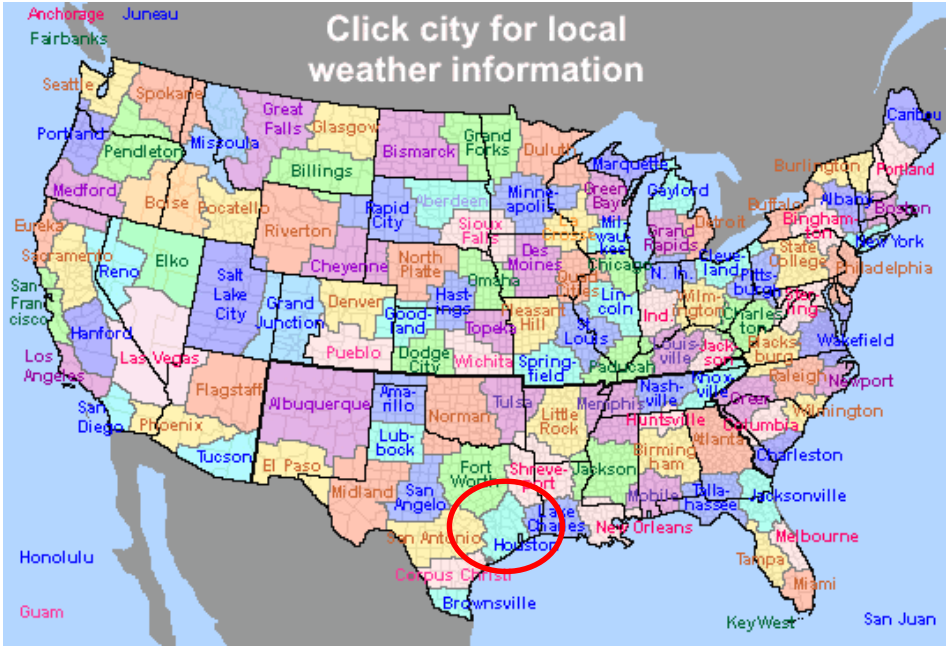
2018 FloodWarn Training

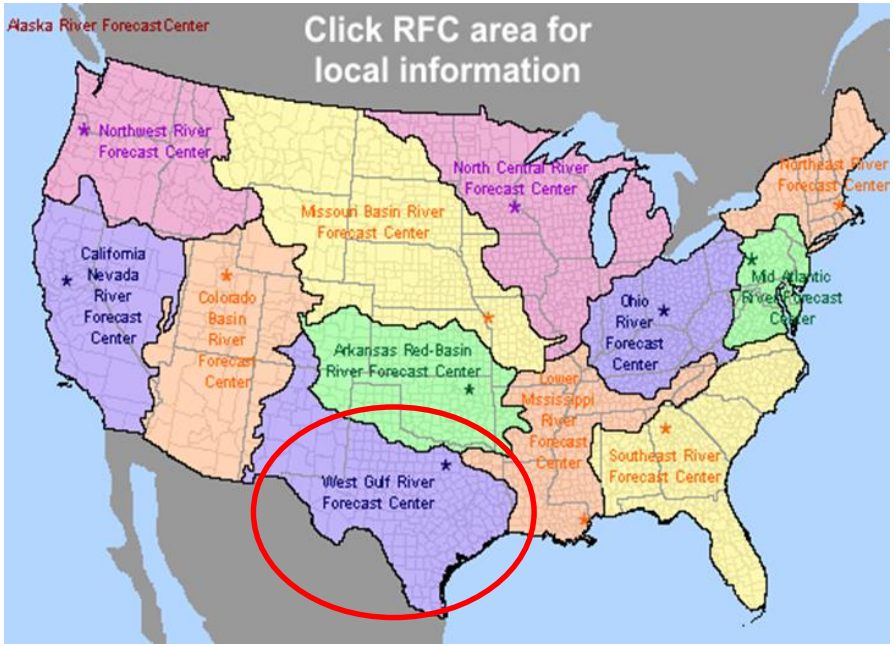
Katie Landry-Guyton
Senior Service Hydrologist/Meteorologist
National Weather Service- Houston/Galveston, TX

National Weather Service

Weather Forecast Offices



River Forecast Centers



Outline

Flooding Importance

Flooding Types and Causes

Flood Products

River Flooding

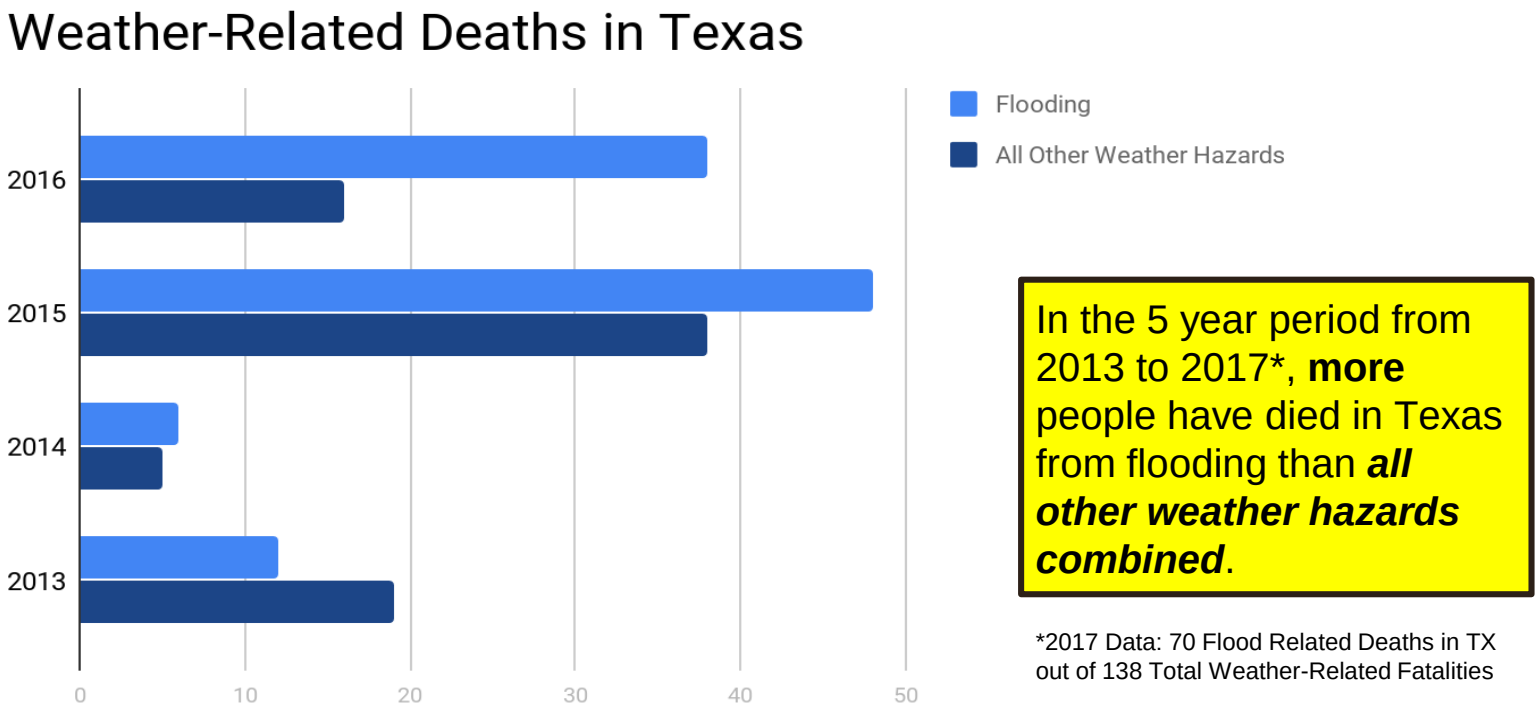
Partners

Flood Preparedness

Reporting Flooding

Flooding Importance

Flooding is Deadly!

