

A quantification of factors that affect incision in the Rio Puerco watershed, New Mexico

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Abstract. Excessive erosion in the Rio Puerco watershed of northwestern New Mexico has been the focus of much attention since the beginning of the century. Abundant research has identified land use changes, climate changes, and internal channel adjustments as the most significant factors driving incision throughout this area (Cooke and Reeves, 1976). The purpose of this study is to quantify the relationship between these factors and the extent of incision in the Rio Puerco. Specifically, I estimated local incision levels with volumes of sediment in reservoirs and evaluated overgrazing, precipitation, and physical factors (soil properties, drainage areas, and valley slopes) with historical records and related maps.

Management agencies have constructed over six hundred small dams throughout the Rio Puerco watershed to prevent the sediment produced by local incision from traveling downstream. I surveyed the reservoirs of eighteen of these dams in the northeastern portion of the Rio Puerco watershed, each installed directly over an active headcut by the Bureau of Land Management (BLM) in the mid-1960's. These eighteen reservoirs represent all intact dams in the basin with accessible documentation of original reservoir dimensions (two-foot contour maps) and exact dates of construction. Using PC Arc/Info 3.5.1 (ESRI) and Surfer 7.0 (Golden Software, Inc.), I subtracted the initial land surface of each reservoir—digitized from historic BLM contour maps—from the modern surveyed surface, thus calculating the volume of sediment that has accumulated in each reservoir since its construction. Preliminary results range from 3360 to 42,400 m³ of sediment in sub-basins with drainage areas between 0.71 and 9.20 km². Initial statistical models indicate that sediment accumulation is weakly correlated with other factors, including drainage area, relief, and selected soil properties ($r^2 = 0.3$ to 0.4 .) Further modeling to incorporate the entire data set will better quantify the relationships between local factors and erosion.