Cl ratios. These similarities suggest that most river banks in the valley are recharged by the river. The hydraulic heads and EC values indicate that some of these river banks are recharged throughout the year, while others are only recharged during high flow events. Some near-river groundwater and bank water in the valley have a much lower 3H concentration, ranging from 0.97 to 1.27 TU. They also have a lower Na/Cl ratio of 1.6 – 3.1. These differences imply that some of the river banks in the valley are rarely recharged by the river. The lack of infiltration is supported by the constant head gradient toward the river and the constant EC values in these river banks.

The river banks with bank infiltration are located in the first few hundred kilometres in the valley and in the middle catchment where the valley is broaden. In the first few hundred kilometres in the valley, it has a relatively flat landscape and does not allow a high regional water table to form. The river thus is always above the water table and recharges the river banks and the valley aquifers. In the broader valley, the relatively low lateral hydraulic gradient is sometimes reversed during high flow events, causing river to infiltrate the river banks. The river banks with no infiltration are in a location where the river runs in the middle of valley with a relatively steep incised bank. Thus, a strong lateral heads gradient toward the river can from in the bank, preventing river water from infiltration, even during a high flow event.