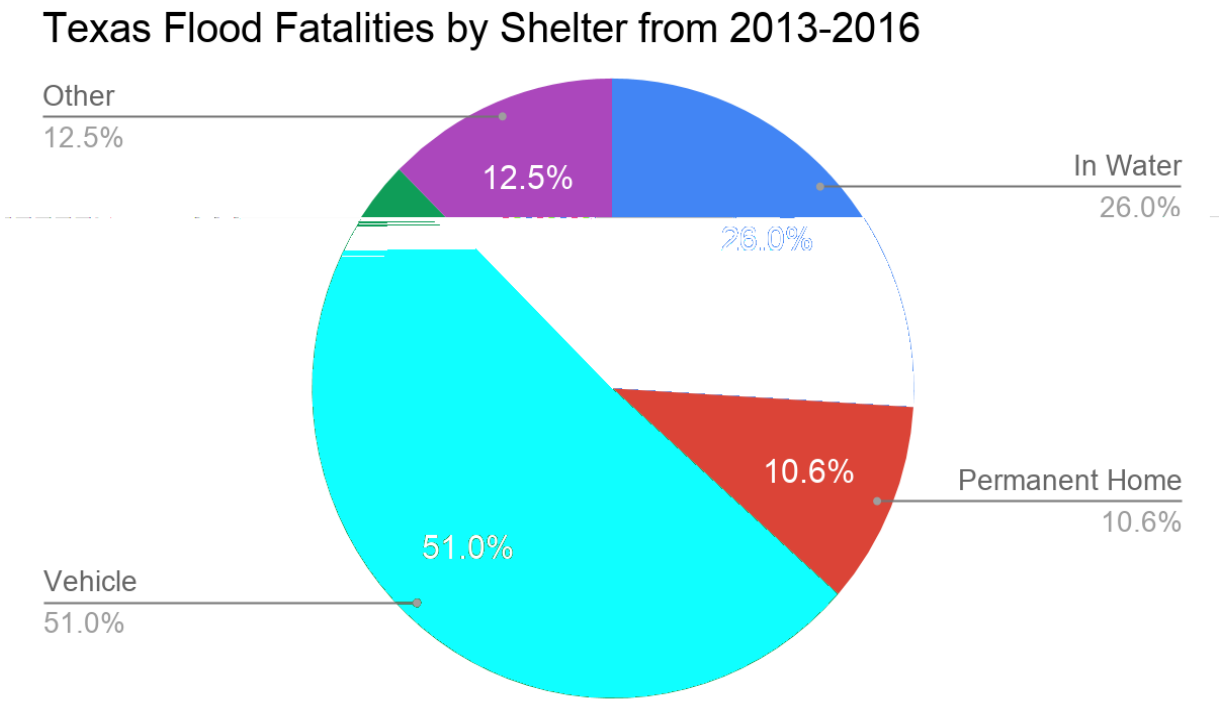


In the 5 year period from 2013 to 2017*, **more** people have died in Texas from flooding than ***all other weather hazards combined***.

*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

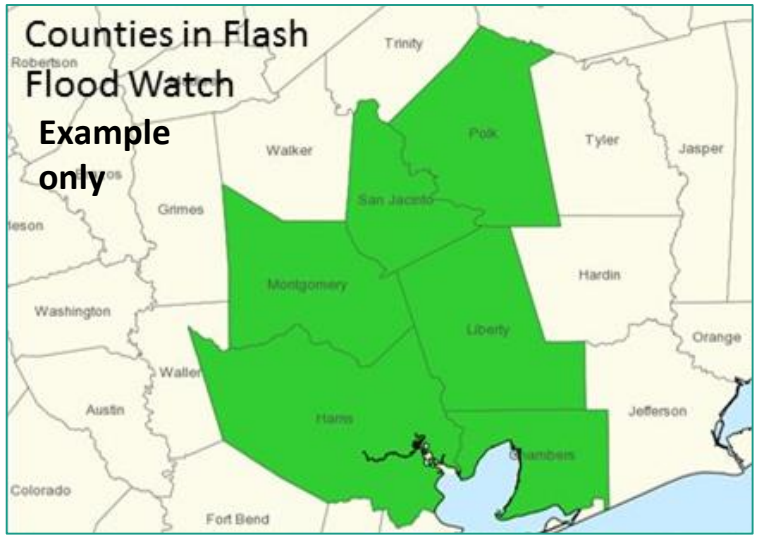
Flooding along a coastline either from high tides or storm surge during a tropical storm or hurricane

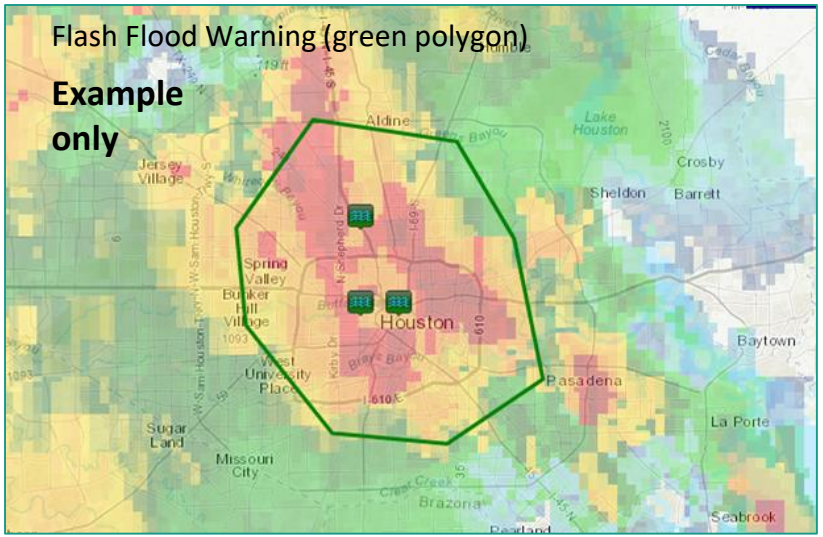
Flood Products

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

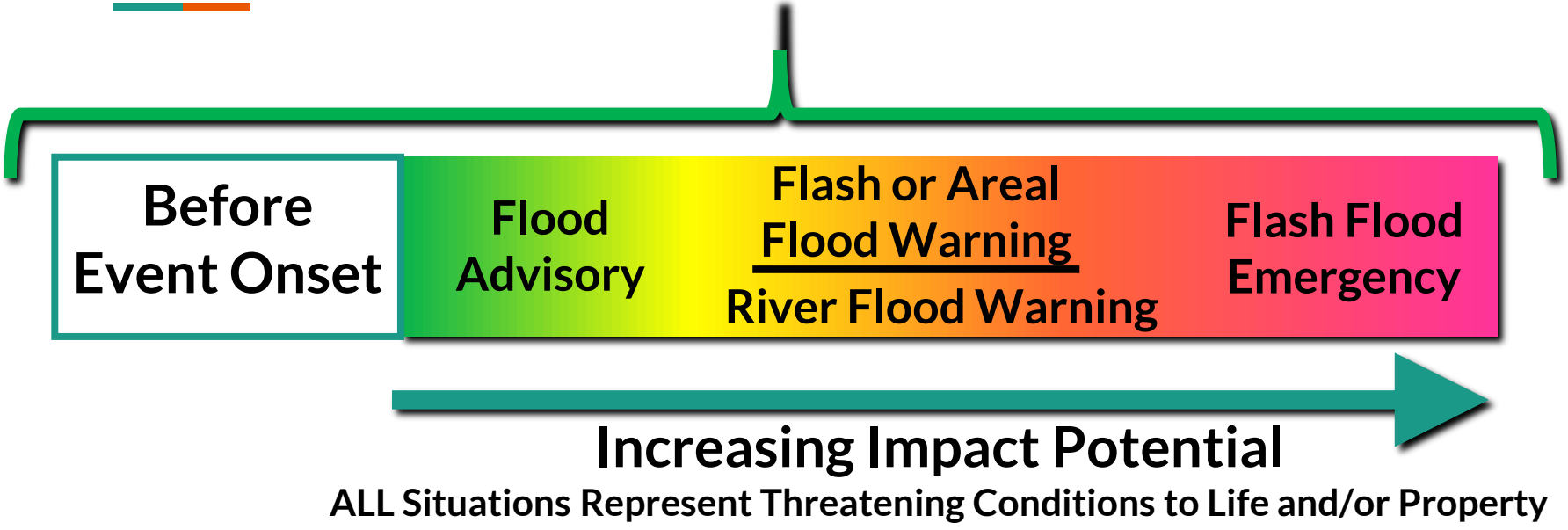
Urban / Small Stream Flood Advisory

Flash Flood Warning

Flash Flood Emergency

Flood Warning (Areal/ River/ Bayou)

