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QUANTIFYING THE ROLE OF AN ALLUVIAL AQUIFER IN KARST AQUIFER RECHARGE IN THE UPPER NUECES RIVER, TEXAS

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ABSTRACT

The carbonate Edwards and Trinity aquifers are crucial water resources in south-central Texas, with the former serving as the primary water source for over 2 million people in the greater San Antonio area. The Nueces River basin is the largest contributor of recharge to the Edwards Aquifer, and recharge has traditionally been measured as the difference between river discharge at the upstream and downstream ends of the Edwards Group outcrop (Edwards Aquifer Recharge Zone, EARZ). However, broad terraces of alluvium derived from erosion of the Edwards Plateau may lead to significant groundwater storage which impacts the volume and timing of Nueces streamflow entering the recharge zone, and thus recharge to the Edwards Aquifer. Here, we integrate dye tracer tests, hydrograph analyses, synoptic water chemistry analyses, and floodplain groundwater mass balance to quantify the role of transient floodplain storage in recharge. Importantly, we record significant stream flow losses in the upper Nueces basin upstream of the EARZ. In dry conditions, the Nueces River loses up to 100% of flow until it is resupplied by relatively constant discharge from Candelaria Creek, a spring-fed gaining stream and major tributary to the Nueces. Under wet conditions, fluorescent dye tracer testing reveals that Candelaria Creek is partially sourced by Nueces River underflow through high transmissivity gravel deposits. Subsurface velocities were estimated at greater than 300 m/day using dye arrival time. We upscale our intensive local observations to compute the potential volume of dynamic alluvial water storage within the upper Nueces basin, and estimate the temporal effect on recharge downstream in the EARZ. Accurate estimation of recharge to the Edwards Aquifer is essential for management of the resource.

Advisor: _____

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