



Collaborating Nationally and Empowering Locally

the Flood Decision Support Toolbox (FDST)

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Texas GIS Forum
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InFRM

Interagency Flood Risk Management (InFRM) Team -

- FEMA Region 6 - Sponsor
- U.S. Army Corps of Engineers (USACE)
- U.S. Geological Survey (USGS)
- National Weather Service (NWS)



Why InFRM?

■ Goals

- Integrate information and simplify access to data
- Increase accuracy and timeliness of information
- Provide high resolution information and forecasts
- Enrich stakeholder participation

■ Mitigate and “inform” flood risk as a team



■ *Collaborating Nationally, Empowering Locally*



A Web Presence for InFRM



Interagency Flood Risk Management

Collaborating Nationally. Empowering Locally.

Flooding remains the leading cause of natural-disaster loss across the United States. The Interagency Flood Risk Management (InFRM) team brings together Federal Partners with mission areas of hazard mitigation, emergency management, floodplain management, natural resources management or conservation to leverage the skillsets, resources and programs to determine the needs of communities and define solutions and implement measures to reduce long term flood risk throughout the States of Arkansas, Louisiana, New Mexico, Oklahoma and Texas.

In 2014, the Federal Emergency Management Agency (FEMA) began sponsorship of the InFRM team initiative to allow Federal teams across the States of Texas, Oklahoma, New Mexico, Louisiana and Arkansas to better align and integrate. Currently, the InFRM team is comprised of FEMA, US Army Corps of Engineers, US Geological Survey, and the National Weather Service. No single agency has all the answers, but through a coordinated effort of multiple programs and various perspectives, a cohesive solution can be found. By applying their shared knowledge, the InFRM team can also enhance response and recovery efforts when flood events do occur.

While floods are impossible to prevent completely, and there is no way to guarantee protection of property, loss of life can be greatly reduced when communities have access to good data, practice sound land use, floodplain management and development practices and incorporate warning systems. Local communities can partner with the InFRM team to investigate solutions to reduce their communities flood risk.



InFRM Projects – estBFE Viewer

Estimate Your Base Flood Elevation

Base Level Engineering is a watershed-wide engineering modeling method that leverages high resolution ground elevation, automated model building techniques, and manual model review to prepare broad and accurate flood risk information for FEMA to assess its current flood hazard inventory. Base Level Engineering prepares flood risk information with scalable engineering, allowing FEMA to both assess its current flood hazard inventory and expand the coverage and availability of flood risk information to communities and individuals interested in reviewing their potential flood risk.

Goal: Centralized and available flood hazard analysis to support floodplain management activities and development review, while increasing risk awareness for individuals.

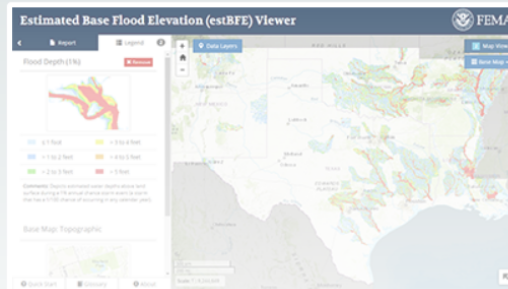
Benefits:

- The Estimated Base Flood Elevation Viewer allows users to determine the flood risk (High, Moderate, Low) throughout watersheds that have been assessed using Base Level Engineering methods.
- Estimated base flood elevations and flood depths for site specific locations (within the estimated 1% annual chance floodplain)
- Immediate point-click-download access to engineering models and Base Level Engineering datasets.
- Allows Federal, State, and local governments, as well as individuals, access to flood risk information.

FEMA is working with its Federal and State partners to identify watersheds each fiscal year that your community is interested in having watersheds

Find Out More

- Base Level Engineering Data visualization
- Point, click & download
- Search functionality
- My estBFE report →



Estimated Flood Extent

Estimated 1% Flood Depth

EXPLANATION

- Stream
- High risk (1% Flood zone)
- Low to moderate risk (0.2% Flood zone)

EXPLANATION

- 1% Flood depth: 0 to 1 foot
- > 1 to 2 feet
- > 2 to 3 feet
- > 3 to 4 feet
- > 4 to 5 feet
- > 5 feet

Flood Event	Estimated Flood Depth*	Estimated Base Flood Elevation*
1 Percent (100 Year)	0.6 feet above land surface	481.6 feet NAVD 1988
0.2 Percent (500 Year)	1.1 feet above land surface	482.2 feet NAVD 1988

* The information included in this report is based on the location marker shown in the map. Results are not considered an official determination.

Information made available from the Estimated BFE Viewer needs to be accepted by local community officials to be used for insurance rating purposes.

Knowing Your Risk

Base Level Engineering data availability and analysis information is important because it can be used to:

- Inform floodplain management decisions and ordinance administration.
- Identify significant floodplain changes.
- Serve as base modeling for map re-evaluation and
- Support the Zone A BFE information for a Letter of Map Amendment (LOMA) request.

Graphic is not to scale.

DOCUMENTS



Estimated Base Flood Elevation Viewer Factsheet

Summarizes base level engineering and how to use the new Estimated Base Flood Elevation Viewer, which is an interactive web portal.

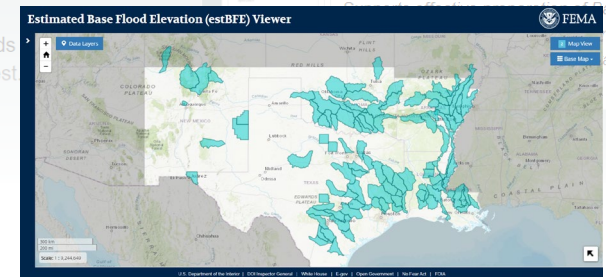


What is Base Level Engineering? Factsheet

Explains the base level engineering production approach and how it can be used to reduce flood risk.



Base Level Engineering Region 6 Submittal Guidance Document



estBFE Viewer – Multi-functionality

The screenshot shows the 'Estimated Base Flood Elevation Viewer' interface. At the top right is the FEMA logo. The main content area is titled 'Welcome to the' and contains three interactive cards: 'View Base Level Engineering Data', 'Download Datasets & Models', and 'Property Look Up'. Each card has an 'I Want to' icon and a list of instructions. The background shows a map of the Little Rock area with various streets and landmarks. At the bottom, there is a navigation bar with 'Quick Start', 'Glossary', and 'About' buttons, and a footer with government links.

Estimated Base Flood Elevation Viewer

Welcome to the

Base Level Engineering assessments are produced using high resolution ground data to create technically credible flood hazard information that may be used to expand and modernize FEMA's current flood hazard inventory.

I Want to Explore

View Base Level Engineering Data

Access all available Base Level Engineering data without GIS software.

- Click the **DATA LAYERS** button to add or remove map layers.
- Click the **LEGEND** tab to view an explanation of all data shown.
- Click the **MAP VIEW** button to open or close a second viewing window for side-by-side comparisons.

I Want to Download

Download Datasets & Models

Download the Base Level Engineering data presented in the viewer.

- Click the **DATA LAYERS** button and add the **DOWNLOADABLE DATA** layer.
- Click shaded areas in the map to open a dialog for choosing datasets to download.

I Want to Explore

Property Look Up

Where data is available, produce a property-specific report with estimated base flood information.

