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Influence of vegetation and outer bank roughness on rates of bank erosion along a large meandering river

Kory Konsoer (1,2), Bruce Rhoads (3), James Best (3,4,5), Eddy Langendoen (6), Mick Ursic (6), Marcelo Garcia (5), Jorge Abad (7), and Dongchen Wang (5)

(1) Louisiana State University, Geography and Anthropology, Baton Rouge, United States (kkonsoer@lsu.edu), (2) Louisiana State University, Coastal Studies Institute, Baton Rouge, Louisiana, United States, (3) University of Illinois, Urbana-Champaign, Department of Geography and Geographic Information Science, Urbana, Illinois, United States, (4) University of Illinois, Urbana-Champaign, Department of Geology, Urbana, Illinois, United States, (5) University of Illinois, Urbana-Champaign, Ven Te Chow Hydrosystems Laboratory, Urbana, Illinois, United States, (6) U.S. Department of Agriculture, Agricultural Research Service, National Sedimentation Laboratory, Oxford, Mississippi, United States, (7) University of Engineering and Technology, Department of Civil and Environmental Engineering, Lima, Peru

Spatial variability in erosion-resistance characteristics of channel banks and floodplains plays a significant role in moderating rates of bank erosion and channel migration. Along a series of meander bends of the Wabash River (Illinois, USA), floodplain vegetation varies from agricultural to forested, bank material properties range from coarse unconsolidated sediments to fine-grained, highly cohesive sediment, and the extent and location of exposed bedrock within the channel varies. In addition, these floodplain characteristics lead to differences in the amount of large woody debris present along the outer bank, as well as large-scale roughness provided by bank morphology. In this study, we investigate the differences in these resistance properties and near-bank velocities and shear stress, and link to the spatial patterns of bank erosion revealed from repeat annual LiDAR surveys and bankline maps digitized from aerial photographs dating back to 1938. Findings from this study highlight the importance of near-bank large woody debris at reducing shear stresses acting on the outer bank, how differences in bank material properties can result in substantial differences in bank morphology roughness, and the influence of relatively small outcrops of bedrock on overall planform evolution.