

GIS Project: Prioritizing eroding bluffs for stabilization, Minnesota River Basin

Data Available: LiDAR DEM, air photos, delineated bluffs with assigned erosion rates

Goal: prioritize bluffs for stabilization to reduce sediment loading and protect infrastructure, accounting for access as well as construction cost.

Rivers erode valley walls (bluffs and ravines) and contribute the largest proportion of sediment delivered to the Minnesota River. In places, bluff erosion also threatens roads, buildings, and other infrastructure. Bluff

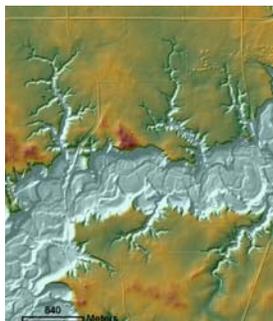


repair consists primarily of hardening the toe to prevent further bluff retreat. Cost for this repair must include the cost to access the bluff toe. Some bluffs are easy (and cheap) to reach, whereas others are much more difficult (and expensive) to access.

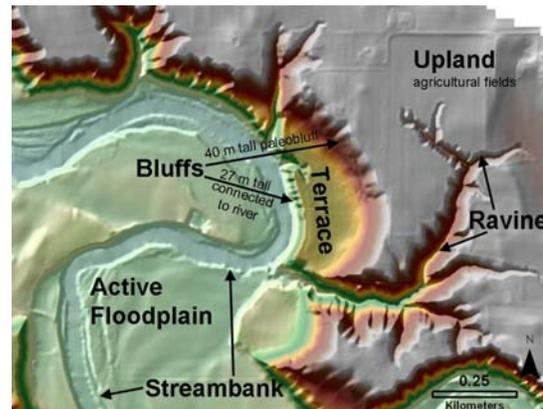
Currently available GIS data includes, for each bluff or ravine, location, linear ft along river, rate of erosion (e.g. m/yr) and sediment supply (e.g. t/yr). What we need to add for each bluff is proximity to infrastructure and information regarding access from a road (e.g. length, elevation change, maximum slope of route) from which access cost can be calculated. The end product should be an attribute table combining all of this information such that we can examine the joint distributions of cost and reduction in sediment supply. We need a ranking of bluffs and ravines, the cost of their stabilization, and the benefit of protecting land and infrastructure and reducing sediment supply.

A little detail.

Distance of bluffs or ravines to infrastructure and presence/absence of currently cropped land. Can this be automated? Rate of farmland loss and risk to infrastructure both depend on rate of bluff retreat and risk to infrastructure also depends on distance to bluff top.



The most feasible path from a truckable road to each bluff and ravine is needed. This is an interesting challenge in topographic analysis. One approach would be to first remove from consideration impassable terrain because of the height and slope that would need to be traversed. The shortest route would be found over the remaining “passable terrain”. Accommodation would be needed for neighboring bluffs or ravines for which access costs could be partly shared.



Available for advice and guidance: Peter Wilcock (wilcock@usu.edu) and others