Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11610, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11610
EGU General Assembly 2008

Late Holocene alluvial history and geomorphic evolution of a semi-arid watershed complicated by contrasting bedrock lithologies, northwest New Mexico, USA

T. F. Bullard

Division of Earth & Ecosystem Sciences, Desert Research Institute, Reno, Nevada, USA
(tom.bullard@dri.edu /Fax: 775.673.7485 / Phone: 775.673.7420)

The geomorphic evolution of alluvial systems in arid and semiarid settings typically reflects the complex interactions between driving and resisting forces, principally climate and geology, and the geomorphic processes and responses resulting from those interactions. It is not uncommon for geomorphic response to regional climate change events to be recorded in the alluvial stratigraphy similarly over broad areas. However, in northwest New Mexico, the geomorphic evolution and Holocene alluvial record of the 1,200 km^2 Kim-me-ni-oli Wash ephemeral discontinuous arroyo system have been influenced and complicated by the presence of two contrasting bedrock types: resistant marine sandstones in headwater regions and marine fluvio-deltaic mudstones and resistant paleochannels sandstones in the lower two-thirds of the drainage. Based on field data gathered on the latest Pleistocene and Holocene stratigraphy, the presence of weakly to moderately developed surface and buried soils having weak Bt and Bwk horizons, radiocarbon dates and archaeological materials, correlation to dated stratigraphy in adjacent watersheds, and geomorphic analyses of drainage basin morphometry, the complex, and at times conflicting alluvial stratigraphic record can be reconciled by the distribution of rock types and their influence on geomorphic processes. The contrasting rock types have played a role by impeding the migration of regional base level into headwater regions, the erosional development of tributary basins, production and transport of sediment through the axial stream, development and preservation of

fluvial stratigraphy, and the soil-geomorphic signature upon the landscape. The upper headwater regions underlain by resistant sandstones produced large volumes of sandy alluvium several meters thick and temporarily stored in tributary and axial valleys cut into bedrock. The middle and lower drainage basin underlain by erodible mudstones responded rapidly to base-level changes by incising. A complex alluvial fill stratigraphy representing cycles of late Holocene incision and valley filling is preserved in these reaches. In the lower drainage basin, the geomorphic development has been further complicated by the resistant paleochannels sandstone units within the mudstones. These resistant units locally impeded incision and caused non-uniform migration of base-level into some tributary basins resulting in the spatially variable distribution of surface soils and their hydrologic characteristics. The geologic setting of this watershed underscores the necessity for carrying out a thorough geologic and geomorphic characterization in order to understand the geomorphic history, the past, present, and future responses to environmental change, and the planning of potential development in the watershed.