Baseflow source quantification to the San Pedro River, Arizona: a geochemical approach.

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The Upper San Pedro River Basin (Southeastern Arizona, U.S.A.) contains one of the few high biodiversity desert riparian areas in the Southwest that is dependent on both shallow groundwater to support phreatic vegetation and baseflow for aquatic plants and animals. Proper management decisions for sustaining this rare resource requires understanding the hydrology of the riparian system and its interaction with the basin aquifer. To meet this need, we addressed the following questions. What are the contributions of different water sources (e.g. local recharge during monsoon flood events versus inflow of basin groundwater) to riparian groundwater and river baseflow? How does the spatial variability in water sources relate to gaining and losing reaches along of the river? We first characterized the possible water sources to the riparian system using a suite of geochemical tracers. Results indicate that, of the possible sources, the most dominant riparian water sources are basin groundwater recharged along the Huachuca Mountains to the west and local recharge of monsoon floodwaters. Then, using their geochemical composition, we quantified these sources using a two end-member mixing model. We found that riparian groundwater composition varies between gaining and losing reaches. Locally recharged monsoon floodwater comprises 60 to 85% of riparian groundwater in losing reaches while that of gaining reaches contains only 10% to 40% monsoon floodwater. Baseflow, sampled year round, also contains a significant component of monsoon floodwater ranging from 80% on the upstream end and decreasing to 55% after passing though several gaining reaches. These results highlight local recharge during monsoon flood events as a significant water source for desert riparian systems, a fact that should be addressed when constructing and calibrating hydrologic models used to evaluate these future water management decisions.

Biographical Sketch:

Matt Baillie was born in Nebraska, but has lived in AZ for the past 13 years. He attended Arizona State University, where he got his B.S. in Geology (2001) while working with the Active Tectonics group and doing an independent thesis project on ground subsidence and related earth fissuring in central Arizona. He then worked in hydrogeologic consulting for a couple of years in the Phoenix area. Afterwards, he moved on to the University of Arizona, where he received his M.S. in Hydrology in 2005. He worked with Brenda Ekwurzel and James Hogan on the project being presented in this seminar. He then came to NMT in June of 2006 to begin his Ph.D.