

THE RICE UNIVERSITY FLOOD ALERT SYSTEM



Designed by Houston flood expert, Dr. Philip Bedient at Rice University from 1997 to 2016, with assistance from Dr. Nick Fang and Dr. Baxter Vieux, the Flood Alert System (FAS3) is an integrated system that predicts inundation levels caused by heavy rainfall events in order to provide lead-time for flood-response decisions by the Texas Medical Center.

**Current users include the Texas Medical Center, TxDOT and the City of Sugar Land.
The Flood Alert System (FAS3) can be deployed to any community.**

FAS3 FEATURES

Prediction Capability

Provides on average 2 to 3 hours lead-time predictions of maximum flood conditions

Highly Accurate

80-90% prediction accuracy on peak water flows and timing

Automatic Emergency Alerts

Automatic notification provided to emergency personnel to ensure lead-time for flood-response decisions

Accessible

The FAS website is accessible from any device with internet access

Reliable

Back up servers ensure results even during power outages

Track Record of Success

Proven results for over 50 major storm events, including Tropical Storm Allison (2001) and Hurricane Ike (2008)

State of the Art Technology

Real-time NEXRAD radar-rainfall, advanced hydrologic and hydraulic modelling

Expandable

FAS has been expanded to City of Sugar Land and TxDOT



RICE

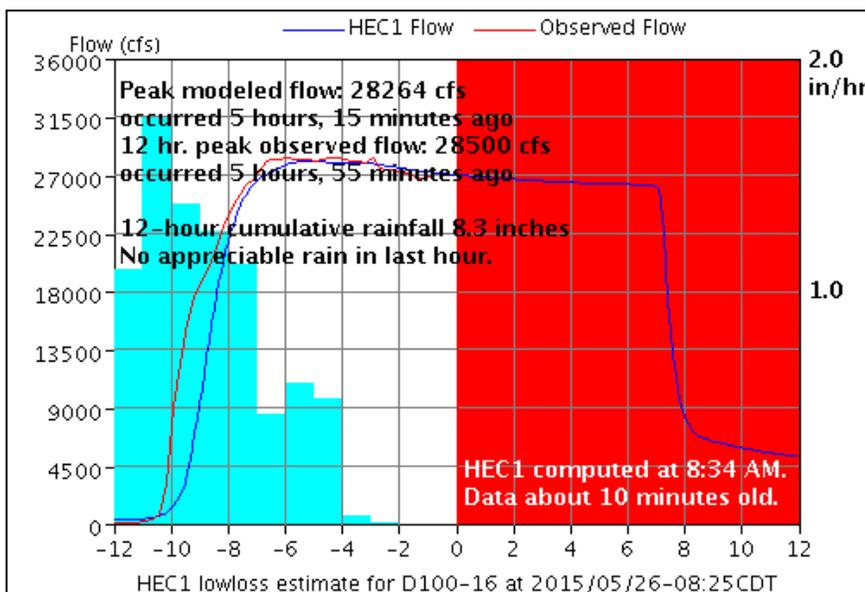
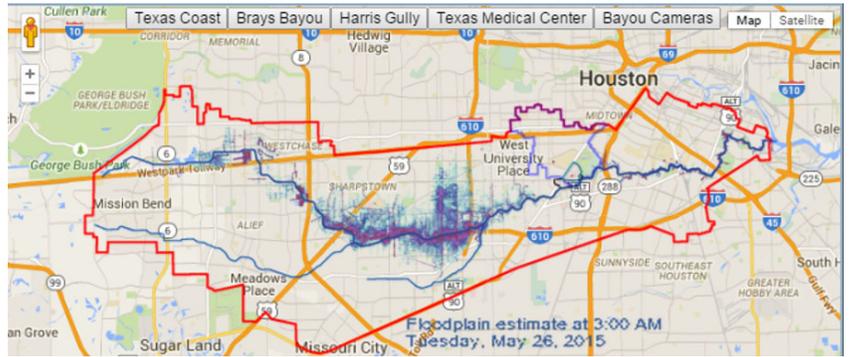
FAS3.flood-alert.org

FAS3 IN ACTION

Our goal is to improve the lead time and accuracy of flood predictions and to deliver real-time information to emergency managers.

