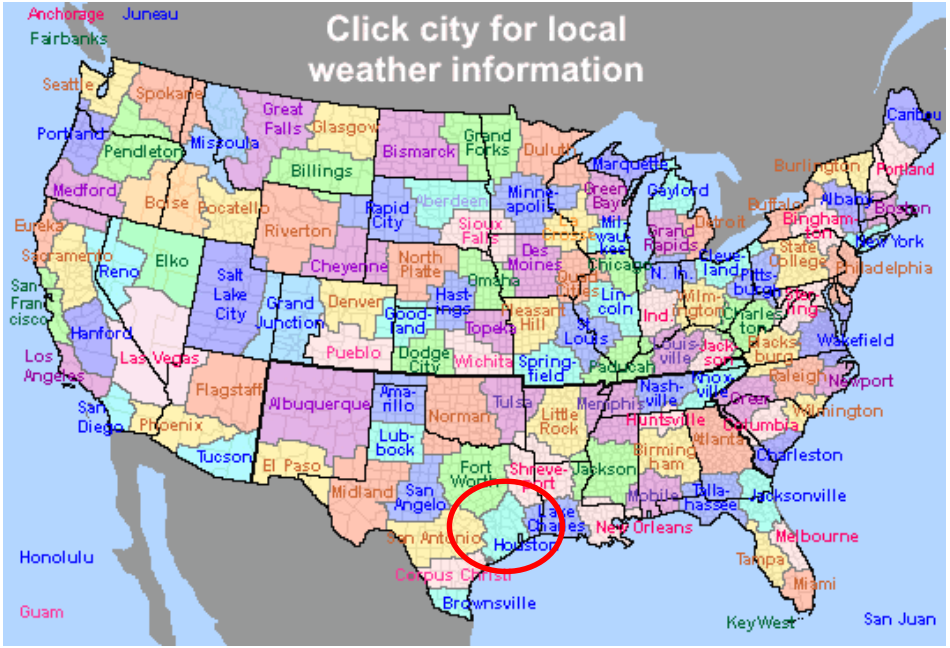
2018 FloodWarn Training

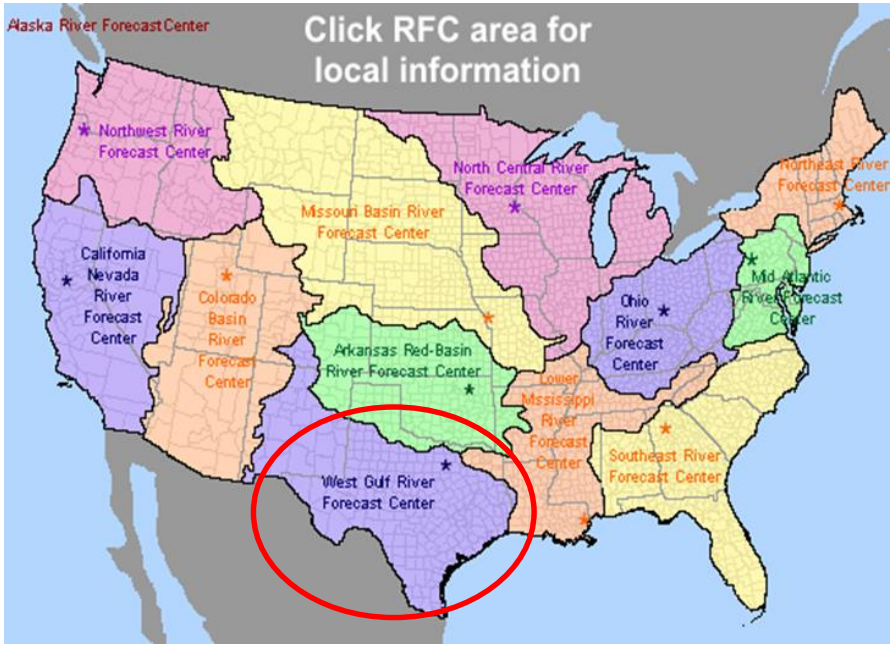
Katie Landry-Guyton
Senior Service Hydrologist/Meteorologist
National Weather Service- Houston/Galveston, TX

National Weather Service

Weather Forecast Offices



River Forecast Centers



Outline

Flooding Importance

Flooding Types and Causes

Flood Products

River Flooding

Partners

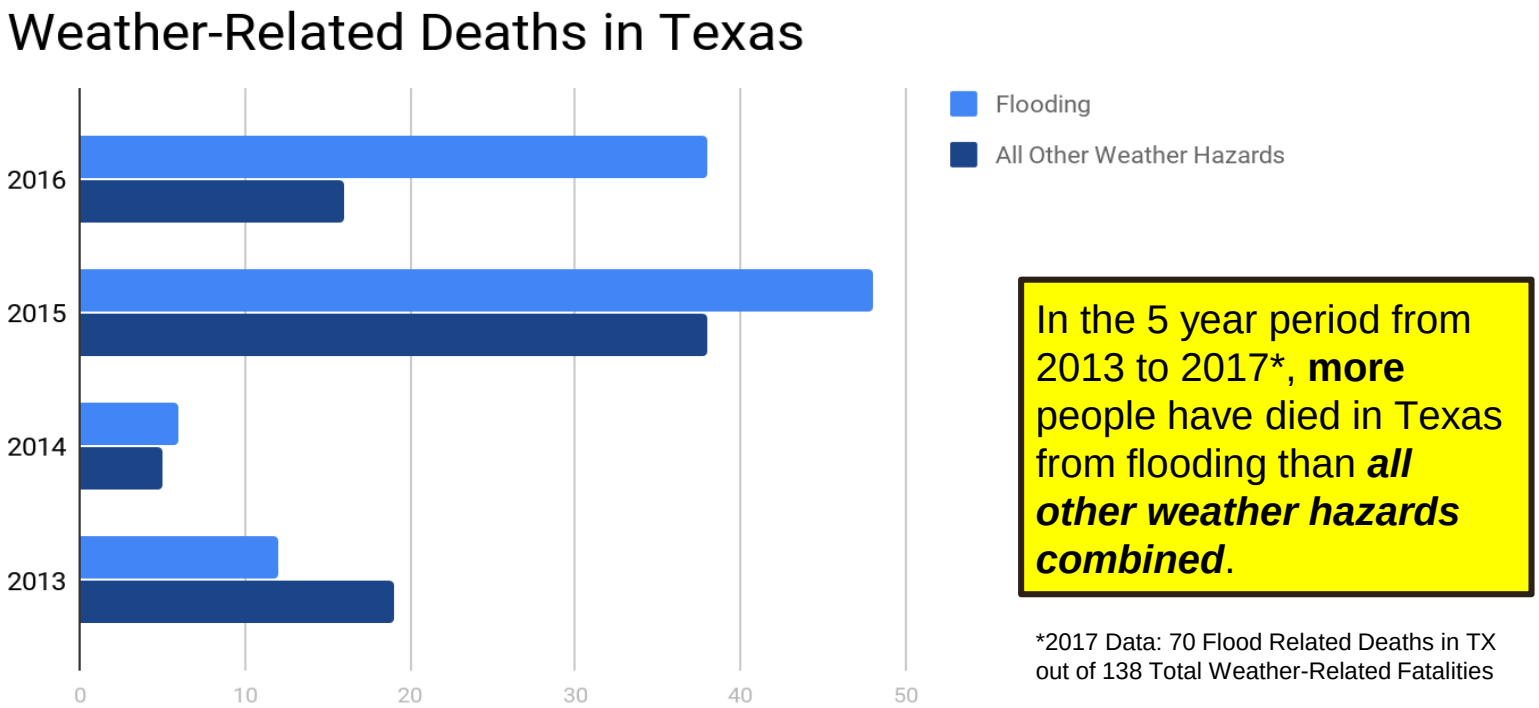
Flood Safety

Reporting Flooding

Flood Risk

Flooding Importance

Flooding is Deadly!

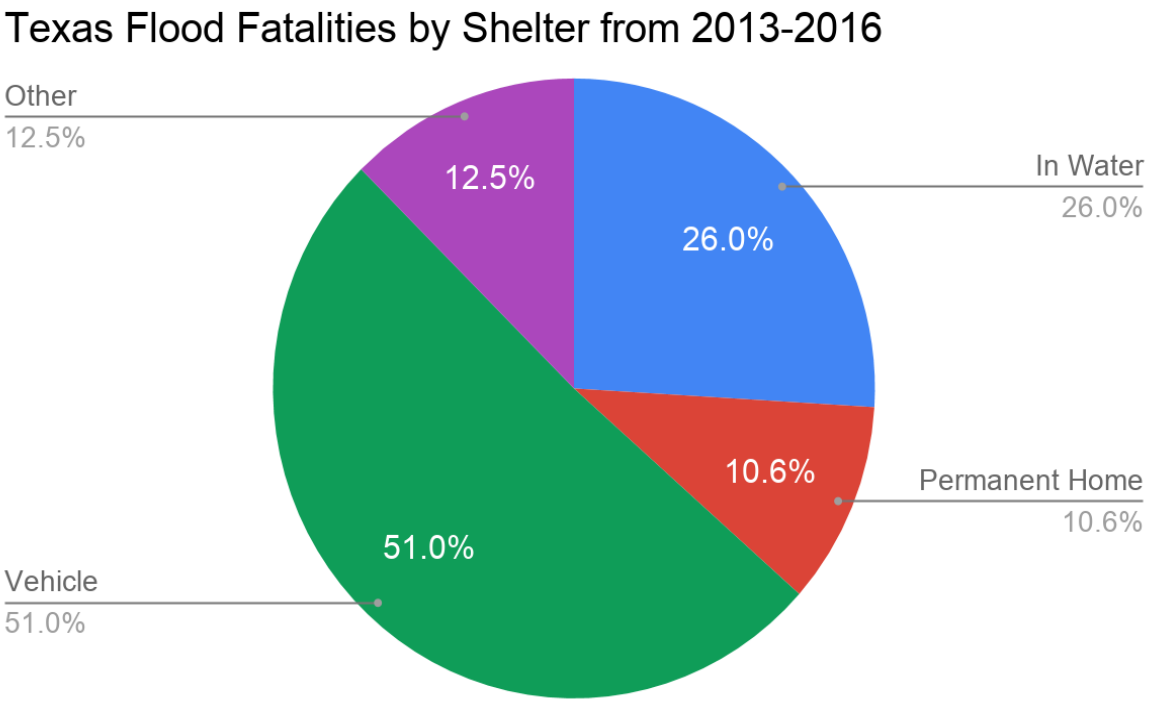


In the 5 year period from 2013 to 2017*, **more** people have died in Texas from flooding than ***all other weather hazards combined***.

*2017 Data: 70 Flood Related Deaths in TX out of 138 Total Weather-Related Fatalities

Data from NWS National Hazard Statistics

Flood Fatalities



Over half of the flood fatalities in Texas occurred while people were in their car.

Data from NWS National Hazard Statistics

Houston Floods: April 18, 2016

Recent Big Floods…

Memorial Day 2015

Tax Day 2016

Brenham 2016

Harvey 2017

And other historic floods…

Tropical Storm Allison

1994 Flood

Tropical Storm Claudette

Flooding Types and Causes

What Causes Flooding?

- Intense rainfall
- Rain over several days
- Dam/levee failures
- High tides or storm surge
- Snowmelt
- Ice or debris jams

Types of Flooding

Ponding & Sheet Flow Flooding

Flooding that occurs gradually over time, usually 6 hours after the rain begins or longer (longer duration)

Flash Flooding

Flooding that develops quickly (typically 6 hours or less) either from heavy rainfall or dam/levee failure (shorter duration).

River Flooding

Flooding that occurs from water escaping river banks.

Coastal Flooding

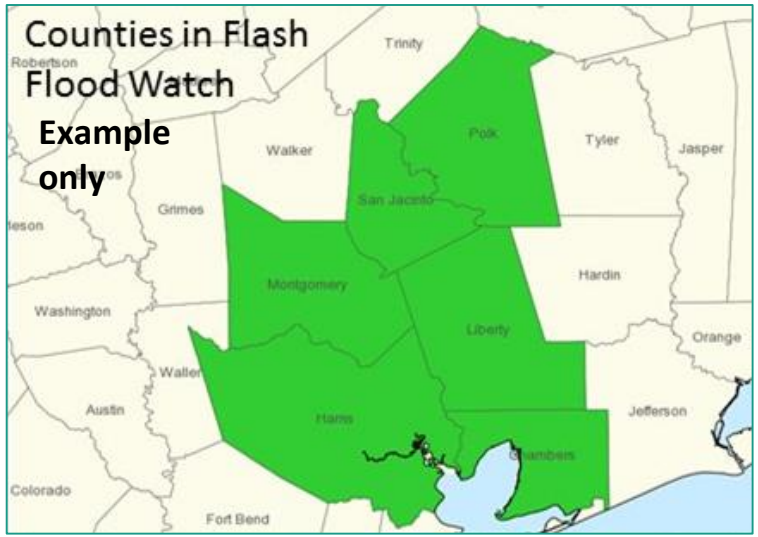
Flooding along a coastline either from high tides or storm surge during a tropical storm or hurricane

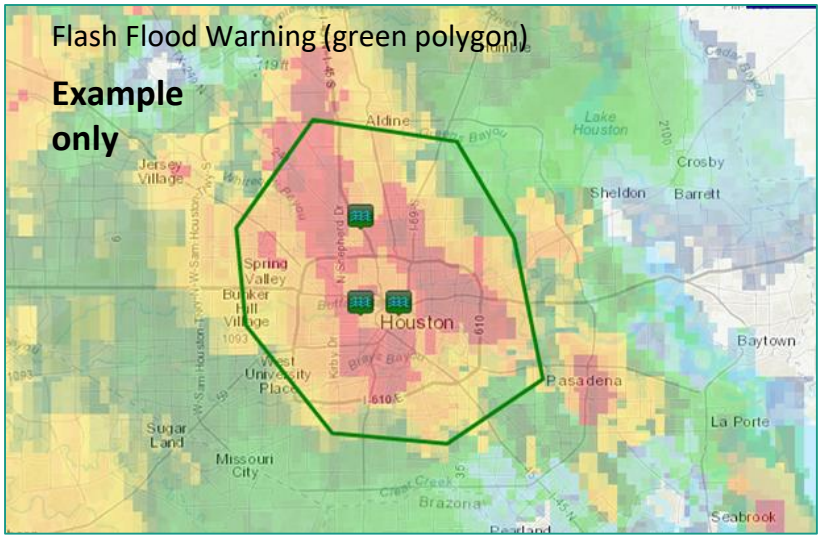
Flood Products

Watch vs Warning

A Watch is issued when conditions are favorable to occur.

A Warning is issued when the threat is *occurring or imminent*, threatening life or property.





Flood vs. Flash Flood

A **Flood** is an overflow of water onto normally dry land likely caused by rising water in a river/bayou or poor drainage. Flooding is a longer term event than flash flooding. It may last days or weeks.

A **Flash Flood** is a flood caused by heavy or excessive rainfall in a short period of time, typically 6 hours or less. Flash floods are defined as:

- ≥ 3 feet of standing water (less if threatening life or property), and/or
- ≥ 6 inches of fast flowing water across a road or bridge, or
- Water in a stream or bayou flowing rapidly out of its banks, or
- A dam break (even on a sunny day)

Understanding Flooding

Urban / Small Stream Advisory	*Flood Watch*	*Flash Flood Watch*	*Flood Warning*	*Flash Flood Warning*	*Flash Flood Emergency*
WHAT IS IT? Flooding of small streams, streets and low-lying areas. **WHAT TO DO?** Stay away from areas that are prone to flooding and stay clear of rapidly moving water	**WHAT IS IT?** Flooding is possible – typically within a 6 to 48 hours before rain is expected to reach the area. **WHAT TO DO?** Stay tuned to local river forecasts; prepare for areas near rivers to spread towards nearby roads and buildings	**WHAT IS IT?** Flash flooding is possible –typically 6 to 48 hours before rain is expected to reach the area. **WHAT TO DO?** Have a way to receive local warnings, expect hazardous travel conditions and have alternate routes available	**WHAT IS IT?** Flooding impacts are occurring or imminent. **WHAT TO DO?** Stay ***alert*** for inundated roadways and follow all local signage! Additional impacts include homes and structures could become flooded and need to be evacuated	**WHAT IS IT?** Flash flooding impacts are occurring or imminent. **WHAT TO DO?** Conditions will ***rapidly*** become hazardous! Do not cross flooded roadways or approach inundated areas as water may still be rising	**WHAT IS IT?** Flash flood situation that presents a clear threat to human life due to extremely dangerous flooding conditions **WHAT TO DO?** ***Immediately*** reach higher ground by any means possible

You make the call…

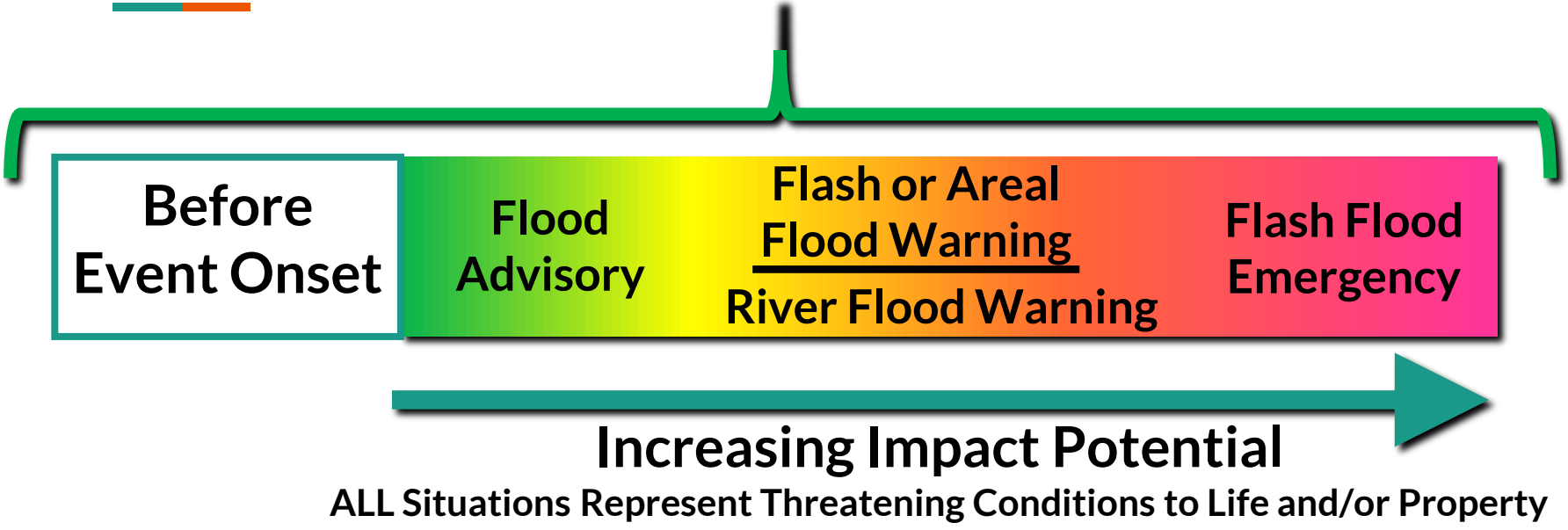
What type of flooding is this?

What type of flooding is this?

What type of flooding is this?

What type of flooding is this?

Flood Timeline



Note: Flooding can (and does) occur without a Flash Flood Watch!

Be sure to have multiple ways to receive warnings.

Ways to Receive a Warning

NOAA Weather Radio

Wireless Emergency Alerts and Weather Apps

TV and Radio

Social Media

NWS Website: https://www.weather.gov/hgx/

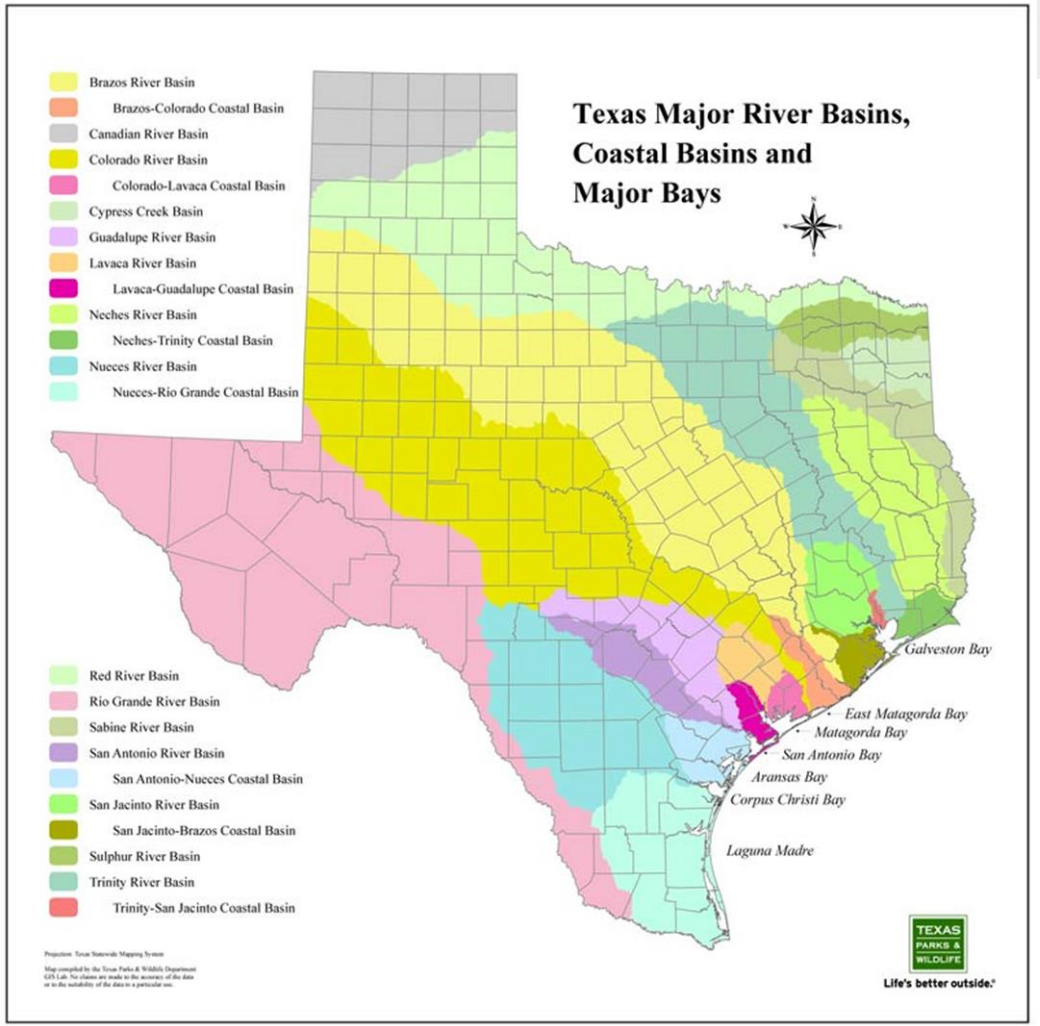
River Flooding

River Flooding

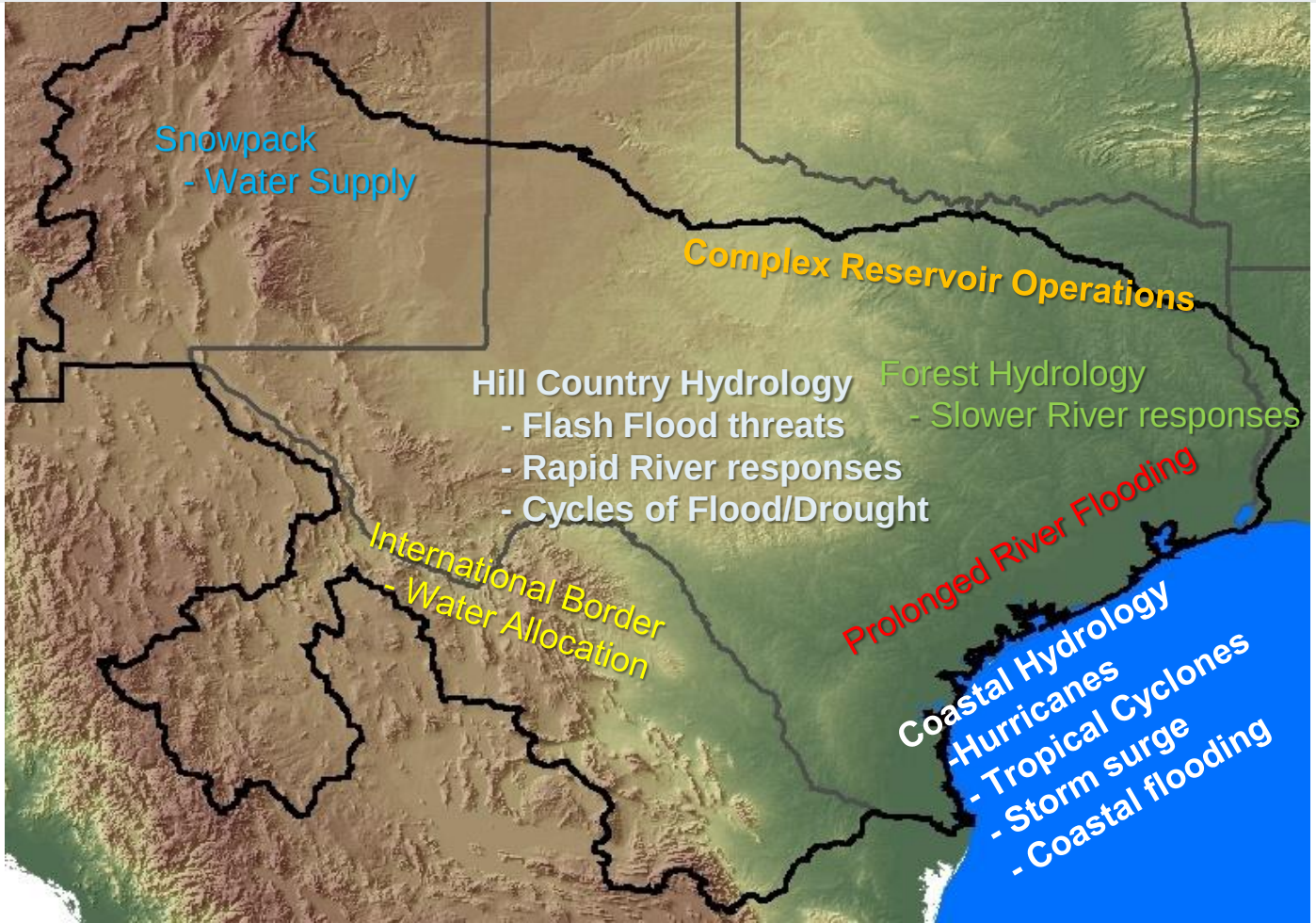
River flooding occurs when water escapes the river banks. There are different thresholds for river flooding: action, minor, moderate, major and record flooding. This image depicts what a river flooding looks like.

