Designed by flood expert, Dr. Philip Bedient at Rice University, with assistance from Dr. Nick Fang and Dr. Baxter Vieux, FAS4 is an integrated system that predicts inundation levels caused by heavy rainfall events in order to provide lead-time for flood-response decisions.

Current Users: The Texas Medical Center, TxDOT and the City of Sugar Land.

FAS4 celebrates its 20th year of providing fast and accurate flood warning predictions by introducing a new edition to its users.

**Spotlight**

**New Advancements:** The new FAS4 edition has expanded its technological advancements, including smart phone and tablet compatibility options, to provide or more mobile experience for decision makers during rain events.

- Real-Time Rainfall
- Real-Time Hydrographs
- Visual Monitoring & Verification
- Real-Time Forecast Flood Map
- Flood Protection & Emergency Actions
  - Evacuations
  - Flood door closure
  - Backup Power

**How it Works**

FAS4 uses an integrated system of state-of-the-art radar-rainfall technology, rain-gauge networks, and hydrologic modeling to predict flooding conditions.

**Workflow:** 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 stream-flow for major rivers or streams. The combined real-time radar-rainfall and stream-flow prediction process is repeated every 5 to 10 minutes during a storm. Maximum stream-flow 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 stream-flow 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 messages.
FAS4 has predicted maximum stream-flow, or flooding conditions, for over 50 major storm events. In the image below, the reliability of FAS4 is demonstrated by a close fit between maximum predicted stream-flow and the later observed maximum stream-flow values.

FAS4 in Action

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

Houston’s May 25-26th, 2016 Flood Event

- 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
- FAS4 immediately notified TMC Emergency personnel of potential flooding conditions
- A maximum predicted stream-flow from FAS4 of 28,264 cfs matched well with observed peak flows of 28,500 cfs
- Fortunately, FAS4 provided TMC with sufficient lead-time to determine whether or not to close their flood doors and evacuate cars out of basement parking garages

FAS4 Features

New Advancements: The new FAS4 edition has expanded its technological advancements, including smart phone and tablet compatibility options, to provide or more mobile experience for decision makers during rain events.

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), Hurricane Ike (2008), Memorial Day Flood (2015) and Tax Day Flood (2016)

State of the Art Technology: Real-time NEXRAD radar-rainfall, advanced hydrologic and hydraulic modeling

Expandable: FAS has been expanded to City of Sugar Land and TxDOT

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 FAS4 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 FAS4.

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 (V&V), delivers the calibrated radar for use in FAS4, and delivers similar products to clients all over the world.

FAS4 Accuracy

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FAS4.flood-alert.org