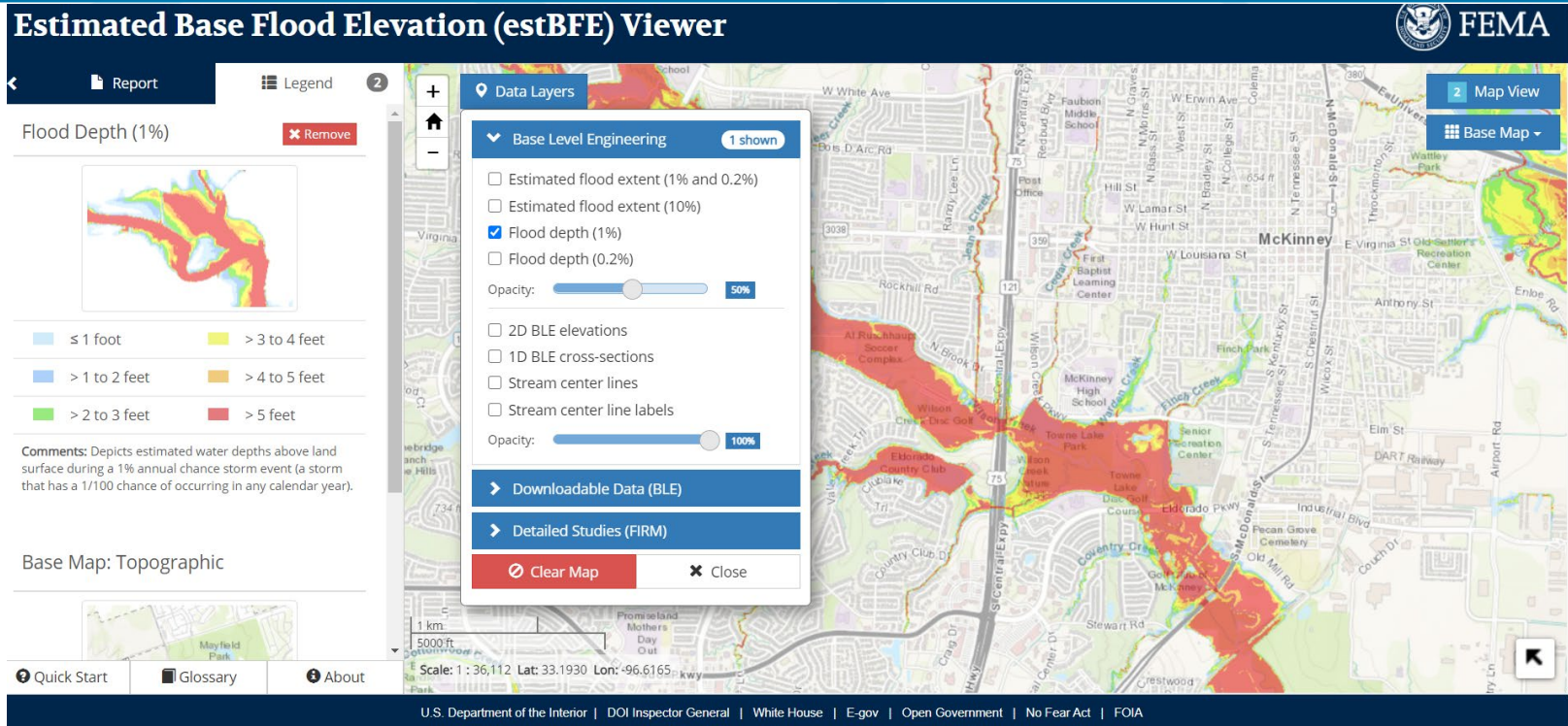
- Click the **REPORT** tab to create a flood risk report for a specific location.

Click a topic to get started!

U.S. Department of the Interior | DOI Inspector General | White House | E.gov | Open Government | No Fear Act | FOIA



estBFE Viewer – View Base Level Engineering Data



- **Base Level Engineering** – approach to flood risk reduction that combines high-resolution ground elevation data and modeling advancements to create engineering models and flood hazard data on a watershed-level scale



InFRM Projects – Watershed Hydrology Assessments (WHAs)

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 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. The watershed assessments examine the hydrology across the entire basin, reviewing non-stationary influences, such as regulation, land use changes, and wet/dry 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.

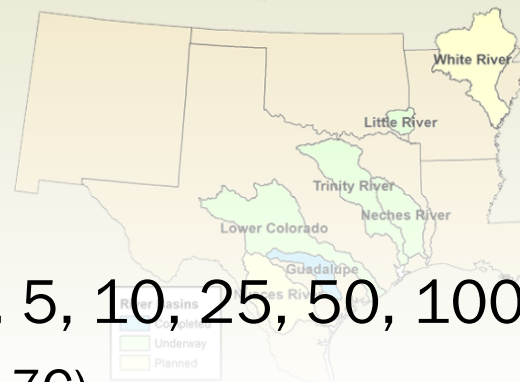
The goal of the watershed hydrology assessments is to produce consistent 1% annual chance (100-yr) and other frequency flows across the river basin, based on all available hydrologic information. The results of the hydrology assessments represent the best available estimate of flood risk across the entire river basin and provide suggestions for areas where the current flood hazard information may need to be updated.

River basins within the region are selected for hydrology assessments based on watersheds where USACE already had sufficiently detailed modeling products available as a starting point for the assessments and where FEMA had future floodplain mapping activities scheduled.

InFRM watershed hydrology assessments are currently underway for the following river basins:

- the Guadalupe,
- the Trinity,
- the Neches, and
- the lower Colorado River basins in Texas, and
- the Little River basin in Oklahoma.

Additional basins will be added to the program as funding allows.




- Flood flow frequency for 2, 5, 10, 25, 50, 100, 250, and 500 yr
 - Statistical analysis (Bulletin 17C)
 - Rainfall-runoff modeling (CWMS)
 - RiverWare generated period of record


DOCUMENTS



InFRM Hydrology Report for the San Marcos River Basin
Summarizes new analyses completed to estimate frequency flows for various stream reaches in the San Marcos River Basin.



InFRM Watershed Hydrology Assessment for the Guadalupe River Basin
Summarizes new analyses completed to estimate frequency flows, for various stream reaches in the Guadalupe River Basin.



InFRM Watershed Hydrology Assessments Factsheet
Highlights and description of the Watershed Hydrology Assessments



InFRM Watershed Hydrology Assessment for the Trinity River Basin
Summarizes new analyses completed to estimate frequency flows, for various stream reaches in the Trinity River Basin.

[Report](#) [Appendices](#)



WHA - Results

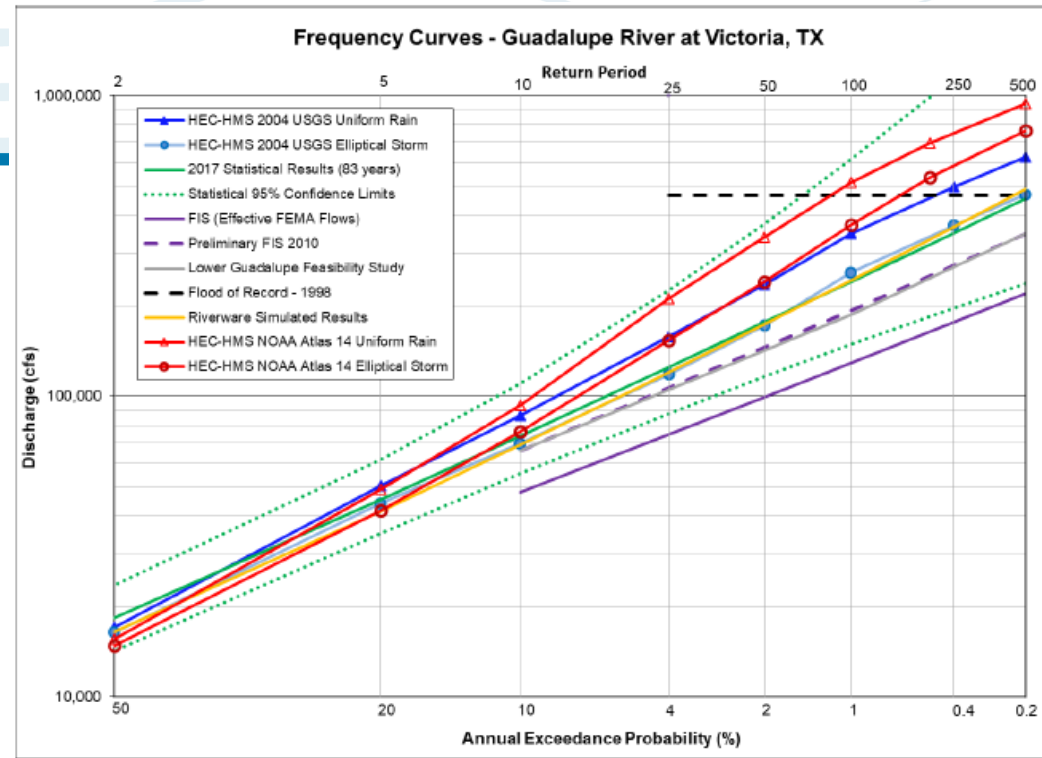
- Statistical flood frequency results compared to previous effective flows, basin models to produce recommended results.


- Reports available at infrm.us

- Completed:
 - Guadalupe/San Marcos
 - Trinity

- In review:
 - Neches

- In Progress:
 - Colorado
 - Nueces





Interagency Flood Risk Management (InFRM) Watershed Hydrology Assessment for the Guadalupe River Basin

InFRM report

This report summarizes new analyses that were completed as part of a study to estimate the 1% annual chance (100-yr) flow, along with other frequency flows, for various stream reaches in the Guadalupe River Basin...



The Flood Decision Support Toolbox

Background – Flooding in the South-Central U.S.