Watershed

- A watershed, or basin, is an area of land that drains runoff from rainfall (stormwater) to a body of water, either a river, bayou, creek, or lake.
- Topography plays a big role in how watershed boundaries are defined.
- A watershed can flow into another watershed.
- Watersheds vary in shape and size which ultimately lead to unique challenges.

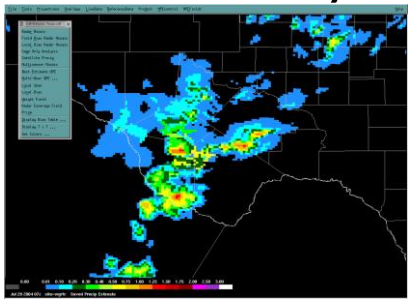


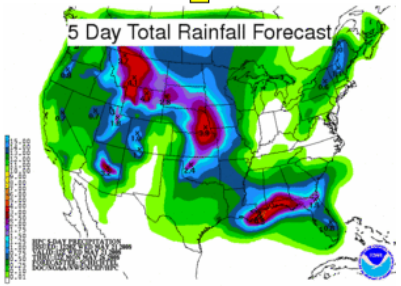
Diverse Watershed Characteristics in Texas



River Forecast Process

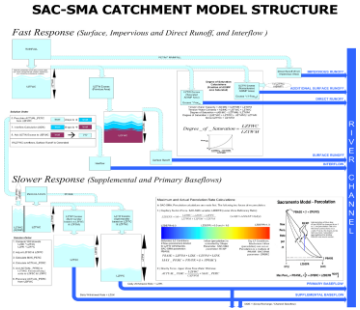
Rainfall Analysis

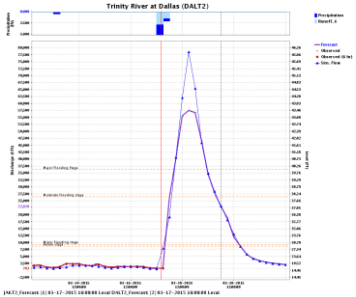




Rainfall estimates and forecasts merged into continuous dataset

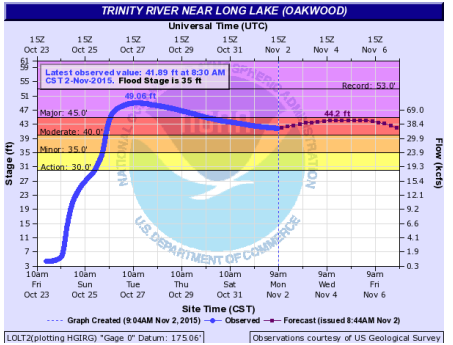
Hydrologic Modeling





Rainfall ingested into hydrologic model. Forecasters adjust model parameters in real time

Forecast



Warning

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FLOOD WARNING
NATIONAL WEATHER SERVICE HOUSTON/GALVESTON, TX
926 PM CDT THU MAY 26 2016

...The National Weather Service in Houston/Galveston has issued a flood warning
for the following rivers...

Brazos River In Richmond affecting the following counties in Texas...Austin
and Fort Bend

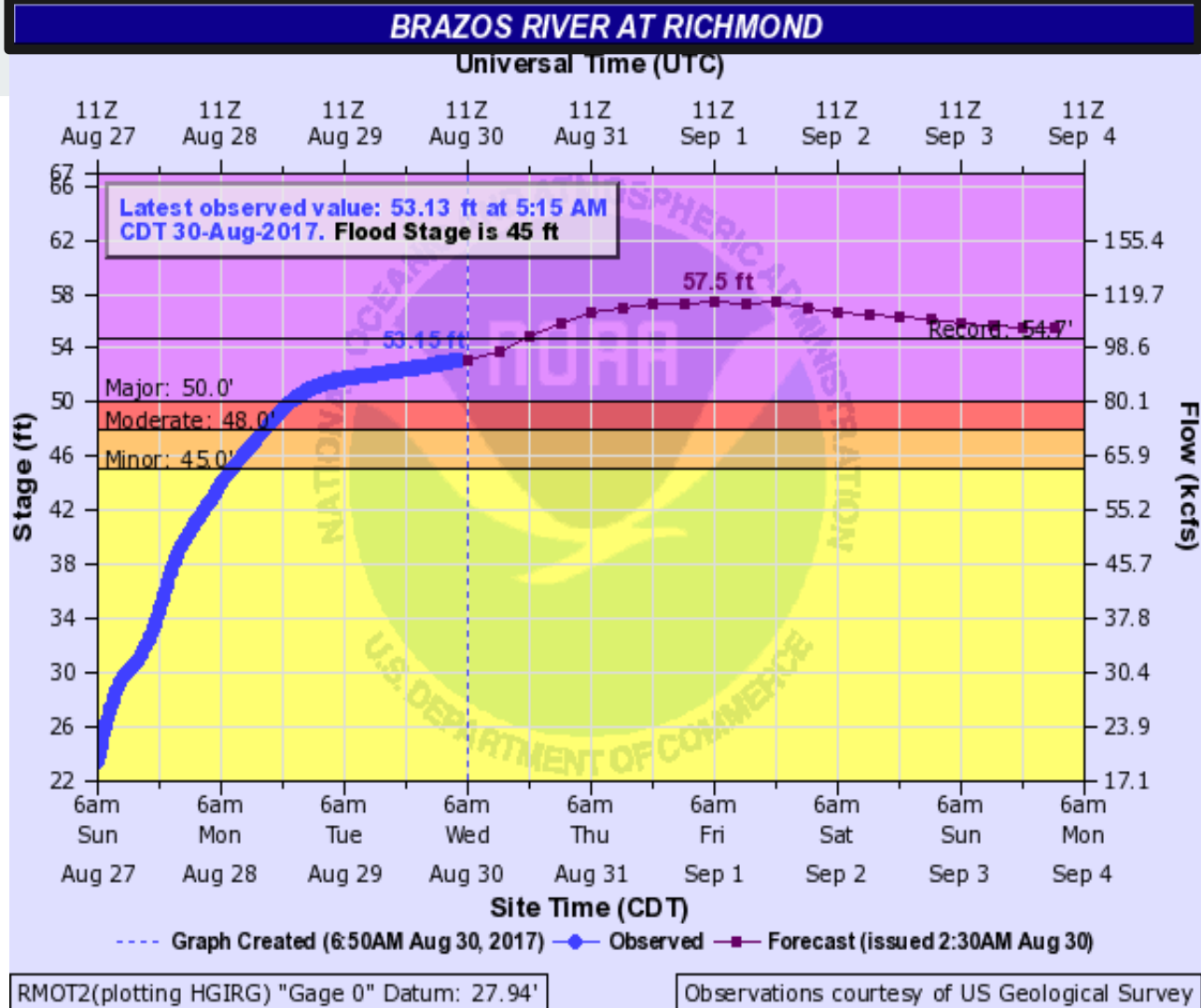
TXC015-039-157-473-271425-
/O.NEW.KHGX.FL.W.0149.160529T0730Z-000000T0000Z/
/RMOT2.1.ER.160529T0730Z.160531T0600Z.000000T0000Z.NO/
926 PM CDT THU MAY 26 2016

