Developing a vulnerability index for assessing riverbank erosion in large catchments

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Riverbank erosion is a natural process involved in floodplain development, but can have negative impacts such as excessive sediment supply to the river channel, undermining infrastructure and eroding valuable agricultural land. Catchment managers often work with limited budgets and for remediation efforts to be the most effective they should be targeted in areas that are at the highest risk of suffering excessive riverbank erosion. Recent developments in high resolution spatial data capture, such as aerial LiDAR have allowed for much more detailed representation of the riparian area, including the channel location and riparian vegetation. This presentation will propose a new dimensionless index that has been developed to identify and rank sections of river channel according to erosion vulnerability. The index combines information on channel position, slope and curvature extracted from LiDAR-derived DEMs with riparian vegetation cover. It also accounts for the extent of lateral confinement limiting erosion and bank silt-clay composition influencing erodibility. The index is designed to be applied to alluvial channels across large catchments (>500 km2) to support the identification riverbank erosion 'hotspots' at the reach scale (approximating 50-200 m intervals). The performance of the vulnerability index in discriminating actively eroding and non-eroding channel reaches was assessed in the River Lugg catchment, UK. Historic mapping and aerial photographs were used to determine the channel position, slope and riparian vegetation coverage in the 1960s. The index was then calculated for the historic river channel position and compared with ranked metrics of lateral channel change that occurred between the 1960s and present. This approach provides a basis for evaluating the utility of a simple vulnerability index that could be used for prioritising the location of future investments to reduce excessive riverbank erosion in large catchments.