

Climate, Land-use Change, and Hydrologic Response— Modeling the Rio Puerco Basin

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PURPOSE OF STUDY

This project is an extensive study of west-central New Mexico's Rio Puerco watershed that will use current data and computer models to improve understanding of the shifting relationships between rainfall and runoff when considering variables such as climate, land use, and surface alterations. Semi-arid catchments of New Mexico are susceptible to fluctuations in precipitation occurring at time scales ranging from annual to daily amounts. These rainfall variations in regions of low water availability can result in dramatic shifts in basin hydrologic response, channel erosion, and vegetation distribution. The ecological, hydrological, and land surface alterations occurring at the watershed surface are intertwined phenomena driven by the amount of available rainfall. In this study, the researchers will investigate the hydrologic dynamics associated with an observed increase in precipitation within the Rio Puerco watershed within the last fifty years. Specifically, the researchers will utilize a computer model with soil, topography, land-use, and rainfall data to simulate evapotranspiration, runoff, and recharge. Using this output, they seek to understand shifts in the rainfall-runoff relationship and quantify the percentage of variability attributed to land-use, climate, and land surface alteration.

STUDY UNDERWAY

- In its preliminary stages, the researchers plan to investigate the hydrological dynamics associated with an observed increase in precipitation within the Rio Puerco watershed within the last 50 years. They will begin by using a computer model employing soil, topography, land-use, and rainfall data to simulate evapotranspiration, runoff, and recharge in the basin.
- Thus far, the Rio Puerco watershed and the corresponding stream network have been delineated using a basic Geographic Information Systems tool package, in conjunction with elevation data provided by the U.S. Geological Survey. In addition, Wyckoff has completed an investigation of the relationship between two climate indices and stream discharges at various gauges within the Rio Puerco Basin.
- Currently, radar, rain gauge, soils, land-use, stream discharge, elevation, and well data required to analyze a specific Rio Puerco flood event are being gathered.
- Computer simulations will be conducted in the course of the study using the triangular irregular network (TIN) based Real-time Integrated Basin Simulator, which was developed at MIT. A TIN provides an accurate approximation of elevation, while simultaneously reducing the computations required to quantify the rainfall-runoff mechanisms for a given watershed.
- Prior to performing model runs, parameters describing hydrometeorological, soil, and energy conditions will be established. Once calibrated, various model combinations will be performed in an effort to describe climatic and land-use effects on stream discharge in the Rio Puerco Basin.

Hydrometeorological and Hydrological Studies in the Rio Puerco



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