The National Weather Service in Houston/Galveston has issued a

* Flood Warning for
  The Brazos River In Richmond.
* from late Saturday night until further notice...or until the warning is
  canceled.
```

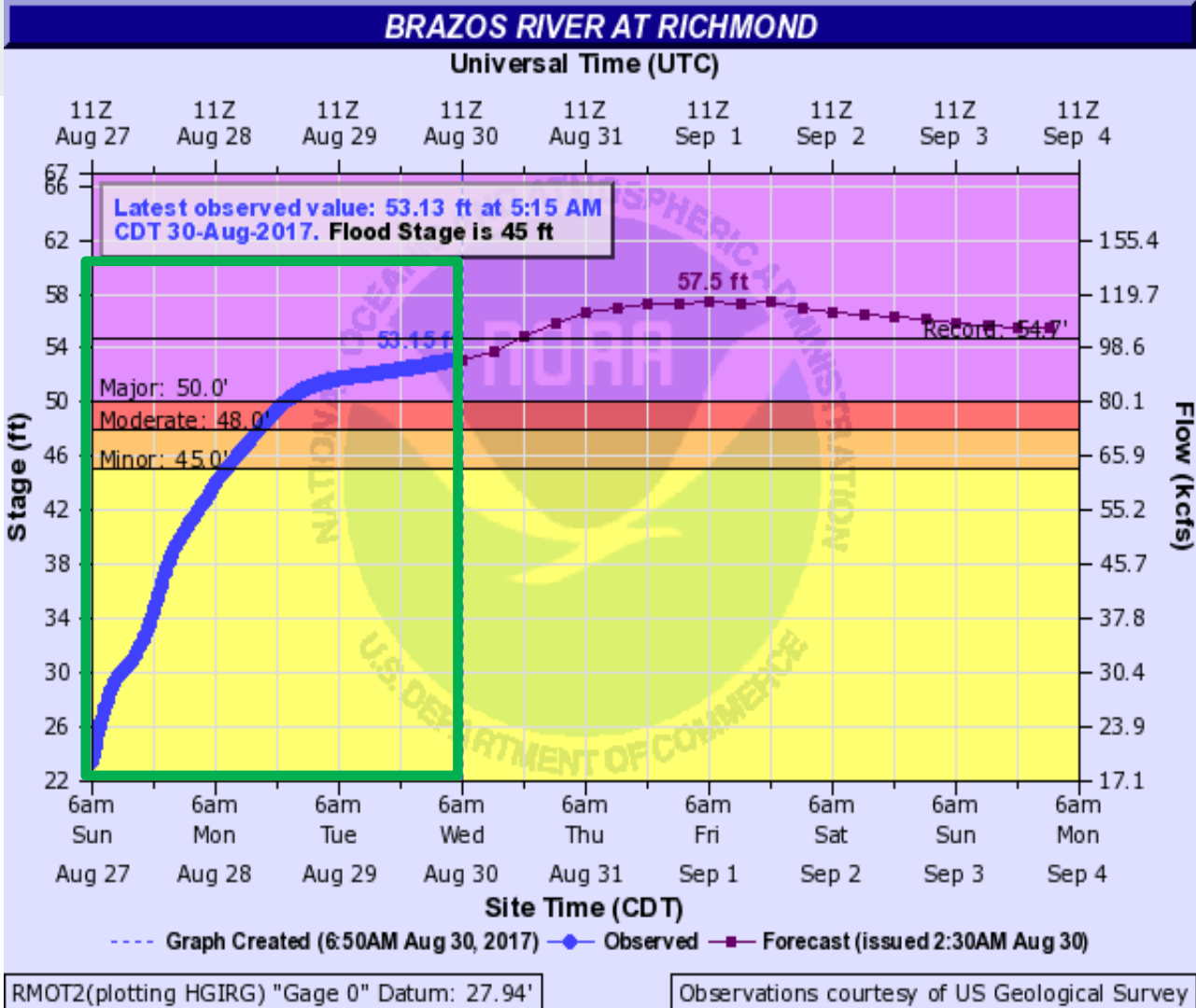
Hydrograph Basics

LOCATION:
Of the gage the forecast is made, AT means the gage is in the limits of the town/city, NEAR or NR means that town/city has the closest post office



Hydrograph Basics

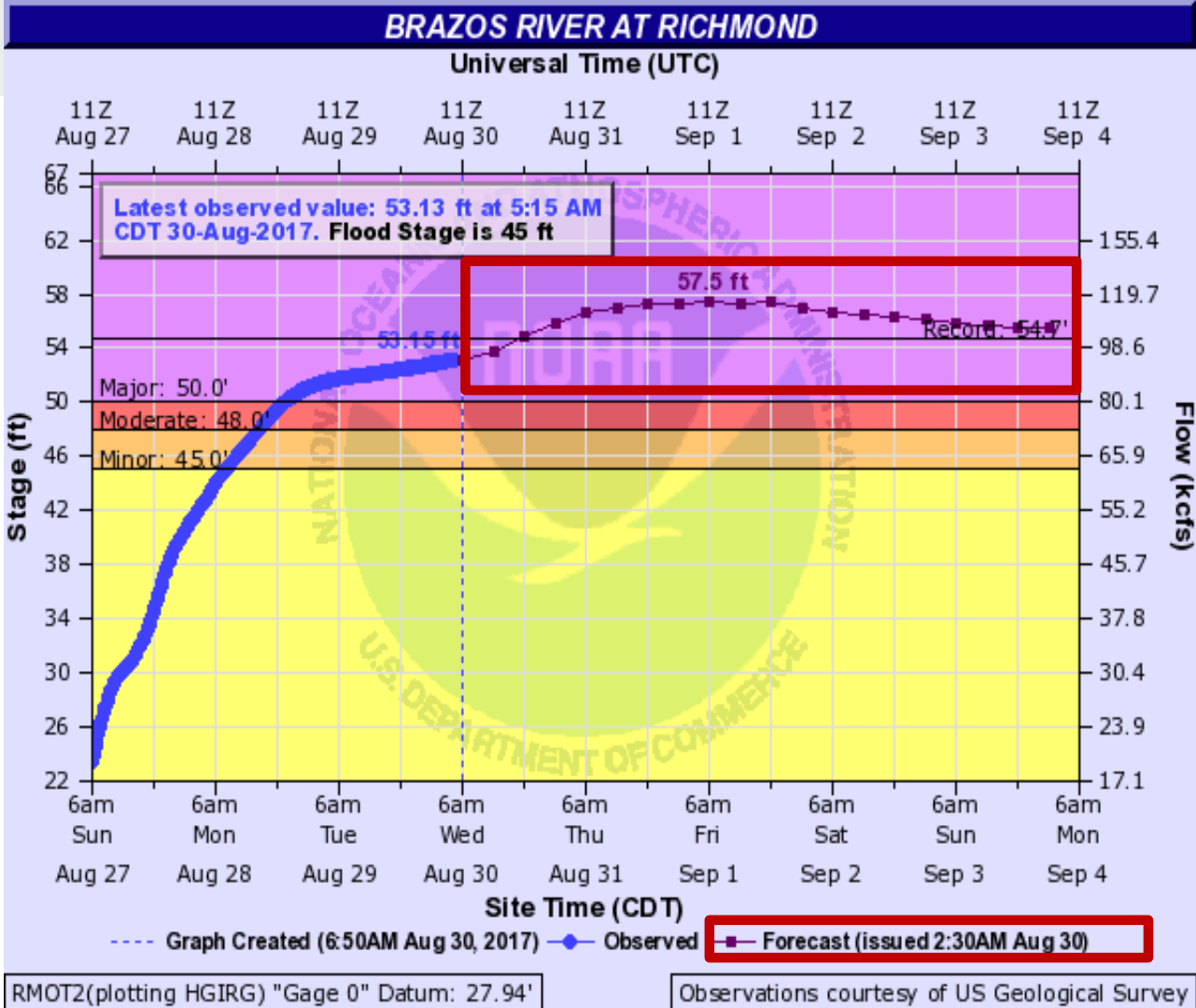
OBSERVATIONS:
Past river stages



Hydrograph Basics

FORECAST:
Forecast River Stages

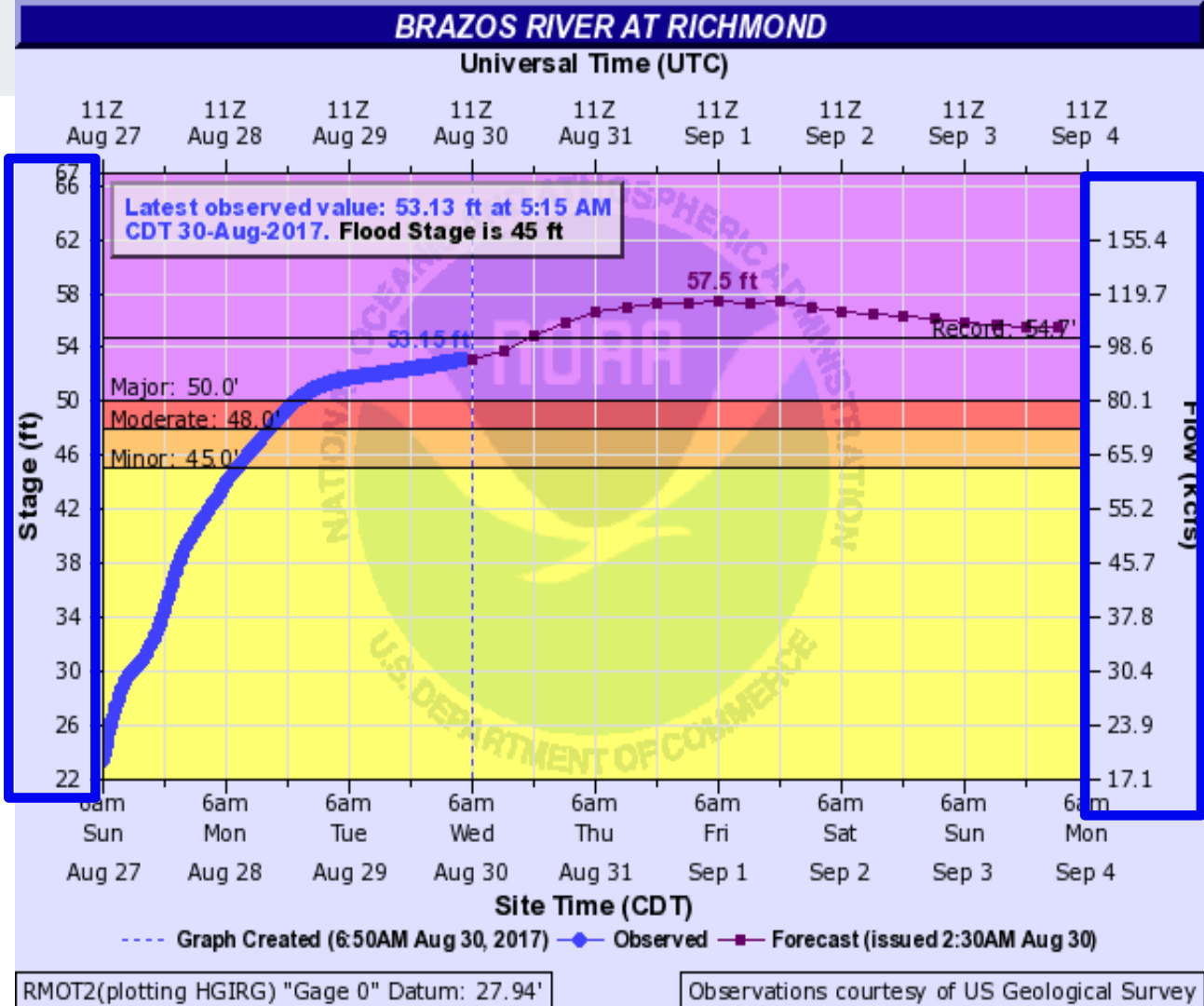
CREST:
Peak Stage



Hydrograph Basics

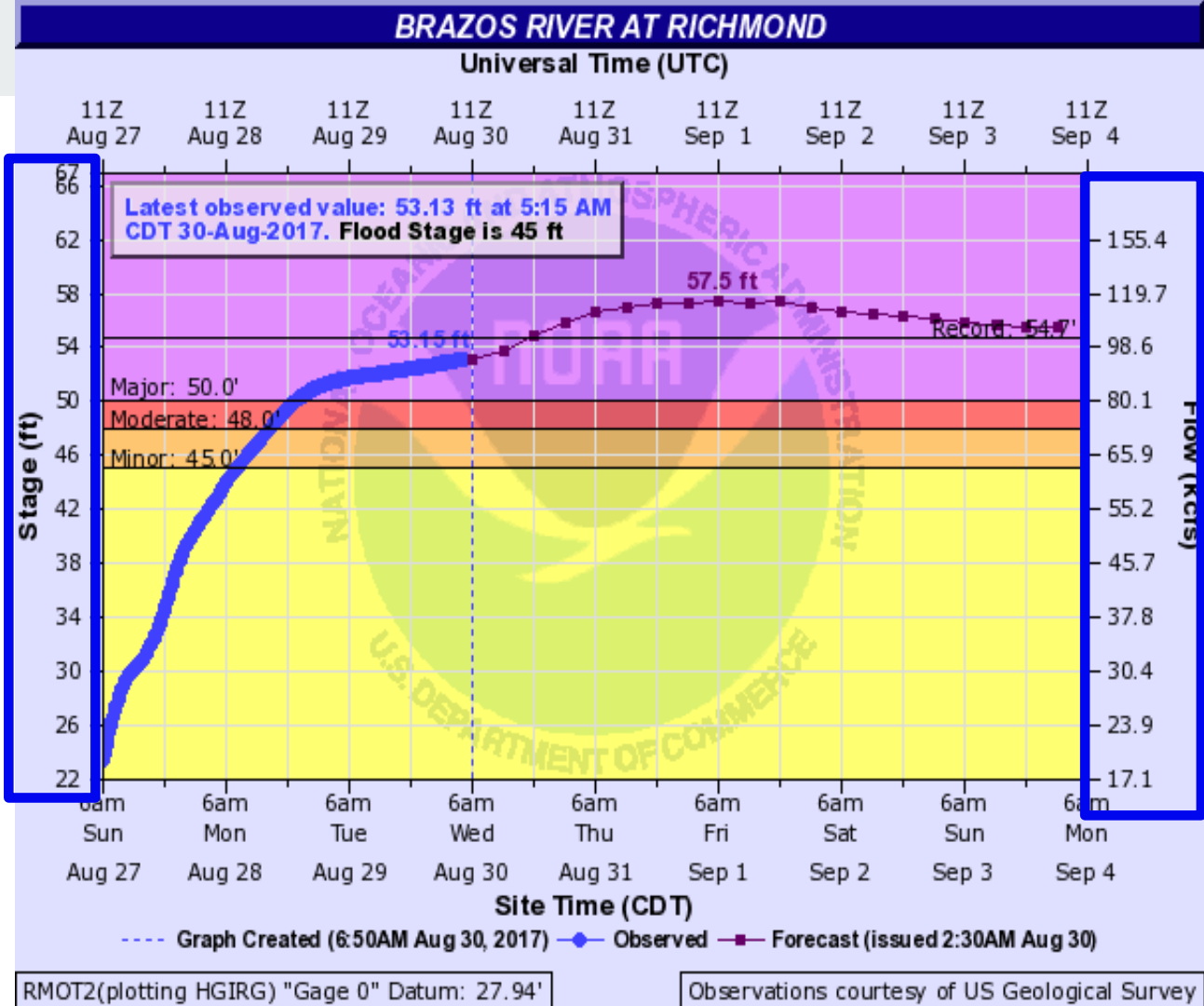
STAGE VS FLOW: Hydrologists, models, reservoirs work in flow. Emergency managers, media, general public work in stage.

What is flow or a cubic foot per second?



Hydrograph Basics

A basketball is roughly a cubic foot, so 20,000cfs is 20,000 basketballs of water passing the gage every second.



Understanding River Criteria Levels

BELOW CRITERIA

Impact: Water is within the banks of the river with no impacts to the surrounding area. Flow speeds may still be high during rainfall or releases which could impact recreational activities

ACTION

Impact: Water is over the banks and into the flood plain, but not a threat to structures or roadways. Some action may be required such as moving farm equipment or increasing awareness

MINOR

Impact: Typically water is impacting areas inside of floodplain which can vary by location. Some low water crossings covered by water, agricultural flooding, water approaching public areas (parks, sidewalks etc.). Areas frequently flooded can expect to be impacted

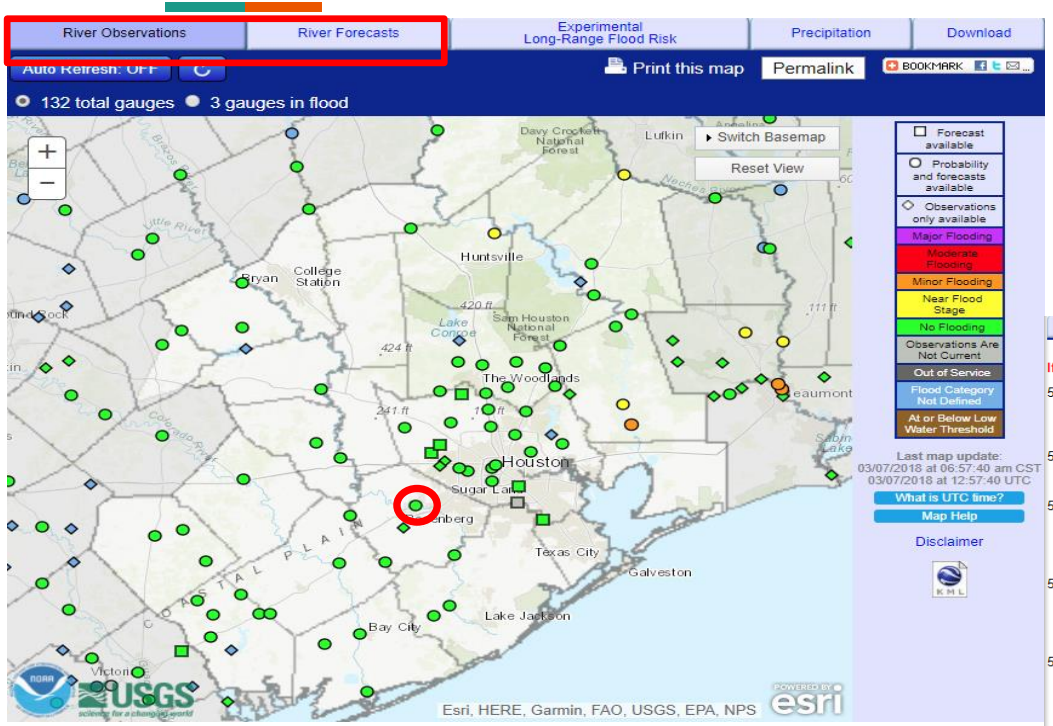
MODERATE

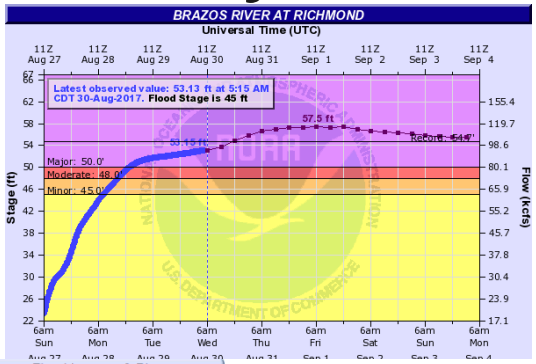
Impact: Water now reaching areas only impacted by significant rain events. Structures can be inundated, several roads covered with water, water may cut off certain areas, widespread agricultural flooding.

MAJOR

Impact: Water is near the highest it's ever been representing rare flooding and significant widespread impacts. Most roads will be covered by water in the area cutting off if not completely flooding subdivisions, rivers can be several miles wide in areas. Homes and structures underwater, bridges inundated and in danger of being hit by debris. Impacts may be greater than ever experienced.

Advanced Hydrologic Prediction System





Flood Categories (in feet)

Major Flood Stage:	50
Moderate Flood Stage:	48
Flood Stage:	45
Action Stage:	20
Low Stage (in feet):	0

Historic Crests

(1) 55.19 ft on 09/01/2017
(2) 54.74 ft on 06/02/2016
(3) 50.30 ft on 10/21/1994
(4) 50.01 ft on 06/03/2015
(5) 49.68 ft on 01/01/1992
Show More Historic Crests

(P): Preliminary values subject to further review.

Recent Crests

(1) 55.19 ft on 09/01/2017
(2) 54.74 ft on 06/02/2016

Flood Impacts & Photos — Collapse

If you notice any errors in the below information, please contact our Webmaster

54.74 Major flooding continues with significant home flooding in the following areas: Valley Lodge near Simonton, Bar Rd, Baker Rd/Cumings Rd/Rio Brazos area north of Rosenberg, Edgewood/Baudet Rd in Richmond, and FM 2759 near Thompsons. Low lying homes in Grand River, Rivers Edge, Pecan Estates in Thompson, and Pecan Bend flood as well.

54 Major flooding continues with US90A eastbound lanes inundated and impassible between Harlem Rd and New Territory. Pitts Rd is impassible between US90A and Savannah Dr.

53 Major lowland flooding continues with FM 359 impassible between US90A and the Pecan Grove levee near Southern Place Dr. The intersection of FM 359 and Mason Rd is impassible. FM 2759 is completely inundated east of Agnes Rd. Street flooding occures along Sienna Parkway between McKeever Rd and Steep Bank Trace. Street flooding occurs along McKeever Rd between Sienna Parkway and SH6. Miller Rd near Arcola is inundated.

52 Major lowland flooding continues with homes near intersection of Sixth St. and Avenue B in Rosenberg beginning to take on water. FM 1489 is inundated south of Simonton to Johnson Rd. FM 723 is inundated north of Rosenberg to FM 359, making the Kingdom Heights and Riverside ranch subdivisions inaccessible. FM 359 between US90A and Pecan Grove begins taking on water. Thompson Ferry Rd south of LJ Parkway is inundated outside of the leveed area.

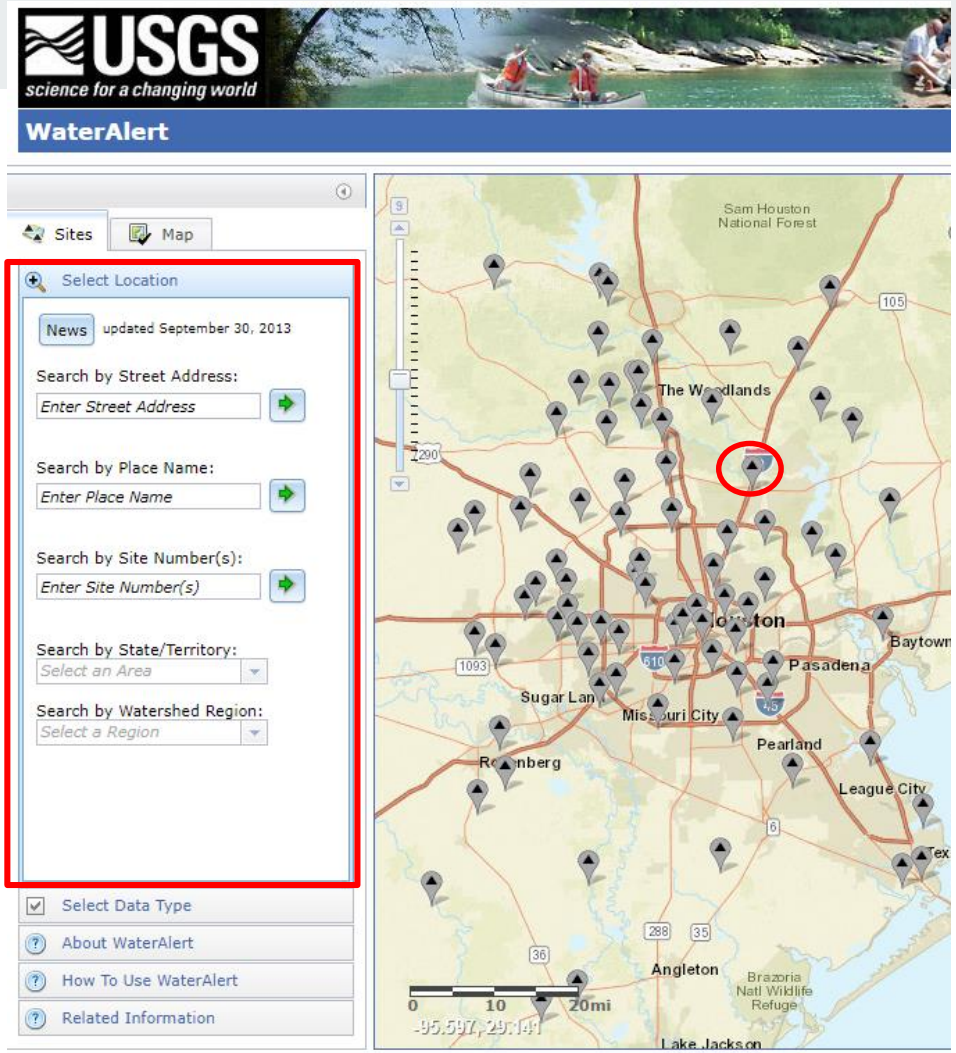
51 Major lowland flooding continues with homes flooding along Cumings/Baker Roads and in Rio Brazos north of Rosenberg. FM 1093 is inundated to Stansberry Rd in Simonton. Underpass at intersection of SH36/90A west of Rosenberg is inundated/impassible. Fort Bend County flood fight operations in Simonton are exceeded and cease. Low lying streets on west side of Quail Valley take on water. Feeder roads along SH6 near intersection of FM 521/McKeever Rd are inundated. Low lying areas along Knights Ct take on water.

50 Major lowland flooding begins as homes in Richmond begin flooding and many homes in Simonton and Thompsons have water in them. FM 1458 near FM 1093 remains inundated and closed. Homes along Carrol and McKeever Roads near FM 2759 in southeast Fort Bend County are close to taking water. Strange Drive...Greenwood Drive...and Second Street in Richmond and Sixth Street...Avenue B...and River Road in Rosenberg and Pittman Road in Thompsons are inundated with over one foot of water.

