USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Generation of Non-Point Source Pollution and Flood Waters: Identifying Source Areas from Considerations of Soil Moisture Dynamics

Duration: Sept 1, 97- Aug 31, 99

Federal Funds Requested: $70,000 (over two years)

Non-Federal Matching Funds: $140,180 (over two years

Principal Investigators:

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Congressional District: 5 th

Statement of Critical Regional Water Problem:

Two serious problems are arising in the context of hydrology of urbanizing regions' flooding and non-point source pollution. Both are generated in saturated (or near saturated) regions of the watershed and pose risks to downstream resources, natural and otherwise. Attempts have been made to explain average annual pollutant and sediment delivery to streams and surface water bodies from use of other annual mean values, such as precipitation or runoff volumes. However, nonpoint source pollutants are generated and transported through random, intermittent hydrologic events. And, as with the regions of saturation, the generation processes are distributed non-uniformly in space and time.

This research seeks a framework for explaining the spatial and temporal distributions of the saturated areas of the landscape that contribute nonpoint source pollution, sediment, and floodwaters to downstream resources. Many studies in steep forested catchments have focused on topography as the single control. However, in the rapidly urbanizing areas of the coastal mid-Atlantic states other controls (e.g. spatial variability of vegetation, drainage, evapotranspiration) may be equally important.

Statement of results and benefits:

This research will provide a framework for explaining the spatial and temporal distributions of the saturated areas of the landscape that contribute nonpoint source pollution, sediment, and floodwaters to downstream resources. The resulting framework is planned to be general in nature and easily extended to other sites, with the physical variables easily derived from remote sensing and digital topography products. It will be tailored to extract information about large scale soil moisture fields from emerging

remote sensing technologies. The remotely sensed soil moisture may define the large scale trend, with the results of this project providing the ability to predict the smaller scale variability about the overall trend.

Ultimately, this tool will be of use to land managers seeking to prioritize the prescription of protection measures. As the framework will be based in transport fundamentals it will identify the causes and allow for physical linking of them with the effects, thus providing a physical basis for subsequent economic/management analysis for optimizing mitigation measures, such as buffer strips. Hence, this framework will likely become a critical tool for integrated assessments of urbanization, nonpoint source pollution, and ecosystem restoration.