Harvey 2017



Mississippi River 2019



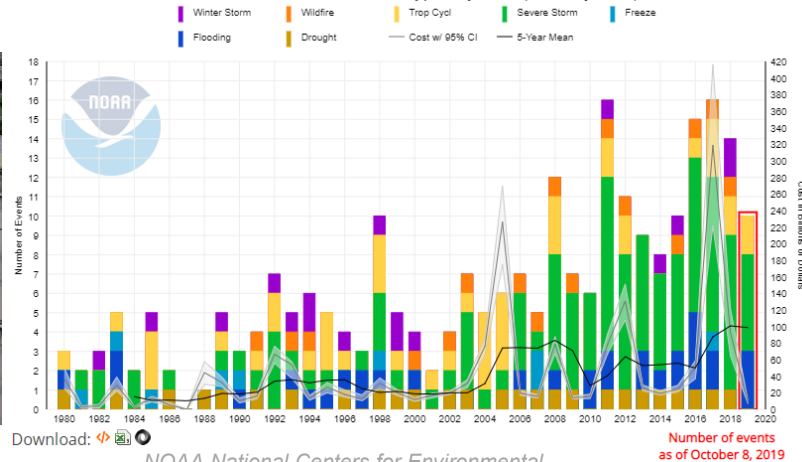
TS Imelda 2019



Wimberly 2015



Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)



Ida 2021

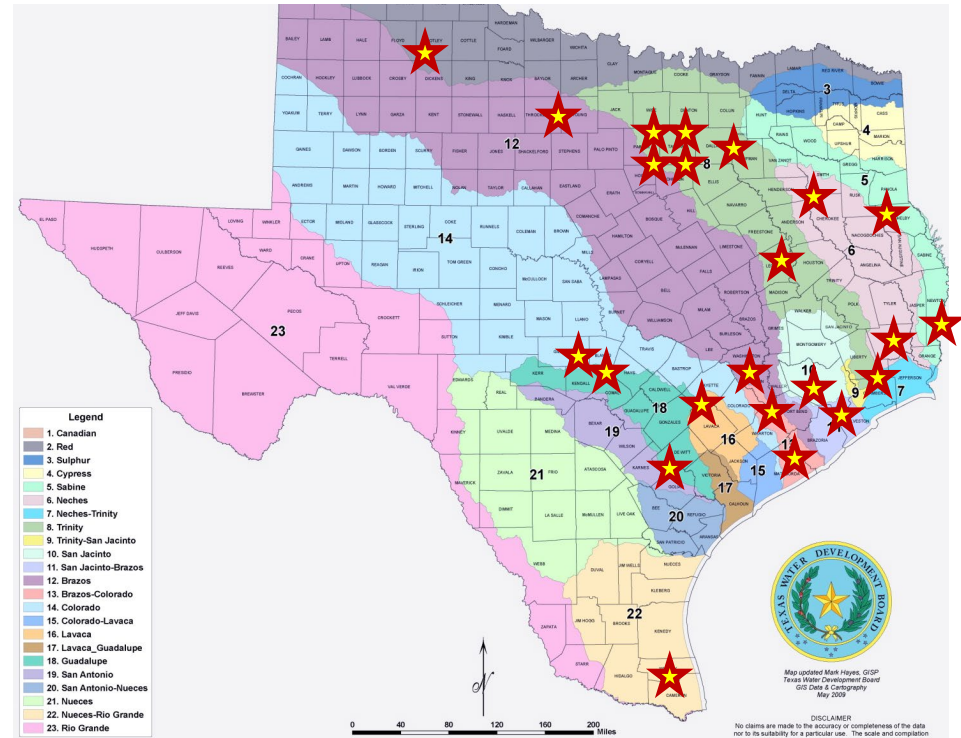


NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2019). <https://www.ncei.noaa.gov/billions/>



A better warning system is needed!

- Inundation mapping requests during 2015/2016 floods
- USACE/USGS/Others?
- Over 1,500 river miles
- Requests came from
 - Federal Agencies
 - State Agencies
 - Cities
 - Municipalities
- Disadvantages
 - Pressure for time
 - Lack of quality models (*out-of-date, low-res terrain, not purpose-built, etc.*)
 - Prioritizing
 - Potential for error



InFRM Projects – Flood Decision Support Toolbox (FDST)

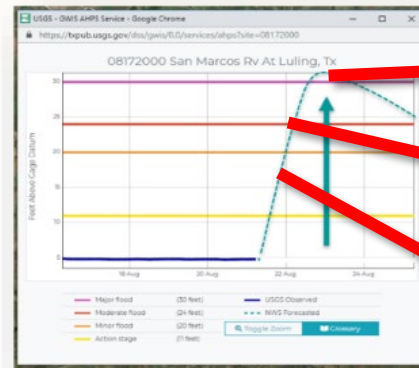
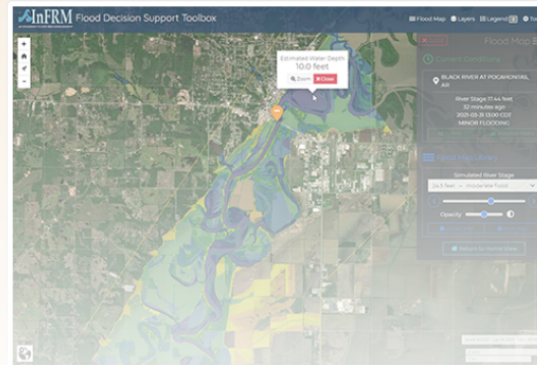
Flood Decision Support Toolbox

The InFRM [Flood Decision Support Toolbox \(FDST\)](#) is an interactive web application (WebApp) which:

- visualizes current flood-related weather conditions in FEMA region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, Texas),
- allows peace-time analysis by emergency planners, local governments, and other stakeholders preparing for potential response activities (such as planned evacuation routes, identification of vulnerable areas requiring road closure, and resource planning in advance of flood events),
- leverages federal, state, regional and local engineering model information to develop pre-positioned flood inundation libraries for micro-level efforts (neighborhood level),
- connects National Water Model predictions for macro-level planning (community, county, state level)
- **Pre-positioned map libraries**
- uses pre-positioned map libraries to identify inundation areas in relation to a field reported streamgauge height.
- **Tied to:**

- USGS streamgauge data
- NWS River Forecasts
- NWS Flood Categories

- Scenario Planning
- Historical Flood viewing
- Print Map Generation



DOCUMENTS

FDST User Guide

How to use FDST for estimating flood extent and depth for possible flood scenarios based on the underlying models.

FDST Executive Summary and Submittal Guidance

Provide standardized guidelines, quality assurance checks, and data input format for submitting flood inundation data for inclusion on the FDST viewer.



FDST Functionality

InFRM Flood Decision Support Toolbox
INTERAGENCY FLOOD RISK MANAGEMENT

Click a river measurement station to select a Flood Map Library

E FK SAN JACINTO RV NR CLEVELAND, TX
River Stage 4.54 feet
53 minutes ago
NOT FLOODING

Scale 10,169,114 Lat 30.5639 Lon -94.9149
300 km
200 mi

Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement
U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

Follow

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows a satellite view of Cleveland, Texas, with several river stages highlighted in yellow. A blue information box in the upper center of the map reads: "Select a river stage from the Flood Map Library to view flood maps." with a close button and a mute icon. The top navigation bar includes "Flood Map", "Layers", "Legend", and "Tools". On the left, there are navigation controls for zooming, home, and search. On the right, a "Flood Map" panel is open, showing "Current Conditions" for "E FK SAN JACINTO RV NR CLEVELAND, TX". The current river stage is 4.54 feet, recorded 55 minutes ago on 2021-08-31 09:45 CDT, with a "NOT FLOODING" status. Below this, there are buttons for "Hydrograph" and "Historical Peaks". The "Flood Map Library" section includes a "Simulated River Stage" dropdown menu, a "Select Stage" input field, a slider for "Opacity", and buttons for "Library info" and "Print Map". At the bottom of the panel, there is a "Return to Home View" button and a scale bar showing 3 km and 2 mi. The footer contains links for "Privacy Policy", "Legal", "Accessibility", "Site Map", "Contact USGS", and "USGS Provisional Statement", along with social media icons and the text "Follow".

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows a flood simulation over an aerial view of Cleveland, Texas, with various colored zones representing different flood stages. A sidebar on the right contains a 'Current Conditions' panel for 'E FK SAN JACINTO RV NR CLEVELAND, TX', showing a river stage of 4.53 feet. Below this is a 'Flood Map Library' panel with a 'Simulated River Stage' dropdown set to '19.0 feet - minor flood' and an 'Opacity' slider. A white mouse cursor is pointing at the right arrow of the opacity slider. The interface also includes a 'Return to Home View' button and social media icons at the bottom right.

