

Dendrogeomorphology for Post-hoc Erosion Evaluation in Southern U.S. Prairie Streams

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October 4, 2023

Abstract

Streambank erosion impacts rivers and reservoirs due to bank erosion. However, little information of stream bank is available due to the need for advanced planning. Dendrogeomorphology offers a *post-hoc* method to calculate streambank erosion providing information about past erosion events and processes. Bank retreat can be calculated by dendrogeomorphology where the distance from a channel bank of an exposed live root shows anatomical changes that are dated from the root's growth rings. We estimated bank erosion for three different sized southern U.S. watersheds ranging in area from 4 to 3781 km² using dendrogeomorphology compared to modeled erosion based on critical velocity required for sediment transport. Erosion values ranging from 3.8 to 13.5 cm/yr for the smaller drainages with no difference found between root and modeled erosion rates. The large sub-basin had erosion ranging from 33.6 to 196.4 cm/yr with high variance associated with two prior 2-year flow events with significant differences found between root and modeled values. We also found distance to bank strongly and positively correlated with root exposure in straight sections of the channel in contrast to roots collected in meander bends attributed to erosion processes (i.e., scour, mass wasting) occurring at these locations. When compared with other erosion studies across the southern U.S. prairie, our values were similar in magnitude but with low correlation to drainage area indicating site specificity of erosion mechanisms. We confirm dendrogeomorphology provides reasonable estimate of bank erosion across multiple spatial scales, important for watershed management in areas lacking intentional and persistent monitoring.

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