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

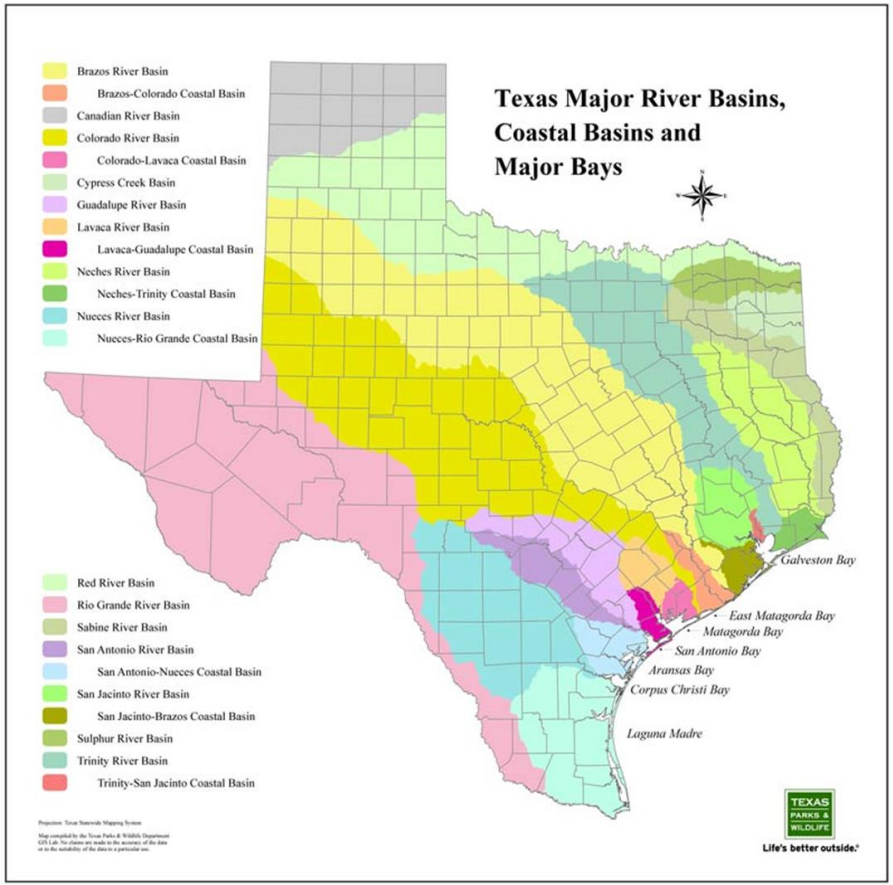
Llano River Flooding

River Flooding

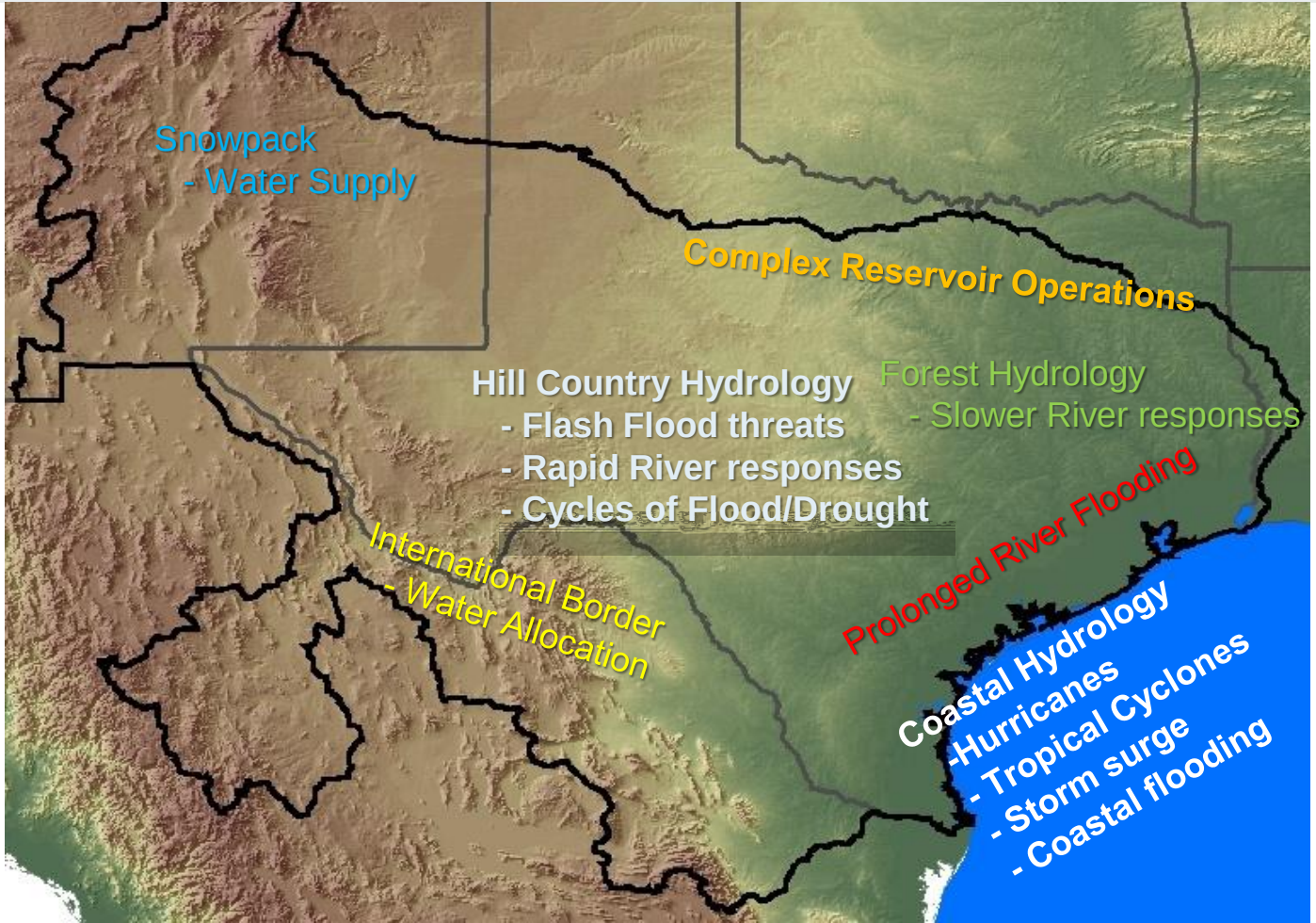
River flooding occurs when water escapes the river banks. There are different thresholds for river flooding: action, minor, moderate, major and record flooding. This image depicts what a river flooding looks like.

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



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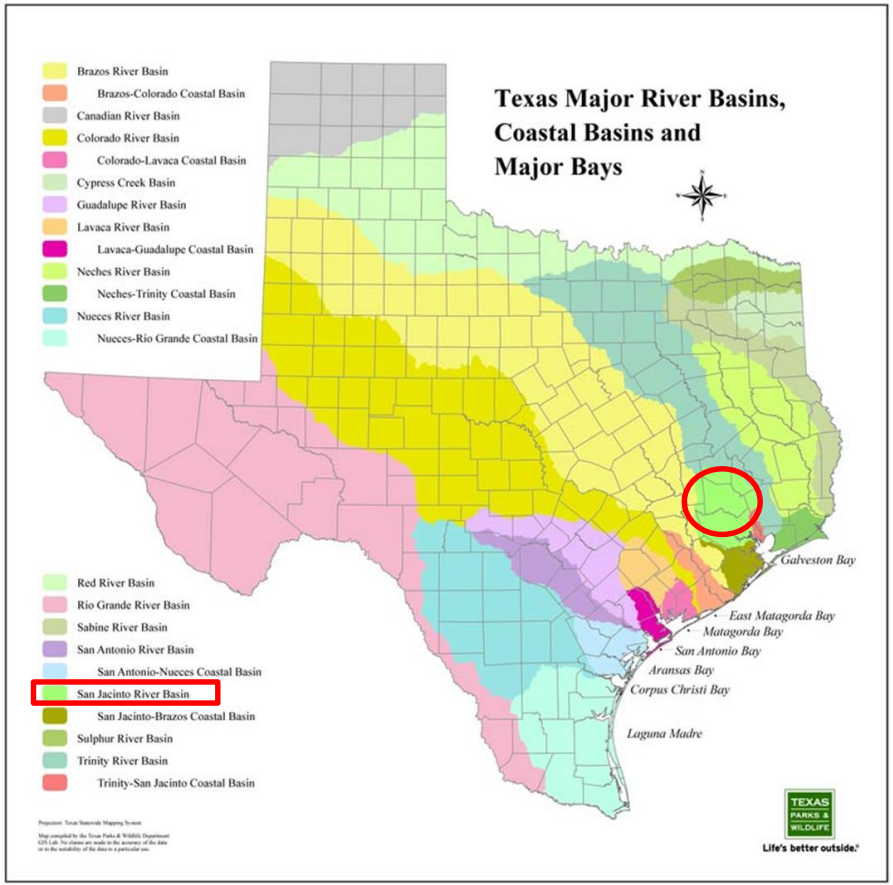
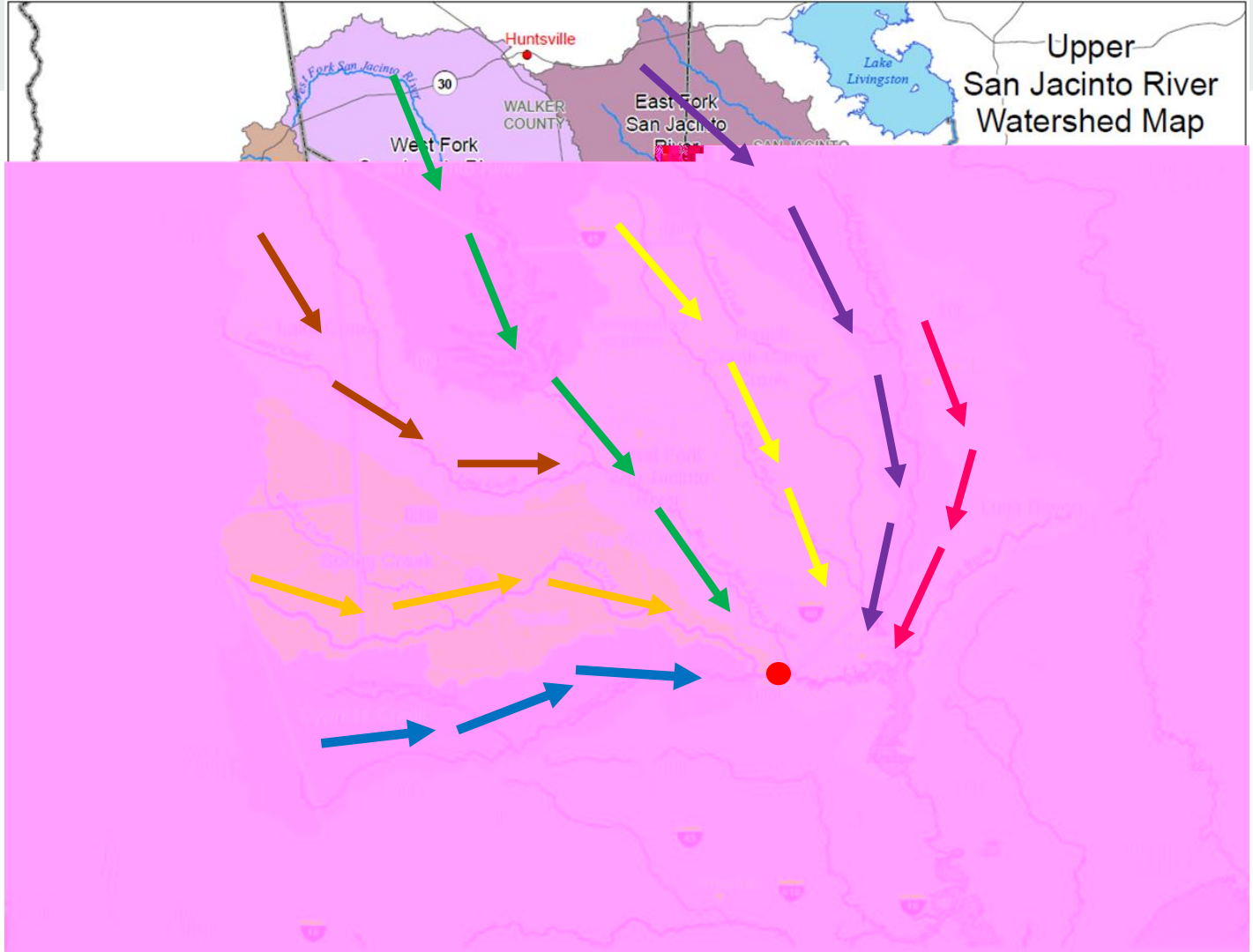
- Montgomery County deals with 1 primary watershed: San Jacinto River