InFRM Flood Decision Support Toolbox

Flood Map Layers Legend 3 Tools

Current Conditions
E FK SAN JACINTO RV NR
CLEVELAND, TX

River Stage 4.53 feet
7 minutes ago
2021-08-31 10:45 CDT
NOT FLOODING

Hydrograph Historical Peaks

Flood Map Library

Simulated River Stage
19.0 feet - minor flood

Opacity

Library info

Return to Home View

500 m
2000 ft

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U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

Follow

15

Map library extends from **NWS Minor Flood** stage to maximum expected flood (**max observed OR 500-year event**)

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows a flood risk assessment for Cleveland, Ohio, with various flood stages overlaid on a satellite view. The legend on the right side of the map lists the following stages and their corresponding water levels:

- 19.5 feet - minor flood
- 20.0 feet - minor flood
- 20.5 feet - minor flood
- 21.0 feet - moderate flood
- 21.5 feet - moderate flood
- 22.0 feet - moderate flood
- 22.5 feet - moderate flood
- 23.0 feet - major flood
- 23.5 feet - major flood
- 24.0 feet - major flood
- 24.5 feet - major flood
- 25.0 feet - major flood
- 25.5 feet - major flood
- 26.0 feet - major flood
- 26.5 feet - major flood
- 27.0 feet - major flood
- 27.5 feet - major flood
- 28.0 feet - major flood
- 28.5 feet - major flood
- 29.0 feet - major flood

The legend also includes a 'CLOSE' button at the top left and a 'Return to Home View' button at the bottom. The map interface includes a home button, a search bar, and a scale bar (500 m / 2000 ft) at the bottom right. The footer contains the following text: Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement | U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

Map library extends from **NWS Minor Flood** stage to maximum expected flood (**max observed OR 500-year event**)

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map area shows an aerial view of a residential area with a color-coded flood risk overlay. A white callout box is positioned over a specific location, displaying the text "Estimated Water Depth 0.7 feet" and buttons for "Zoom" and "Close". A white mouse cursor is pointing at the callout. The top navigation bar includes "Flood Map", "Layers", "Legend", and "Tools". The right sidebar contains a "Flood Map" section with "Current Conditions" for "E FK SAN JACINTO RV NR CLEVELAND, TX", showing a "River Stage 4.53 feet" and "NOT FLOODING". Below this is a "Flood Map Library" section with a "Simulated River Stage" set to "25.0 feet - major flood" and an "Opacity" slider. The bottom of the interface features a footer with "Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement" and social media icons for Facebook, Twitter, YouTube, and Instagram.

Select anywhere in the map to view estimated water depth

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows an aerial view of the San Jacinto River area with flood simulation overlays in green and yellow. A red circle highlights the 'Legend' button in the top right corner, with a white arrow pointing to it. The right-hand panel, titled 'Flood Decision Support Toolbox', contains the following information:

- Current Conditions:**
 - Location: E FK SAN JACINTO RV NR CLEVELAND, TX
 - River Stage: 4.53 feet
 - Time: 12 minutes ago
 - Date: 2021-08-31 10:45 CDT
 - Status: NOT FLOODING
- Flood Map Library:**
 - Simulated River Stage: 25.0 feet - major flood
 - Opacity: [Slider]
 - Buttons: Library Info, Print Map
 - Return to Home View

At the bottom of the interface, there is a footer with the following text: Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement | U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA. Social media icons for Twitter, Facebook, YouTube, and Instagram are also present.

FDST Functionality

InFRM Flood Decision Support Toolbox

Flood Map Layers Legend Tools

Legend

Flood Map

- ≤ 1 foot
- > 1 to 3 feet
- > 3 to 6 feet
- > 6 to 9 feet
- > 9 feet
- Flood map limits

Comments: Value indicates estimated water depth. Depths outside of the flood map limits are unknown.

Data Source: Data prepared by the USGS Texas Water Science Center. [More information](#)

TIP - Click colored flood areas to show estimated water depth.

River Measurement Stations

STATUS - COLOR

- Major flooding
- Moderate flooding
- Minor flooding
- Action flood stage
- Not flooding
- Flood stages not established

TREND - SYMBOL

- River rising ≥ 0.05 foot/hour
- River changing < 0.05 foot/hour

Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement

U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

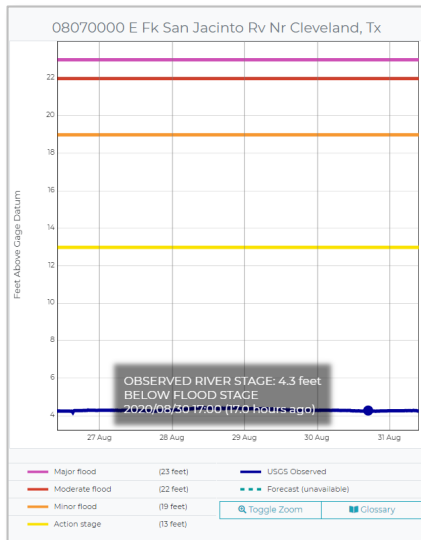
Follow

FDST Functionality

Hydrograph:

- Tied to USGS streamgauge data, NWS AHPS prediction service
- Stage forecast*
- Flood categories*

* If available



X CLOSE
Flood Map

Current Conditions

E FK SAN JACINTO RV NR CLEVELAND, TX

River Stage 4.53 feet
14 minutes ago
2021-08-31 10:45 CDT
NOT FLOODING

Hydrograph
 Historical Peaks

Flood Map Library

Simulated River Stage

25.0 feet - major flood v

← →

Opacity ◉ ◐ ◑

Library Info
 Print Map

Return to Home View

Historical Peaks:

- Top 10 historical stages
- Enables user to view the effects of a historical flood as if it were to happen today

Top 10 Historical Peak Stages

E Fk San Jacinto Rv nr Cleveland, TX

Sun Aug 27 2017	27.17 feet	MAJOR Flood	View Flood Map
Wed Jan 07 1998	24.57 feet	MAJOR Flood	View Flood Map
Mon Oct 17 1994	24.57 feet	MAJOR Flood	View Flood Map
Sat Nov 23 1940	24.1 feet	MAJOR Flood	View Flood Map
Wed Jun 13 1973	23.92 feet	MAJOR Flood	View Flood Map
Sat May 04 1935	23.6 feet	MAJOR Flood	View Flood Map
Fri Nov 13 1998	21.72 feet	MODERATE Flood	View Flood Map
Fri May 27 2016	20.85 feet	MINOR Flood	View Flood Map
Sat May 21 1983	20.68 feet	MINOR Flood	View Flood Map
Sat Apr 18 1959	20.38 feet	MINOR Flood	View Flood Map

[USGS Station Website](#)

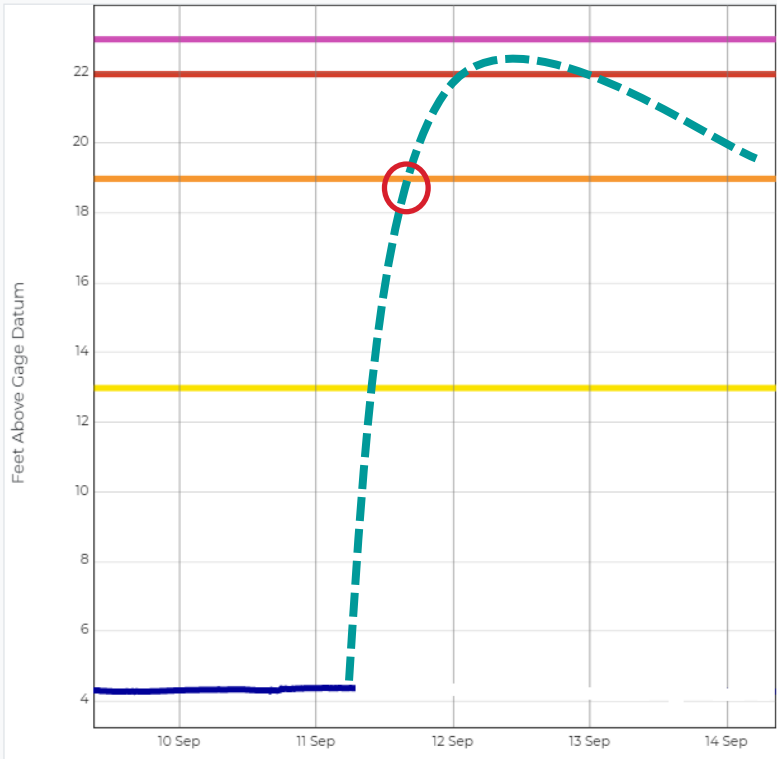
[NWS Station Website](#)

[Stages reported in feet above gage datum, which is 107.96 feet above NAVD88]

