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Assessing the role of floodplain topography in enhancing cutoff formation on meandering rivers

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Cutoffs represent an intrinsic process by which meandering rivers regulate their sinuosity through time. Meanders can be terminated by one of two distinct mechanisms: neck cutoff occurs when two meanders migrate into one another; chute cutoff occurs where a shorter, steeper bypass channel is incised across the floodplain between two bends. The latter process can be influenced by a number of factors including floodplain roughness and lithology, in-channel obstructions, and the propensity for the channel to generate overbank flows. Contrastingly, neck cutoff is controlled by lateral channel migration and the hyporheic conditions within the bend. Here we explore the role of antecedent floodplain topography in promoting the development of meander cutoff using a combination of optical and topographic timelapse imagery. We observe that both neck and chute cutoff formation is enhanced by pre-existing floodplain depressions originating from meander migration, floodplain channels, and historic cutoffs. These observations suggest that rivers with greater floodplain complexity – particularly with respect to relief – may experience greater cutoff frequencies, thus impacting channel evolution, and concomitant sediment and nutrient cycling.