FRAMEWORK OF YEARLY STREAM SEDIMENT INPUT

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Abstract: The US Army Corps of Engineers has developed a watershed model called Gridded Surface Subsurface Hydrologic Analysis (GSSHA) that also computes sediment erosion and deposition in both overland flow areas and stream reaches. One of the primary problems in using GSSHA for sediment yield studies is a mismatch of temporal resolution. River morphology and sediment yield studies often cover a 30- to 50-year time scale with times steps measured in years while GSSHA typically operates on time steps of seconds and simulation periods usually cover a few months to a year. In order to bridge this gap between simulation time scales another model has been created. This model interfaces with GSSHA and is called the Framework of Yearly Stream Sediment Input (FYSSI.) FYSSI in essence simulates annual yield by running GSSHA for hypothetical storm events, stochastically generating a sequence of storm events, and then aggregating the results of the GSSHA model for each storm event sequence. What is then generated are sediment yield curves that show values of sediment input by grain size into individual stream reaches over the lifetime of the project. This data is a primary input of the SIAM model, a model being developed by USACE to analyze annual stream sediment yield and aggradation and degradation trends over a project lifetime. The nature of this approach lends itself to a stochastic analysis that helps answer another primary concern in sediment yield analysis, namely the uncertainty in sediment runoff produced by seemingly identical precipitation events. FYSSI currently takes into account seasonal effects of cover, variability in soil moisture, and the return period and duration of a given storm when generating a series of hypothetical storm events and input parameters for GSSHA. To produce a distribution of expected sediment input over the project lifetime FYSSI simulates 1000 storm sequence scenarios over the project lifetime and uses the results to create a distribution of values for each year and each grain size for each segment of the stream network. These ranges of values can then be used by SIAM to produce a confidence range on the lifetime of the project. This project is funded as part of the System Wide Water Resources Program funded by Headquarters, U.S. Army Corps of Engineers.