An Analysis of the Lost River Karst Aquifer's Hydrometeorological Response to Storm Events for Flooding and Water Quality Management

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The purpose of this research is to examine storm event induced flooding and hydrometeorological responses in the Lost Rive Karst Aquifer System. In order to achieve this, precipitation totals from Automated Surface Observing System (ASOS), Cooperative Observer Program (COOP), Community Collaborative Rain, Hail and Snow Network (CoCoRAHS), and Kentucky Mesonet (KYMN) weather stations within the same drainage basin were compared to discharge totals from Lost River Rise (LRR) and Blue Hole Four (BHF), both outputs of the Lost River Karst Aquifer. (Figure 1) ASOS and COOP are both automated, quality-controlled weather networks ran by the National Weather Service. KYMN is also automated and quality controlled, but is ran by the Kentucky Climate Center on WKU's campus. CoCoRAHS is a manual, volunteer-based weather network. All of

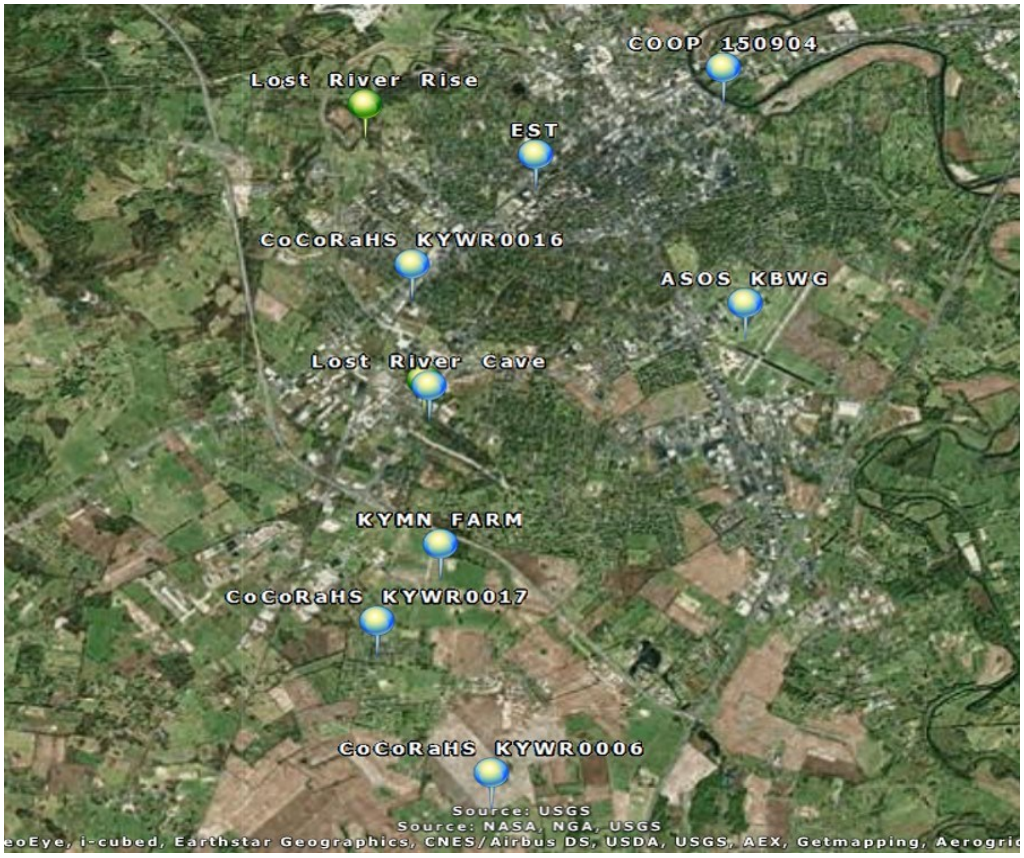

Figure 1 Monitoring locations

the major weather stations that are located in the Lost River Basin were used to make it possible to address the non-homogeneity of precipitation across the basin. Both daily and monthly resolutions were used so that individual storm events could be analyzed, while also focusing on comparison of the larger hydrometeorological responses by comparing those to the baseflow regime. Definite baseflow levels were found at both LRR and at BHF (Figures 2 and 3).

Data were measured and collected for 20 continuous months, with evapotranspiration being accounted for at monthly resolution. HOBOWare and EcoWatch software were used to measure and record data, while SigmaPlot was used for further statistical analysis of storm events to determine predictive flood modeling between the primary output (LRR) and the upstream conduit (BHF). A predictive storm model that helps explain the basin responses in the system to differing storm events was created. The results indicate there are critical thresholds at which the system responds to storm events and that seasonal influences are present. The next step of this research is to pair the geochemical data already being collected with the discharge values, displaying the flux in geochemical composition during storm events. It is also hoped to create a flood mitigation index to better prepare for future flooding events. This research has broader impacts in providing an increased understanding of karst-related hydrometeorological interactions within the Lost River Cave Aquifer System, which pose the threat of flood risk, and possible application to better plan for development in the basin as well as others with similar characteristics.

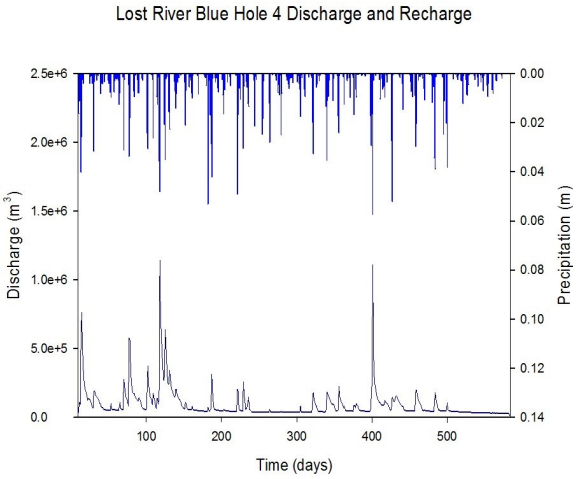

Figure 2 Discharge and Recharge graph for Lost River Blue Hole

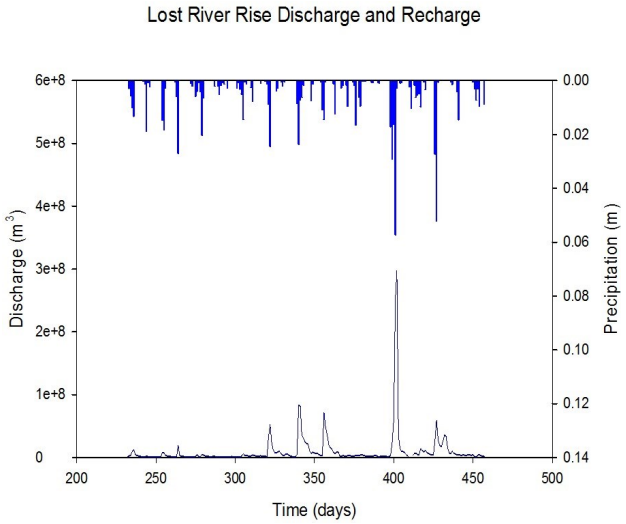

Figure 3 Discharge and Recharge graph for Lost River Rise.