http://water.weather.gov/ahps2/index.php?wfo=hgx

USGS Water Alerts

- Set alerts when a gauge reaches certain water surface elevations.
- Identify the gauge nearest you
- Click on the gauge



USGS Water Alerts:
https://maps.waterdata.usgs.gov/mapper/wateralert/

USGS Water Alerts

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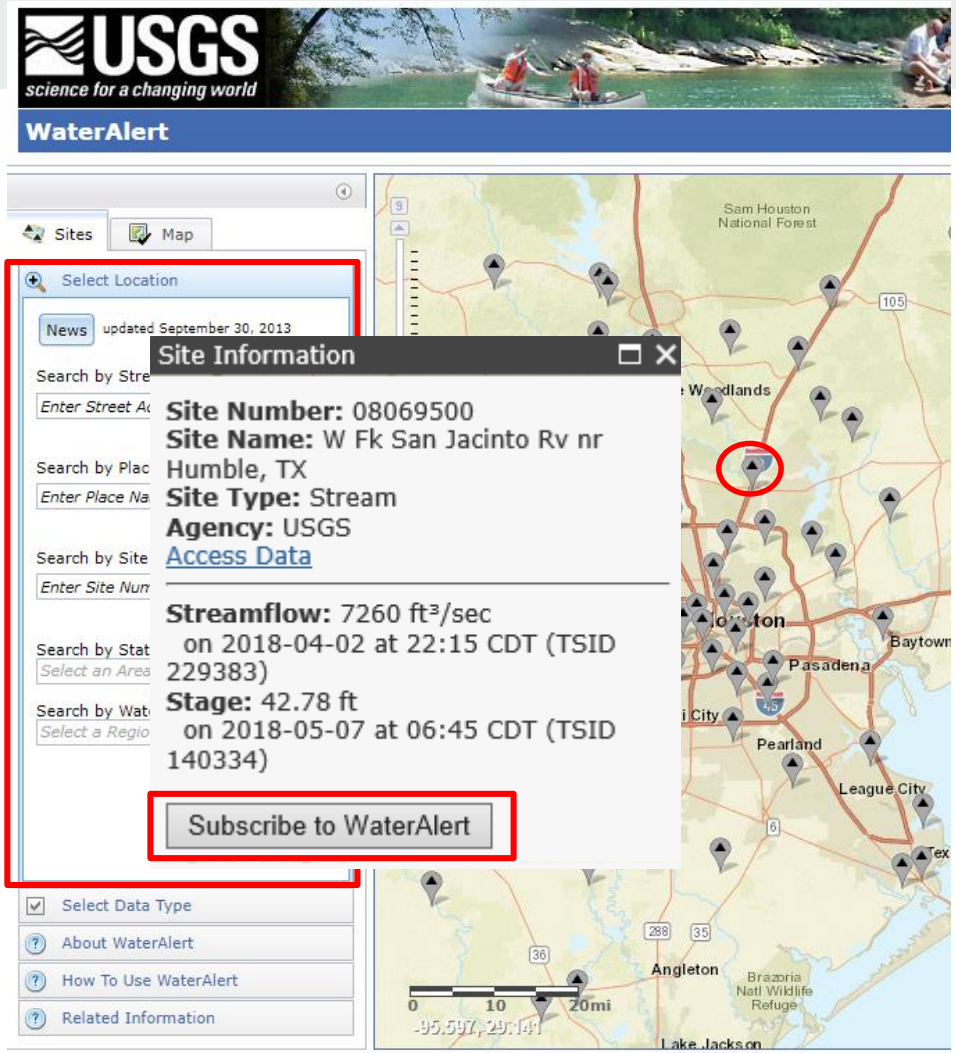
- Click on the gauge and select “Subscribe to WaterAlert"



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https://maps.waterdata.usgs.gov/mapper/wateralert/

USGS Water Alerts

- Set alerts when a gauge reaches certain water surface elevations.
- Identify the gauge nearest you
- Click on the gauge and select “Subscribe to WaterAlert"
- Define how you want to receive the information:
  - Email or phone
  - Frequency
  - Stage or Discharge
  - Stream Elevation(s)
- Note: Use Internet Explorer

Subscription Form

The U.S. Geological Survey WaterAlert service sends e-mail or text (SMS) messages when certain parameters, as measured by a USGS real-time data-collection station, exceed user-definable thresholds. The development and maintenance of the WaterAlert system is supported by the USGS and its partners, including numerous federal, state, and local agencies.

Real-time data from USGS gages are transmitted via satellite or other telemetry to USGS offices at various intervals; in most cases, 1 to 4 times per hour. Emergency transmissions, such as during floods, may be more frequent. *Notifications will be based on the data received at these site-dependent intervals.*

Site Info:		
Number:	08069500	
Name:	W Fk San Jacinto Rv nr Humble, TX	
Agency:	USGS	
Transaction ID:	stsCN	
Send Notification To:	about this...	
○ My mobile phone		
○ My email address		
Notification Frequency:	about this...	
Hourly	○	
Daily	◉	
Streamflow Parameter(s):	about this...	Recent value:
Discharge, in ft3/s	◉	7260 [peak chart]
Gage height, in ft	○	42.78 [peak chart]
Alert Threshold Condition:	about this...	
◉ Greater than (>)		
○ Less than (<)		
○ Outside a range (< or >)		
○ Inside a range (> and <)		

Real-time value is greater than: _____ ft3/s

☐ I have read and acknowledge the Provisional Data Statement and Disclaimer.

Submit Reset Cancel

Related Information

0 10 20mi

-95.597, 29.144

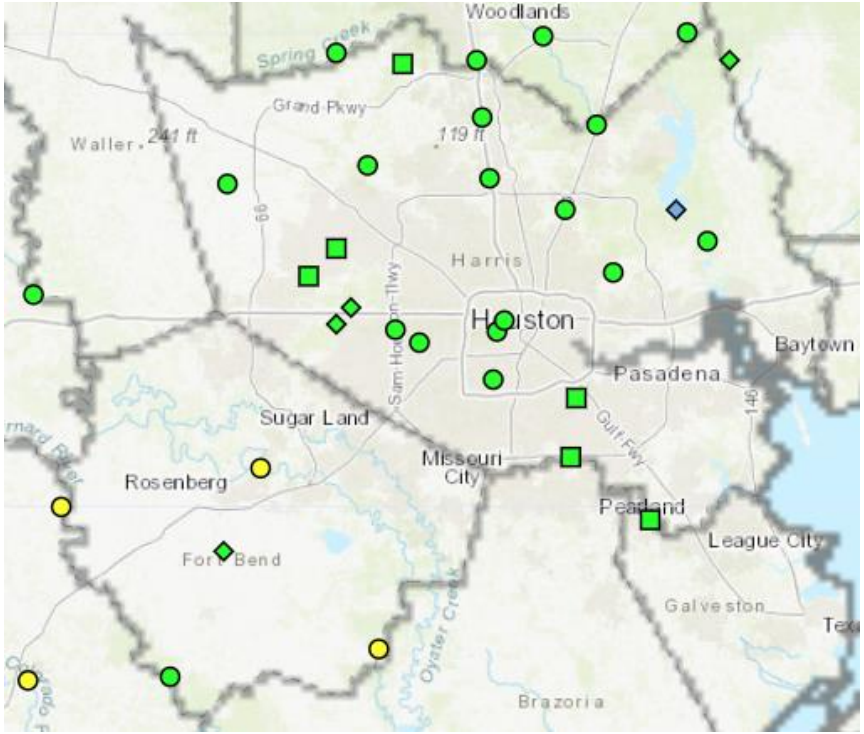
Natl Wildlife Refuge

Lake Jackson

USGS Water Alerts:
https://maps.waterdata.usgs.gov/mapper/wateralert/

Watershed

- Fort Bend County deals with 3 primary watersheds: Brazos River, San Bernard River and Upper Harris/Brazoria County.
- Harris County deals with 23 watersheds.
- Katy deals with the Buffalo Bayou watershed.
- NWS issues river forecasts for 4 sites in Fort Bend County and 21 sites in Harris County.



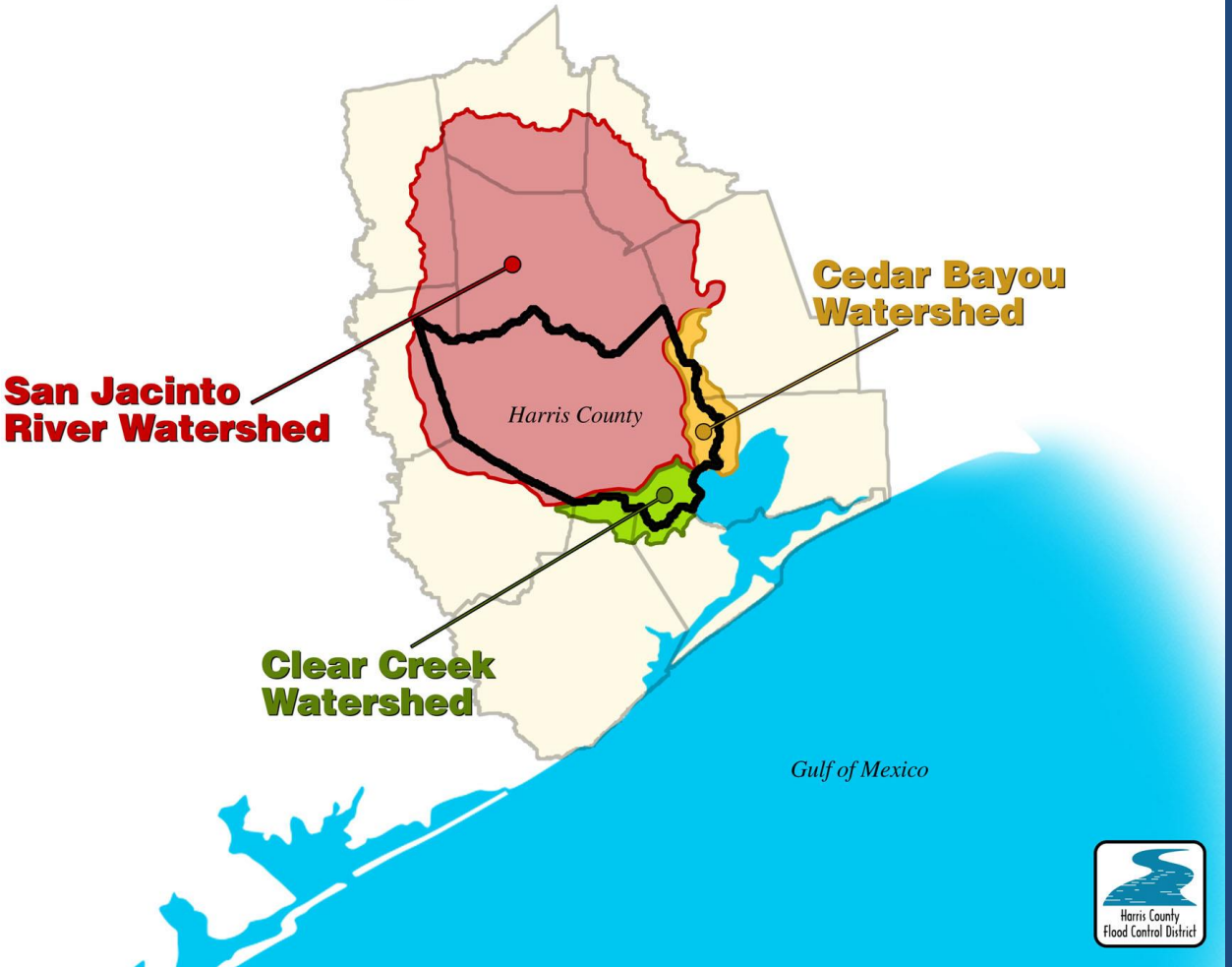
Partners

Hydrology in Harris County

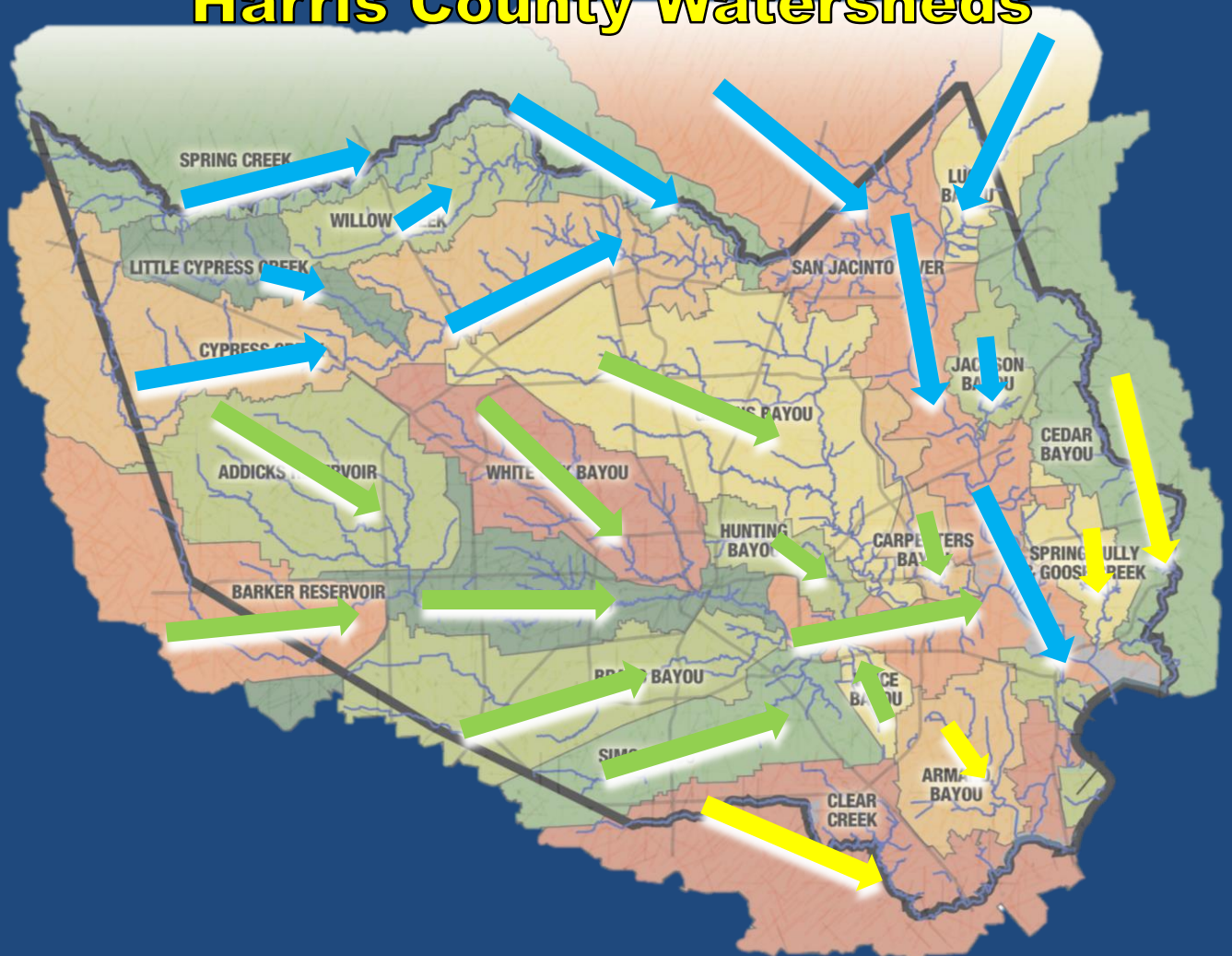
Mark Moore
Lead Hydrologic Technician
Harris County Flood Control District

Southeast Texas Watersheds

Harris County Local Watersheds

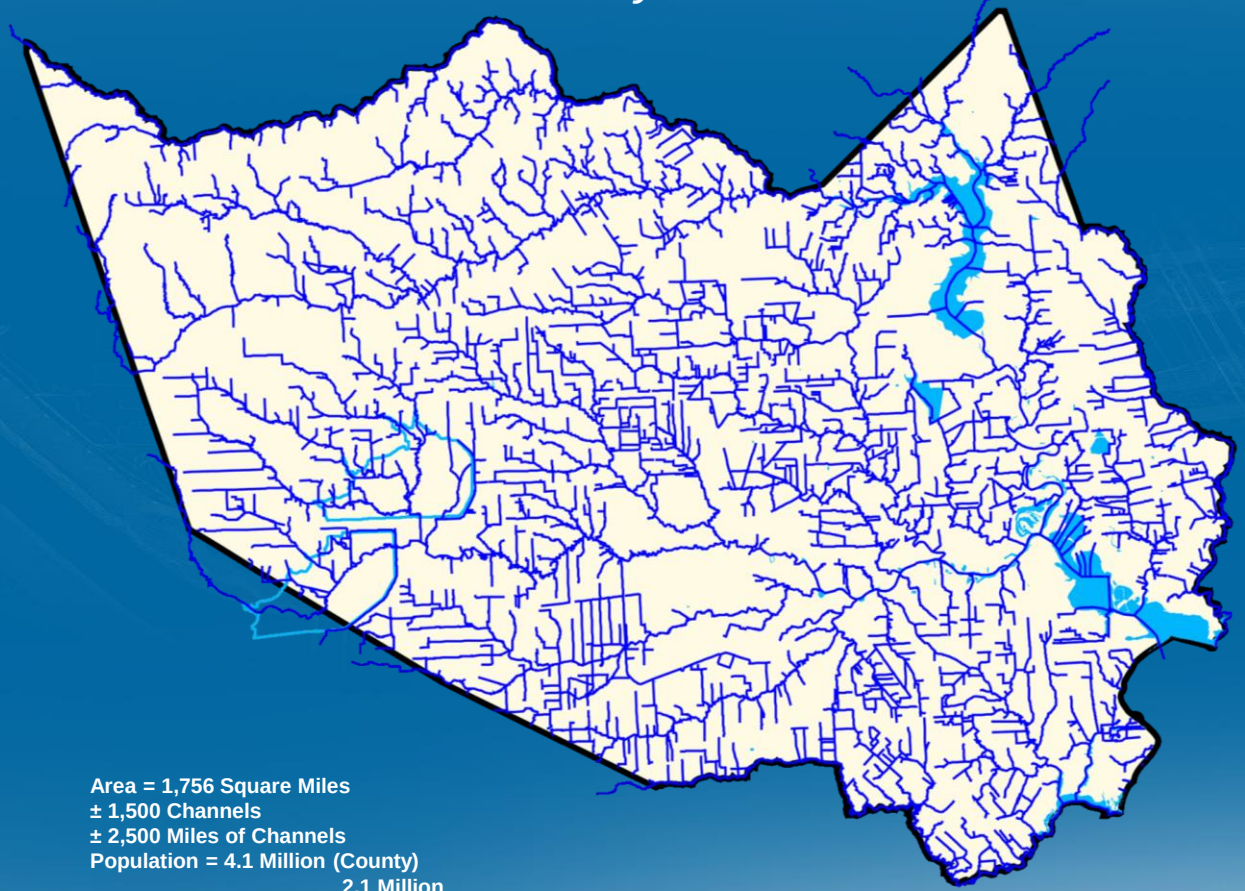


Harris County Watersheds



Harris County Open Channel Network

2,500 Miles of Bayous and Creeks

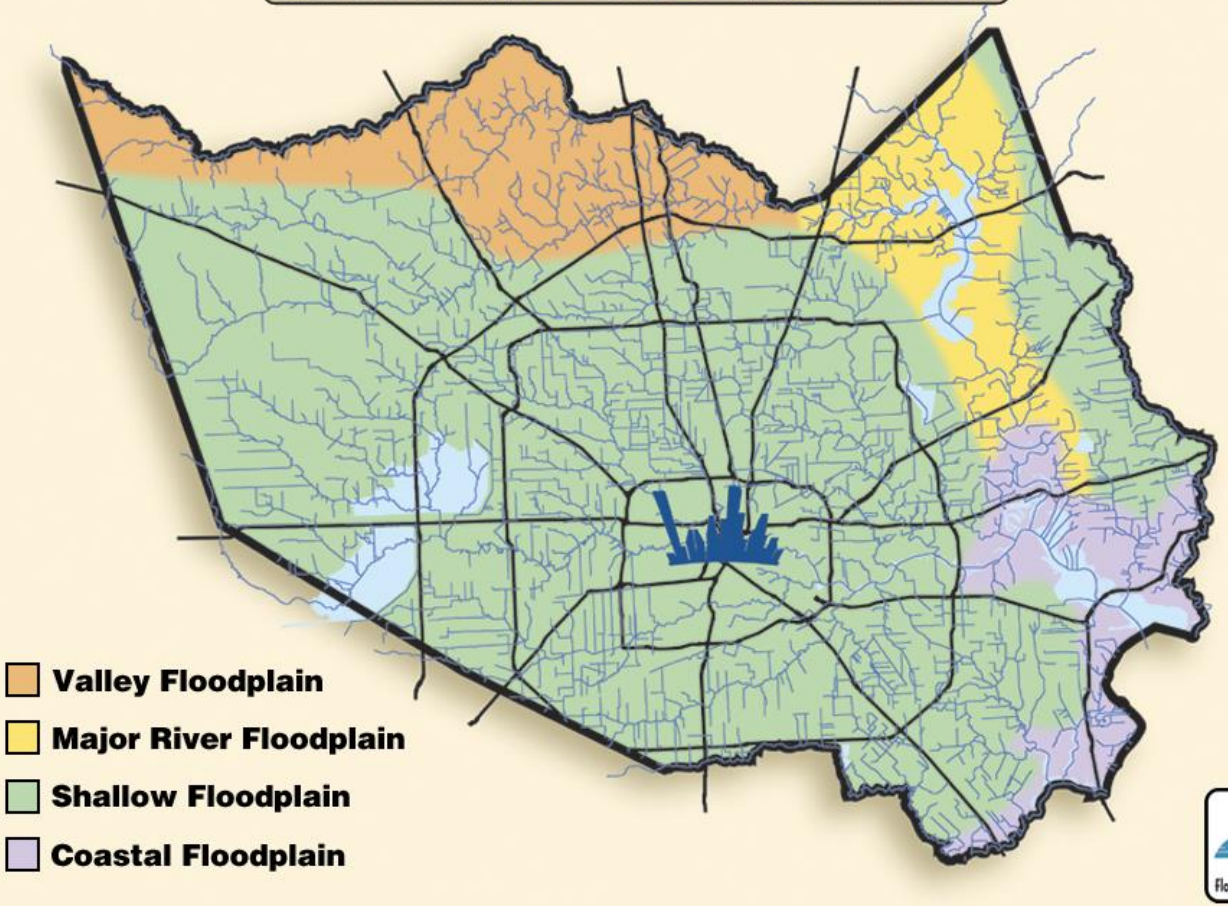


Area = 1,756 Square Miles
± 1,500 Channels
± 2,500 Miles of Channels
Population = 4.1 Million (County)
2.1 Million (Houston)

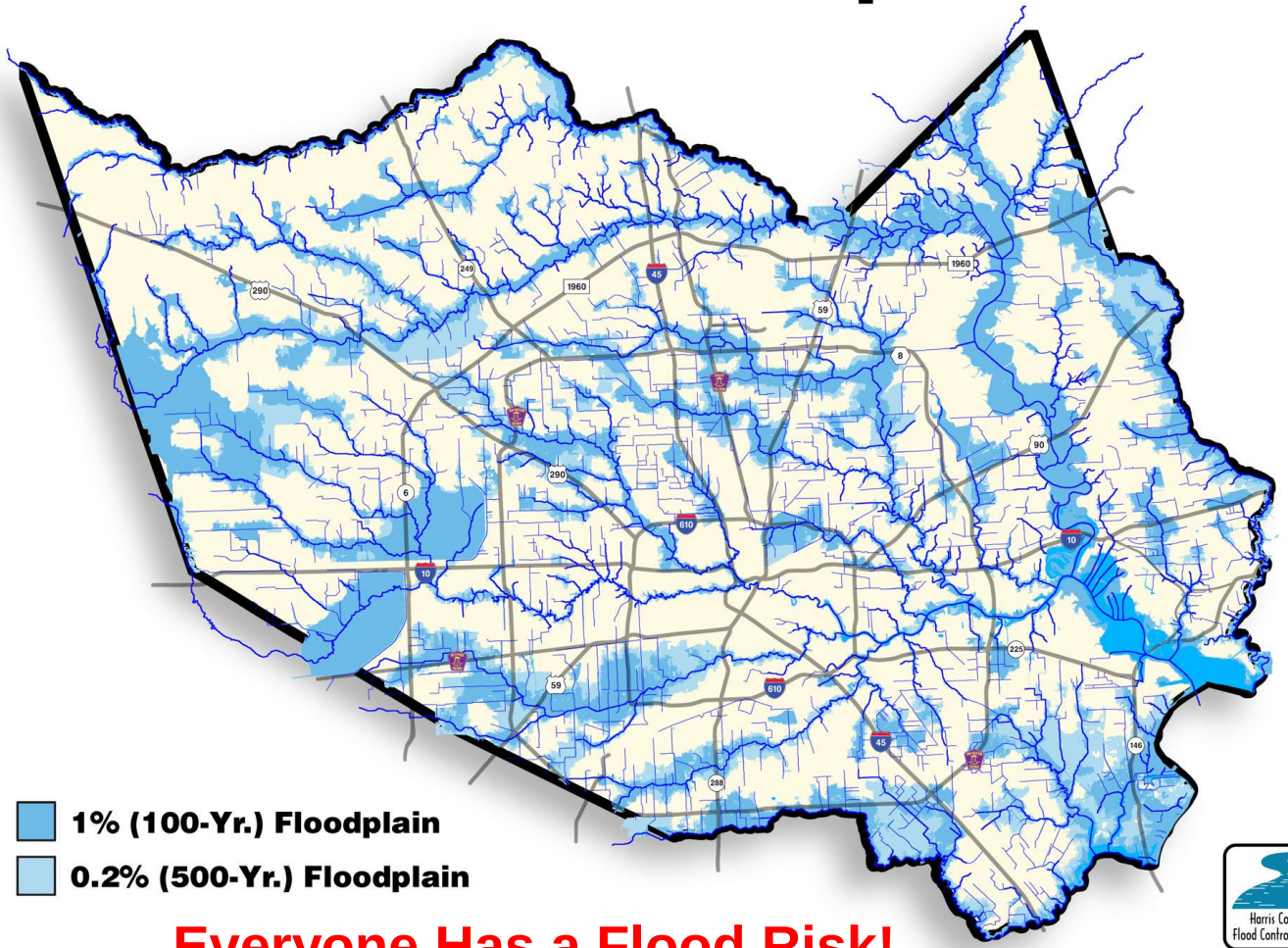
HARRIS COUNTY FLOOD CONTROL DISTRICT

Understanding Our Flooding

HARRIS COUNTY'S 4 TYPES OF FLOODPLAINS



2007 FEMA Floodplains

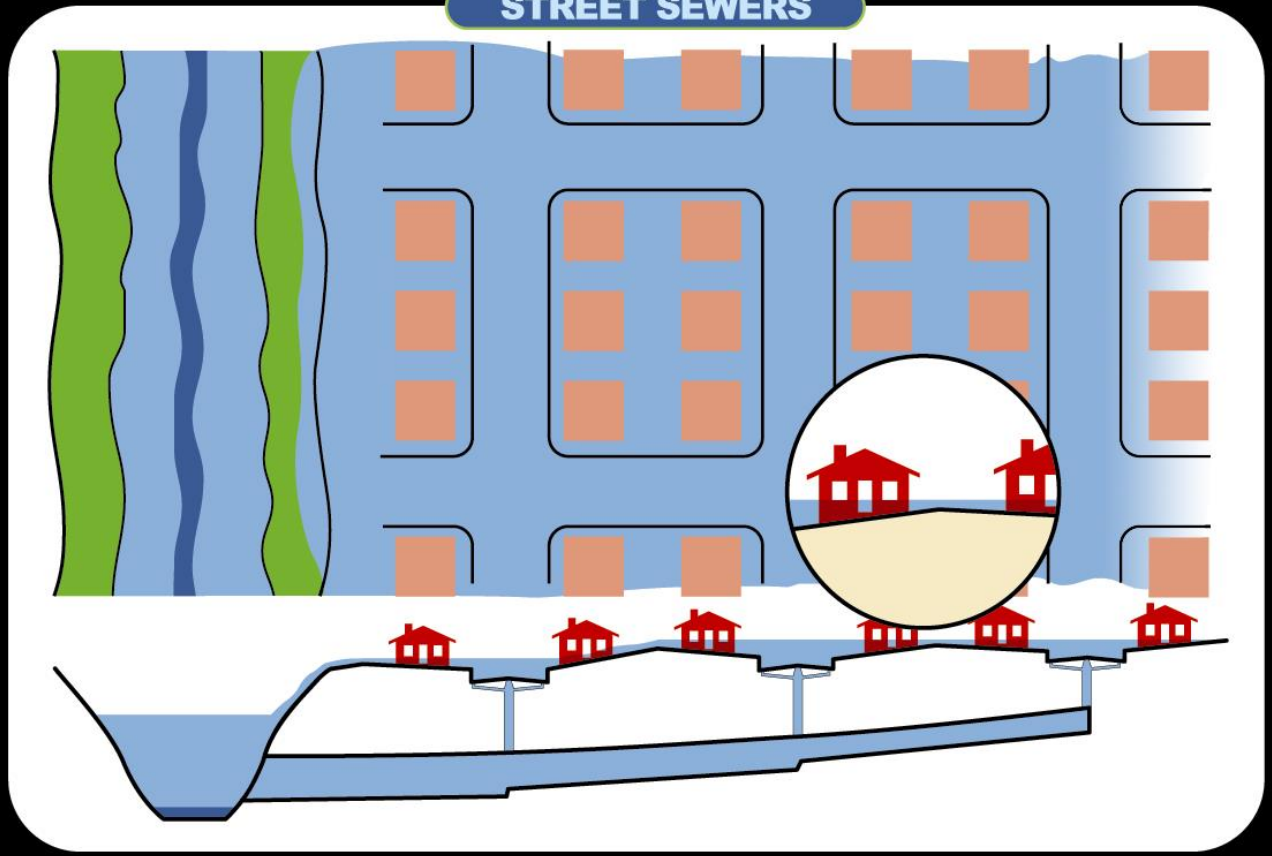


Harris County Flood Control District

Everyone Has a Flood Risk!

HARRIS COUNTY FLOOD CONTROL DISTRICT

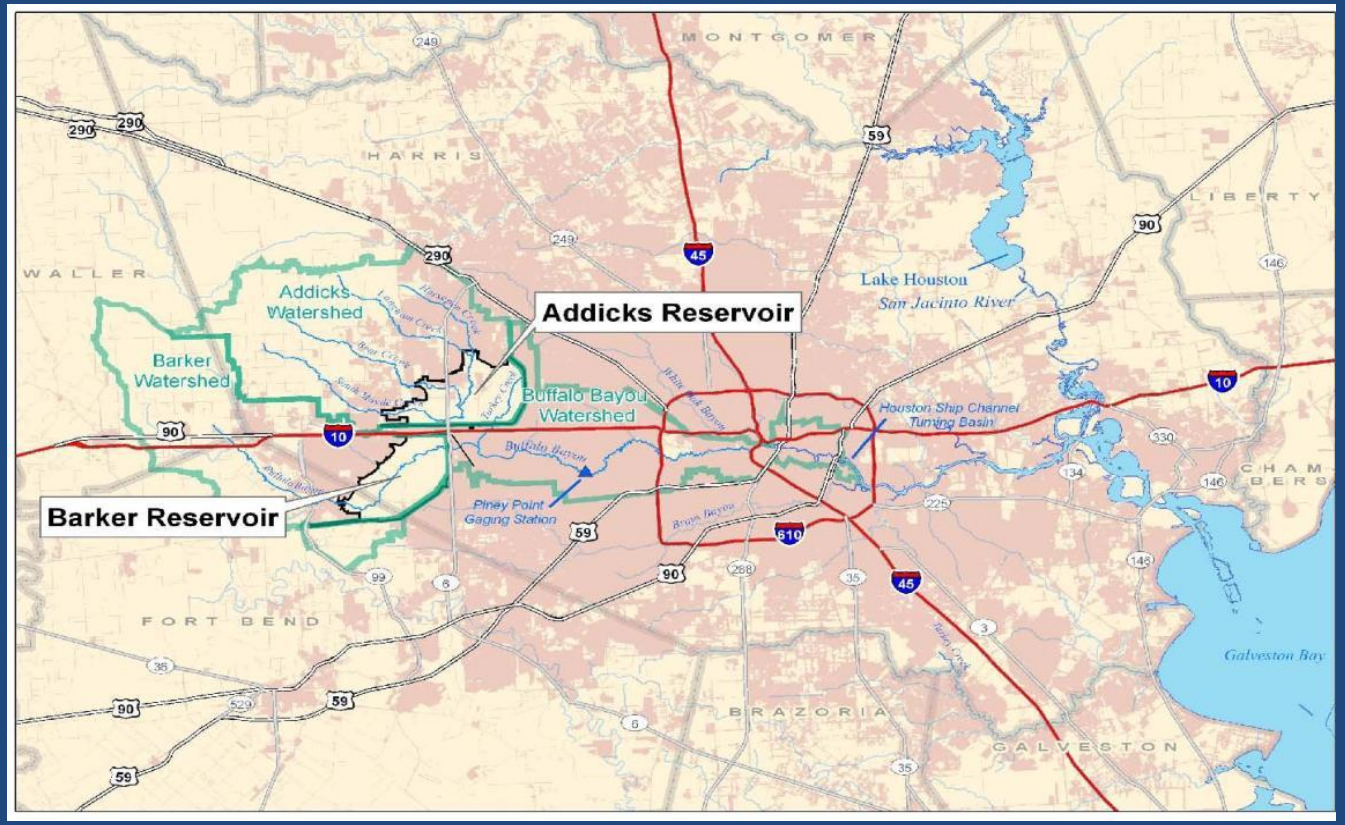
Ponding & Sheet Flow Flooding



FLOODING FROM INTENSE LOCAL RAINFALL
(Longer Duration)

HARRIS COUNTY FLOOD CONTROL DISTRICT

Addicks and Barker Watersheds



Flood Warning System


CONTACT US
FWS MAP | ALERTS | ABOUT FWS | DOCUMENT LIBRARY | GLOSSARY | FAQs | HELPFUL RESOURCES
HARRIS COUNTY FLOOD CONTROL DISTRICT
HELP
MAP VIEW OPTIONS
Watersheds
Channels
Rainfall
Channel Status
Mouse over map label for more information
RAINFALL DATA
Current
Historical
Rainfall in the last
24 Hours
Refresh Data
GAGE SELECTIONS
Gages by Agency
Harris County Flood Control District
Gage by Location
(Select Gage)
Reset to Agency View
ADDRESS SEARCH
Find
e.g. 9900 Northwest Fwy., Houston 77092
Clear Search
Agency View
An interactive map of the Harris County Flood Control District
Disclaimer
Showing rainfall for the last 24 Hours (before 10/7/2017 11:10 AM CDT)
Road
Conroe
Splendora
Shenandoah
New Caney
Porter
Eastgate
Dayton
Liberty
Tarkington Prairie
Courtney
Karen
Howth
Sunny Side
Brookshire
Wallis
Pecan Grove
New Territory
Richmond
Rosenberg
Greatwood
Tavener
Fresno
Arcola
Manvel
Pleak
Rowell Point
Needville
Dickinson
Trinity Bay
Galveston Bay
TOLL
Bing
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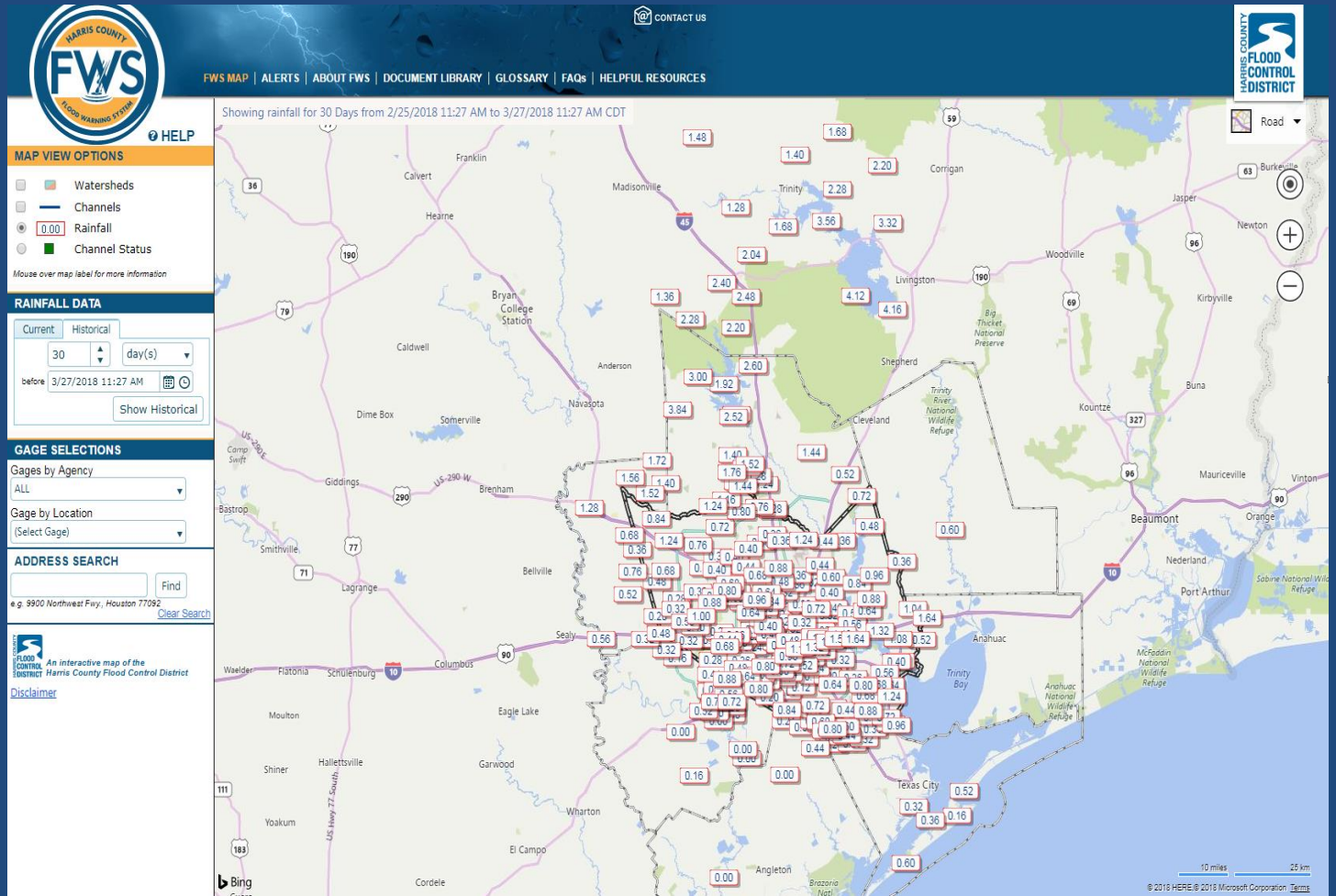
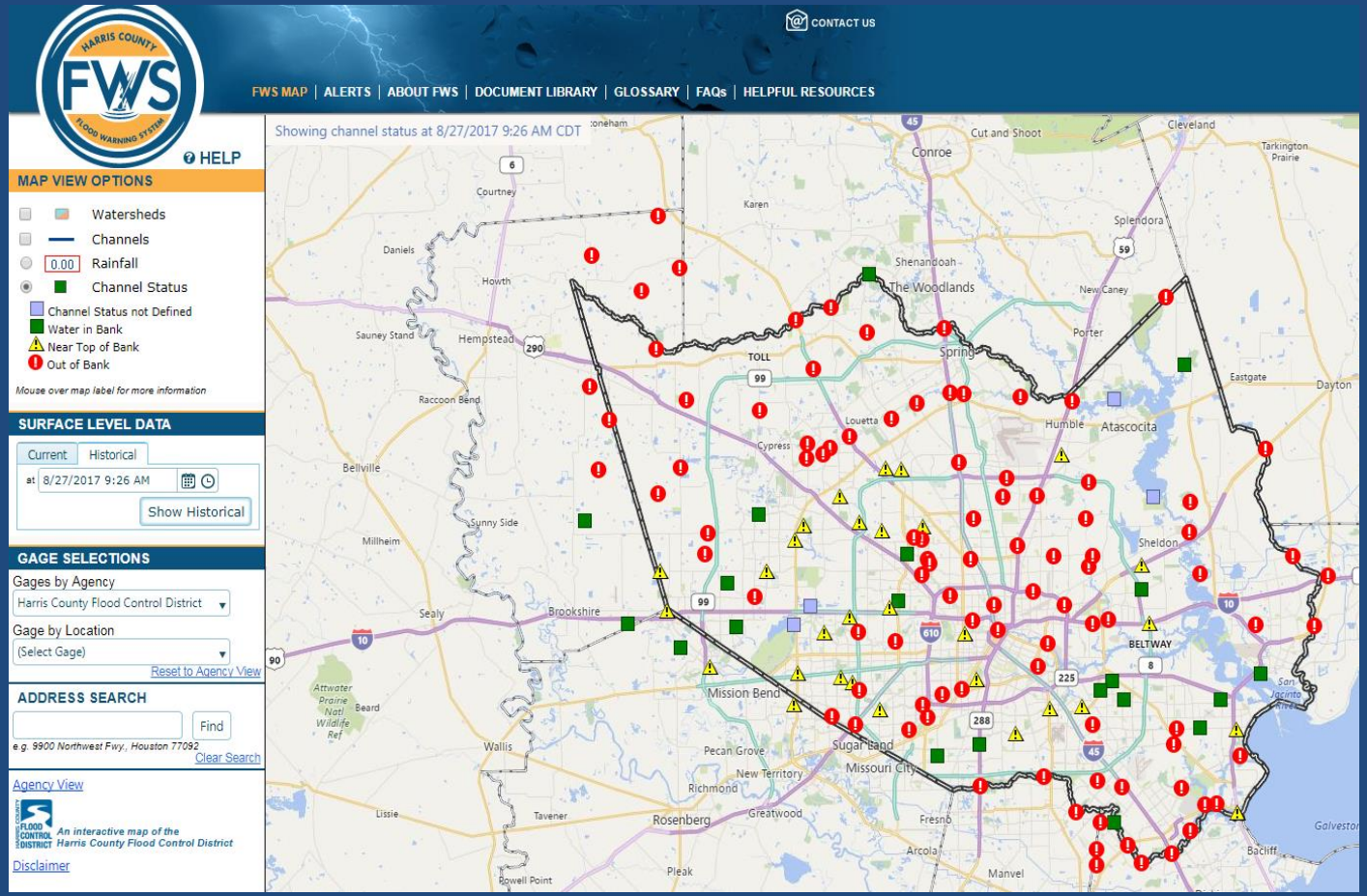
www.harriscountyfws.org

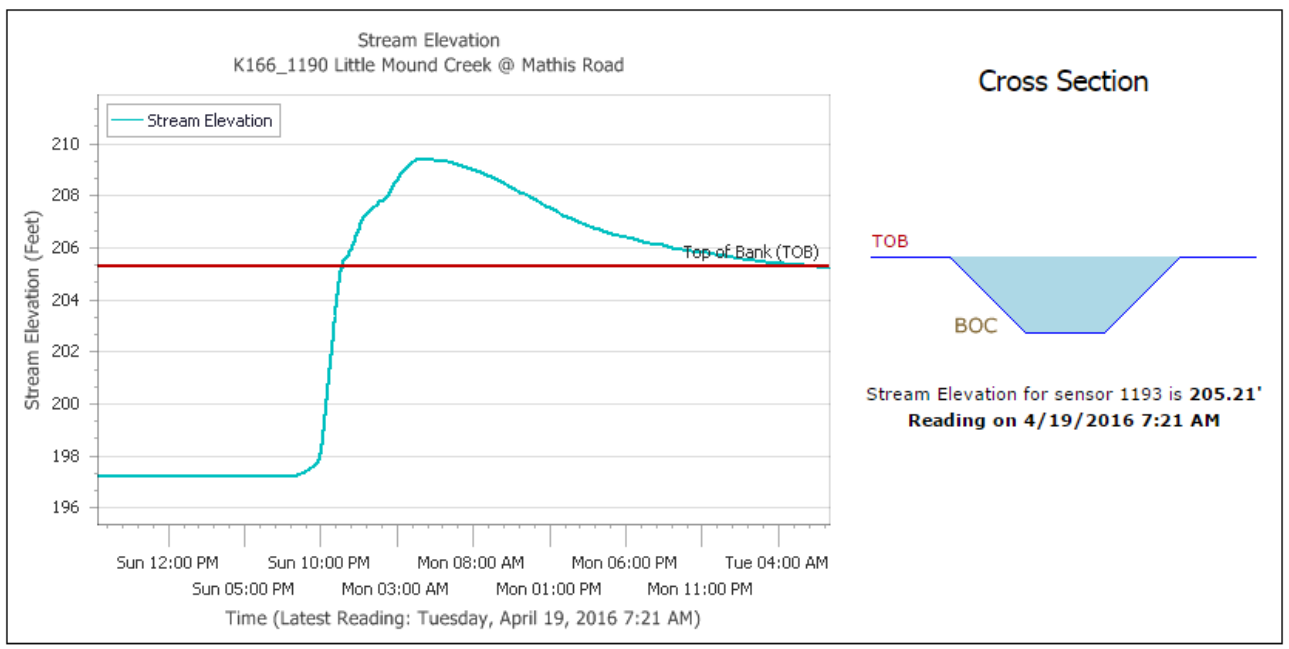
All FWS Gages



Public Website – Channel Status



Public Website – Water Level



Flood Frequency	Elevation
10% (10-year)	208.80'
2% (50-year)	209.70'
1% (100-year)	210.10'
.2% (500-year)	211.10'

Historical Storm

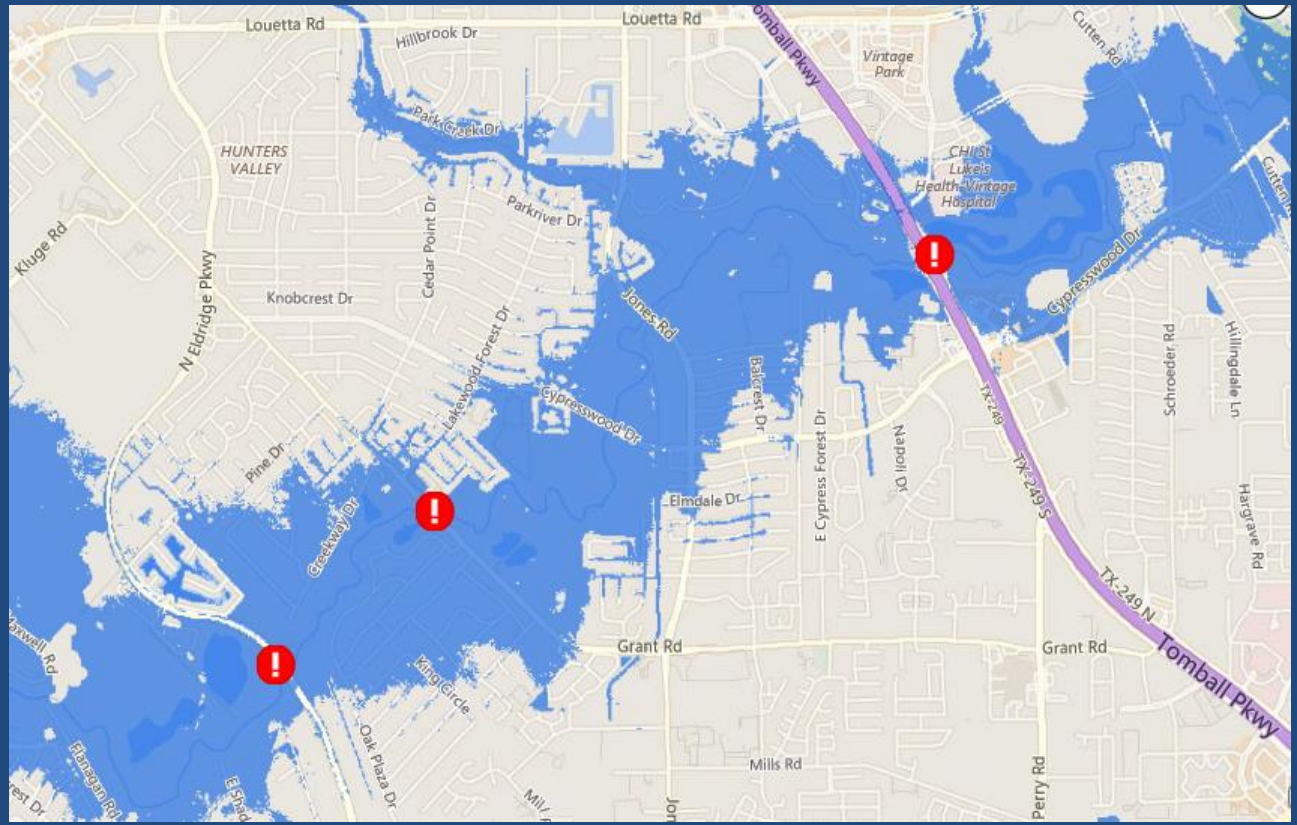
Date	Event	Elevation
7/12/2012		207.90'
4/18/2016		209.30'
5/27/2016		208.05'
8/27/2017	Harvey	208.90'

