

A conceptual model for assessing the influence of scale and sediment transport regime on geomorphic sensitivity to environmental change

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Abstract. Prediction of river response to environmental changes (ECs) (e.g., dams, urbanization, & climate change), which result in alterations to flow regime and sediment supply, continues to be an intellectual and management challenge for fluvial geomorphologists. Geomorphic response to EC can affect ecosystems services and aquatic and riparian ecosystems. Existing empirical and theoretical studies do not quantitatively predict how systematic changes with drainage area in flow variability, sediment size and supply interact to produce rivers with differential sensitivities to EC. Geomorphic sensitivity is defined as the relative change in response variables (channel slope, width, & bed grain size) to changes in driving variables (flow & sediment regimes). I present a conceptual, process-based model for quantifying the sensitivity of channel morphology (slope, geometry, bed material size) to EC as a function of drainage area and sediment transport mode. My primary hypothesis is that rivers located further down in a basin, in which mixed and suspended load sediment transport, dominates will be the most sensitive to changes in geomorphic driving variables.