DEBRIS PRODUCTION AND FLOOD HAZARD EVALUATION FOR PLANNING, SAN ANTONIO CREEK WATERSHED, VENTURA COUNTY, CALIFORNIA

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San Antonio Creek drains approximately 50 square miles in the Ventura River Basin in western Ventura County, California. Recurring floods along San Antonio Creek and its tributaries, including Lion, Reeves, and Thacher Creeks, have resulted in millions of dollars in damages in Upper Ojai and Ojai Valleys, and in the canyon downstream. The Ventura County Watershed Protection District (VCWPD), in partnership with the Natural Resources Conservation Service (NRCS) and Ventura County Resource Conservation District, developed an approximated floodplain map as part of ongoing efforts to reduce flood-related damages to agricultural and rural residential properties. This presentation discusses the procedure used for developing the floodplain map, including the application of empirical equations developed by others to estimate sediment/debris production from upland subwatersheds.

Sediment and debris production and yield from the steep uplands in the San Antonio Creek watershed, directly and significantly contribute to the flood hazard by bulking stormflows. Sediment/debris production rates vary over time, and are significantly greater following wildfire and large (high intensity and/or duration) storm events. Numerous empirical equations for estimating sediment yield have been developed using cleanout data collected from debris basins in Los Angeles and Ventura counties (including the Stewart Debris Basin located in the San Antonio Creek watershed). These equations are most appropriately applied to estimate sediment production from the steep upland watersheds (i.e. supply-limited sedimentation processes). For flood-hazard and sedimentation analyses, sediment yield estimates made using one or more of these equations may be input as point loads into models that characterize transport-limited processes for bedload and suspended sediment transport through lower-gradient valleys

For this evaluation, five empirical equations from three published reports were applied and compared to estimate event-based sediment yield rates to the bases of selected upland subwatersheds in the San Antonio Creek watershed (Scott and Williams, 1978; Gatwood et. al, 2000; Gartner et. al, 2009). An Excel© spreadsheet was developed that allows the user to enter equation-specific parameters and readily compare results. Results of applying the different equations to the 15 upland subwatersheds, assuming current cover and hydrologic conditions, were highly variable, and as a group, inconclusive. Factors that likely contribute to the large variation include: 1) spatial and temporal variations in sediment production, transport, and yield; 2) limitations and large margins of error associated with available data; and 3) at least four of the five equations include inputs that are notably subjective, insufficiently documented, and difficult to reproduce. For this evaluation, results using Equation 2 by Scott and Williams (1978) were chosen as a reasonable characterization of sediment yield to the bases of the upland subwatersheds.

For the flood hazard analysis, sediment yield estimates as a function of subwatershed drainage area were compared to a family of empirically-generated curves developed by the Los Angeles County Department of Public Works (1993), to estimate a sediment bulking factor. Stormflows

for each stream reach, estimated using NRCS hydrologic modeling tools and published data, were bulked by a factor of 1.6 to represent the runoff and sediment moving through the system.

A HEC-RAS model was developed to delineate inundation areas within the watershed for a 100-year storm. Model inputs, including bulked stormflow estimates and channel cross-sections generated using LIDAR data obtained from the VCWPD, were imported into the GIS-based platform, which then ran the HEC-RAS model and delineated the estimated inundation areas onto topographic map and orthophoto bases. This information will be used to identify alternatives for protecting agricultural and rural residential properties that have potential for flooding during a 100-year storm event.

REFERENCES

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