High water mark elevations are approximate.

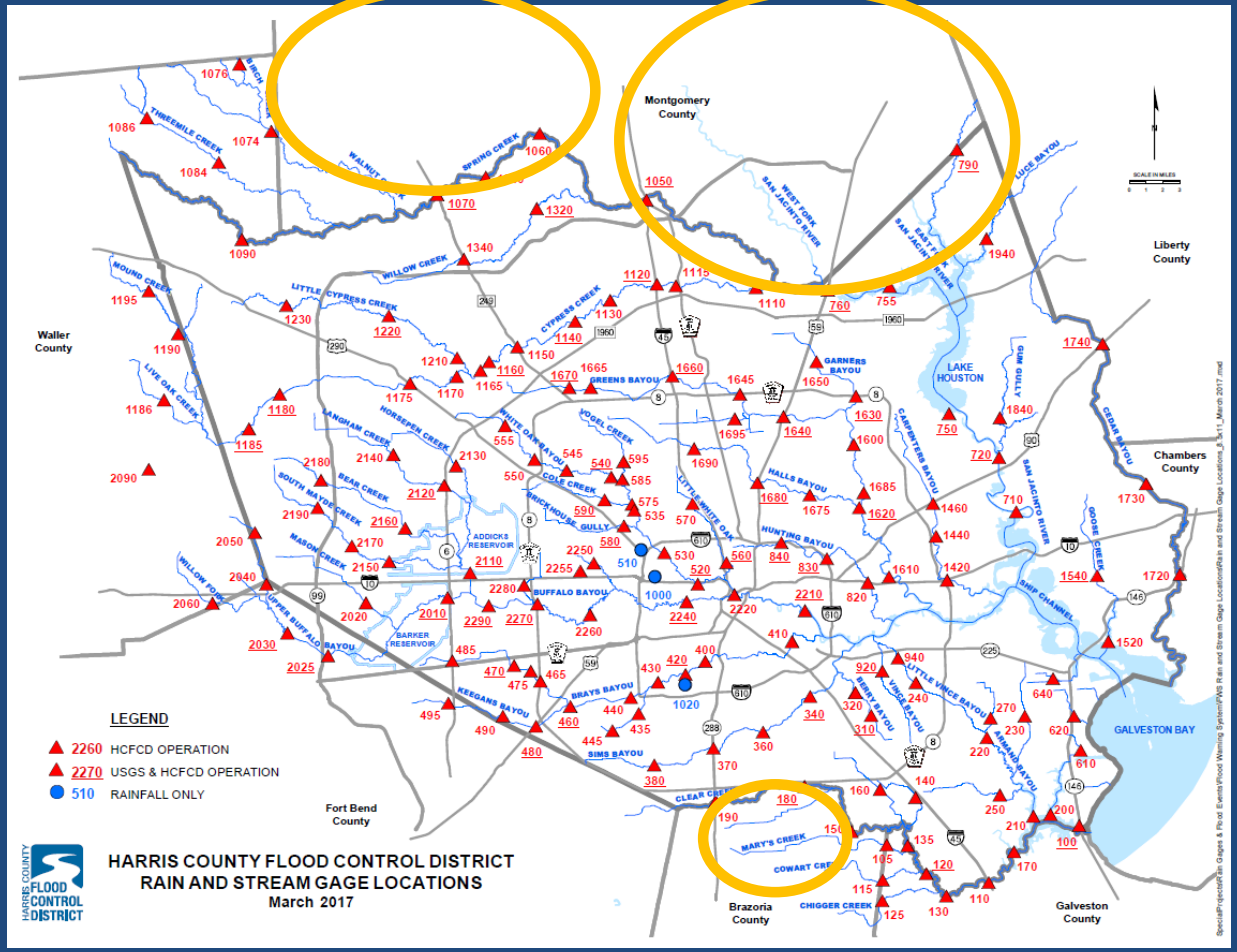
Future Enhancements

- Near real time inundation mapping
- Public customizable alarms
  - Rainfall and stage
  - Text or e-mail
- Expansion of FWS gages (Regional)
- Add roadway flooding (TranStar)

Inundation Mapping



Gage Network Expansion



Important Information Sources

- Harris County Flood Control District
- City of Houston
- Harris County Office of Emergency Management
- Fort Bend County Office of Emergency Management
- Fort Bend County Drainage District
- National Weather Service
- U.S. Army Corps of Engineers

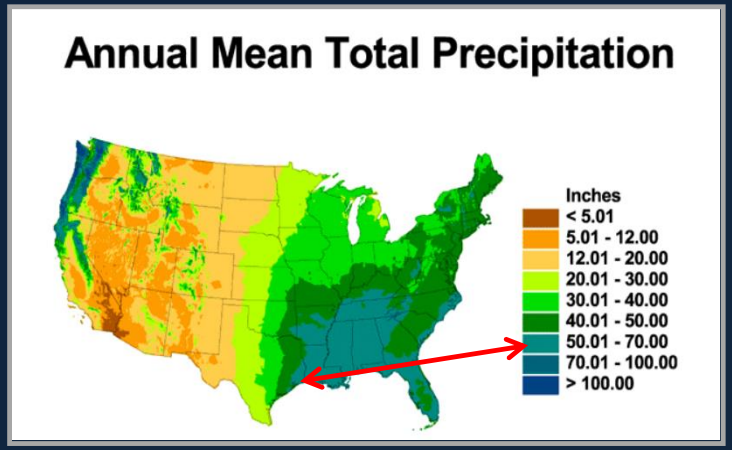
Important Twitter Handles

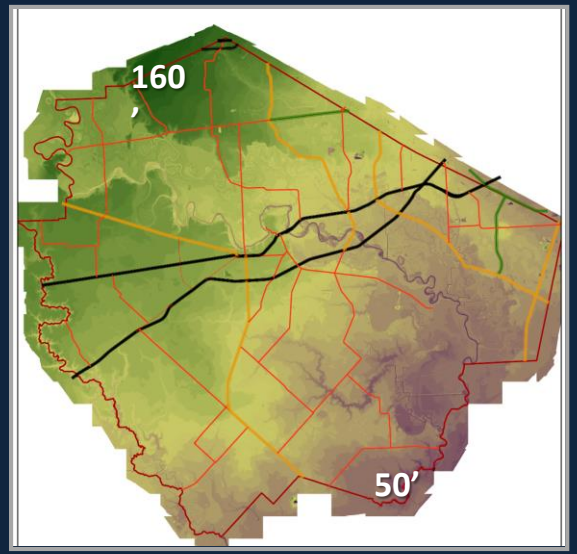
@hcfcd
@readyharris
@houstonOEM
@nwshouston
@jefflindner1

National Weather Service – FloodWarn

Fort Bend County Drainage District

November 7, 2018





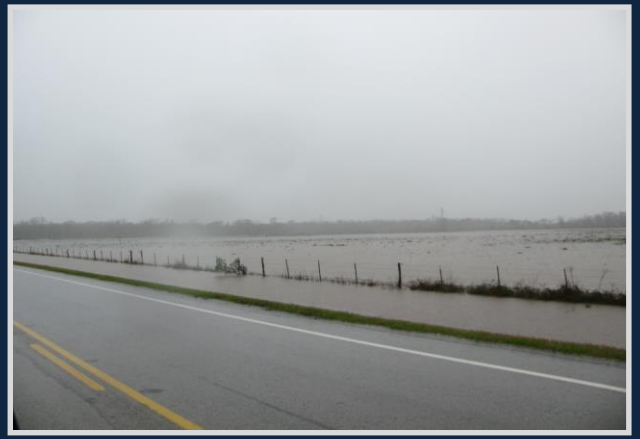
NATURAL CONDITIONS WITHIN FORT BEND COUNTY:

Very high precipitation totals

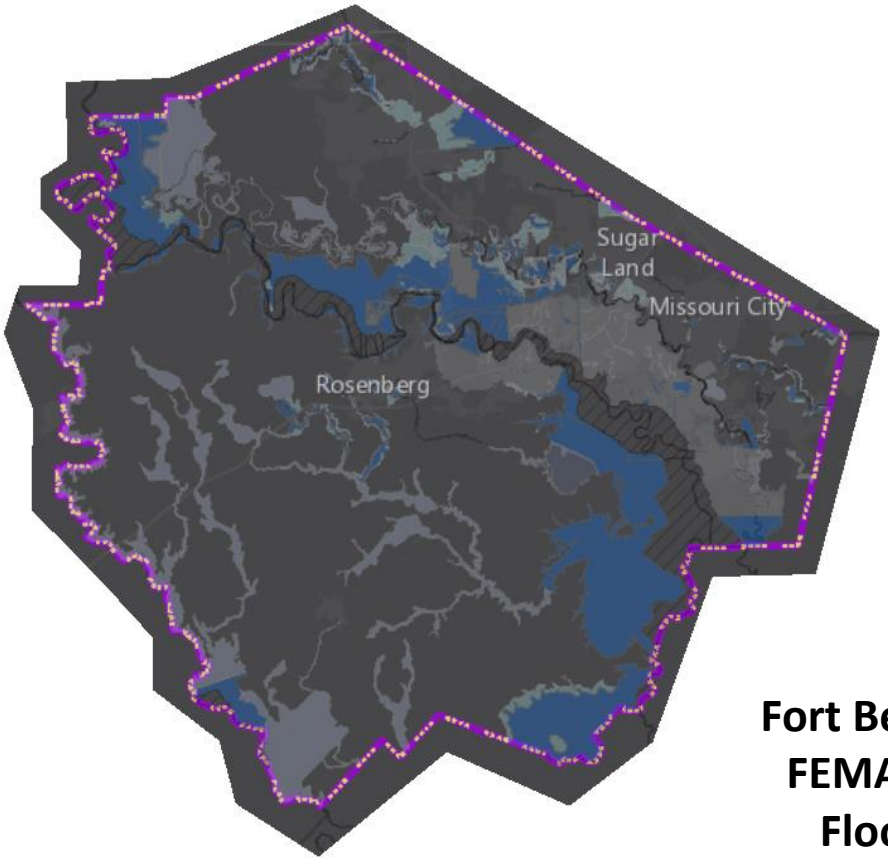
Relatively flat natural ground

(Predominately drains in a NW to SE direction. Highest natural ground is west of Katy at approximately 160' above m.s.l. Lowest is near Brazos Bend State Park and approximately 50' above m.s.l.)

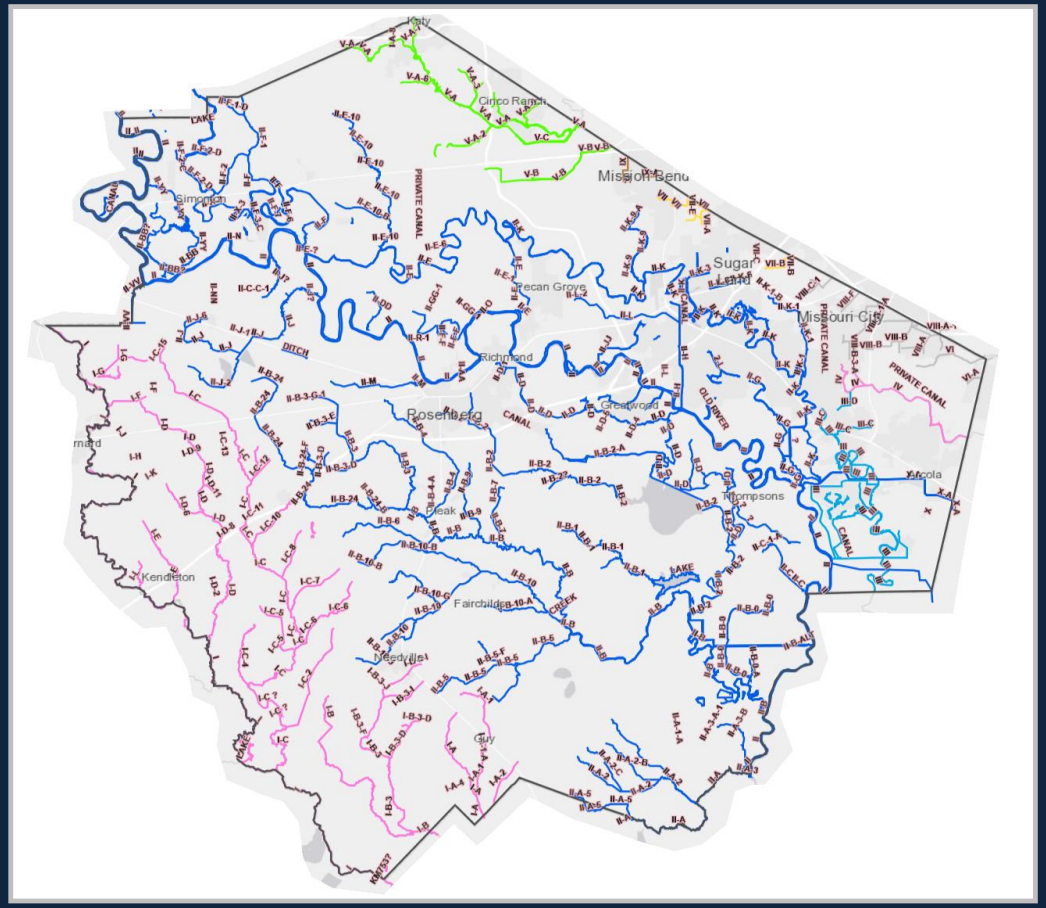
Predominately clay soils produce greater runoff



Fort Bend County – Examples of Flooding on Undeveloped Tracts during Local Rainfall Events



Fort Bend County
FEMA Mapped
Floodplains



Fort Bend County Major Streams & Drainage Channels

San Bernard River

- Mound Creek
  - Guy Creek
- Cedar Creek
  - Buffalo Creek
- Snake Creek
  - Moody Creek
- Turkey Creek
  - Dry Branch
- Means Ditch
- East Bernard Ditch
- Jackson Ditch
- San Bernard Lateral I-J
- Oldag Ditch

Brazos River

- Cow Creek
  - Bee Creek
  - Turkey Creek
  - Hoggs Bayou
  - Parrot Creek
  - Cow Creek Lat. II-A-5
- Big Creek
  - Waters Lake Bayou
  - Dutch John Creek
  - Dry Creek
  - Gapps Slough
  - Theatre Ditch
  - Coon Creek

Brazos River (cont.)

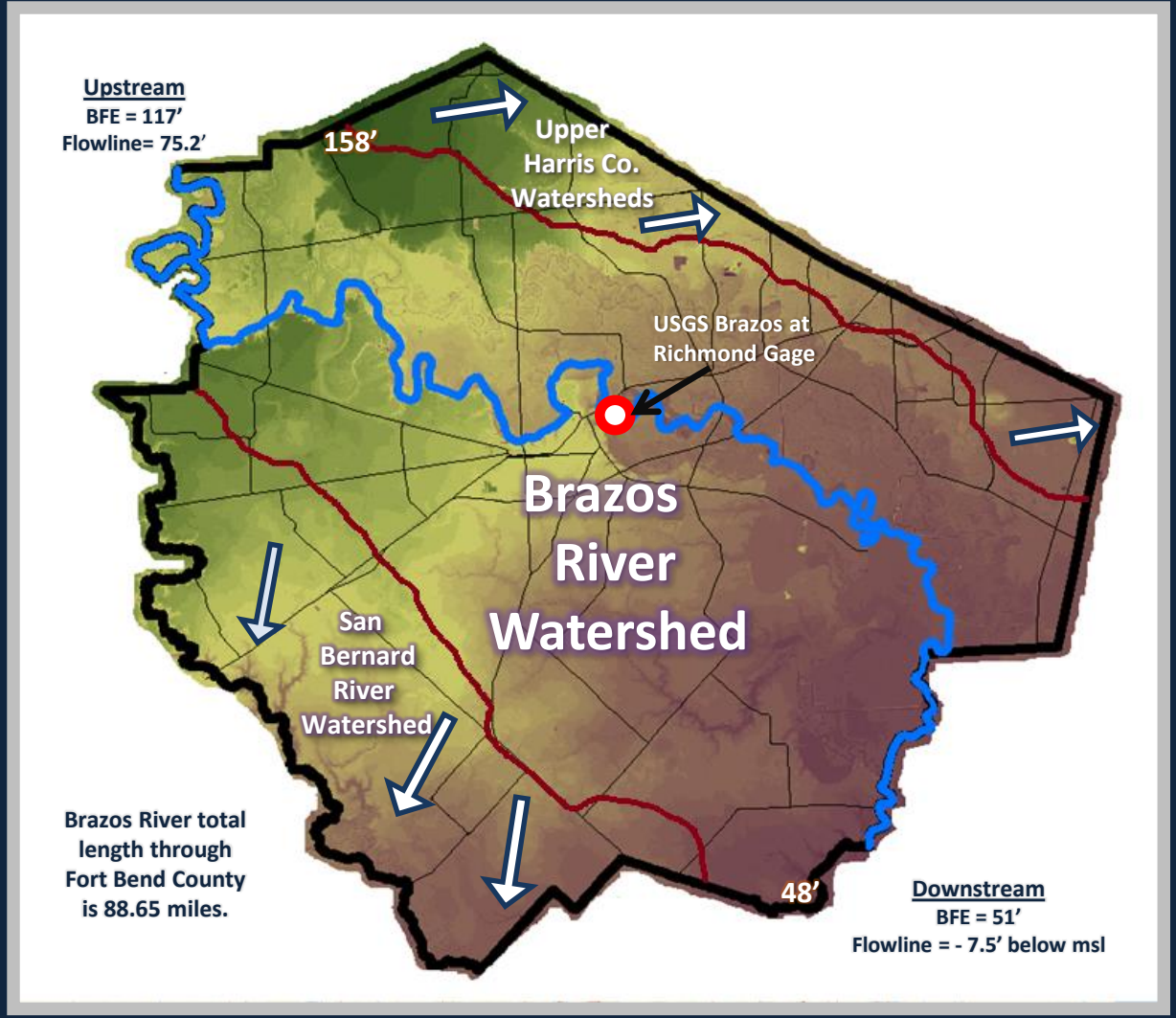
- Big Creek (cont.)
  - Waters Lake Bayou
  - Dutch John Creek
  - Dry Creek
  - Gapps Slough
  - Theatre Ditch
  - Coon Creek
  - Seabourne Creek
  - Deer Creek
  - Big Creek Lat. II-B-7
  - Big Creek Lat. II-B-9
  - Fairchilds Creek
  - Cottonwood Creek
- Rabbs Bayou
  - Middle Bayou
  - Tara Lateral
- Jones Creek
  - Andrus Creek
  - Rosenbush Ditch
  - Flewellen Creek
  - Jones Lateral II-E-1
  - Brynmawr Lateral
  - Woods Edge Lateral
- Fulshear Creek
  - Brookshire Creek
  - Hady Creek
  - Orchard Creek
  - Pool Hill Ditch
- Steepbank Creek
- Ditch H
- Duval Ditch
- Flat Bank Creek
- Bullhead Slough

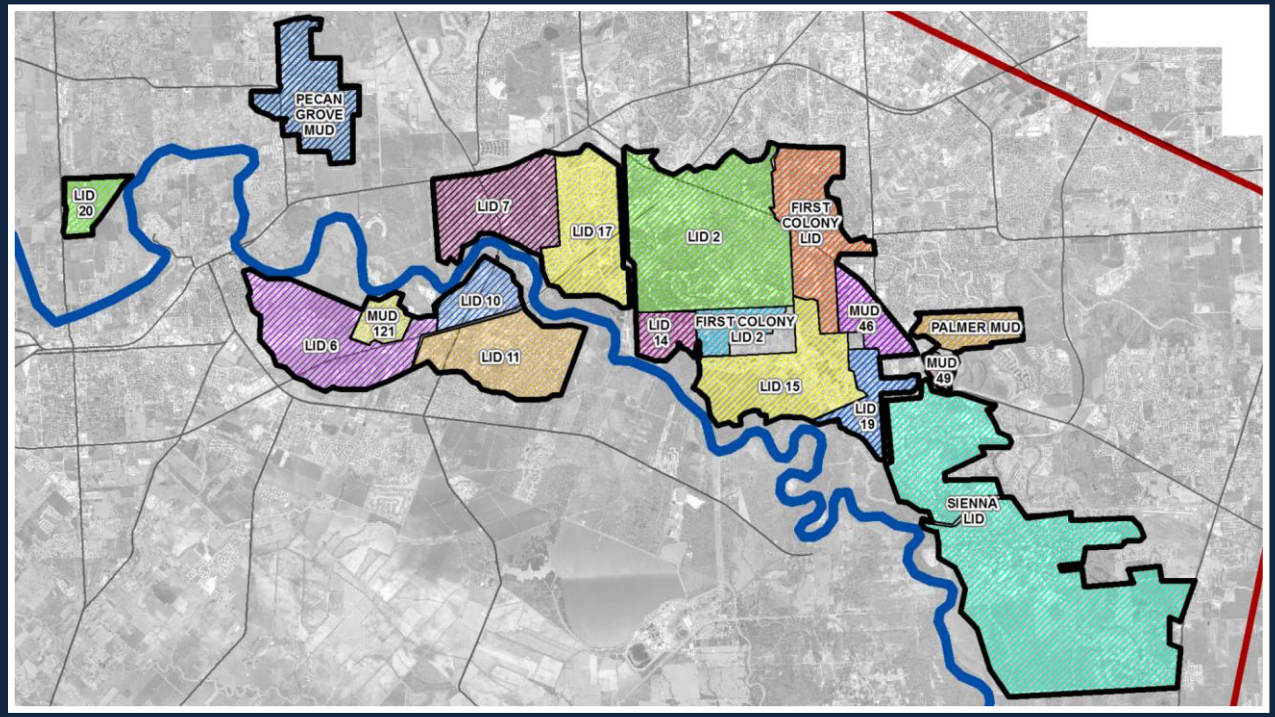
Brazos River (cont.)

- Upper/Middle/Lower Oyster Creek
  - Stafford Run
  - Red Gulley
- Robinowitz Ditch
- Fulshear Farms Ditch
- Pleasant Gulley
- Guyler Ditch
- Moore Gulley
- Sugarland Ditch
- Briscoe Ditch
- Aylor Ditch
- Schuech Ditch
- County Line Ditch
- West Simonton Ditch
- Brazos Lateral II-0

Upper Harris/Brazoria

- Mustang Bayou
- Willow Fork of Buffalo Bayou
  - Cane Island Branch
  - Little Prong Creek
  - Willow Fork Lateral V-A-3
  - Cinco Ranch Ditch
- Long Point Slough / Clodine Ditch
- Clear Creek
- Keegans Bayou
- Sims Bayou
  - Cangelosi Ditch
- Brays Bayou

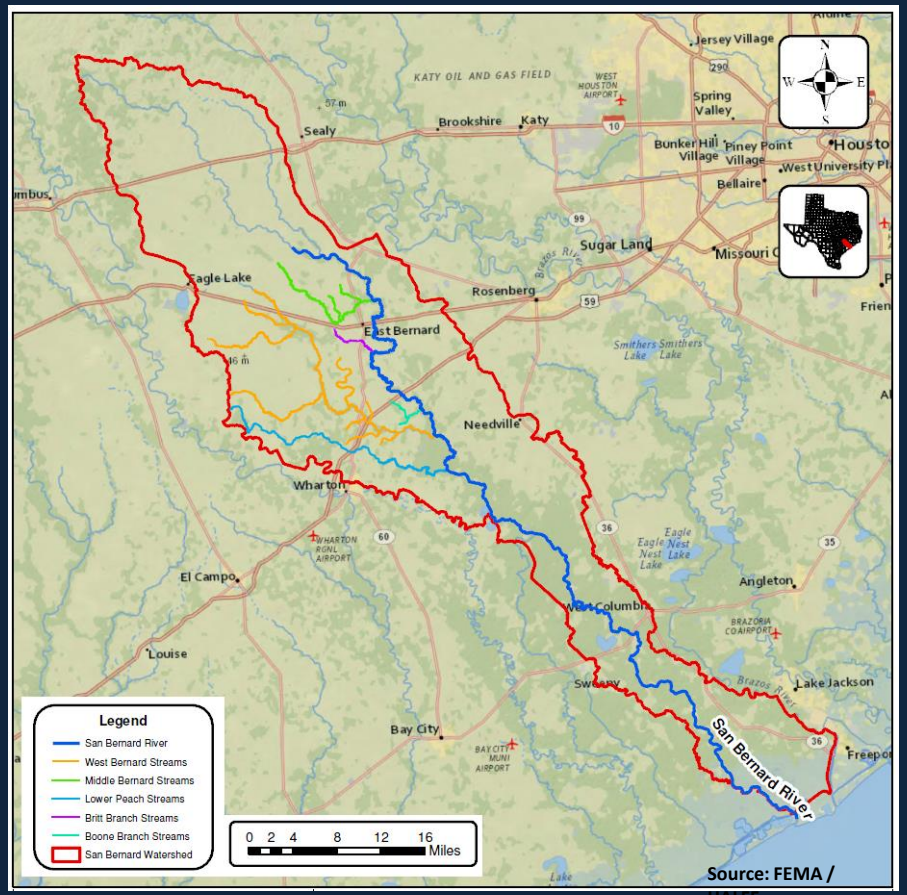

Upstream
BFE = 117'
Flowline= 75.2'
158'
Upper
Harris Co.
Watersheds
USGS Brazos at
Richmond Gage
Brazos
River
Watershed
San
Bernard
River
Watershed
Brazos River total
length through
Fort Bend County
is 88.65 miles.
48'
Downstream
BFE = 51'
Flowline = - 7.5' below msl



FORT BEND COUNTY LEVEES:

- 20 Individual Districts
- Appx. 100 miles of Levees
- Appx. 180,000 Residents
- Appx. $20 Billion in Taxable Value

SAN BERNARD RIVER



Headwaters located north of I-10 between Sealy & Columbus

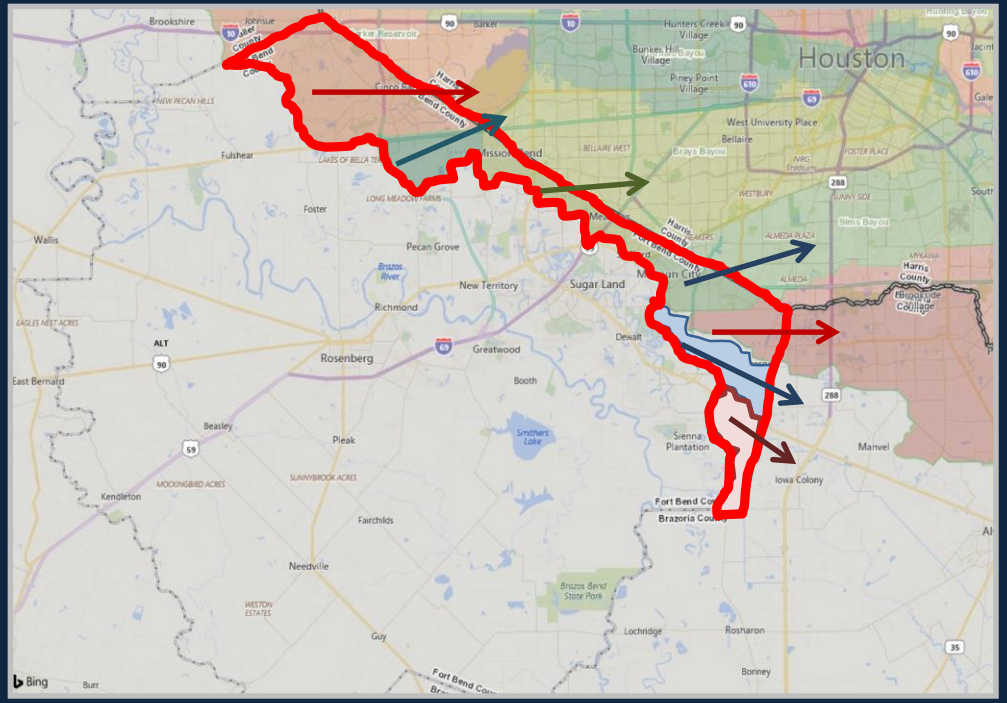
Approximately 20% of Fort Bend County drains into the San Bernard River

Subject to overflows from the Colorado River near Wharton

<u>Major Flood Events:</u>
June 1960
November 1998
Hurricane Harvey (Aug. 2018)

<u>On-Line Flood Gages:</u>
Chesterville at FM 3013
East Bernard at SH90A
Boling at FM442

UPPER HARRIS / BRAZORIA CO.



Willow Fork of Buffalo Bayou/Barker Reservoir **Long Point Slough/Clodine Ditch**

Brays Bayou **Keegans Bayou** **Sims Bayou**

Clear Creek **Chocolate Bayou** **Mustang Bayou**

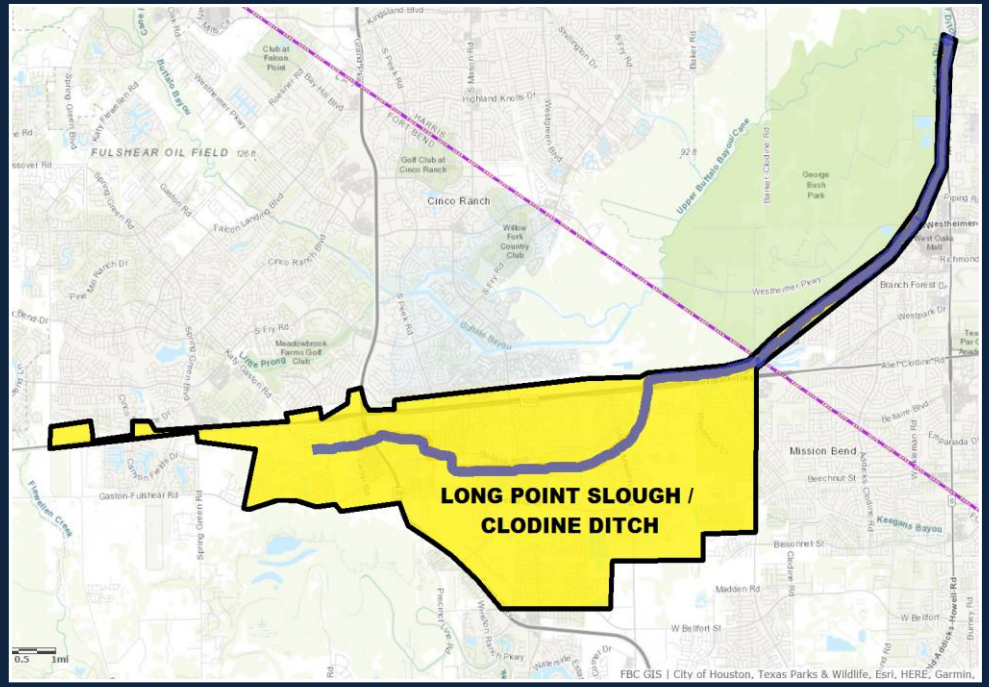
Approximately 15% of Fort Bend drains east into Harris and Brazoria County watersheds

Barker Reservoir owned and operated by US Army Corps of Engineers

Developed/urban watersheds within Houston, Stafford, Missouri City, Arcola city limits

On-Line Flood Gages available at HCFCD Flood Warning Website: **www.harriscountyfws.org**

LONG POINT SLOUGH / CLODINE DITCH



Total Watershed =
9,469 acres
(appx. 2% of FBC)

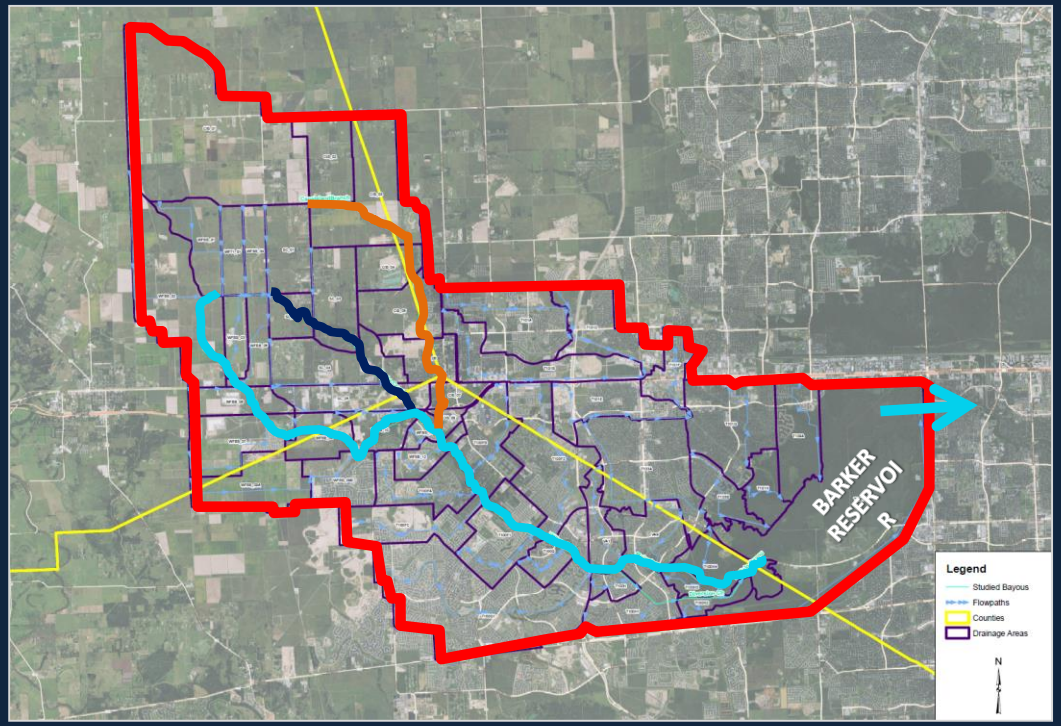
Long Point Slough headwaters is within Lakes of Bella Terra (SW of FM 1093 & Grand Parkway)

Transitions to Clodine Ditch near FM 1093 and runs alongside Barker Reservoir until confluence with Buffalo Bayou near SH6

Total Length = 11.8 miles

<u>Major Developments:</u>
Lakes of Bella Terra
Lakemont
Long Meadow Farms (N)
Grand Mission
Waterview/Fieldstone
Big Oaks MUD

WILLOW FORK OF BUFFALO BAYOU



Total Watershed = 82,432 acres

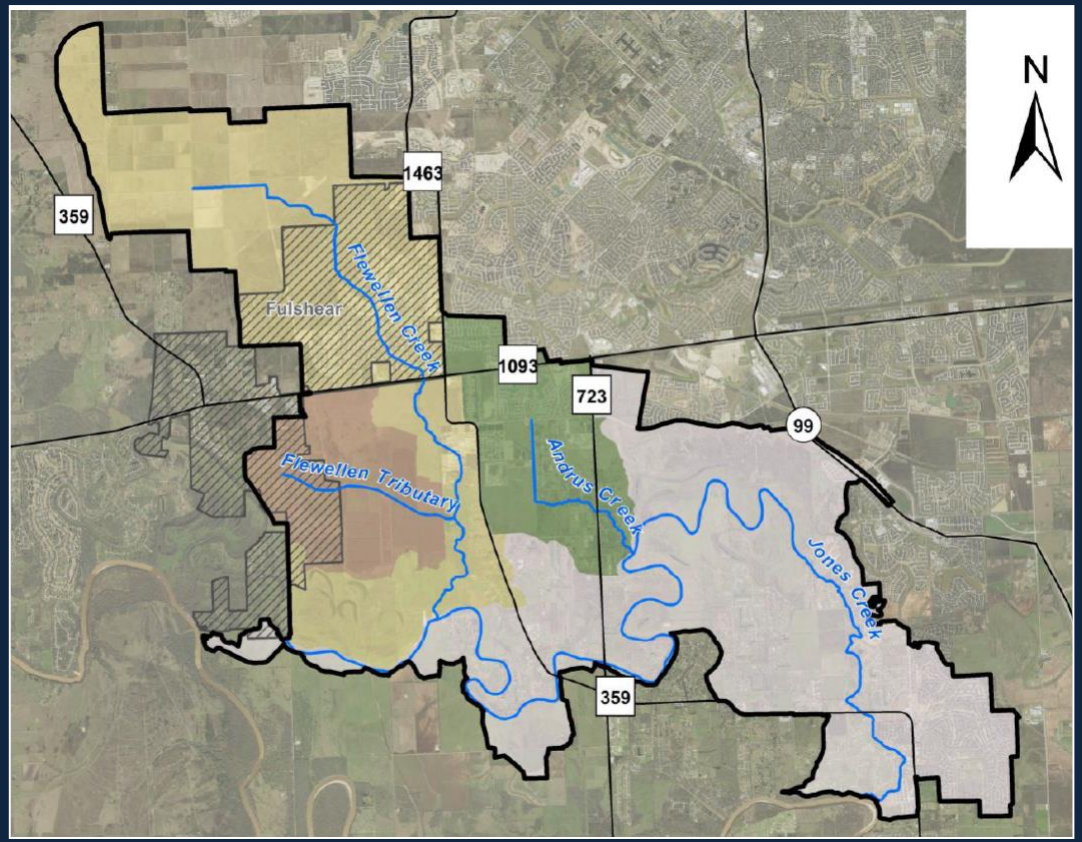