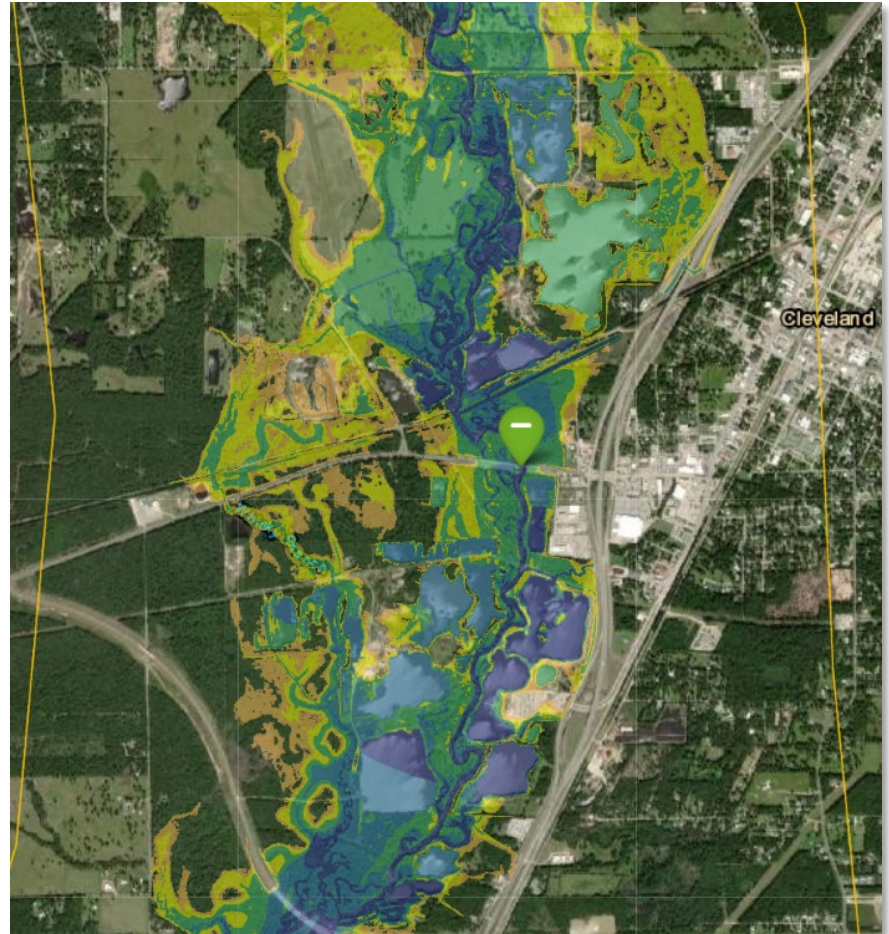
Close

FDST Functionality

08070000 E Fk San Jacinto Rv Nr Cleveland, Tx

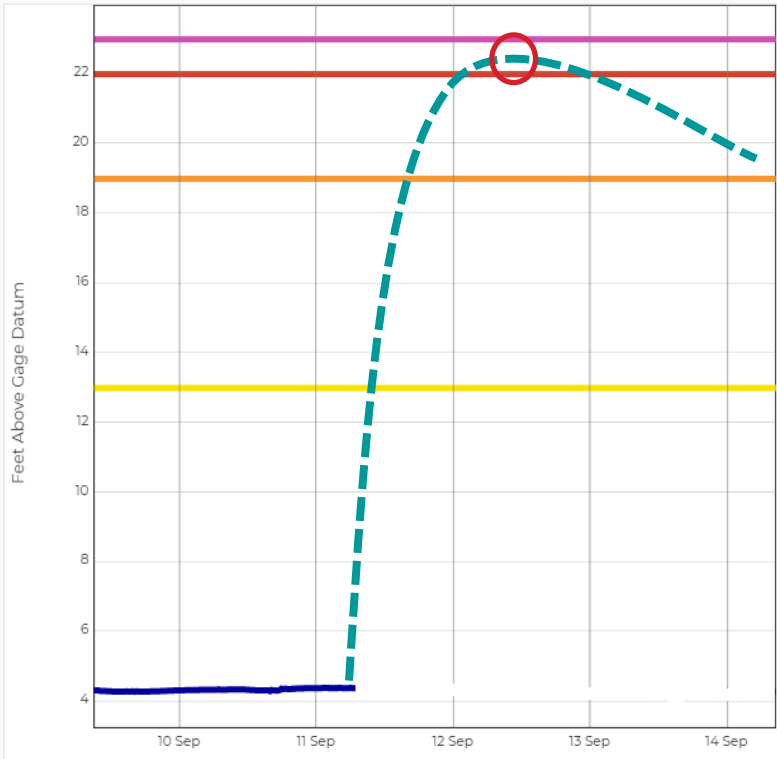


- | | | |
|----------------|-----------|------------------------|
| Major flood | (23 feet) | USGS Observed |
| Moderate flood | (22 feet) | Forecast (unavailable) |
| Minor flood | (19 feet) | |
| Action stage | (13 feet) | |
- [Toggle Zoom](#)
[Glossary](#)



FDST Functionality

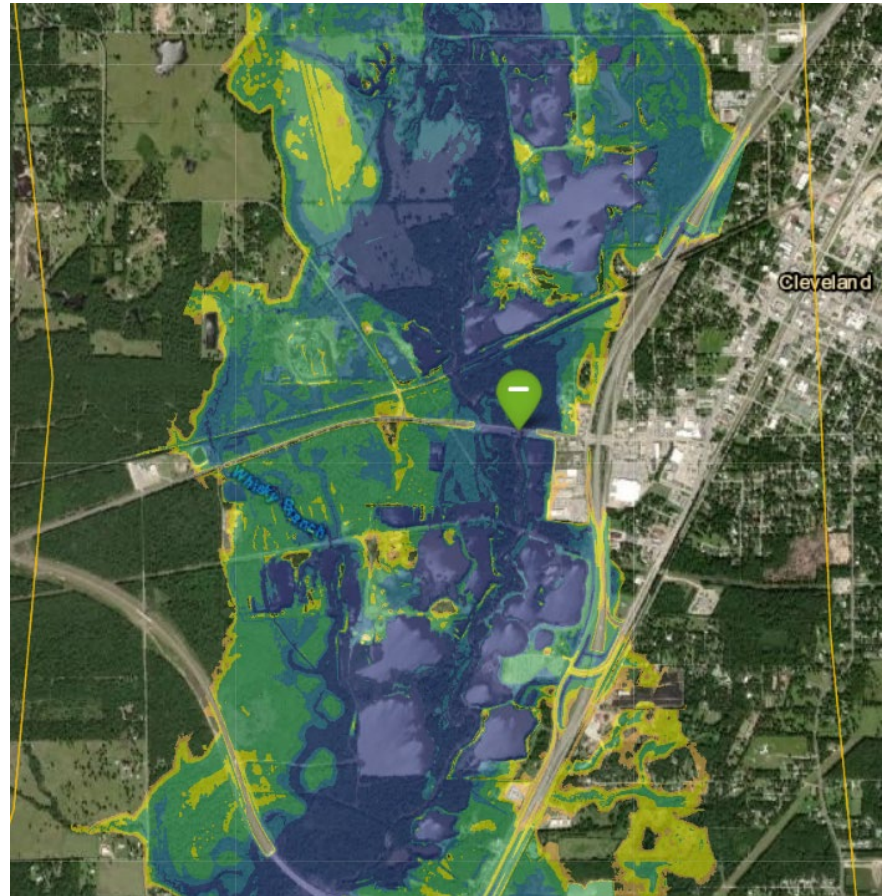
08070000 E Fk San Jacinto Rv Nr Cleveland, Tx



- Major flood (23 feet)
- Moderate flood (22 feet)
- Minor flood (19 feet)
- Action stage (13 feet)
- USGS Observed
- - - Forecast (unavailable)

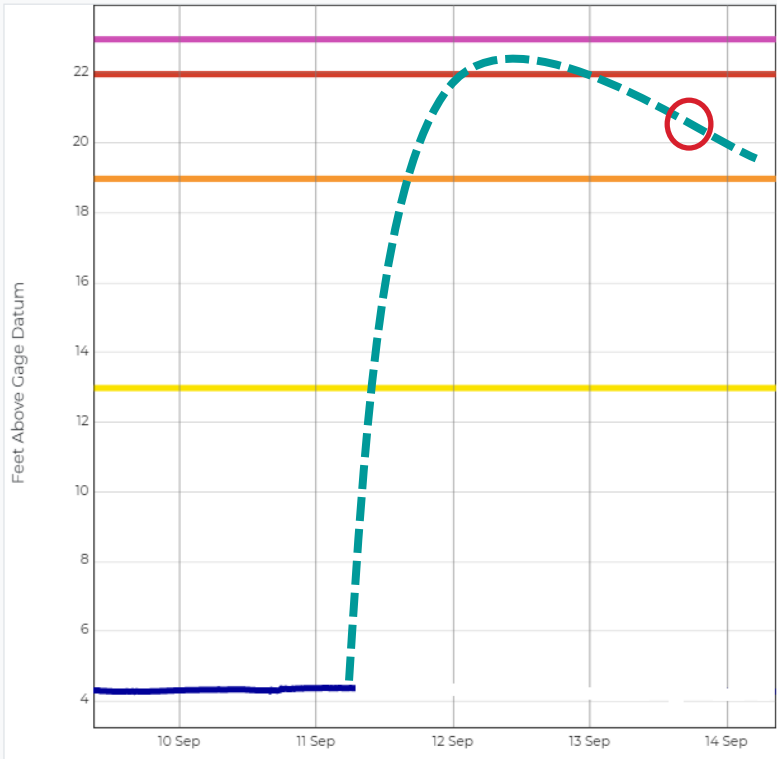
[Toggle Zoom](#)