Upper San Jacinto River Watershed



West Fork San Jacinto River at Humble, TX

Watershed

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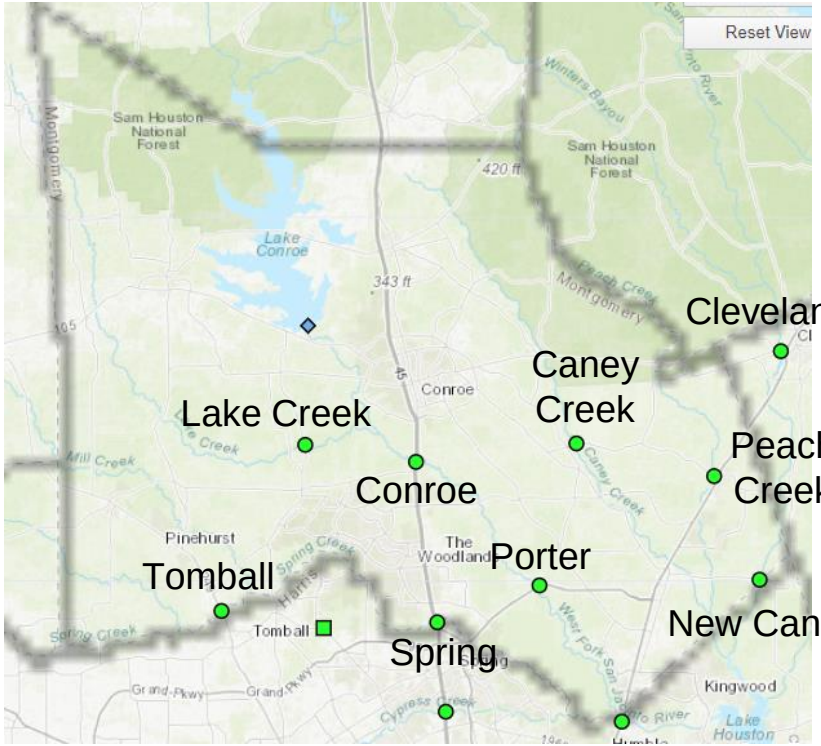
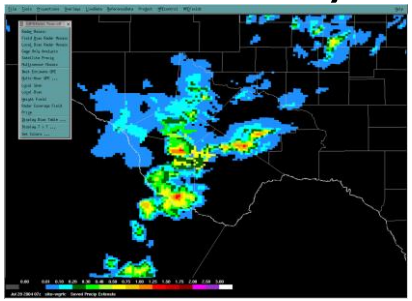
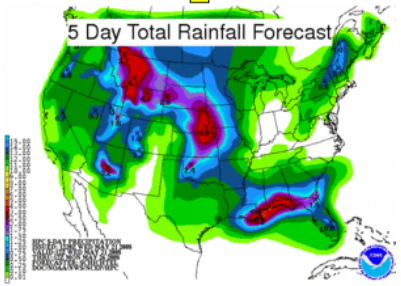
- NWS issues river forecasts for 10 sites in and around Montgomery County.