Appx. 1/3rd of total watershed (27,520 acres) lies within FBC

3 Major Laterals come together at the upper end of Fort Bend (WFBB, Snake Creek, & Cane Island Branch)

All flows routed through Barker Reservoir

<u>Major Developments:</u>
City of Katy
Firethorne
Pine Mill Ranch
Grayson Lakes
Seven Meadows
Grand Lakes
Cinco Ranch
Kelliwood
Canyon Gate

FLEWELLEN & JONES CREEK



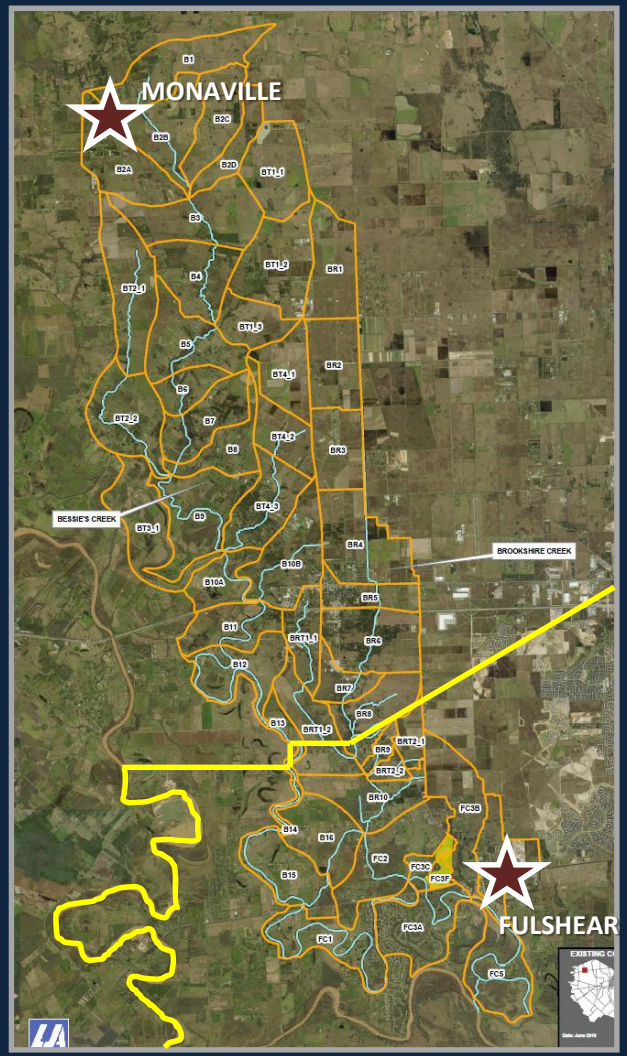
Total Watershed = 31,500 acres (appx. 6% of FBC)

Flewellen Creek is a major lateral and contributes approximately half the drainage area

Jones Creek enters the Brazos just upstream of Richmond

<u>Major Developments:</u>

Cross Creek Ranch
Tamarron
Briscoe Falls
Sendero
Creekside Ranch
Westheimer Lakes
Rolling Oaks
Woods Edge



BESSIE'S CREEK

Total Watershed = 67,584 acres
(appx. 12% of FBC)

Headwaters is located within
Waller County near Monaville

Total length of the main stem
of Bessie's Creek is appx. 45 miles

Brookshire Creek is a major lateral
channel contributing flows

FBCDD refers to lower end of
Bessie's Creek as Fulshear Creek

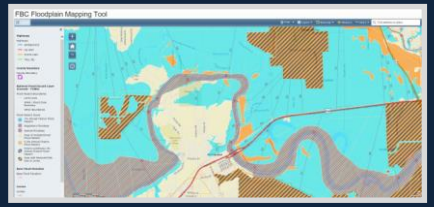
Confluence with the Brazos River
near Bois D'arc Ln & Winner Foster Rd.

<u>Major Fort Bend Developments:</u>
Cities of Fulshear & Simonton
Weston Lakes
Fulbrook
Fulbrook on Fulshear Creek
Proposed Twinwood Development

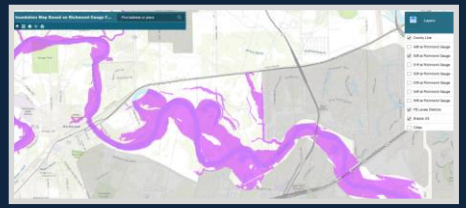
LOCAL RESOURCES:

www.fortbendcountytx.gov

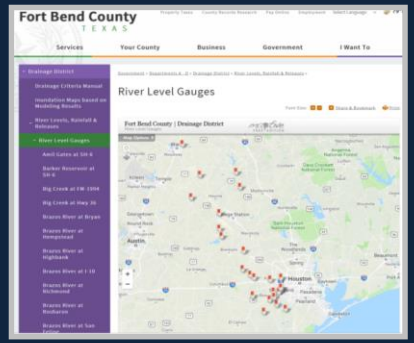
/government/departments/county-services/drainage-district



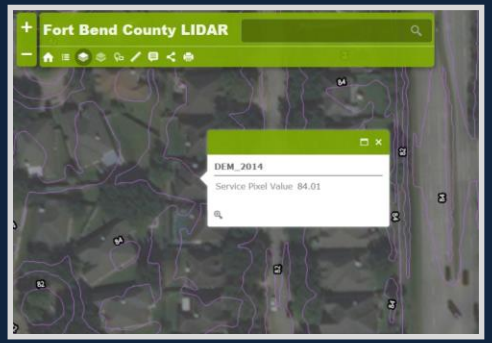
Floodplain Maps



Inundation Mapping (Brazos & Barker)



Links to Flood Gages

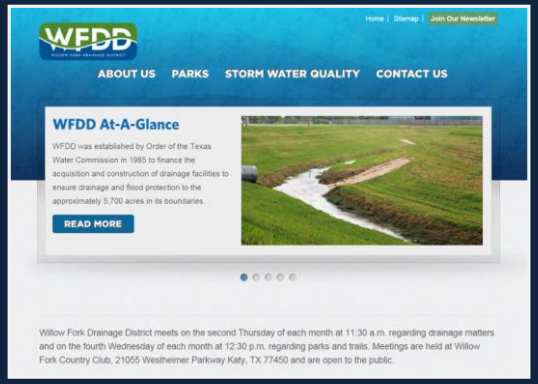


LiDAR Topographic Data

Search Levee Contacts

LOCAL RESOURCES:

City Resources



LID/MUD/WFDD Resources

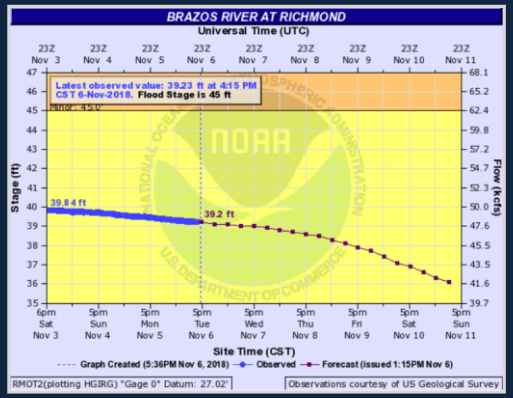
FORT BEND COUNTY OEM

FORT BEND COUNTY OFFICE OF EMERGENCY MANAGEMENT

WEBSITE: www.fbcoem.org

TWITTER: @fbcoem

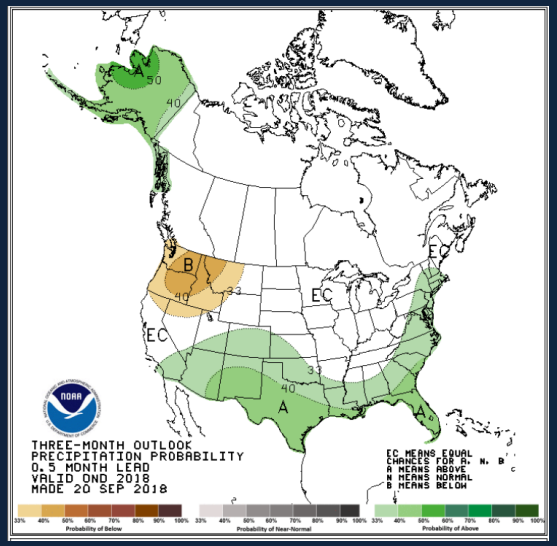
In closing…



We're monitoring river levels…

NWS Total Observed Precipitation at Sugar Land Regional Airport (January - September)	
YEAR	INCHES
2015	56.02
2016	50.40
2017	68.00
2018	32.56

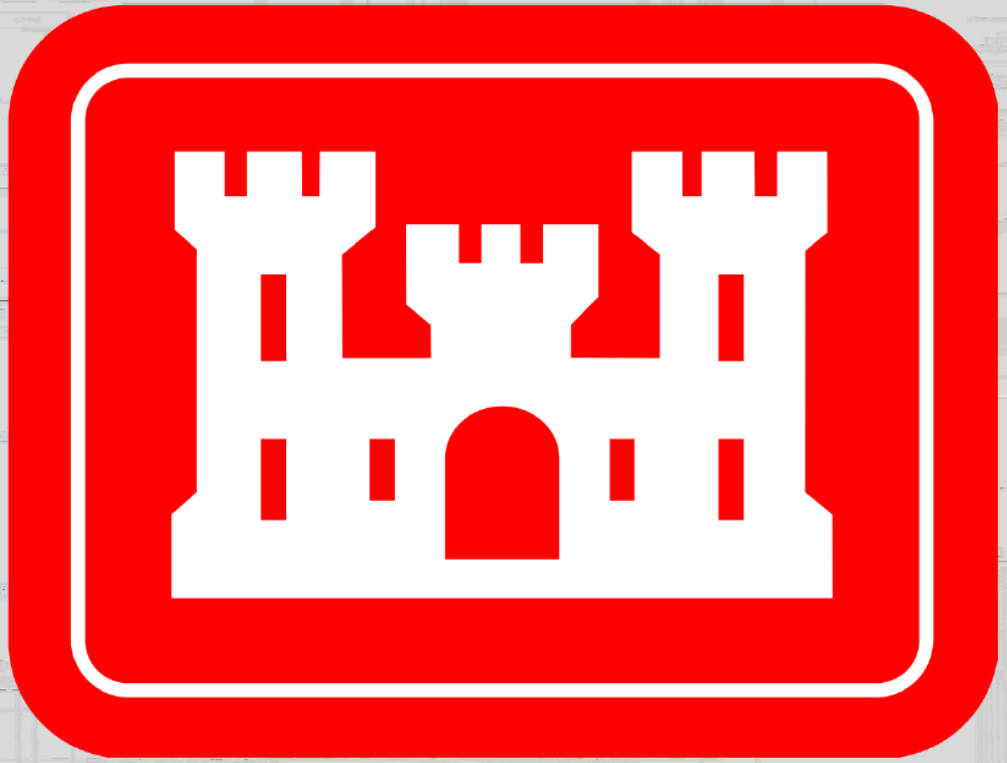
…so far 2018 has been manageable…



…but always keeping an eye on what's ahead!

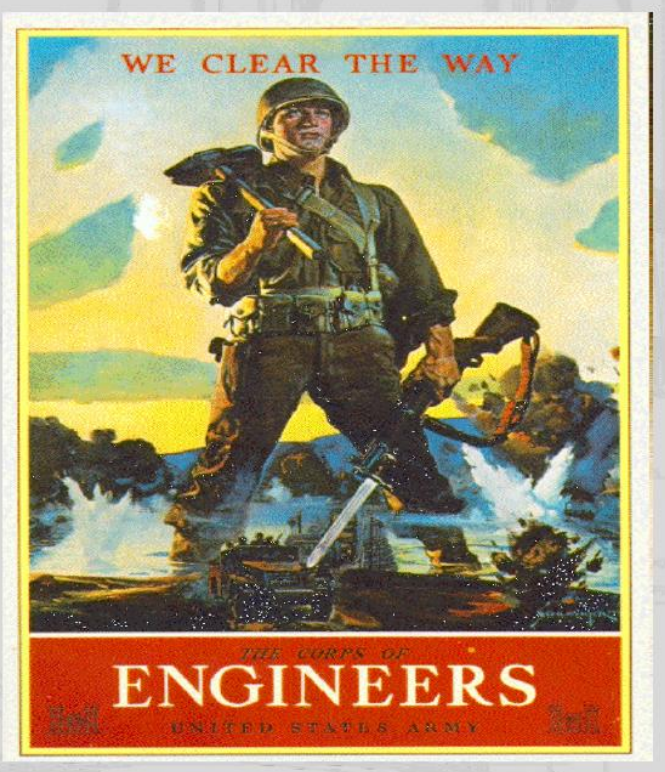
JEFFREY T. JANECEK, P.E.
FORT BEND COUNTY DRAINAGE DISTRICT
jeffrey.janecek@fortbendcountytx.gov

U.S. ARMY CORPS OF ENGINEERS



US Army Corps of Engineers ®

U.S.ARMY



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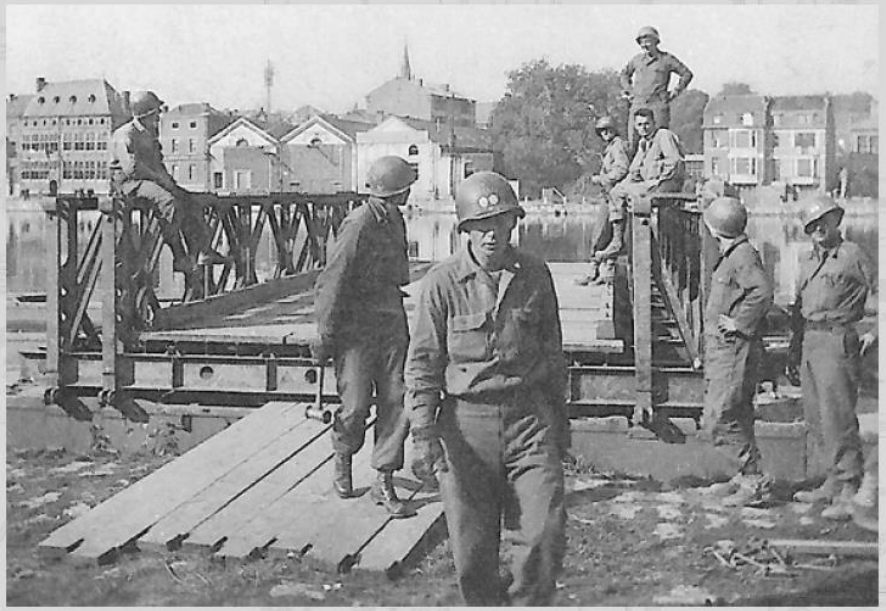

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CIVIL WORKS

Responsibilities

- Plan
- Design
- Construct
- Operate
- Maintain

US Army Corps of Engineers ®

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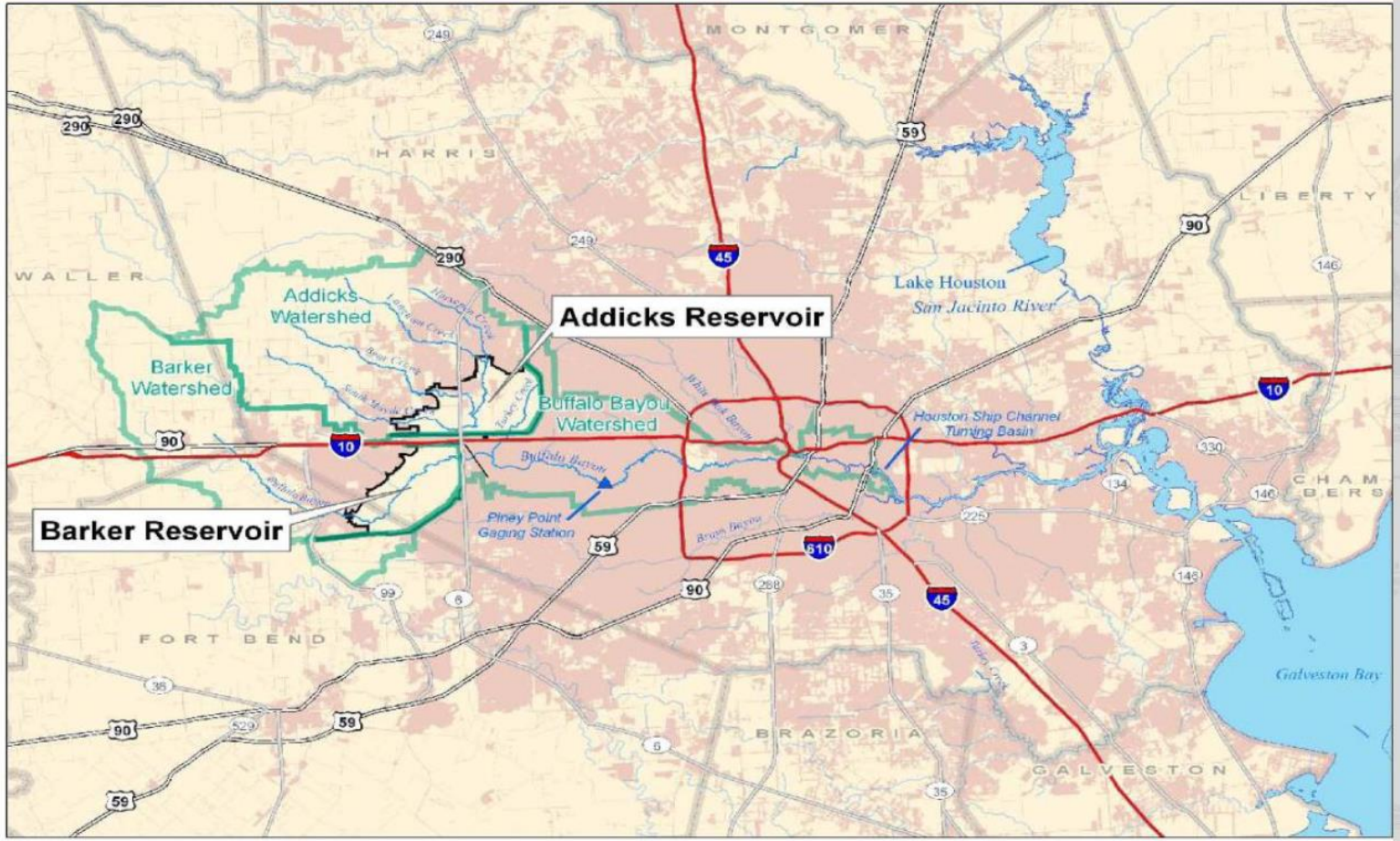
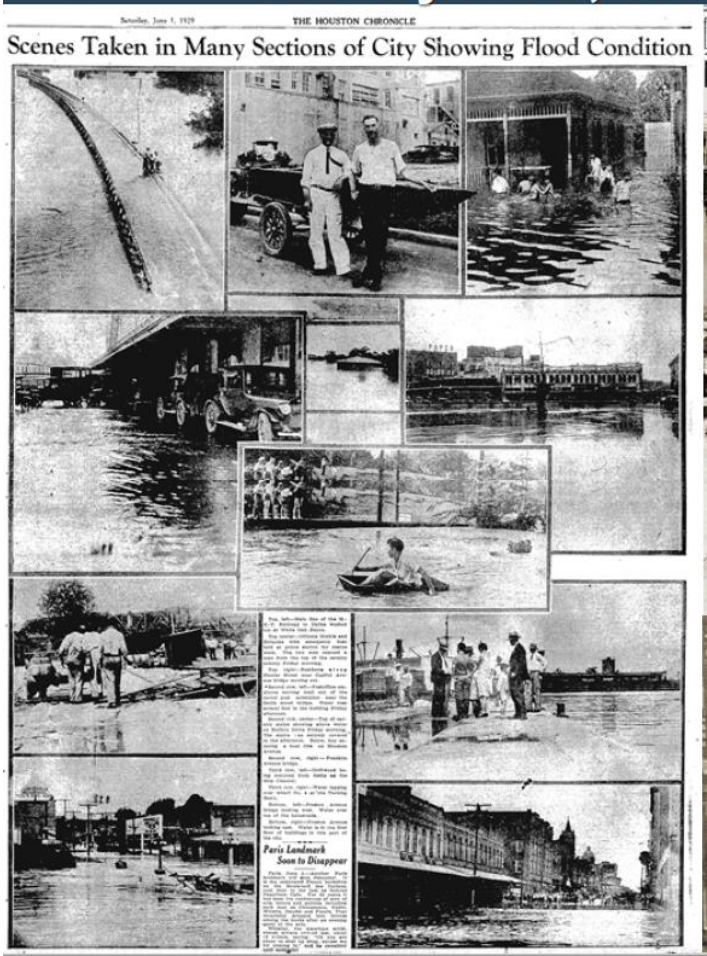
ADDICKS, BARKER AND BUFFALO BAYOU WATERSHEDS

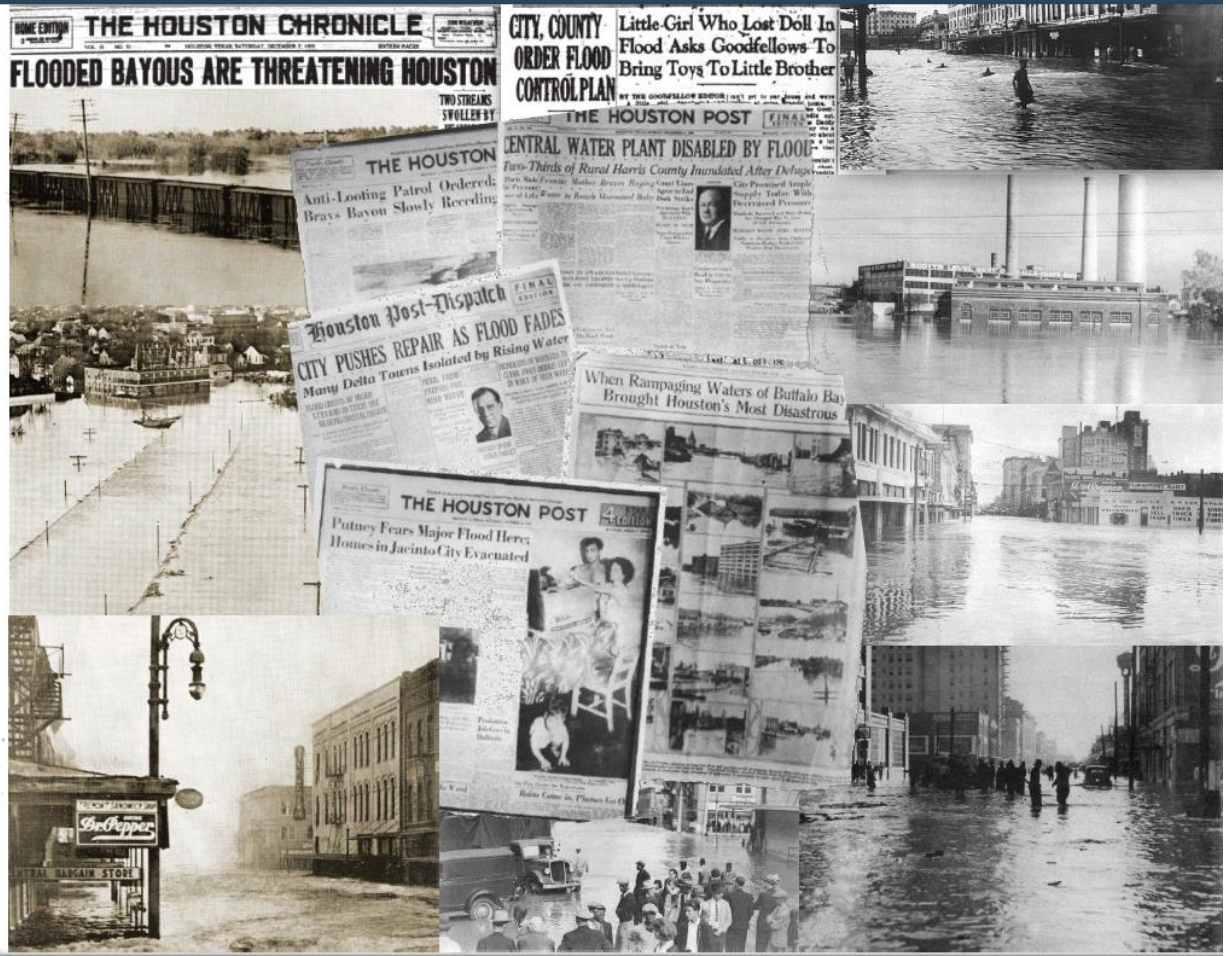


Early Houston Floods
31 May 1929, 1-2 June 1929 and 7-10 December 1935


Saturday, June 1, 1929 THE HOUSTON CHRONICLE

Scenes Taken in Many Sections of City Showing Flood Condition

Paris Landmark Soon to Disappear


THE HOUSTON CHRONICLE

FLOODED BAYOUS ARE THREATENING HOUSTON

TWO STREAMS SWOLLEN BY

THE HOUSTON

Anti-Looting Patrol Ordered; Brays Bayou Slowly Receding

Houston Post-Dispatch

CITY PUSHES REPAIR AS FLOOD FADES

Many Delta Towns Isolated by Rising Water

CITY, COUNTY ORDER FLOOD CONTROL PLAN

Little Girl Who Lost Doll In Flood Asks Goodfellows To Bring Toys To Little Brother

THE HOUSTON POST

CENTRAL WATER PLANT DISABLED BY FLOOD

Two-Thirds of Rural Harris County Inundated After Deluge

When Rampaging Waters of Buffalo Bay Brought Houston's Most Disastrous

THE HOUSTON POST

Putney Fears Major Flood Here; Homes in Jacinto City Evacuated

Dr Pepper

CENTRAL BARGAIN STORE

Construction of Addicks and Barker Dams 1942-1948











US Army Corps of Engineers ®

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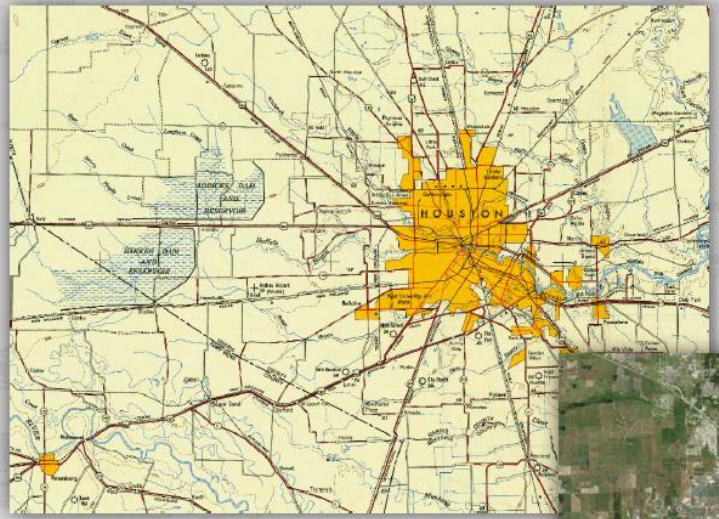
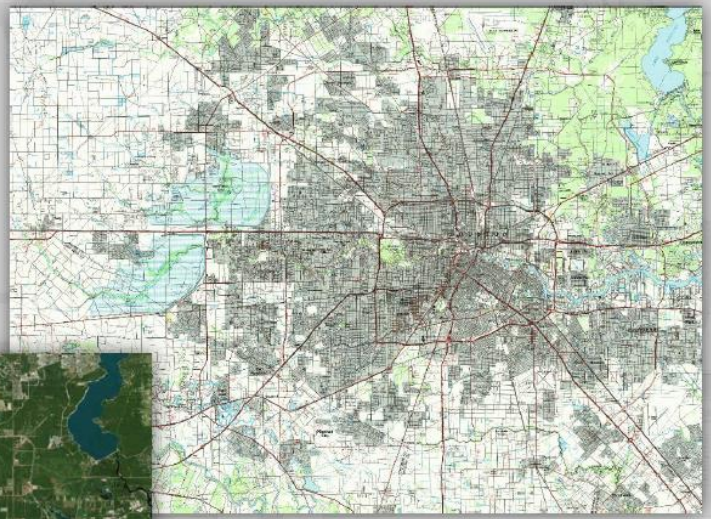
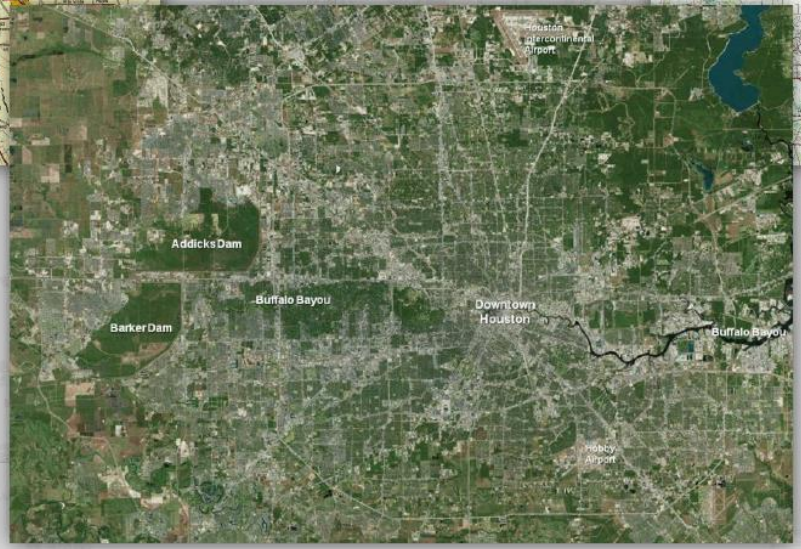
Houston 1950, 1992, 2016







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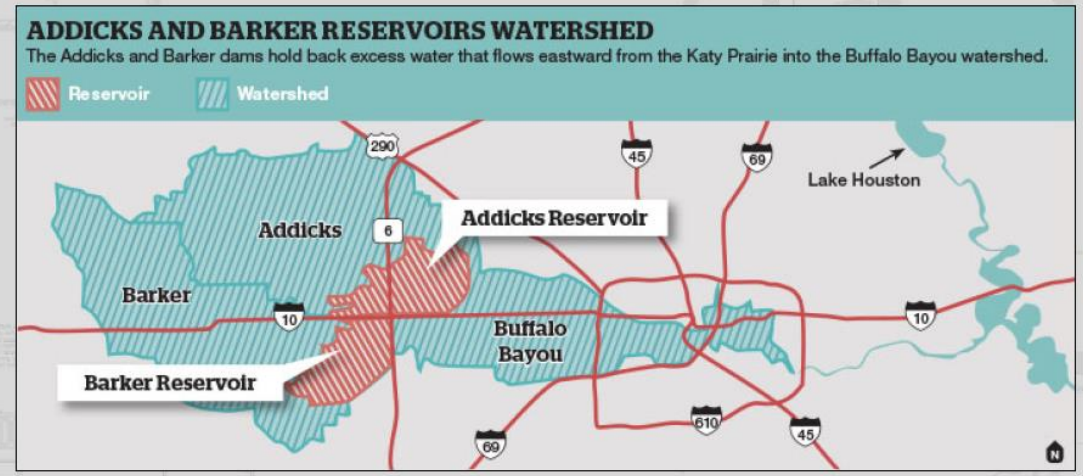
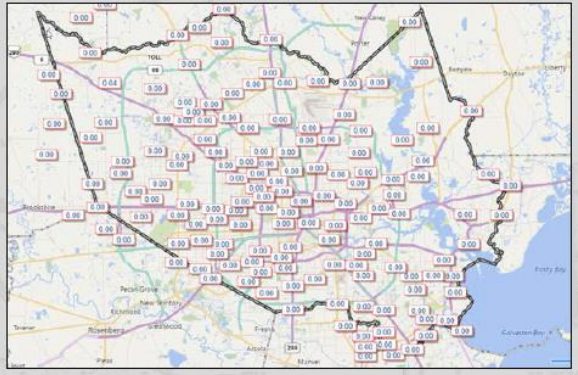
So How Do We Work?





Mission

- Reduce the risk of flooding downstream on Buffalo Bayou in order to protect Houston and the Houston Ship Channel.

Important Numbers

- All rain after 2" is 100% runoff
- Buffalo Bayou is managed at 2000 CFS at the Piney Point USGS Gauge
- Water takes 8 hours to travel from the gates to Piney Point Gauge

When to Close the Gates?

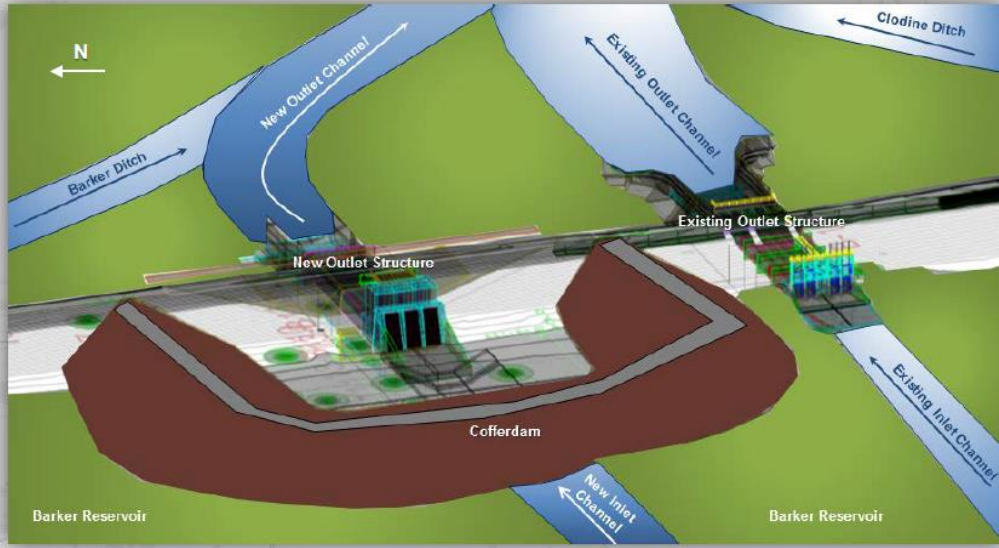
- Whenever the threat of downstream flooding is imminent!
- Usually this means anything over 2" of rain upstream of the dams, and/or 1" below the dam falls.

HARRIS COUNTY FWS FLOOD WARNING SYSTEM

US Army Corps of Engineers ®

U.S.ARMY

Barker Dams New Outlet Structure



Approved Plan Consist of the Construction of A New

- Outlet Structure
- Parabolic Spillway
- Stilling Basin
- Outlet Channel
- Grouting & Abandoning the Existing Outlet Structure in Place

New Outlet Structure

- Located within Existing Dam Embankment
- Approximately 400 Feet North from Existing Outlet Structure
- Three 12-ft Diameter Steel Lined Conduits
- 12X12-ft Rectangular Steel Gates at the Intakes

