

Research Project Title

RES2020-23 Updating Equations for Peak Flow Estimation in Urban Creeks and Streams of Tennessee

Purpose of the Project

This project offers innovative approaches to better understand the hydrologic response of urbanizing watersheds in Tennessee, in order to obtain the best possible predictive equations for urban peak flows, in a context of limited streamflow information, both in time (short records) and space (few stations, that happen to be spatially clustered).

The project's objective is to develop the best possible sets of equations for estimating peak flows in urban areas of Tennessee and then implement them into the StreamStats web application. The study will be conducted jointly by the University of Memphis and the United States Geological Survey (USGS).

Scope and Significance

Together USGS and the University of Memphis will complete the following tasks:

1. Compile and analyze available streamflow and stage data for urban areas in TN and the surrounding urban areas of neighboring states.
2. Review existing peak flow estimation equations for rural and urban watersheds.
3. Obtain all continuously-recorded point rainfall data at and near urban areas to detect jumps or trends in extreme precipitation.
4. Use existing land cover datasets to assess urban and urbanizing watersheds to show dynamism of these environments.
5. Perform event-based rainfall-runoff analyses for all flow events above a determined threshold.
6. Determine homogeneous groups of urban areas and select variables to including equations.
7. Calculate explanatory variables using GIS techniques to improve accuracy.
8. Develop regression equations to estimate flood magnitudes for selected annual exceedance probabilities.
9. Provide final report and flood-frequency decision-support tool for TDOT staff working with newly updated StreamStats web application.

Expected Outcomes

Specific contributions include: (i) An updated database of streamflow, river stage, and rainfall data in and around Tennessee, (ii) thorough analyses of rainfall trends at stations in and around Tennessee, (iii) the development of novel hydrologic approaches to disentangle the effects of urbanization versus those of rainfall trends, and (iv) a description of urbanization trends at all gaged, urban watersheds in the State. The main expected benefits are an improved understanding and predictive capacity of urban peak flows, as well as extreme rainfall events in Tennessee, allowing for better engineering design of drainage structures.



Research Office
Long Range Planning Division
505 Deaderick Street, Suite 900
Nashville, TN 37243
TDOT.Research@tn.gov

Time Period

July 2020 to June 2023

Contact Information

<p>Principal Investigator (PI): Name: Dr. Claudio Meier Department: Civil Engineering University: University of Memphis Address: Memphis, TN 38152 Phone: (901)678-3026 Email: cimeier@memphis.edu</p>	<p>TDOT Lead Staff: Name: Wesley Peck Division: Structures Division Phone: (615)532-5660 Email: Wesley.peck@tn.gov</p>
---	---