River Forecast Process

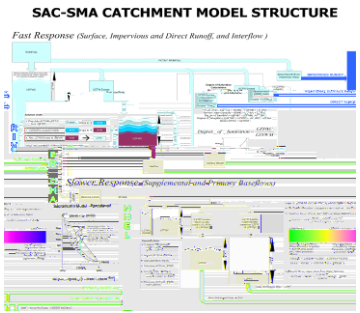
Rainfall Analysis

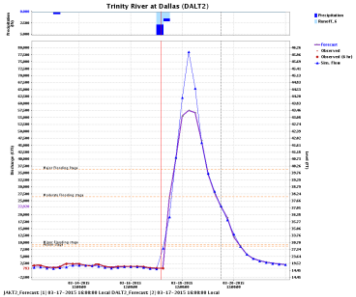




Rainfall estimates and forecasts merged into continuous dataset

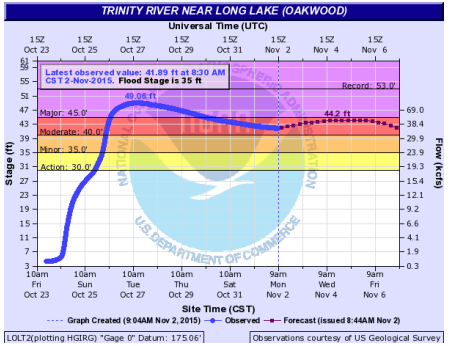
Hydrologic Modeling





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

Forecast

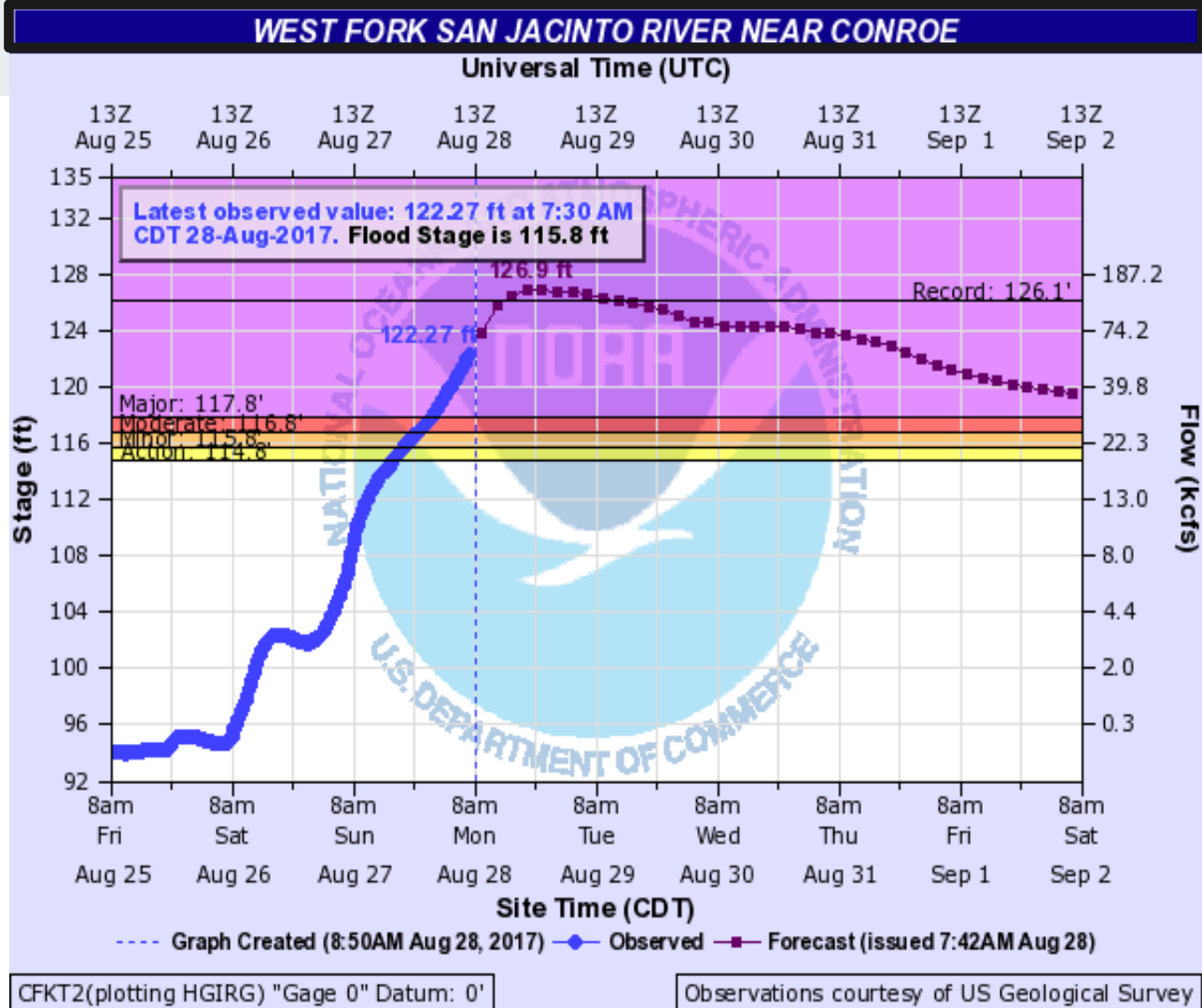


Warning

```
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.
```

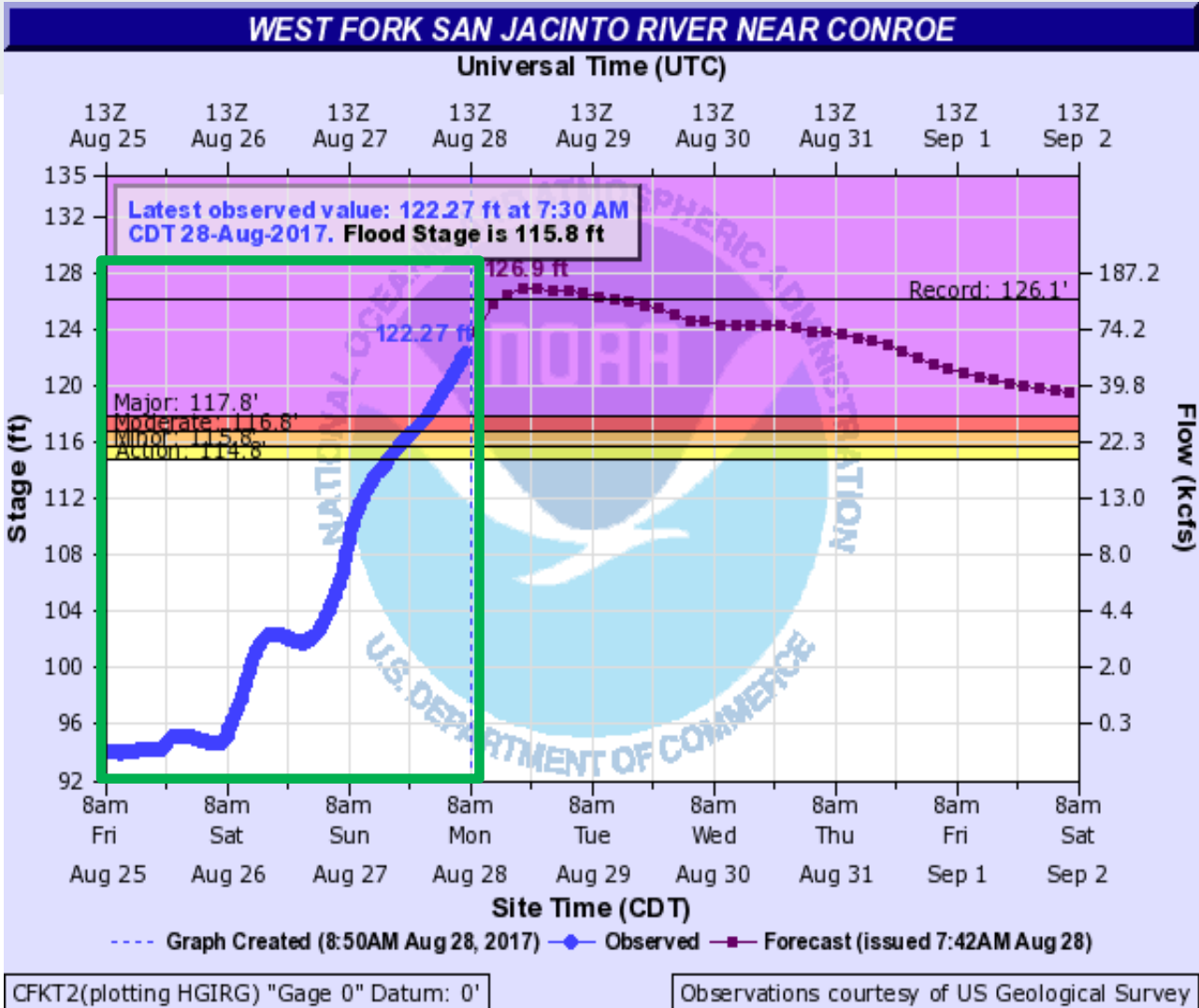
