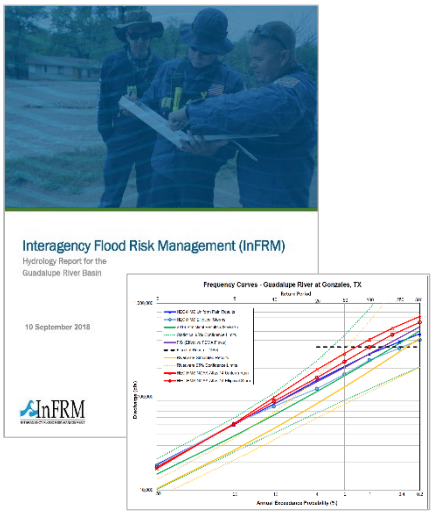
The InFRM Watershed Hydrology Assessments

The Interagency Flood Risk Management (InFRM) Team

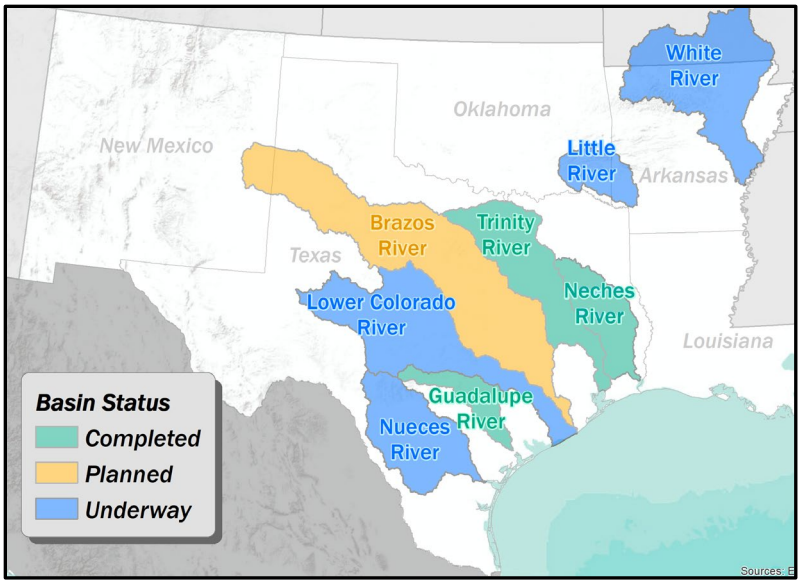
Since 2014, the Interagency Flood Risk Management (InFRM) team has been working across the States of Texas, Oklahoma, New Mexico, Louisiana and Arkansas to develop actionable information to reduce long term flood risk in the region. The InFRM team is comprised of the Federal Emergency Management Agency (FEMA), the US Army Corps of Engineers (USACE), the US Geological Survey (USGS), and the National Weather Service (NWS) and operates at the program delivery level under the umbrella of Integrated Water Resources Science and Services (IWRSS). The InFRM Watershed Hydrology Assessments (WHAs) are performed by an expert team of engineers and scientists from multiple federal agencies using the latest advances in hydrologic science and technology.

Purpose of the Watershed Hydrology Assessments

As hydrology remains the single largest source of uncertainty in our understanding of flood risk, the InFRM team has been performing Watershed Hydrology Assessments to update flood risk estimates in large, complex river basins using suites of models developed by USACE. The watershed assessments examine the hydrology across the entire basin, reviewing non-stationary influences, such as regulation, land use changes, and climate variation, to ensure all variables affecting flood risk in the watersheds are considered. The multi-layered analysis employs a range of hydrologic methods, including rainfall runoff modeling, statistical hydrology, and reservoir simulations, and then compares the results of those methods to one another. The watershed hydrology assessments produce consistent 1% annual chance (100-yr) and other frequency flows across the river basin, based on all available hydrologic information. The results also provide suggestions for areas where the current flood hazard information may need to be updated.



Watershed Hydrology Assessment Report and Frequency Curve Comparison



Selected River Basins

River basins within the region are selected for study based on watersheds where USACE already had sufficiently detailed modeling products available as a starting point and where FEMA had future floodplain mapping activities scheduled. InFRM watershed hydrology assessments are currently complete or underway for the following river basins: the Guadalupe, the Trinity, the Neches, the lower Colorado, and the Nueces basins in Texas, the Little River basin in Oklahoma, and the White River in Arkansas. Additional basins will be added to the program as funding allows.

