

Modeling Ground-Water Recharge through Ephemeral Stream Channels in the Vicinity of Sierra Vista, Upper San Pedro River Basin, Arizona

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A numerical, physically-based, coupled-surface-subsurface model of the Sierra Vista and Fort Huachuca areas of the Upper San Pedro River Basin hydrologic system is being developed to estimate ground-water recharge generated by runoff transmission losses through ephemeral-stream channels. The current work builds upon earlier modeling projects conducted in the study area that resulted in recharge estimates with significant uncertainties owing to the dearth of hydrological and climatic data available for model parameter optimization, calibration and validation.

To address these data deficiencies, this investigation is augmenting precipitation data (for model inputs) and collecting discharge data (for model outputs and calibration). Estimates of the volume and spatial variability of precipitation on an event basis will be refined using Weather Surveillance Radar – 1988 Doppler (WSR-88D) radar data and precipitation data collected by volunteer members of the Rainlog.org rainfall monitoring network. Storm-event-related stream-stage data are currently being recorded at monitoring stations located at basin outlets, control reach outlets, and channel midsections. Monitoring stations are comprised of three successively-placed logging pressure transducers buried in shallow ephemeral stream bed sediments. The continuous slope-area method will be applied to collected stage data to estimate volumetric discharge at each monitoring station. Electrical resistance-sensing loggers will be used to detect

flow in reaches between monitoring stations to document the continuity of low flows and to aid in estimating transmission losses.

Numerical modeling will be accomplished using the newly-developed U.S. Geological Survey GSFLOW ground-water/surface-water flow modeling package that provides the capability for continuous surface-subsurface coupled modeling. Event-based surface water routing modeling will be also be performed in Kineros2, and results will be compared with those from GSFLOW. Ephemeral-stream vegetation and channel characteristics, housing-development-scale rainfall-runoff studies, estimates of infiltration and percolation at six unsaturated zone sites within or downstream of urbanized areas and other existing data will be integrated into the model.