

## **Hydraulic Modeling Analysis of the Middle Rio Grande - Escondida Reach, New Mexico**

Amanda K. Larsen and P.Y. Julien

Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO

**Abstract.** Important changes occurring in the Escondida reach of the Middle Rio Grande are discussed in this study. The Escondida reach covers 17.7 miles in central New Mexico, from the Escondida Bridge to the US Highway 380 Bridge. Spatial and temporal trends in channel geometry, discharge, and sediment are analyzed from 1918 to 2005. Historic bedform data are compared to bedform predictors, and potential equilibrium conditions are predicted.

Aerial photographs, GIS active channel planforms, cross-section surveys, hydraulic model analysis, and channel classification methods are used for a spatial and temporal trend analysis in channel geometry and morphology. Observations of the GIS active channel planforms shows narrowing in the reach. The sinuosity also decreased from 1.19 to 1.09.

Field bedform observations were compared to bedforms predicted by van Rijn and Simons and Richardson. Both methods produced acceptable results, but a large amount of scatter was observed in the data, possibly caused by the variability in flow depth and shear stress within each cross-section.

A trend analysis of measured sediment and water discharges shows a 400% increase in water discharge after 1979. Differential mass curves show aggradation and degradation that approximately correlate with measured changes in mean bed elevation.

Future equilibrium width and slope conditions were analyzed using hydraulic geometry equations, hyperbolic and exponential models, stable channel geometry, and sediment transport relationships. An equilibrium channel width of 300 ft and an equilibrium slope between 0.00065 and 0.00139 are predicted depending on the method used. Both the equilibrium slope and width predictions seem to provide reasonable estimates of future conditions.