USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Effects of Sediment on Channel and Floodplain Storage and Resultant Flooding in Urban Streams Focus

Categories: FL, G&G, NPP

Keywords: sediment, urban streams, storage, floodplains, aggradation, degradation, flood routing

Duration: March 1999 to March 2000

Federal Funds Requested: $18,000

Nonfederal Funds: $36,000

Principal Investigator: Terry W. Sturm, Georgia Institute of Technology, Atlanta, GA, Georgia Water Resources Institute

Congressional District: 5th

Research Need

Continued development in urban watersheds without adequate controls on sediment production from construction activities contributes sediment load to urban streams that may affect its sediment regime. Subsequent deposition of the sediment chokes the benthic aquatic habitat, and affects storage in the channel and floodplain and thus the flooding potential of the stream. In addition, urbanization creates a greater volume of runoff and higher peak flows with a different timing than exists prior to urbanization. These higher flows may contribute to bank erosion in some stream reaches and deposition further downstream. The result is again a change in geometry and sediment regime of the natural stream with consequent adverse affects on aquatic habitat and stream water quality. Furthermore, the deposited finer-grained sediments from urbanized areas may carry with them attached contaminants that are subject to resuspension during subsequent flood conditions. While much work has been done on urban hydrology to predict changes in runoff characteristics due to urbanization, much less attention has been paid to the closely related sediment effects and the changes that they cause in flooding potential and water quality of the receiving stream over the entire watershed.

Expected Results and Benefits

The proposed research will provide a case study of an urban stream to distinguish sediment contributions from watershed development and bank erosion, resultant changes in floodplain and channel storage, and the final effect on flood routing and thus flooding potential as well as movement of sediment-bound contaminants through the watershed

system. In addition, a methodology will be developed that can be applied to other urban streams to predict the effects of urban development not just on the hydrology of the watershed, but on its sedimentology as well. As a result of the study, recommendations will be made on the relative efficacy of specific control measures such as best-management practices on construction sites to limit sediment yield, artificially-created wetlands for additional floodplain and sediment storage, streambank stabilization, vegetative buffer zones along the stream, and strict controls on development of the floodplain. The difference between this research and previous research is that the impacts of development will be considered on the entire watershed system rather than just immediately downstream of a proposed development site, and those impacts will consider sedimentology and its linkage with hydrology. The proposed methodology will allow decision makers to make more informed watershed-wide decisions rather than piecemeal approval or disapproval of particular development projects.

Research Objectives

1. Determine the relative contribution of watershed sediment yield and streambank erosion to the sediment load in a case study of Peachtree Creek in Dekalb and Fulton County, Georgia.
2. Delineate and quantify changes in channel and floodplain storage as a result of sediment aggradation and degradation, considering both past and current conditions on Peachtree Creek.
3. Evaluate the impact of storage changes due to changes in sediment regime on flood potential and suggest future implications for development.
4. Evaluate the relative effectiveness of watershed sediment control measures on improving the water quality and mitigating the current flooding along the creek.