[Glossary](#)



FDST Functionality

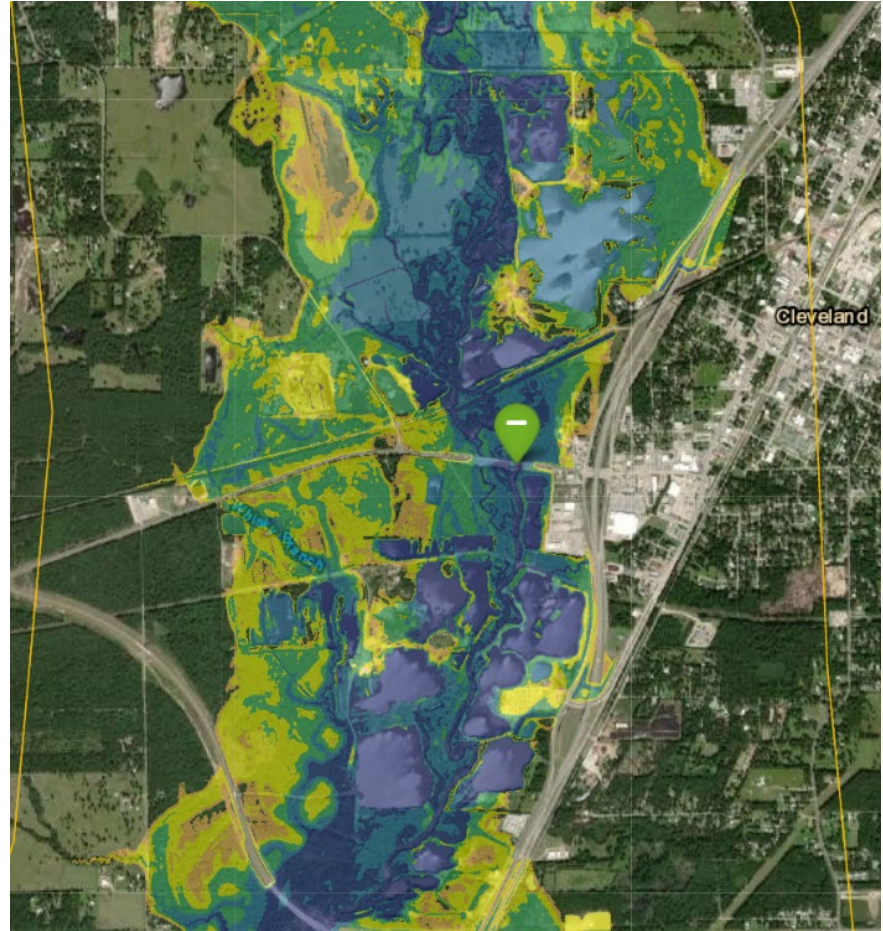
08070000 E Fk San Jacinto Rv Nr Cleveland, Tx



- Major flood (23 feet)
- Moderate flood (22 feet)
- Minor flood (19 feet)
- Action stage (13 feet)
- USGS Observed
- - - Forecast (unavailable)

[Toggle Zoom](#)

[Glossary](#)



FDST Functionality

Library Info:

- Model metadata
- Model source
- Model error, ranking (Tier A, Tier B)
- 'Download Library' option

Library Information

RANGE: 127.0 feet above NAVD88

MINIMUM ALTITUDE: 127.0 feet above NAVD88

MAXIMUM ALTITUDE: 137.0 feet above NAVD88

ALTITUDE INTERVAL: 0.5 feet

NUMBER OF MAPS: 21

DOWNLOAD: [Download Library](#)

FLOOD INUNDATION MODEL

PROVIDED BY: FEMA

PUBLISHED: 2018

RANKING: Tier B (includes hydraulic models that are similar in quality to those used by FEMA for Base Level Engineering flood risk analysis and mapping)

MODEL - RATING CURVE RMSE: 0.7 feet

RMSE NOTES: Rating curve interpolated at a stage of 29 ft. gage datum.

MODEL NOTES: This map library was generated using FEMA's Base Level Engineering (BLE) study for the East Fork San Jacinto River watershed, TX. Model data and supporting documentation may be found through the Estimated Base Flood Elevation (estBFE) Viewer at the InFRM website: infrm.us

CONTACT: InFRM@usgs.gov

[NAVD88, North American Vertical Datum of 1988; NWS, National Weather Service; USGS, United States Geological Survey; FEMA, Federal Emergency Management Agency; DEM, Digital Elevation Model; RMSE, Root-mean-square error; N/A, Not Available]

Flood Map

Current Conditions

E FK SAN JACINTO RV NR
CLEVELAND, TX

River Stage 4.53 feet
14 minutes ago
2021-08-31 10:45 CDT
NOT FLOODING

[Hydrograph](#) [Historical Peaks](#)

Flood Map Library

Simulated River Stage

25.0 feet - major flood

Opacity

[Library Info](#) [Print Map](#)

[Return to Home View](#)

Print Map:

- PDF or print snapshot of map view
- Enables distribution of flood map in field
- Includes map view and library info

Flood Decision Support Toolbox

Library Info

NAME: E FK SAN JACINTO RV NR CLEVELAND, TX

PROVIDED BY: FEMA

PUBLISHED: 2018

RANKING: Tier B (includes hydraulic models that are similar in quality to those used by FEMA for Base Level Engineering flood risk analysis and mapping)

MODEL - RATING CURVE RMSE: 0.7 feet

RMSE NOTES: Rating curve interpolated at a stage of 29 ft. gage datum.

MODEL NOTES: This map library was generated using FEMA's Base Level Engineering (BLE) study for the East Fork San Jacinto River watershed, TX. Model data and supporting documentation may be found through the Estimated Base Flood Elevation (estBFE) Viewer at the InFRM website: infrm.us

CONTACT: InFRM@usgs.gov

FDST Functionality

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows the United States with various data layers overlaid, including streamflow and stream stage data. A red circle highlights the 'Layers' button in the top right corner. A mouse cursor is pointing at this button. A detailed data popup is visible for station 08412500 PECOS RV NR ORLA, TX, showing real-time streamflow and stream stage data.

08412500 PECOS RV NR ORLA, TX

REAL-TIME STREAMFLOW
65.7 cfs
2020-09-09 11:15:00 CDT
Normal for this Day-of-Year

REAL-TIME STREAM STAGE
1.93 feet
2020-09-09 11:15:00 CDT
Remaining steady

Scale 9,244,649 Lat 31.8625 Lon -103.8428

300 km
200 mi

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U.S. Department of the Interior | DOI Inspector General | White House | E-gov | No Fear Act | FOIA

FDST Functionality – Texas

The screenshot displays the InFRM Flood Decision Support Toolbox interface. The main map shows a simulated river stage of 38.0 feet, resulting in a major flood. The map highlights inundated areas in purple and blue, with building footprints overlaid. The sidebar on the right provides controls for the map, including a simulated river stage slider set to 38.0 feet, an opacity slider, and a 'Buildings' section showing damage estimates for 180 inundated buildings with a total cost of \$6,816,000. A 'Report' button is visible below the damage estimates. The interface also includes a 'Flood Map Library' section and a 'Return to Home View' button.

InFRM Texas Water Development Board
INTERAGENCY FLOOD RISK MANAGEMENT
Flood Decision Support Toolbox

Flood Map Layers Legend Tools

× CLOSE Flood Map

Library Flood Map Library

Simulated River Stage
38.0 feet - major flood

Opacity

Library Info Print Map

Buildings

Select Layer
All buildings

ON






DAMAGE ESTIMATES

Inundated Buildings: 180
Estimated Total Cost: \$6,816,000

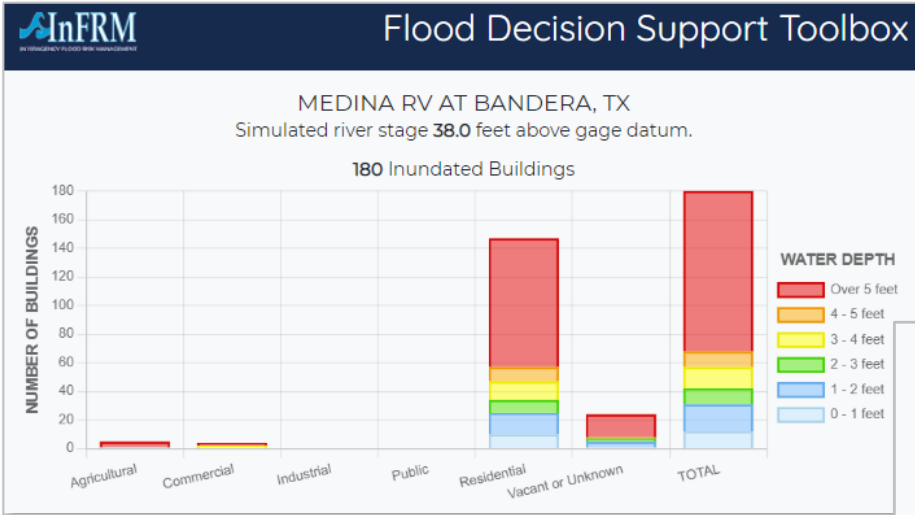
Report

Return to Home View

USGS | USGS Provisional Statement
White House | E-Gov | USA.gov | No FEAR Act Data | FOIA