Noble Road Cut-off Wall

- 1,400-ft long cement bentonite slurry cut-off wall
- Located along upstream embankment at Noble Road
- Will Address Seepage Issues at this Location

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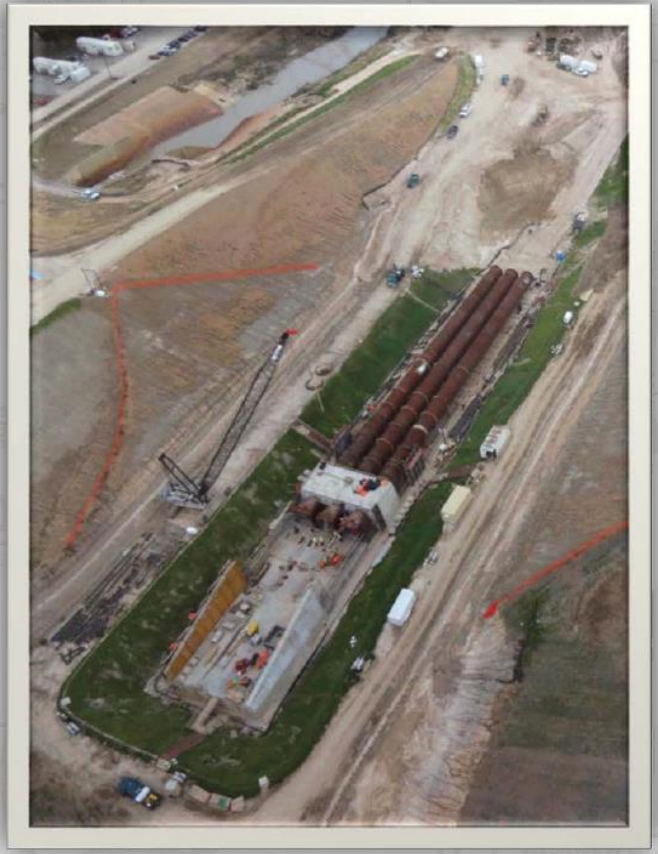

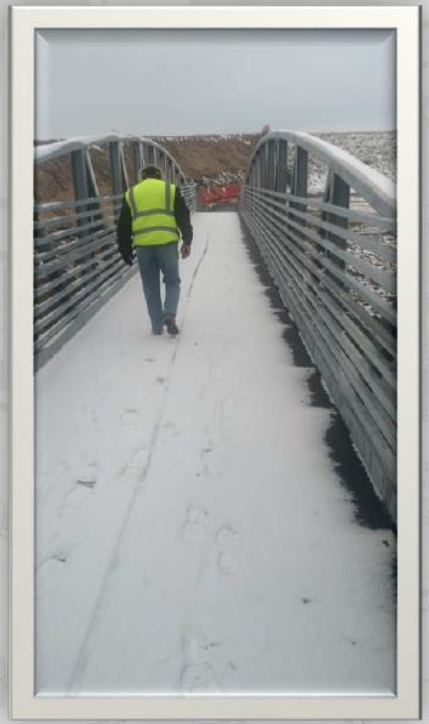

SIGNIFICANT EVENTS

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Buffalo Bayou and Tributaries Resiliency Study, TX

Authorization: Section 216 of Flood Control Act of 1970

Purpose: Flood Risk Management (FRM)

Phase: Feasibility

Non-Federal Sponsor: Harris County Flood Control District

BBA18 Funding: $6M

Scope: Address residual risks associated with flood risk impacts to structures in the pool area upstream of both reservoirs and downstream along Buffalo Bayou

Potential FRM Measures:

- Additional reservoir/dam
- Increased reservoir storage capacity
- Reservoir water level equalization
- Improved outlet discharge capacity
- Improved inflow and outlet discharge channels
- Acquisition of flowage easements and buyouts
- Changes in dam operation plan
- Harris County may develop ways to better inform residents of their risks

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RECREATIONAL OPPORTUNITIES AT ADDICKS AND BARKER RESERVOIRS

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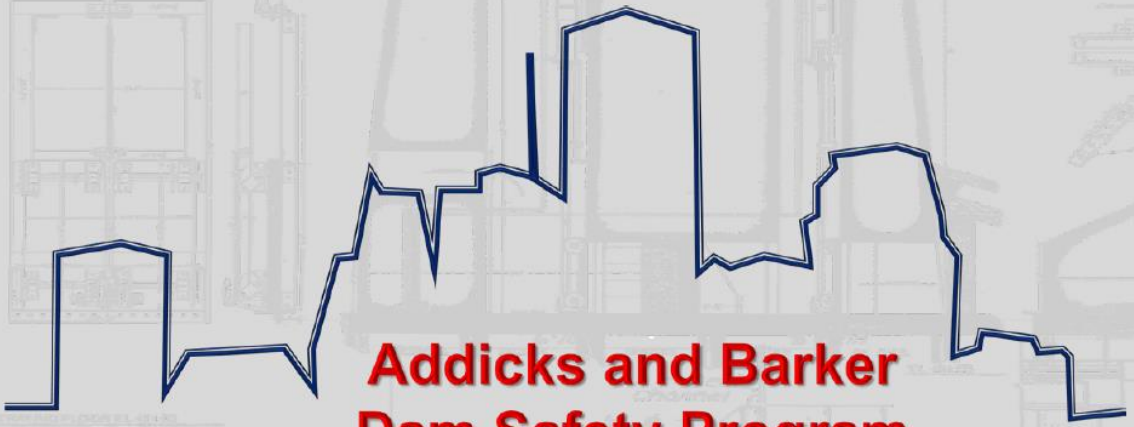
Questions



Addicks and Barker
Dam Safety Program

Thank You

Addicks and Barker
Dam Safety Program

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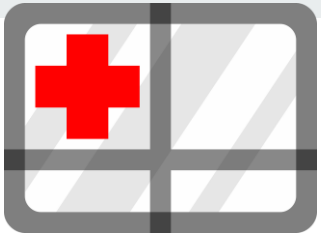
Flood Safety

What to do before, during, and after a flood?

Safety Before a Flood



- Prepare a family disaster plan.
- Check if your insurance covers flood damages. If not, get flood insurance.
- Keep insurance and other important documents, such as copies of driver's licenses and credit cards, and other valuable items, in a safe deposit box.
- Assemble a disaster supplies kit. Be sure to include prescription medications, food, and water.
- Find out where you can go if ordered to evacuate.
- Arrange to keep in contact with relatives and friends.
- Know your resources.

Knowing what to do when a flood occurs will increase your family’s safety and possibly its survival.

Safety During a Flash Flood

- Turn around, don’t drown when encountering flooded roads.
- Be especially cautious at night when it is harder to recognize the dangers of flooding.
- Stay away or be swept away. River banks and culverts can become unstable and unsafe.
- You should monitor the latest forecasts and be prepared to take action should additional Flash Flood Warnings be issued.
- Have multiple ways to receive weather information (cell phone, NOAA weather radio, television, etc.)

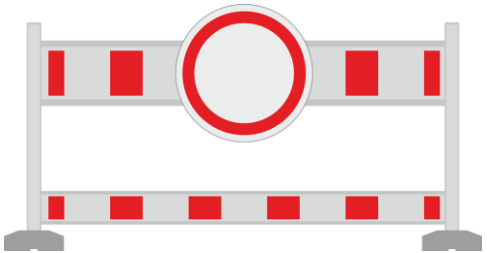
Turn Around, Don't Drown!

- Most flood deaths occur in vehicles.
- It only takes six inches of water for a vehicle to lose contact with the road surface.
- Most vehicles can be swept away in just 18 to 24 inches of water!
- Don't Rely on Your Big Vehicles
- Flooded roads may have hidden dangers, such as washed out road beds or underwater obstructions.
- If your vehicle is caught in rising water, leave it immediately and seek higher ground.

Minnesota road damaged by flood waters, courtesy of FEMA.

Safety During a Flood

- Do not sightsee!
- Evacuations are ongoing and first responders are working hard to get people to safety. Do not get in their way!
- Flood waters from creeks, bayous and rivers will be swiftly moving. *Do not go near the flood waters!* They will sweep you away if you go in the water.
- Stay out of the flood waters!
- Roads may still be closed as they could be damaged or still under water. Barricades are for your protection; do not drive around them!



Safety After a Flood

- Don’t put yourself in danger.
- Return home only when authorities indicate it is safe.
- Use extreme caution when entering buildings
- Cut power to flooded areas of your home
- Only use generators in well-ventilated areas – **Not** in a closed garage!)
- Do not use power tools while standing in water
- If you smell or hear gas, call the Fire Department.

weather.gov/flood

Report Flooding

What to Report

Flash Flooding

- Underpasses filling with water
- Impassible roadways
- Any fast-moving water greater than 6 inches in depth

Any River or Bayou Flooding

Flooding, Washington County (2016)

Formatting Reports

Reports should include the following information:

WHO is calling

WHERE the flooding is located

WHAT type of flooding is occurring (flash, river, or bayou)

WHEN the flooding occurred (is it ongoing?)

HOW deep is the water (if you can *safely* evaluate this)

The Good

"I'm a storm spotter located in Sealy at the intersection of Meyer and FM 2187. Water is flowing over curbs; it's at least 6-8 inches deep in some locations on the road."

The Bad

"Hey, we got some flooding here a few minutes ago!"

The Ugly

"My sister-in-law said the bayou got really closer to her house, did you have a warning out for that?"

How to Report

Call us!

Spotter line: 1-800-846-1828

Report via amateur radio

Call sign WX5HGX

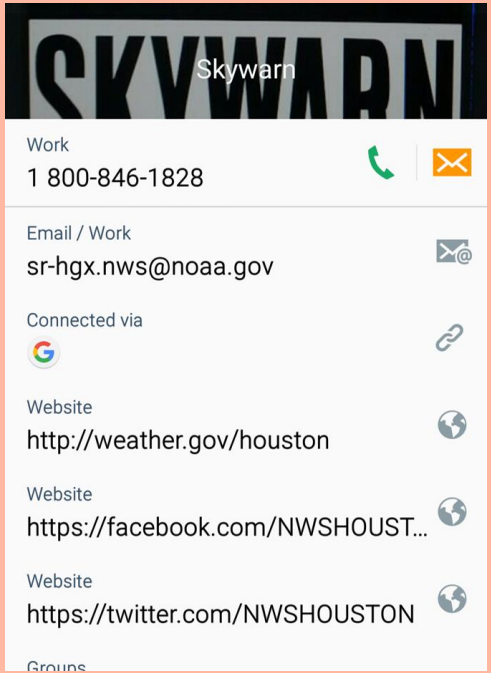
Email

sr-hgx.nws@noaa.gov

Social Media

Twitter: @NWSHouston

Facebook: NWSHouston



Spotter Tip

Set up SKYWARN as a contact in your smartphone

Flood Risk

Flood Risk?

Any situation involving exposure to a Flood danger, harm or loss.

