ESTIMATION OF STREAMBANK LATERAL MIGRATION AND EROSION HAZARD BOUNDARIES

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Abstract It is desirable for floodplain management to be able to define erosion hazard boundaries in addition to flood hazards as a distinct land management tool along river corridors for assessing risks to public safety. This is particularly important now with more stringent environmental regulations which limit construction of streambank protection measures so instead erosion buffers must be implemented. However, rivers are dynamic features, constantly adjusting their banks, beds, and floodplains in response to flood events or human activities which makes lateral erosion prediction difficult. The stability assessment procedures for an alluvial stream system utilize a combination of geomorphic and hydraulic engineering analyses in order to quantify the predicted future amount of stream bank retreat. Representative procedures that have been applied throughout the industry or by various agencies analyzing lateral streambank erosion were reviewed and evaluated to develop guidance on a comprehensive technical assessment process. New technology based river migration applications are also now available that have been developed based on advanced computer mapping procedures including GIS based tools and digital aerial comparative mapping techniques. The recommended methodologies incorporate both (1) qualitative geomorphic techniques along with (2) the application fluvial engineering analysis. This general two-level type approach is typically applied in most river engineering and stream mechanics analysis. The comprehensive design procedure provided utilizes the different results from a variety of analyses to predict the future lateral erosion boundaries through: (1) river reach hydraulic assessments, (2) horizontal velocity distribution within the floodplain, (3) measured lateral erosion rates through historic aerial photographic comparison, (4) geomorphic analyses predictions, (5) channel morphology trends and characteristics, (6) geologic conditions, (7) Field observations, (9) historical channel changes, (10) stream classification data, (11) longitudinal profiles, (12) expected channel pattern, (13) stable bank slopes, (14) expected lateral erosion mechanism, (15) armoring potential, (16) equilibrium channel slope, (17) floodplain hydraulic modeling, (18) allowable velocity estimates, (19) channel morphology relationships – regime equations and hydraulic geometry, (20) sediment transport modeling continuous series of events with lateral erosion analysis. The predicted streambank erosion buffer requires evaluation of both the single short event and the cumulative long term impacts on the lateral erosion in order to adequately a suitable buffer that addresses the different erosion mechanisms. A case study of a successful application of this technique for defining lateral erosion buffers, including fluvial hydraulics and geomorphic analysis techniques is reviewed for a portion of the 110 square mile San Juan Creek watershed in Orange County, California.