Hydrograph Basics

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

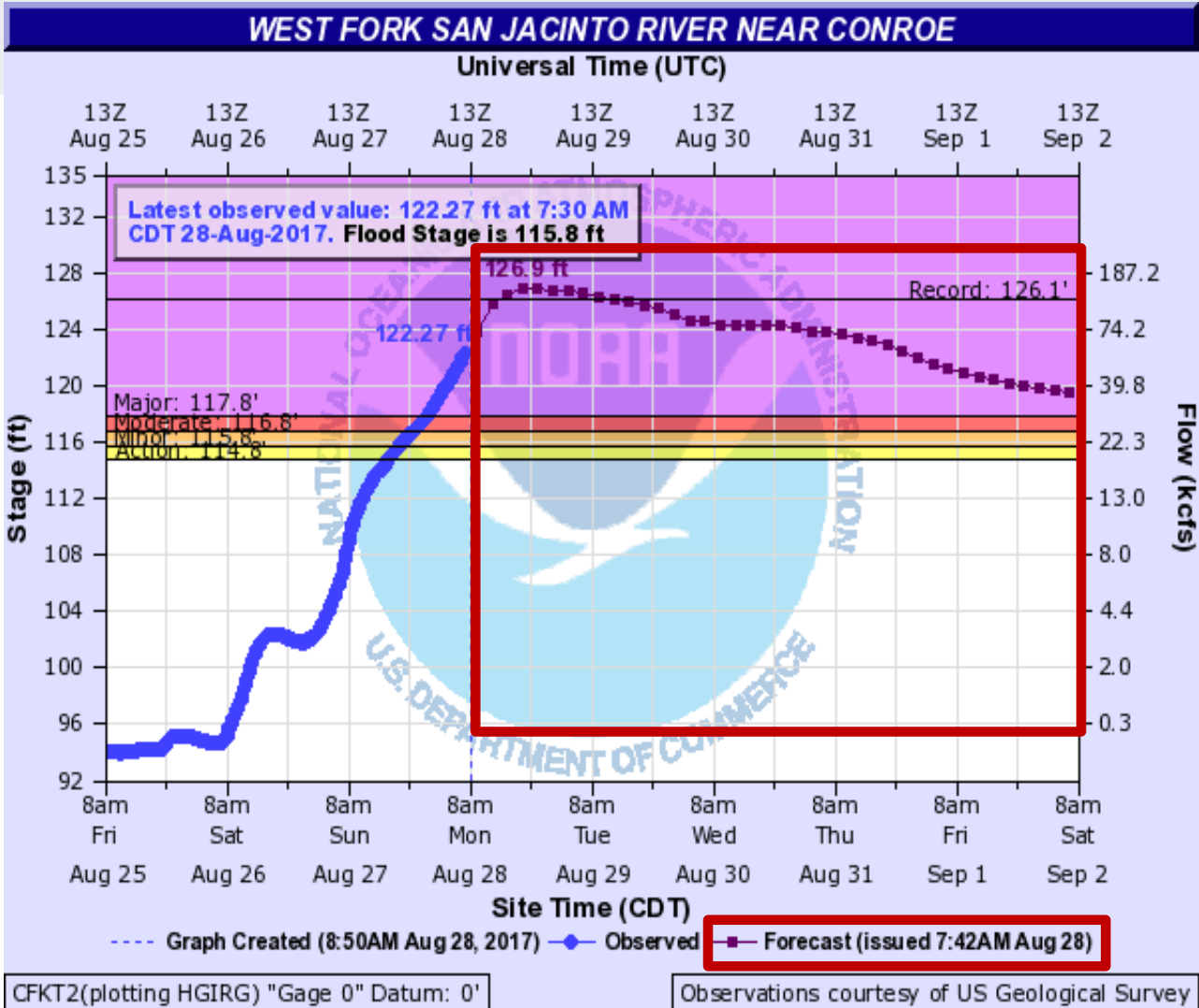
OBSERVATIONS:
Past river stages



Hydrograph Basics

FORECAST:
Forecast River Stages

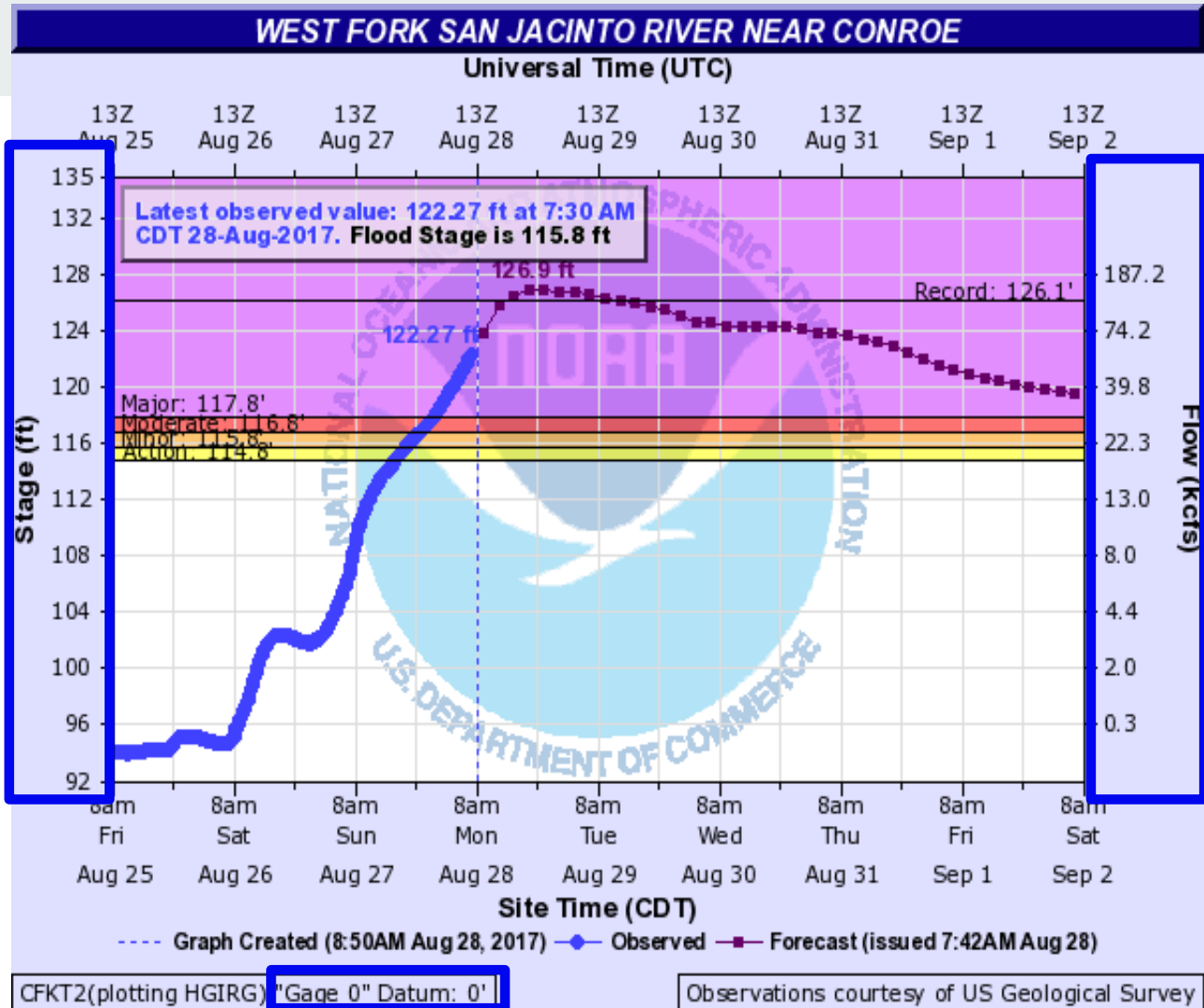
CREST:
Peak Stage



Hydrograph Basics

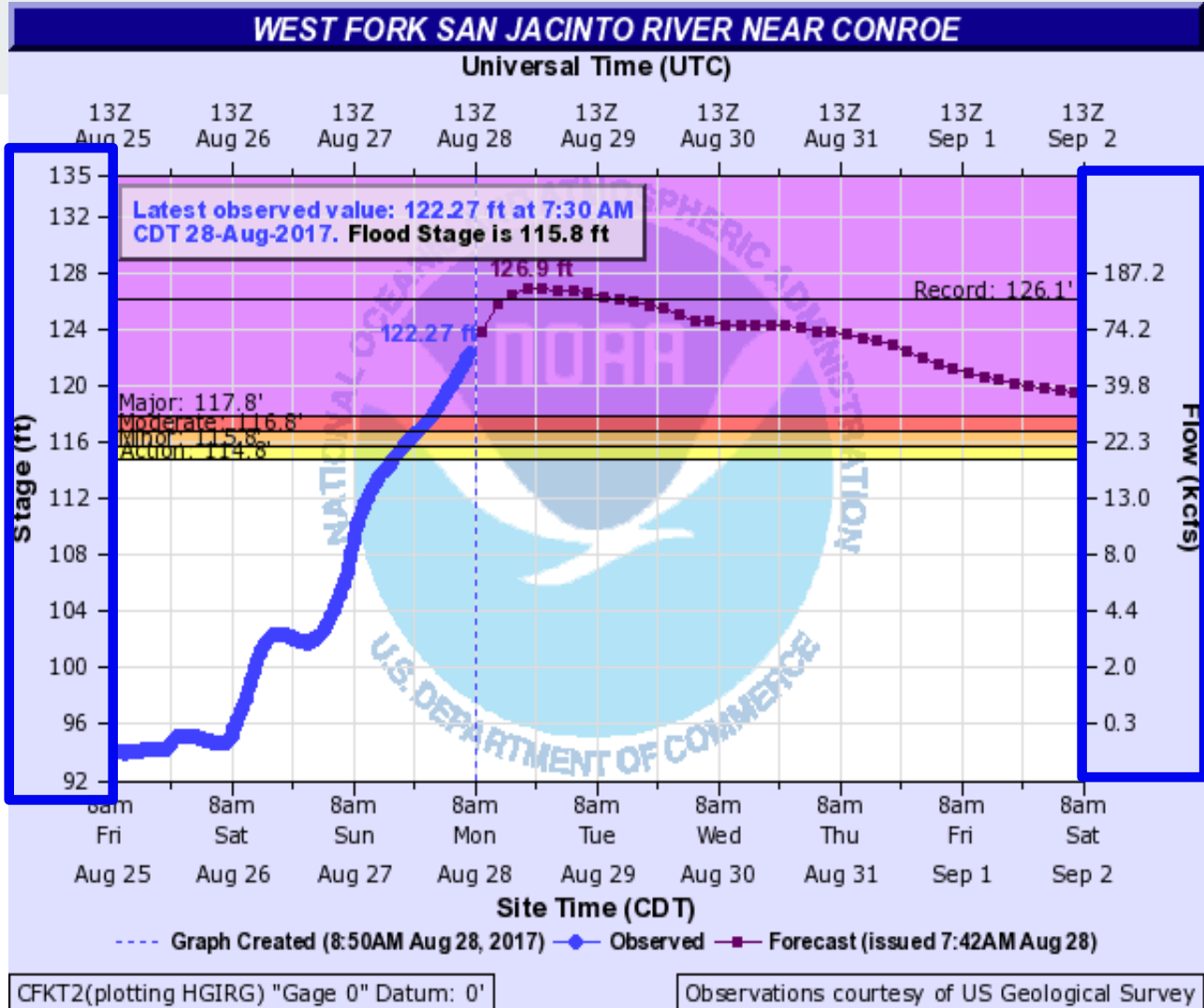
STAGE VS FLOW: Hydrologists, models, reservoirs work in flow. Emergency managers, media, general public work in stage.