"While levees can help reduce flood risk…they do not eliminate the risk."

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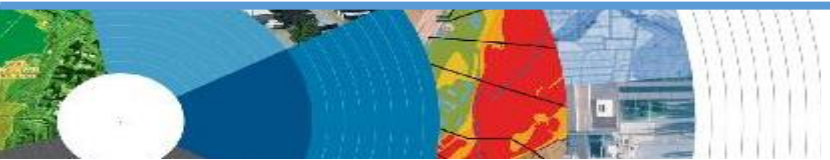
Flood Insurance/Group Flood Insurance

Everyone is at risk for flooding

- **Brief definition of flooding is any forms of rising water in which 2 properties are affected-one being yours**
- **Structure Coverage**
  - Max coverage $250,000
- **Contents coverage**
  - Contents is an optional addition, except for Preferred Risk Policy.
  - Max coverage $100,000 coverage for Actual Cash Value
- **Wait Period**
  - Typically - 30-days from purchase until effective.
- **Average NFIP pay out for Harvey was $112K (March 2018)**

- **Group Flood Insurance**
  - Available during a Presidential Declared event
  - If qualified for a IA grant a GFIP will be purchased in the amount of $600
  - Policy is good for 3 years
  - Must maintain insurance on the property forever
  - Max amount on the policy is 33,500 this includes structure and dwelling
  - Average pay out for Harvey for IA was $6000



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Insurance Misconception

- **Misconception:**

  "I'm already covered—my homeowners policy covers flooding."

- **Fact:**

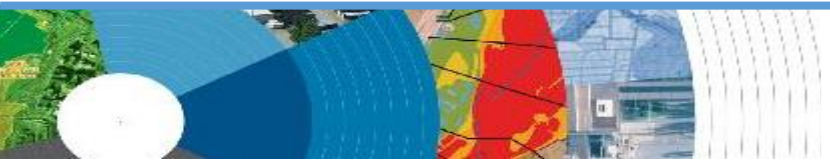
  Most insurance policies do not cover flooding; only flood insurance covers flood damage.

  Renters and Business owners should also consider flood insurance for contents.

- **Misconception:**

  "I don't live in a flood zone."

- **Facts:**
  - Floods are the #1 natural disaster in the United States.
  - If it can rain, it can flood.
  - FIRMs do not show localized flooding from drainage ditches/sewers/road ponding.
  - To some degree overland flooding…but not property to property drainage problems.



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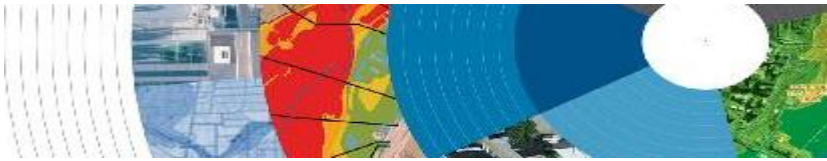
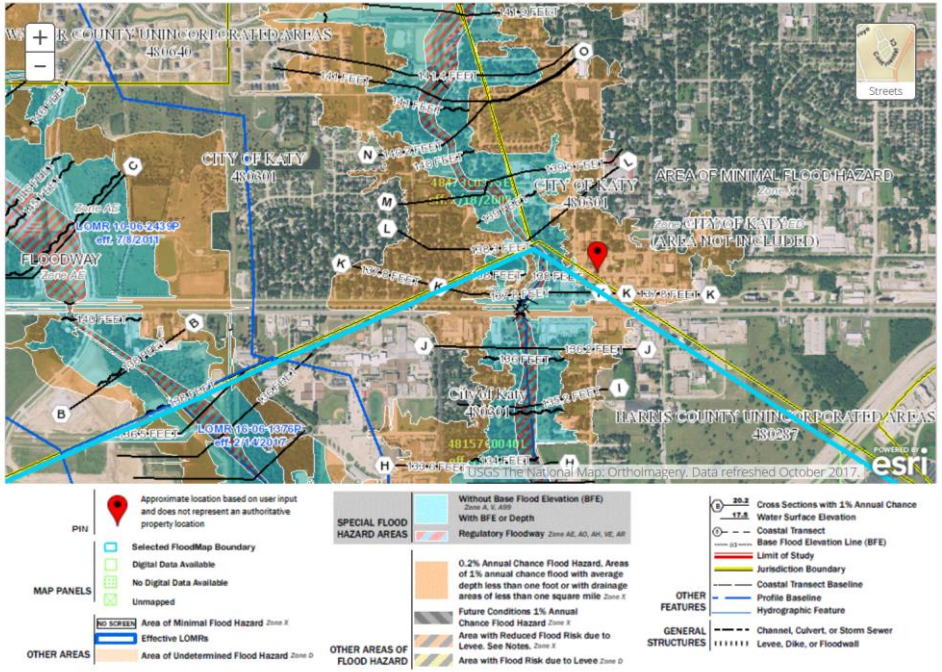
What is a FIRM?



Flood Insurance **Rate** Map

- Identifies the flood zones
- SFHA (high risk)
  - A, AE, AO, AH, VE, V etc. (Aqua)
    - 1% annual chance flood
- Non-SFHA (low to moderate risk)
  - B, C and X (Shaded – orange or gray color & non-Shaded)
    - Orange/Gray area – outlines areas protected by Levees
    - Even the non-shaded is a flood zone – a minimal risk.
- Used for rating flood insurance policies
- Are subdivided by panels to cover jurisdictional boundary.
- Shows what the BFE within the zones
- FIRM's show Costal and Riverine flood risk



Find your zone at https://msc.fema.gov/portal/home

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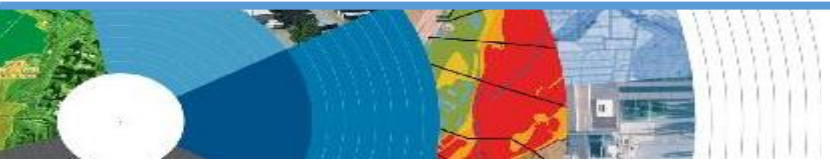
Cost of Flood Damage?

2,500 sqft, one-story home with possessions worth $50,000

Interior Water Depth (Inches)	Cost to Home	Cost to Personal Property	Combined Loss Potential
1"	$23,635	$3,172	$26,807
2"	$23,720	$3,172	$26,892
3"	$24,370	$4,917	$29,287
4"	$31,345	$7,207	$38,552
5"	$31,425	$13,914	$45,339
6"	$37,260	$14,777	$52,037
7"	$37,691	$17,700	$55,391
8"	$38,122	$20,624	$58,746
9"	$38,553	$23,547	$62,100
10"	$38,983	$26,470	$65,453
11"	$39,414	$29,394	$68,808
12"	$39,845	$32,317	$72,162
24"	$44,325	$43,001	$87,326
36"	$47,905	$46,633	$94,538
48"	$53,355	$50,000	$103,355



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Structure Elevation Impact Insurance Rates

High Risk = $$$

Medium Risk = $$

Lower Risk = $

The elevation is just one factor, others include: when was the structure, has it flooded in the past, etc.

EVERY Structure has a risk…

generally the higher the structure the less the risk.

Harvey Numbers

Insurance claims

- Harris Co (includes cities such as Houston) – all claims 55,570**
- City of Katy (unincorporated only) 122 (Losses over 125K)
- Fort Bend Co (unincorporated only) 494 (Losses over 125K)

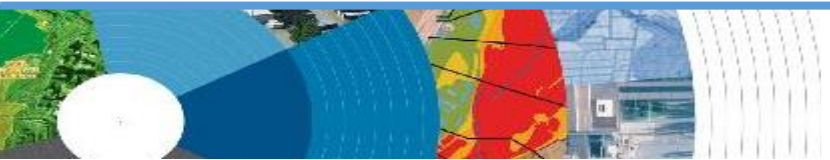
New GFIP's Due to Harvey

- City of Katy – 7
- Fort Bend Co - 180

Harris County Numbers**

- 154,170 Homes 48,850 in 1% Risk Area (100-yr)
- 34,970 in 0.2% (500-yr) floodplain
- **68% OUTSIDE of the 1% Risk Area.**

**Data HCFCD Finale Hurricane Harvey Storm and Flood Information – https://www.hcfcd.org/media/2678/immediate-flood-report-final-hurricane-harvey-2017.pdf



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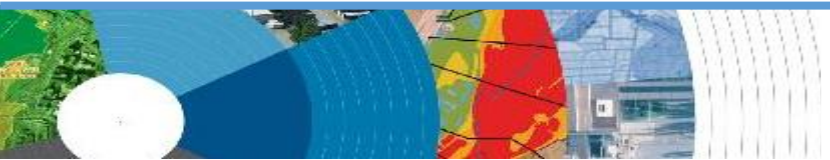
Summary

- Living in Texas means we have a flood risk even with heavy rain.
  - Tax Day 2016 and Memorial Day 2015 – not with a tropical system
- Flood Risk is from multiple sources.
- Flood insurance allows individual property owners to manage their risk.
  - **Buy policies that cover the structure <u>AND</u> contents**.



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Contact Information

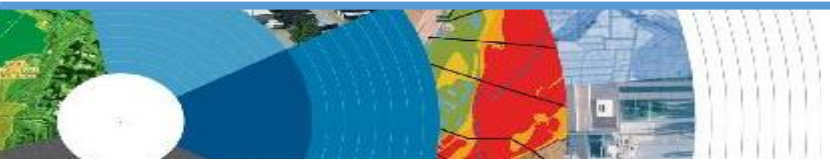
NFIP Hotline
1-800-427-4661
www.fema.gov/nfip

Angela Harrison, Insurance
Cell 470-557-2794 | Angela.Harrison@fema.dhs.gov

Yho-Meka Conway, Insurance
Cell 470-572-0803 | Yho-Meka.Conway@fema.dhs.gov

Lauren Schmied, PE, Floodplain Management
Cell 202-812-6164 | Lauren.Schmied@fema.dhs.gov

Larry Fordham ANFI, CFM, ACA
Acting Senior Regional Insurance Specialist, FEMA Region 6
Phone: 940-383-7253 | Cell: 202-394-4483
|Larry.Fordham@fema.dhs.gov



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Questions

National Weather Service
Harris County Flood Control District
Fort Bend County Drainage District
U.S. Army Corps of Engineers
FEMA