USE OF A WATERSHED MODEL TO UNDERSTAND WATERSHED SENSITIVITY TO CLIMATE CHANGE: A CASE STUDY IN THE MONOCACY RIVER WATERSHED

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ABSTRACT

During the last century, much of the U.S. experienced warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. Water resources and aquatic ecosystems are highly vulnerable to these changes, with possible effects including increased occurrence of floods and droughts, and water quality and ecosystem degradation. Climate change is also likely to interact in complex ways with other watershed stressors such as land-use change. Managing this risk in a way protective of water and aquatic resources will require an improved understanding of potential impacts, and the development of strategies for increasing resilience to anticipated change.

Environmental monitoring provides information essential to risk mangers for identifying current status and trends as well as for evaluating the effectiveness of management in an adaptive management context. Due to operational constraints (e.g. time and cost), typical monitoring programs are less effective for capturing change at a high spatial and/or temporal resolution, and for determining causal relationships when faced with multiple stressors. Monitoring data also provides limited information about future changes, particularly in the long-term.

Watershed models can be a useful complement to monitoring studies to help address these questions and support management decision making. In this presentation we discuss a modeling study conducted using new climate assessment capabilities in EPA's BASINS v4 using the HSPF watershed model. The study evaluates the sensitivity of mean annual streamflow, the 100-yr flood event, 7Q10 low flow, and mean annual sediment, phosphorus, and nitrogen loads to a range of plausible future changes in climate and land-use in the Monocacy River, a 1,927 km² tributary to the Potomac River and Chesapeake Bay. We further comment on how modeling studies can be used to help interpret and understand monitoring data.

KEYWORDS

climate, land-use, model, HSPF