More information and contact information available at www.infrm.us

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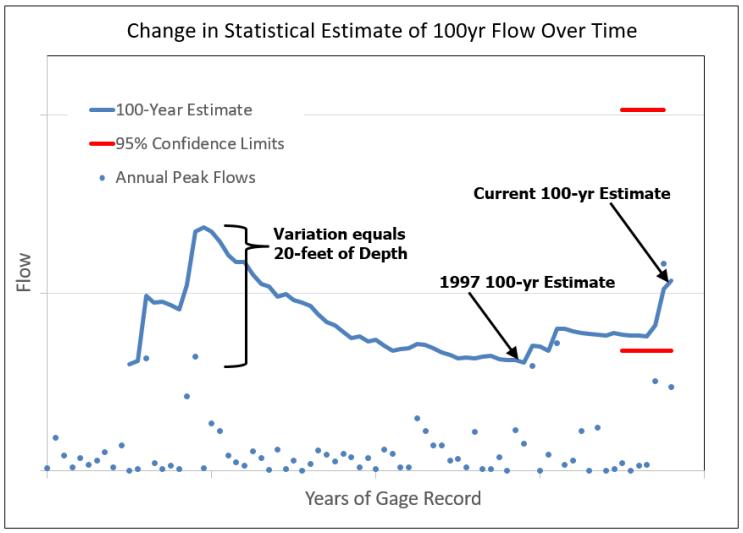
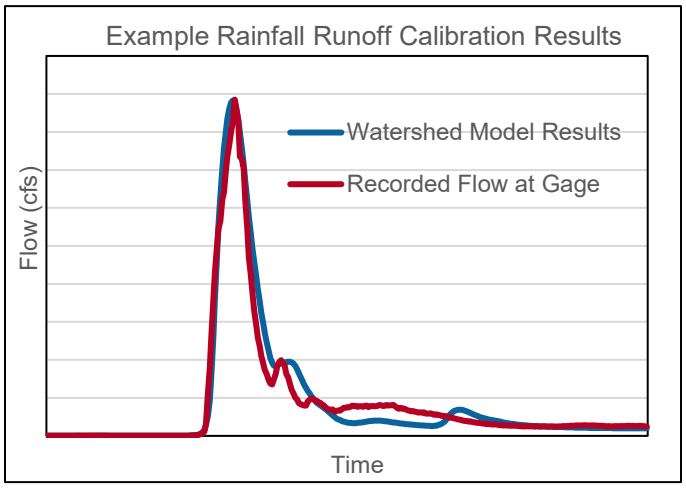
Unique Features in the Hydrology Assessments

The InFRM Watershed Hydrology Assessments strive to lean forward onto the cutting edge of science by incorporating new methods and technology as they become available. Some of the new or unique features in the current hydrology assessments include:

Statistical Flow Frequency Change Over Time Plots

Statistical analysis of the stream gage records can be a valuable tool, but caution should be used as the results can vary widely as additional years are added to the record. In addition to plotting the traditional frequency curves, the InFRM team also plots how the statistical flow estimates from Bulletin 17C have changed over time. These plots are useful in communicating how each added year of record changes the 1% annual chance (100-yr) flow and depth estimate and whether the current year's estimate is at a relative high point or low point. These plots also show that even with 100 years of gage record, the 100-yr flow estimate is still a moving target.



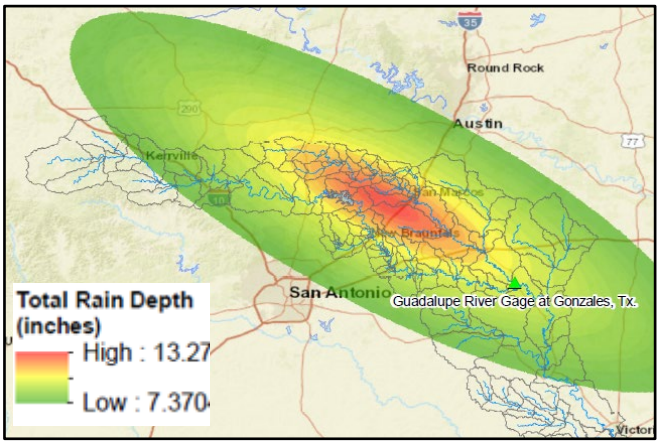


Extensive Model Calibration & Validation

Rainfall-runoff watershed modeling is used to simulate how storm water moves across the land surface and through the streams and rivers. After building a rainfall-runoff model, the InFRM team calibrates the model to verify that it is accurately simulating the response of the watershed to a range of observed flood events, including large events similar to a 1% annual chance (100-yr) flood. Typically, a total of 15-20 recent storm events are used to fine tune the model. When needed, 2D HEC-RAS Rain-On-Mesh technology is also used to validate the watershed's response to intense rainfall events.

Elliptical Frequency Storms

Applying hypothetical frequency storms to a rainfall-runoff model is another commonly used method of estimating the 1% annual chance (100-yr) flow. However, the existing NWS criteria built into watershed models do not support storms beyond 400 square miles. Therefore, the InFRM team developed a method where elliptical shaped frequency storms are applied to the rainfall-runoff model for drainage areas ranging from 400 to 10,000 square miles; thereby greatly extending the usefulness of the watershed model results for large river systems.



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