

## **The effects of sediment supply and self-formed stratigraphy on alternate bar morphodynamics**

Andrew R. Bankert and Peter A. Nelson

Department of Civil and Environmental Engineering, Colorado State University

**Abstract.** Gravel-bed rivers can accommodate changes in sediment supply by adjusting their bed topography and grain size in both the downstream and cross-stream directions. Under high-supply aggradational conditions, this can result in spatially non-uniform stratigraphy that likely affects morphodynamics during subsequent degradation. An experiment was conducted in a straight, rectangular, sediment feed flume under a constant discharge where alternate bars initially formed and stabilized with a low sediment supply. The sediment supply was tripled, causing aggradation and the development of stratigraphy. The supply was then decreased to the original supply rate, causing degradation through that self-formed stratigraphy. During the aggradational phase, the pools filled making the upper portion of the channel nearly planar. Smaller bars formed and migrated through the channel until they grew and stabilized in a different location than the original equilibrium condition. As aggradation occurred, the original and subsequent sediment sorting patterns on the bed surface, which were measured regularly, were fairly well preserved in the subsurface. During the degradational phase, incision through the pools with minimal bar adjustment led to an equilibrium where the location and elevation of the alternate bars differed from the initial equilibrium under identical flow and sediment supply conditions. The differences in equilibrium under the same sediment supply and discharge reflect the influence of the heterogeneous stratigraphy. These results show the importance of historical conditions in predicting channel responses to variations in sediment supply.