Follow     

FDST Functionality – Texas



Buildings

Select Layer

All buildings

ON

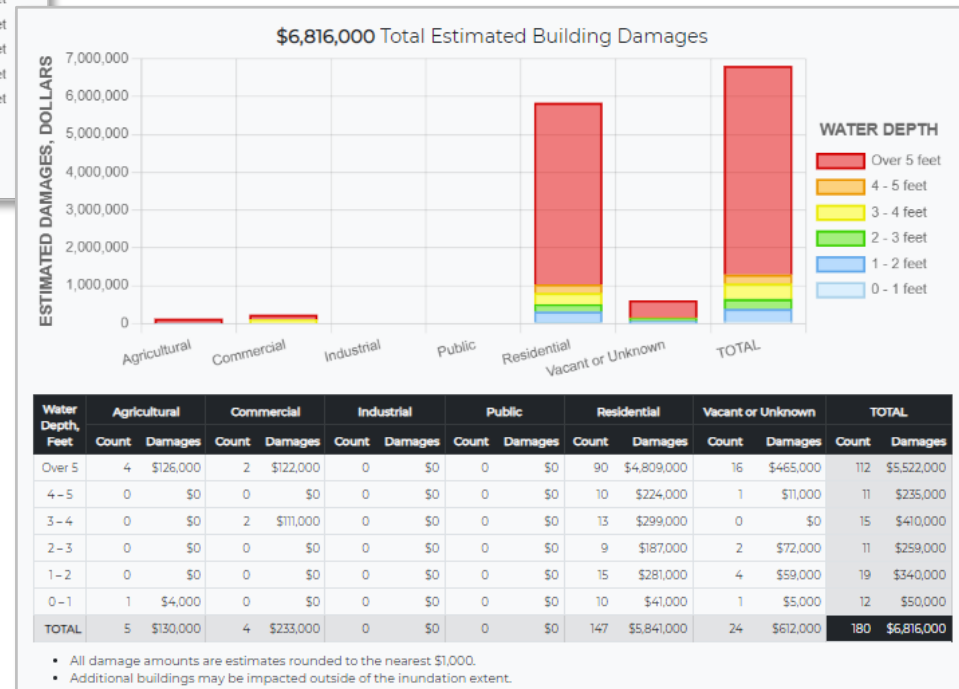
DAMAGE ESTIMATES

Inundated Buildings: 180

Estimated Total Cost: \$6,816,000

[Report](#)

- Click 'Report' to see more details on estimated building damages and estimated costs
- Print Map function also summarizes building damage in Texas
- **NOTE: costs CANNOT be tied back to individual buildings**



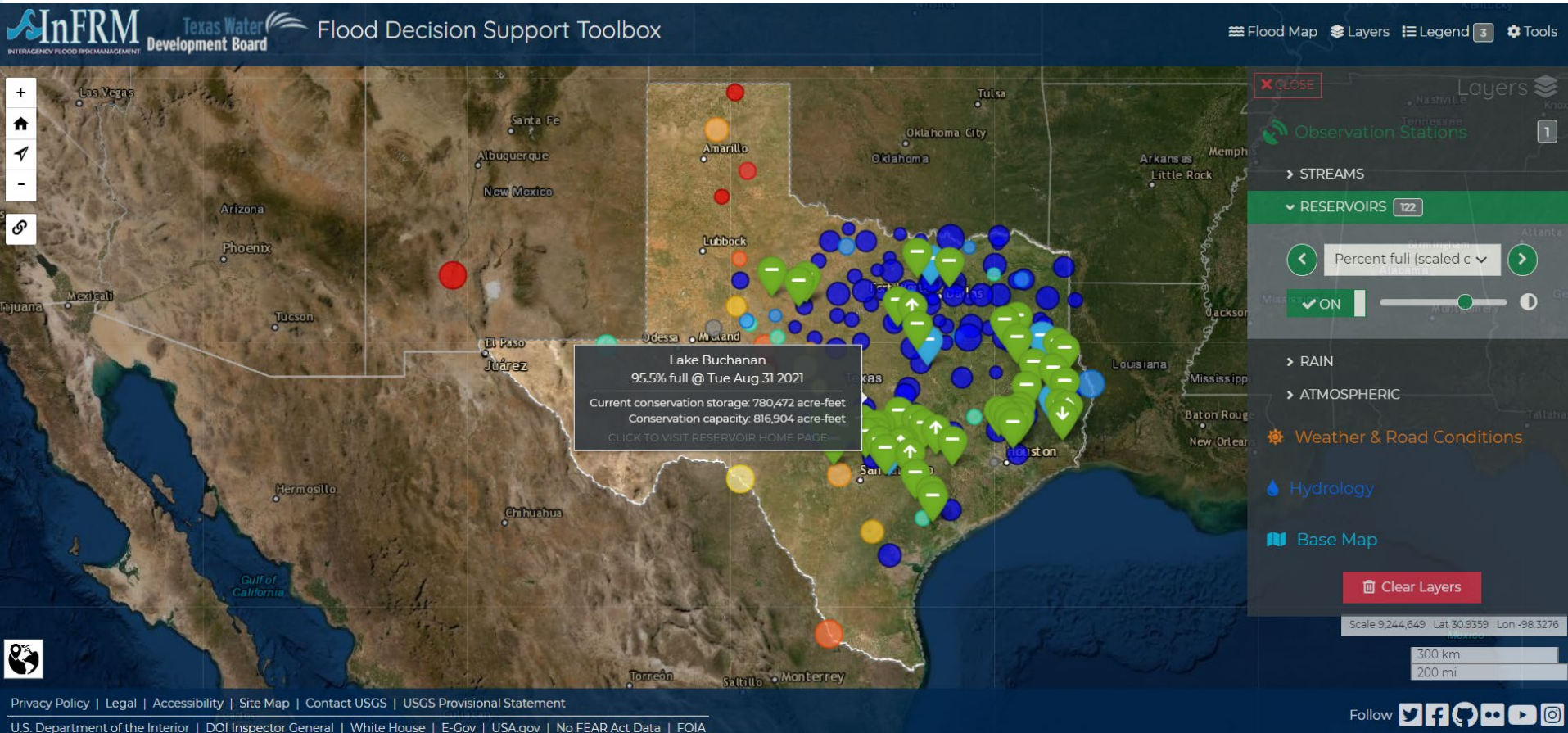
• All damage amounts are estimates rounded to the nearest \$1,000.
• Additional buildings may be impacted outside of the inundation extent.

FDST Functionality – Texas

The screenshot displays the InFRM Texas Water Development Board Flood Decision Support Toolbox interface. The main map shows Texas with various road condition icons (orange triangles, green circles with arrows, blue circles) and a sidebar menu for layers including Observation Stations, Weather & Road Conditions, and Road Conditions (537). The sidebar menu is open, showing a dropdown for Road Conditions with options: All, Accidents, Closures, Construction, Road damage, Flooded roads, and Other. The 'All' option is selected. The interface also includes a 'Clear Layers' button and social media links for Twitter, Facebook, and YouTube.

- Texas viewer shows TXDOT road conditions

FDST Functionality – Texas



- Reservoir status available through *Water Data for Texas* (% full and % flood height)

FDST Functionality – Texas

Recent changes
2013-06-19: The vertical datums of gauge, conservation pool and dead pool elevations for this lake have been adjusted to NGVD29+0.01ft.

Lake Buchanan: 95.5% full as of 2021-08-31

Legend: Dead Pool (orange), Conservation Pool (teal), Flood Pool (red)

Reservoir Storage (thousand acre-feet)

Oct 2020 Dec 2020 Feb 2021 Apr 2021 Jun 2021 Aug 2021

Recent Historical Statistics

The elevation-storage rating curve used to produce the storage hydrograph is made of two segments: (1) the segment up to the conservation pool top (below the red line) is based on measured data, and (2) the segment in the flood pool (above the red line) is an extrapolation from the first segment and shouldn't be relied upon for flood storage information.

