



Vegetation Washout in Flood Control Channels

Products	The product of this research will be a technical note and a technical report describing procedures for estimating vegetation washout.
Benefits	The USACE currently has no procedure for estimating vegetation washout during high flow events. This research will provide important guidance for hydraulic engineers to assess the impacts of vegetation washout on existing flood damage reduction projects (flood risk or water surface elevations during flood events) as well as to establish operation and maintenance requirements in terms of incorporating an “environmentally friendlier” system.
Issue	The recent encroachment of vegetation is a severe water resources management problem in unlined canals, streams, and rivers in the American West. Hydraulic engineers have traditionally viewed vegetation as part of a maintenance program and, hence, have not accounted for long-term impacts if left unchecked. As a result of environmental concerns, existing flood reduction systems must be reanalyzed to allow for vegetation/habitat. The allowance of aquatic vegetation in older projects results in an increase in roughness that affects hydraulic efficiency. The end effect is an increase in flood risk (water surface elevation) for a given flow event. It is known that a portion of the vegetation will be washed out during high flow events, which could potentially increase the hydraulic efficiency of a water course. However, the amount of washout for a given discharge and plant community is not known.
Description	The objective of this study is to develop empirical relations for the washout of various vegetation species. These empirical relations will be obtained through analyzing the pre- and post-flooding aerial photos taken by U.S. Army Corps of Engineers (USACE) District offices. The rate of vegetation removal delineated from aerial photos will be correlated with vegetation species and hydraulic parameters obtained from the Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling analysis. These empirical relations between flow shear stress and vegetation removal rate for various species will be compared with existing analytical models. To date, data have been collected for three rivers in the Los Angeles area (Los Angeles., San Luis Rey, and Santa Clara rivers) including all available HEC-RAS files and an array of maps and aerial photos. Currently, overlapping datasets are being identified, which contain both pre- and post-flood descriptions of vegetated conditions. There are difficulties with a lack of pre- and post vegetation data; however, attempts are being made to collect as much as possible from other agencies in the area. The next step will involve a statistical investigation of washout as a function of flow discharge. Field verifications of washout as well as standing vegetation mapping data will be carried out in future studies.
Sponsor	Urban Flood Damage Reduction and Channel Restoration Development and Demonstration Program for Arid and Semi-Arid Regions (UFDP).
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