- On May 25-26th, 2015 an average of 7.6 inches of rainfall fell in 12 hours over Brays Bayou Watershed
- High flow conditions beyond 18,000 cfs were predicted as far as 3 hours in advance
- FAS3 immediately notified TMC Emergency personnel of potential flooding conditions
- A maximum predicted streamflow from FAS3 of 28,264 cfs matched well with observed peak flows of 28,500 cfs
- Fortunately, FAS3 provided TMC with sufficient lead-time to determine whether or not to close their flood doors and evacuate cars out of basement parking garages

Image Below: During the May 2015 event, floodplain maps were provided to demonstrate the extent of overbank flooding expected during the rainfall event.



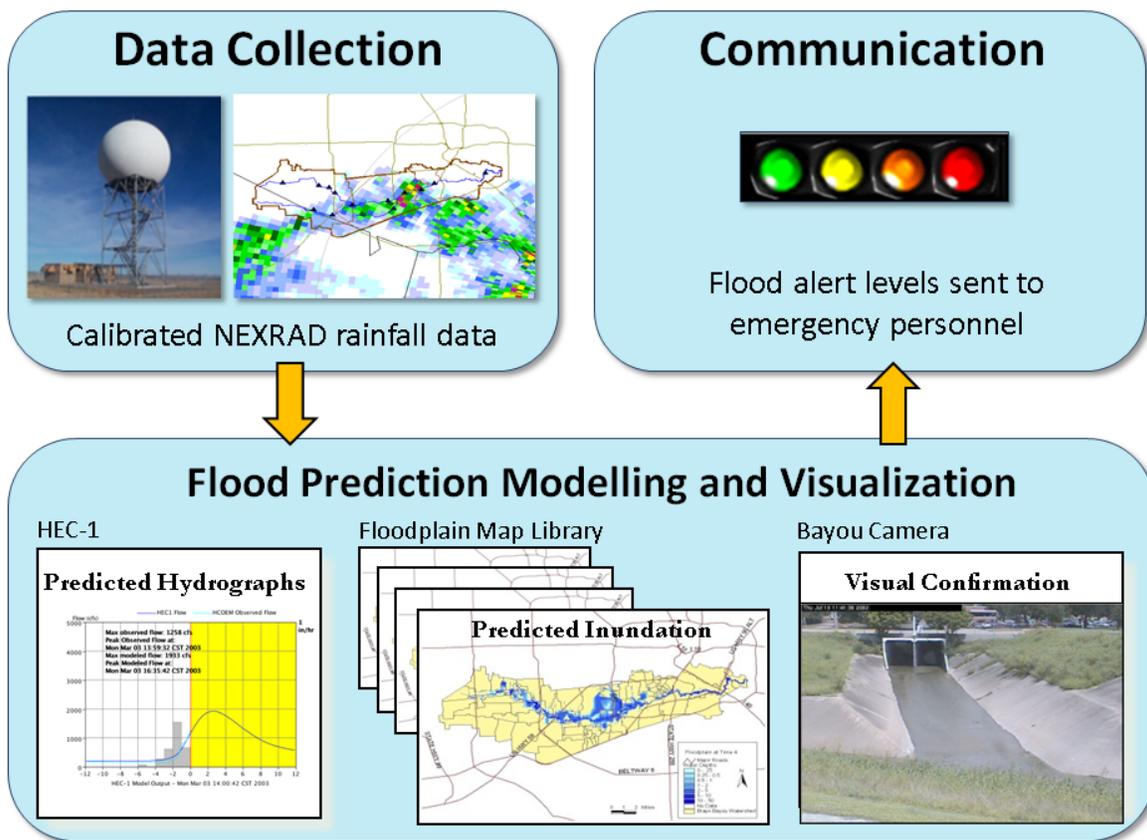
Left Image: Hydrograph representing Brays Bayou streamflow near TMC. The predicted streamflow (blue line) provided lead-time information and matched well with the actually observed streamflow (red line).



HOW IT WORKS

FAS3 uses an integrated system of state-of-the-art radar-rainfall technology, rain-gauge networks, and hydrologic modelling to predict flooding conditions.

WORKFLOW - THE FLOOD ALERT SYSTEM: Real-time NEXRAD radar-rainfall data is collected from the National Weather Service and calibrated by local rain gauges. This rainfall data is then fed to a hydrologic program, HEC-1, which determines streamflow for major rivers or streams. The combined real-time radar-rainfall and streamflow prediction process is repeated every 5 to 10 minutes during a storm. Maximum streamflow conditions determine the flood alert level and corresponding notifications are sent to stakeholders regarding the severity of potential flooding conditions.



