# Urban Watersheds Added to StreamStats, an Online Tool for Estimating Watershed Peak Flows, by ICT/USGS Researchers for IDOT

The Illinois Department of Transportation (IDOT) owns or maintains more than 8,000 bridges over waterways throughout the state. IDOT's Central Bureau of Bridges and Structures (aka the Bridge Office) employs state-of-the art tools to help ensure that bridge and culvert waterway openings are adequately designed to provide safe crossing.

According to Matt O'Connor, Acting Hydraulics Unit Chief in IDOT's Bridge Office, the StreamStats web-based system is one such tool. An automated platform for applying flood-frequency equations, StreamStats has been in use in Illinois since 2010, when it was implemented for Illinois by the U.S. Geological Survey (USGS). It is used by all nine IDOT district offices and hundreds of local agencies in Illinois to compute peak discharges for flood-risk analysis in the design of bridges, culverts, and other highway stream crossings. However, the existing flood-frequency equations did not take into account the spread of urbanization, particularly in the Chicago area.

Therefore, in 2013, the Illinois Center for Transportation (ICT) partnered with IDOT on a project to update the 1979 Illinois urban regional flood-frequency equations for the drainage basins in northeastern Illinois. The project, "Development and Implementation of Updated Urban Regional Flood-Frequency Equations for Illinois," was overseen by an IDOT Technical Review Panel headed by O'Connor.

USGS staff that headed up the ICT/IDOT project were principal investigator Audrey Ishii, Supervisory Hydrologist; co-investigator Thomas Over, Hydrologist; and co-investigator David Soong, Research Hydrologist. They were assisted by Riki Saito, Jennifer Sharpe, and Katie Merriman-Hoehne. All are with the USGS Illinois–Iowa Water Science Center, in Urbana, Illinois. Staff from the USGS Office of Surface Water at various offices throughout the United States provided additional assistance on the project.

Over explains the process for updating the previous flood-frequency equations: "First, we selected streamgages that monitor streamflow from basins with a wide range of urbanization histories through the northeast Illinois region and applied a procedure to adjust the peak discharges from those streamgages to 2010 land-use conditions.

"Next, we analyzed the streamgage records to compute their flood-frequency characteristics—that is, discharges corresponding to different probabilities of exceedance, such as the 100-year flood.

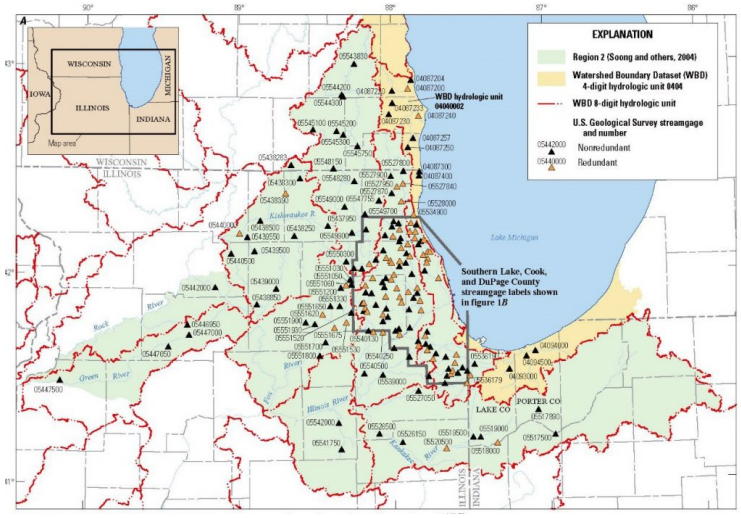
"In the third stage, we used basin characteristics as predictors to fit regression models to predict flood-frequency characteristics. These regression models provided the prediction equations that were implemented in the online StreamStats tool that allows IDOT engineers and others to estimate peak discharges at different probabilities of exceedance."

USGS hydrologic technician servicing streamgage 05599490 on Illinois Route 127 bridge across the Big Muddy River at Murphysboro, Illinois. Photo taken by Trent Legg, USGS, 03/22/2007.

"Each year," says IDOT's O'Connor, "peak discharge data from StreamStats are used for waterway design at literally thousands of hydraulic structures across the state. The savings in engineering time and the consistent, uniform, and reliable output generated by StreamStats made this research project a very worthwhile investment."

USGS hosted a StreamStats training session for IDOT District and Central Office hydraulic staff on August 25, 2016 in Urbana, IL. The session was attended by approximately 20 hydraulic engineers throughout the state. IDOT's O'Connor went on to say, "The direction and training from USGS was very well received and was a great introduction to the new methodology, which should promote consistent and uniform use of the StreamStats webpage."

The project's final report, Estimation of Peak Discharge Quantiles for Selected Annual Exceedance Probabilities in Northeastern Illinois, is available on ICT's website.




Map of entire study area and streamgages used in the study.

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