Collaborative Research, Water Sustainability and Climate-Category 2: Regional Climate Variability and Patterns of Urban Development—Impacts on the Urban Water Cycle and Nutrient Export

01589312, Dead Run near Catonsville, MD

Start Date: January 1, 2011

End Date: December 31, 2015

Partners: University of Maryland, Baltimore County, Center for Urban Environmental Research and Education; U.S. Forest Service; Princeton University; Cary Institute of Ecosystem Studies; University of Rhode Island; University of Maryland, College Park; Ohio State University.

USGS Project Lead: Ed Doheny

Background: The continued expansion of the urban footprint poses a significant challenge to protecting water quality and water availability. In the mid-Atlantic region, plentiful supply of high-quality water is often assumed to be available into the indefinite future. However, recent experience indicates that the resource is both finite and vulnerable. Water shortages during recent droughts have led to usage restrictions and construction moratoria. Drinking-water quality is being threatened by increasing salt concentrations in water-supply reservoirs. The decline of living resources in Chesapeake Bay has been linked to nutrient and sediment fluxes from the land. These concerns are not limited to any one urban area. Management of water in urban areas must be rooted in scientific understanding of the process linkages that couple the hydrologic cycle to patterns of landscape transformation and climate variability.

Objectives: The goal of the Water Sustainability and Climate (WSC) project is to evaluate the interactions between urban development patterns and the hydrologic cycle and its associated nutrient cycles, within the context of regional and local climate variability. The specific objective is to create a modeling system capable of simulating the feedback relations that control urban water sustainability. In building this system, the following research questions are being addressed by the research team:

(1) How do human locational choices, water-based ecosystem services, and regulatory policies affect the supply of land and pattern of development over time?

(2) How do the changing composition and variability of urbanizing surfaces affect local and regional climate?

(3) How do patterns of development (including the engineered water system) and climate variability affect fluxes, flow paths and storage of water and nitrogen in urban areas?

Dead Run is one of the local watersheds being used by the project team for conducting the research.

Approach: During the project period, the U.S. Geological Survey, MD-DE-DC Water Science Center is performing the following tasks as part of the WSC Project:

1. Delivery of real-time stage data, data archiving, and annual stage-data publication at all five existing streamflow gages in the Dead Run sub-watersheds. Gage locations included in the study are as follows:

   01589312 Dead Run near Catonsville, MD
   01589315 Dead Run at Woodlawn, MD
   01589316 Dead Run Tributary near Woodlawn, MD
   01589317 Tributary to Dead Run Tributary at Woodlawn, MD
   01589320 Dead Run Tributary at Woodlawn, MD

2. Providing interpretation of previously-published continuous-record stage data to produce and publish continuous discharge data and standard discharge statistics for the period of record (Water Years 2008 through 2015) at all five existing streamflow gages in the Dead Run sub-watersheds.

3. Providing quality assurance/quality control review for up to three indirect high-flow discharge measurements from one or more of the three existing streamflow gages that have no measured discharge confirmation of the upper end of the stage-discharge rating relation.

Results:

1. Publication of stage-only records and development of discharge records for the gages is ongoing. Data through Water Year 2013 has been published in the USGS Annual Water-Data Report, and will be published in the new online format thereafter.

2. Indirect discharge measurements of peak flow were made for the storm of September 7, 2011 (Tropical Storm Lee) at four of the Dead Run sub-watershed streamflow gages (01589315, 01589316, 01589317, 01589320). These measurements have been checked and reviewed, and are being used to develop the upper end of the stage-discharge ratings for each of these gages.

Publications: USGS Annual Water-Data Report: http://wdr.water.usgs.gov/

01589315, Dead Run at Woodlawn, MD

01589320, Dead Run Tributary at Woodlawn, MD

01589316, Dead Run Tributary near Woodlawn, MD

01589317, Tributary to Dead Run Tributary at Woodlawn, MD