Historical Data

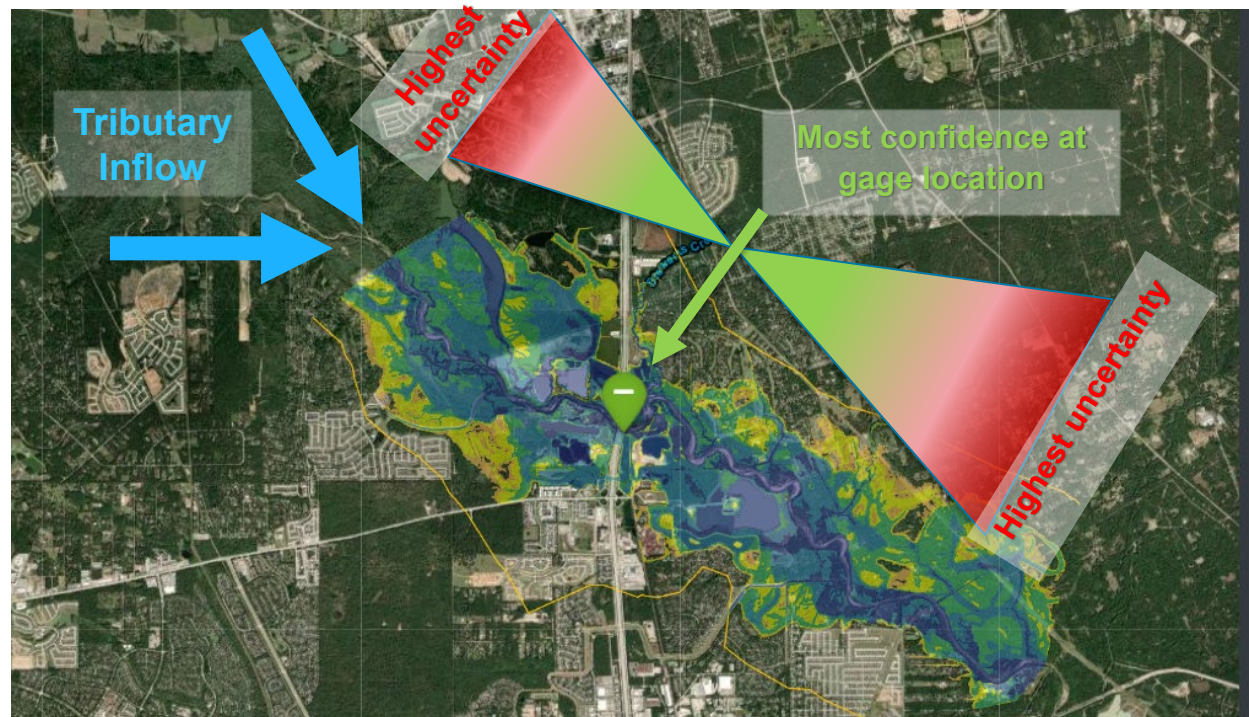
Water Data for Texas
Texas Water Development Board
Flood D
InFRM
INTERAGENCY FLOOD RISK MANAGEMENT

Layers Legend 3 Tools
Observation Stations
STREAMS
RESERVOIRS 122
Percent full (scaled c)
ON
RAIN
ATMOSPHERIC
Weather & Road Conditions
Hydrology
Base Map
Clear Layers
Scale 9,244,649
300 km
200 mi
Follow

- Reservoir status available through **Water Data for Texas** (% full and % flood height)

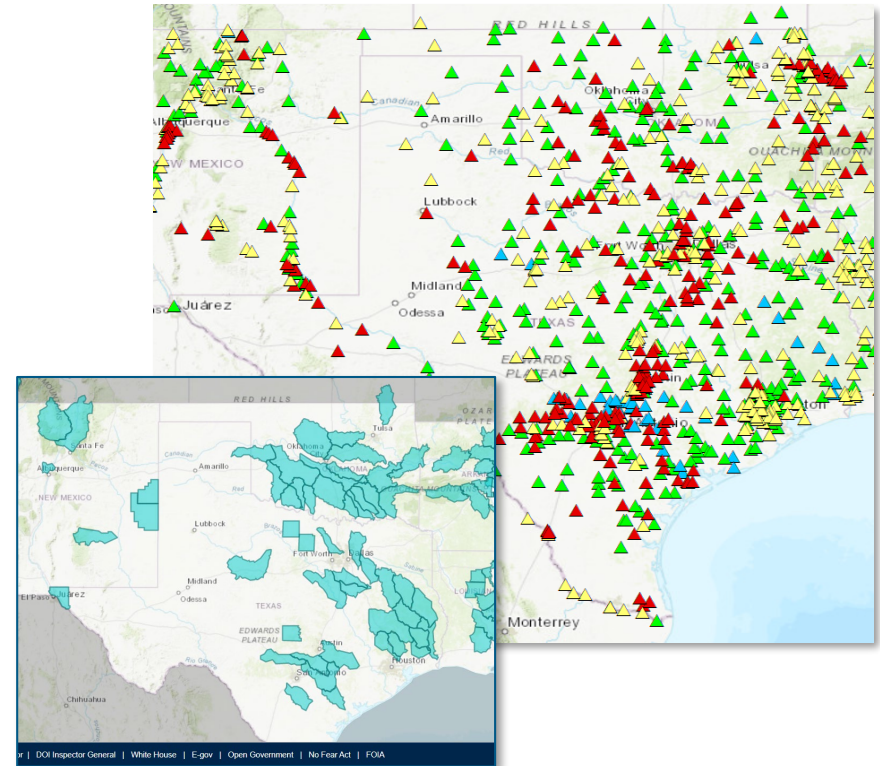
Uncertainty in Modeling

- **No model is 100% correct**
 - No information is better than poor or misleading information, ***BUT*** fair or reasonably reliable information is better than no information
- **Important to communicate uncertainty of model**
 - Tier A/B
 - Rating Curve RMSE
 - Uncertainty in forecasts
- **FDST maps flow at gage, and as far upstream and downstream as that gaged flow is valid**



Federal – State – Local Partnerships

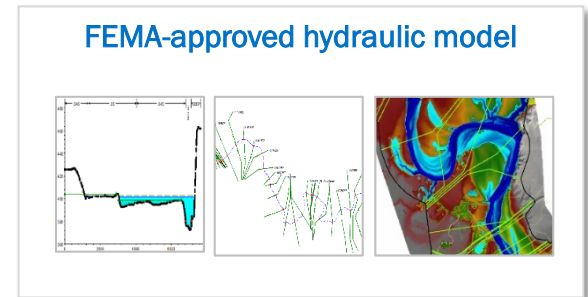
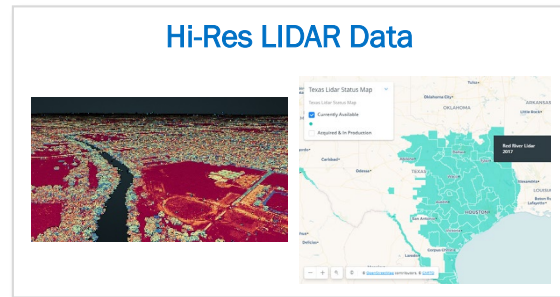
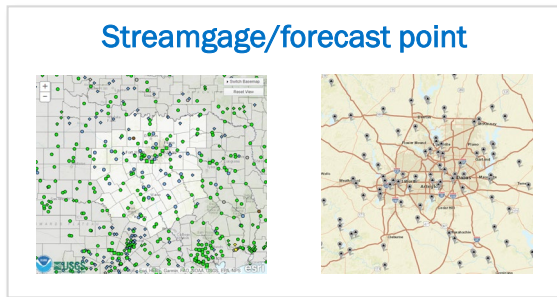
- **FDST designed to be a living website**
 - Map submission guidelines describe map library submittal process
 - InFRM team working on new/updated features and functionality
- **Flexible framework enables some customization to regional/local partners' needs**
- **Goal is for State and Local partners to be primary contributors**
 - Add missing sites of need
 - Update sites with new models



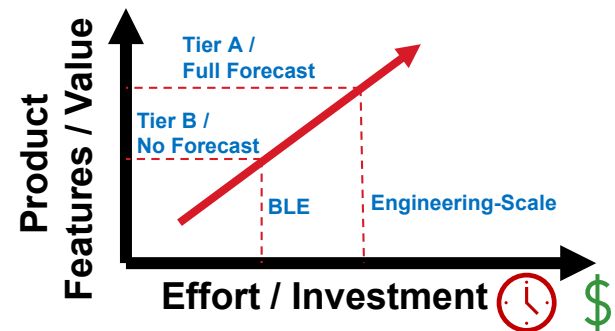
- ▲ Completed/In progress
- ▲ NWS Flood Categories NO River Forecast
- ▲ NWS River Forecast AND Flood Categories
- ▲ Streamgauge only

The FDST Process

- Three items needed to generate a map library;
 - USGS streamgage (AHPS forecast point a plus)
 - Hi-res LIDAR
 - Hydraulic Model



- Hydraulic model scalable:**
 - FDST flexible with model requirements
 - Begin with Base Level Engineering
 - Update with full-scale Engineering model





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