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

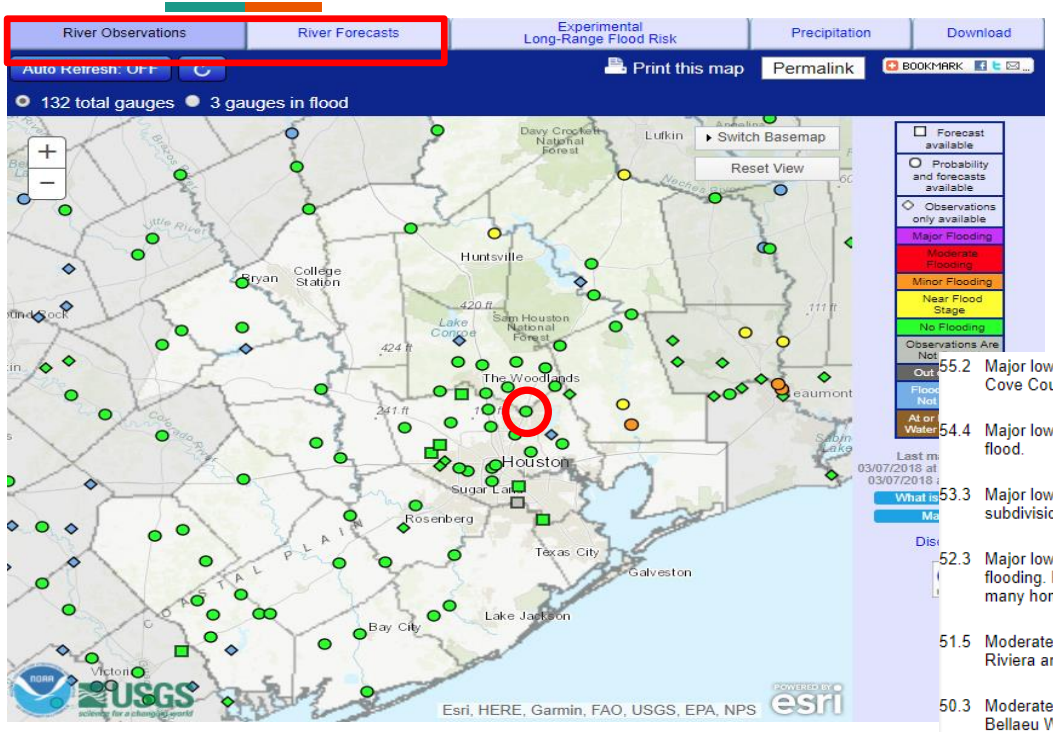
MODERATE

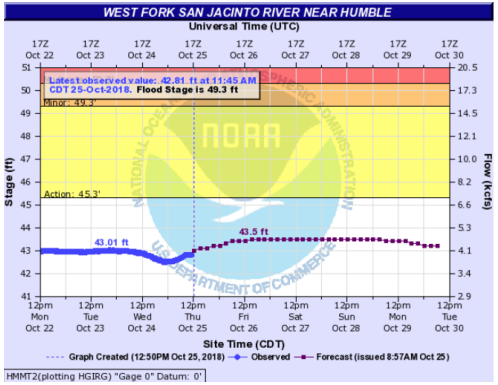
Impact: Water now reaching areas only impacted by significant rain events. Structures can be inundated, several roads covered with water, water may cut off certain areas, widespread agricultural flooding.

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:	52.3
Moderate Flood Stage:	50.3
Flood Stage:	49.3
Action Stage:	45.3
Low Stage (in feet):	0

Historic Crests

(1) 69.18 ft on 08/29/2017
(2) 67.30 ft on 10/18/1994
(3) 63.23 ft on 05/31/1929
(4) 63.23 ft on 11/26/1940
(5) 62.80 ft on 09/14/2008

Show More Historic Crests

55.2 Major lowland flooding continues with up to 6 inches of water is over the 800 block Hamblen Road adjacent to the Kingwood Cove Country Club Golf Course with many homes in the Bellau Woods and Treasure Cove subdivision are flooded.

54.4 Major lowland flooding continues with homes along Riverview Drive in River Ridge subdivision upstream of the gauge begin to flood.

53.3 Major lowland flooding continues with water is in homes on Lake Lane West and Southshore Drive in the Bellau Woods subdivision and Homes in the Treasure Cove subdivision and along Aqua Vista Drive begin flooding.

52.3 Major lowland flooding begins as homes on Lake Lane West and Southshore Drive in the Belleau Woods subdivision begin flooding. Roads into the Treasure Cove subdivision are inundated and homes along Aqua Vista Drive threatened. Water is in many homes on Lake Point Drive in the Northshore subdivision.

51.5 Moderate lowland flooding continues with up to one foot of water is over the road at the intersection of Bellau Wodd and Riviera and many homes in the Northshore subdivision are flooded.

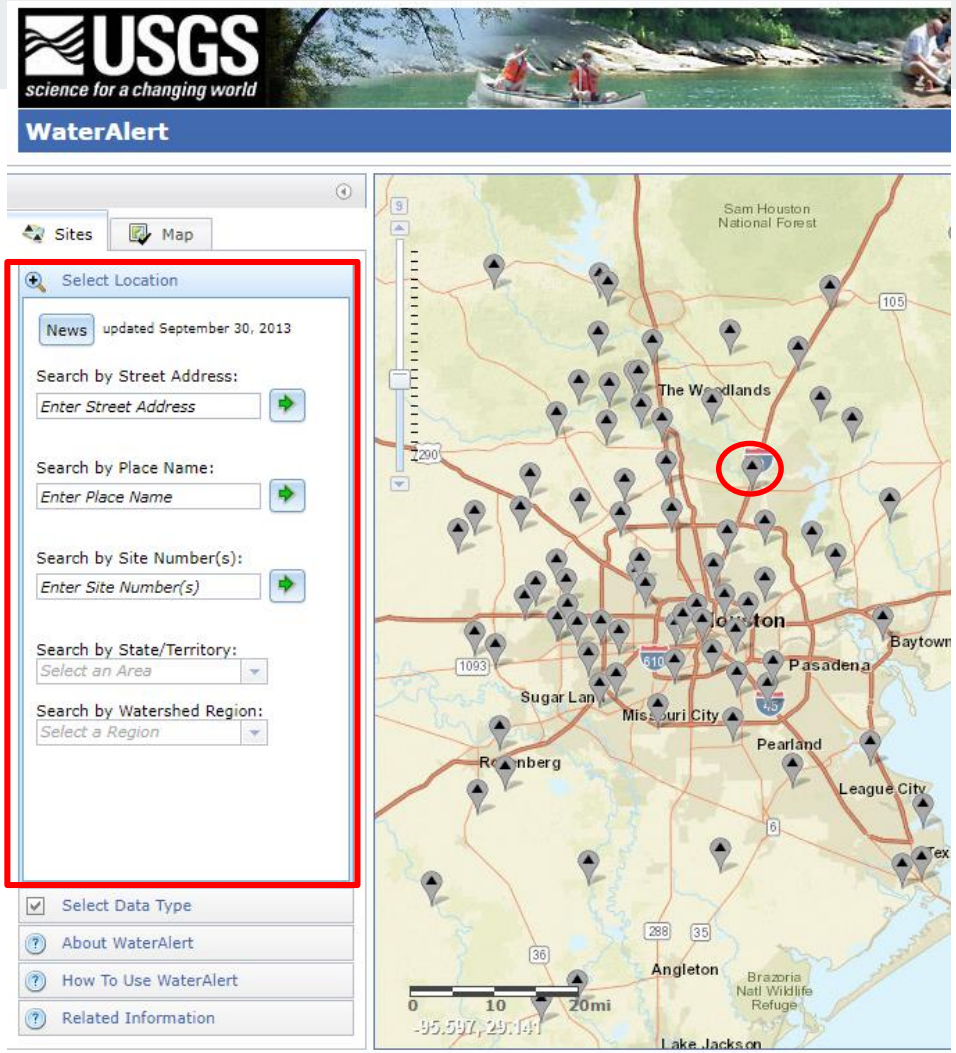
50.3 Moderate lowland flooding begins as homes on Lake Point Drive in the Northshore subdivision begin flooding and roads in the Bellaeu Woods subdivision are inundated.

49.3 49.5 feet MSL...Minor lowland flooding begins in the vicinity of the gage. North side turnaround at US 59 begins to flood. Low points on Thelma Road, Aqua Vista Drive, and Riverview Drive begin to flood.

