Matrix, fracture, and conduit flow in the Edwards aquifer

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The Edwards aquifer of Texas produces from fractured and karstified Cretaceous carbonate rocks. Well yields can be extremely high. Recharge is highly variable over the 6 decades of record and the region is undergoing rapid urbanization. In order to determine if the aquifer can continue to meet the variety of water resource demands, we must assess the Edwards aquifer on more detailed spatial and temporal bases than have heretofore been common. Fracture mapping and its analysis may eventually allow *a priori* prediction of permeability trends and distributions; fracture domains have been inferred based upon model calibrations, tracer tests, flow loss studies, and patterns of well yield. Fractures form the template upon which the regional flow systems develop, but predictions are complicated by karstification, geologic structures, stratigraphic variability, and anthropogenic effects. Existing models are not yet adequate for predicting precise flow paths and flow rates, well yields, effects of artificial recharge, or fate of contaminants. The degree to which turbulent flow and matrix porosity affect both well yields and models of flow and transport are yet unclear. Core analyses, geostatistical analyses of pumping tests, and outcrop fracture and solution cavity data indicate that productive wells produce from fractures but that karstic features/conduits control the regional flow systems. Detailed geologic and geophysical mapping and testable numerical models are needed to guide the expected, intensive development of the aquifer while minimizing the environmental consequences.