STATE-OF-THE-ART TECHNOLOGY

- High resolution NEXRAD Radar-rainfall calibrated by rain-gauges
- Rapid prediction of streamflow conditions using hydrologic models HEC-1 and Vflo[®]
- Rapid prediction of inundation levels using the Floodplain Map Library based on HEC-RAS
- Visual confirmation of inundation levels provided by in-situ bayou cameras
- Automatic dissemination of emergency warnings delivered via website and text message

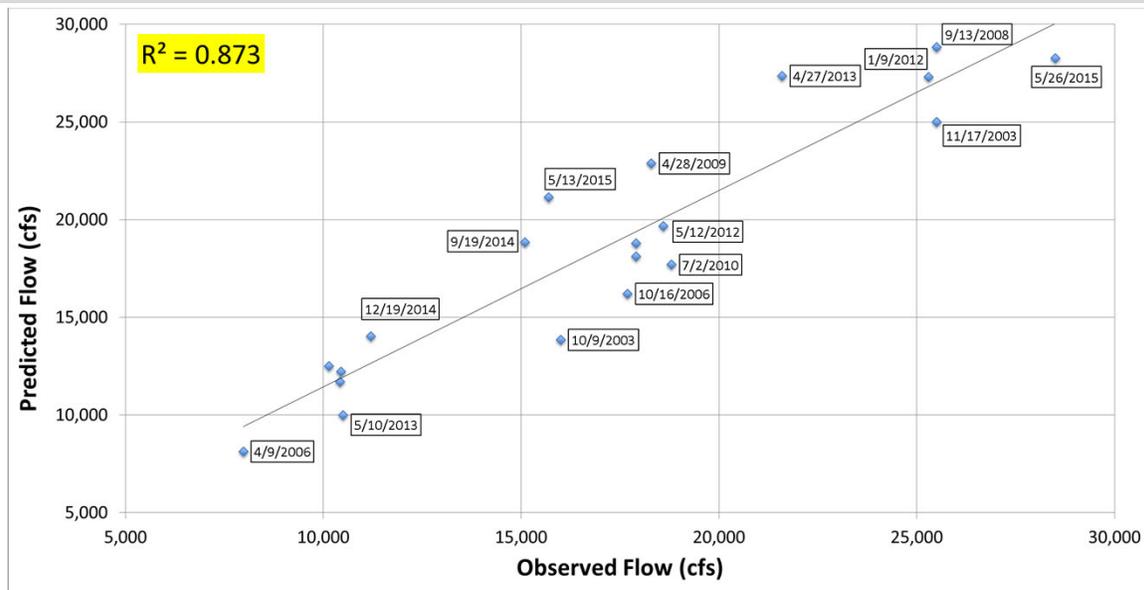


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ACCURACY: FAS3 has predicted maximum streamflow, or flooding conditions, for over 50 major storm events. In the image below, the reliability of FAS3 is demonstrated by a close fit between maximum predicted streamflow and the later observed maximum streamflow values.



AUTHORS



PHILIP BEDIENT Dr. Bedient is the Herman Brown Professor of Engineering at Rice University in Civil and Environmental Engineering. He teaches and performs research in surface water hydrology and flood prediction systems. He has directed 60 research projects over the past 35 years, and has written over 180 articles in journals and conference proceedings. Dr. Bedient directs the SSPEED Center at Rice for severe storm prediction, consisting of several universities in the Gulf Coast area, which has funding to address the impacts of Hurricane Ike in the Houston area. Dr. Bedient has directed the development of FAS3 since 1997 with funding from The Texas Medical Center and FEMA.



NICK FANG Dr. Nick Z. Fang is an assistant professor in the Civil Engineering Department at the University of Texas – Arlington. He obtained his Ph.D. in Civil and Environmental Engineering at Rice University. He has been working on surface water and groundwater problems for over ten years including floodplain studies, hydrologic/hydraulic modeling, water treatment, hydrodynamic simulation, storm water management modeling, and water quality assessment for a number of watersheds in Texas, Florida, and Louisiana. Dr. Fang's Ph.D. research focused on developing the mapped libraries for flood inundation for FAS3.



BAXTER VIEUX Dr. Vieux's professional focus is radar rainfall and distributed hydrologic modeling. He is distinguished in the application of high-resolution rainfall monitoring to hydraulic modeling of collection systems. Dr. Vieux has directed the development of design storms for collection system planning, operations. He has over 100 publications appearing as textbooks, journal articles, and conference proceedings. Dr. Vieux was a full Professor at the University of Oklahoma. His company, Vieux & Associates (VAI), delivers the calibrated radar for use in FAS3, and delivers similar products to clients all over the world.



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Questions? Send us an email: sspeed@rice.edu