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# Changes in fluvial erosion with stream chemistry

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Stream channels with noncohesive beds and fine-grained cohesive banks are ubiquitous; however, previous research on channel enlargement and migration has focused primarily on the transport of noncohesive sediments. Unlike noncohesive soils, cohesive soils are bound together via multiple mechanisms related to interlayer clay bonding, sesquioxide-cement bonds, and organic secretions by roots and soil microorganisms. As a result, the fluvial entrainment of fine-grained streambanks is affected by stream chemistry. The overall goal of this project was to evaluate the impact of changes in stream chemistry commonly observed in urbanized catchments, and expected to occur due to climate change, on streambank fluvial erosion. Remolded samples of two cohesive riparian soils, dominated by differing clay minerals, were tested in a recirculating hydraulic flume under a range of shear stresses. One soil was dominated by montmorillonite, while the second soil was dominated by vermiculite. Three dimensional velocities and the distance to the soil surface were monitored using a Vectrino II acoustic Doppler profiler. The process was repeated for combinations of average water temperature (10, 20, and 30°C), pH (6 and 8), and salinity (5 and 5000 mg/l) and the erosion rate for each environmental condition was measured by tracking the amount of advancement necessary to keep the sample flush with the wall for the duration of the experiment. Parametric and non-parametric statistical analyses were used to determine significant differences in average erosion rates for the samples under different environmental conditions. Study results indicated erosion rates for both soils increased significantly with increases in water temperature, likely due to increased activity of the interlayer cations. A significant interaction effect of salinity and pH was also observed for both soils: at high salinities, erosion rates increased slightly with pH. At low salinities, erosion rates significantly increased with decreases in water pH, perhaps due to changes in pH-dependent changes in the soil cation exchange capacities. These results suggest that the increased channel degradation observed in urbanized catchments may be the result of changes in water chemistry in addition to increased flood flows.