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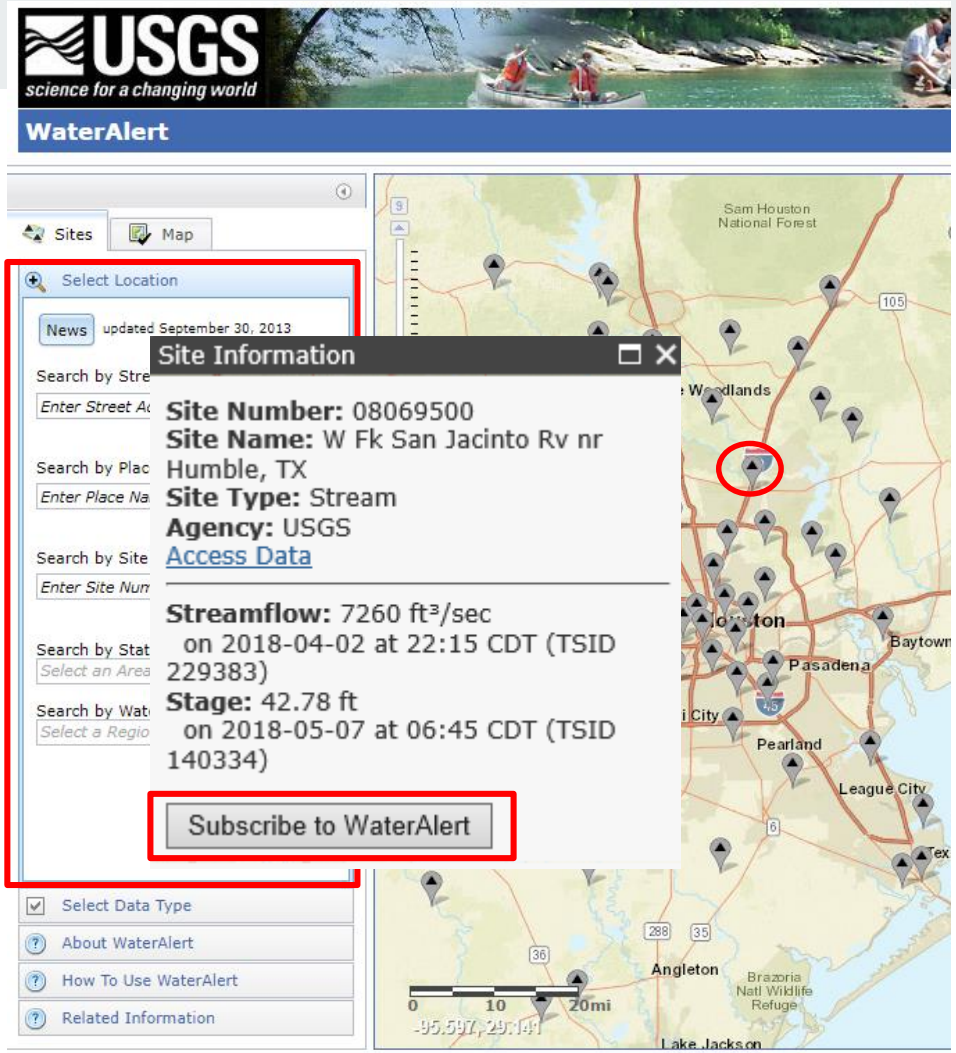
- Identify the gauge nearest you
- Click on the gauge and select “Subscribe to WaterAlert"



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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/

Partners

Partners

Roles of Primary River Forecast Partners

US Army Corps of Engineers

- Operate Flood Control Reservoirs
- Manage Other WR Projects

USGS science for a changing world

- U.S. Stream Gage Network
- Water Science Studies

National Weather Service

- Issue Weather & Water Forecasts, Watches, Warnings & Data

Shared Data and Resources

US Army Corps of Engineers

- Assist w/Gage Maintenance
- Assist w/Stream Measurements
- Assist w/Funding Data Networks

USGS science for a changing world

- Gage Maintenance
- Stream Measurements
- Focus Stream Gage Network

National Weather Service

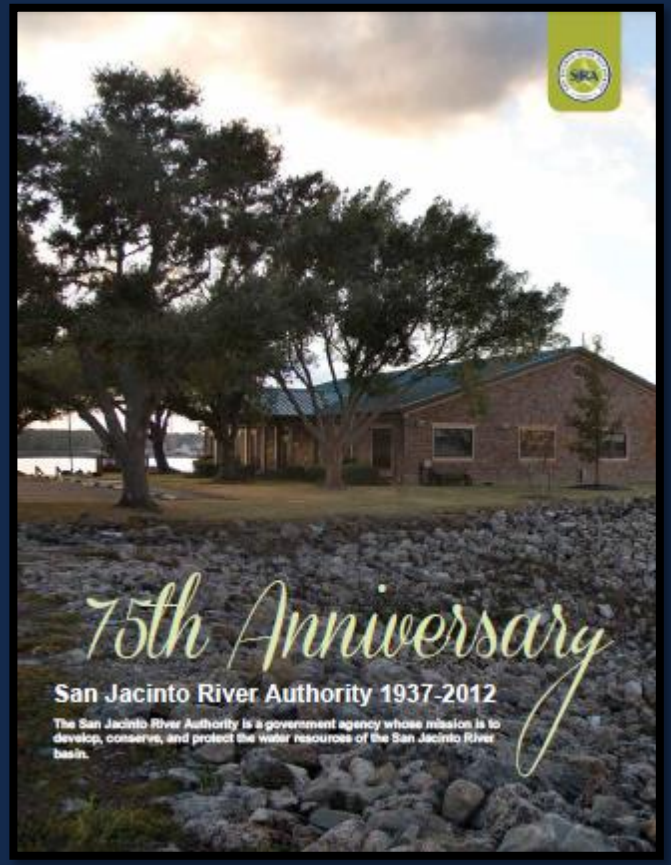
- Cooperative Data Network
- NOAA/NWS Satellite Transmission
- Forecasts/Data for Operations

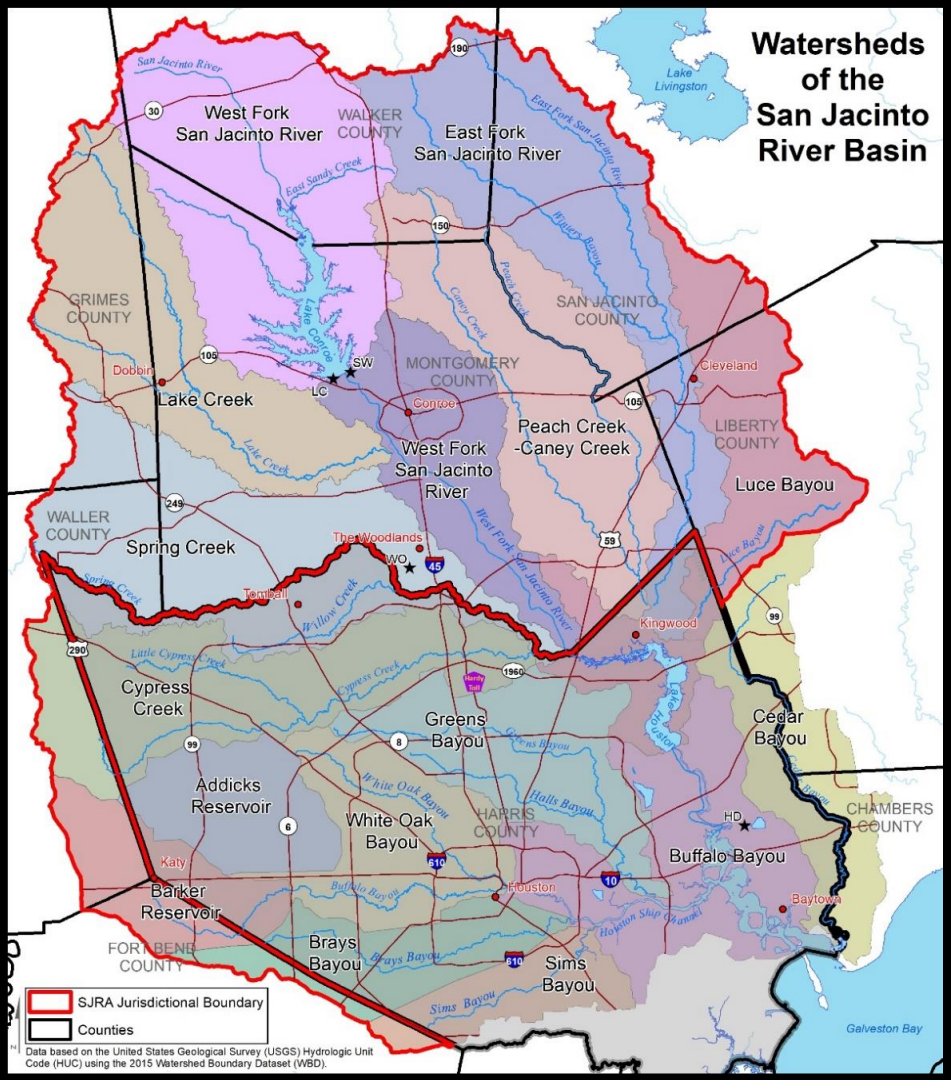
SJRA Update: From Flood Operations to Flood Management

October 25, 2018

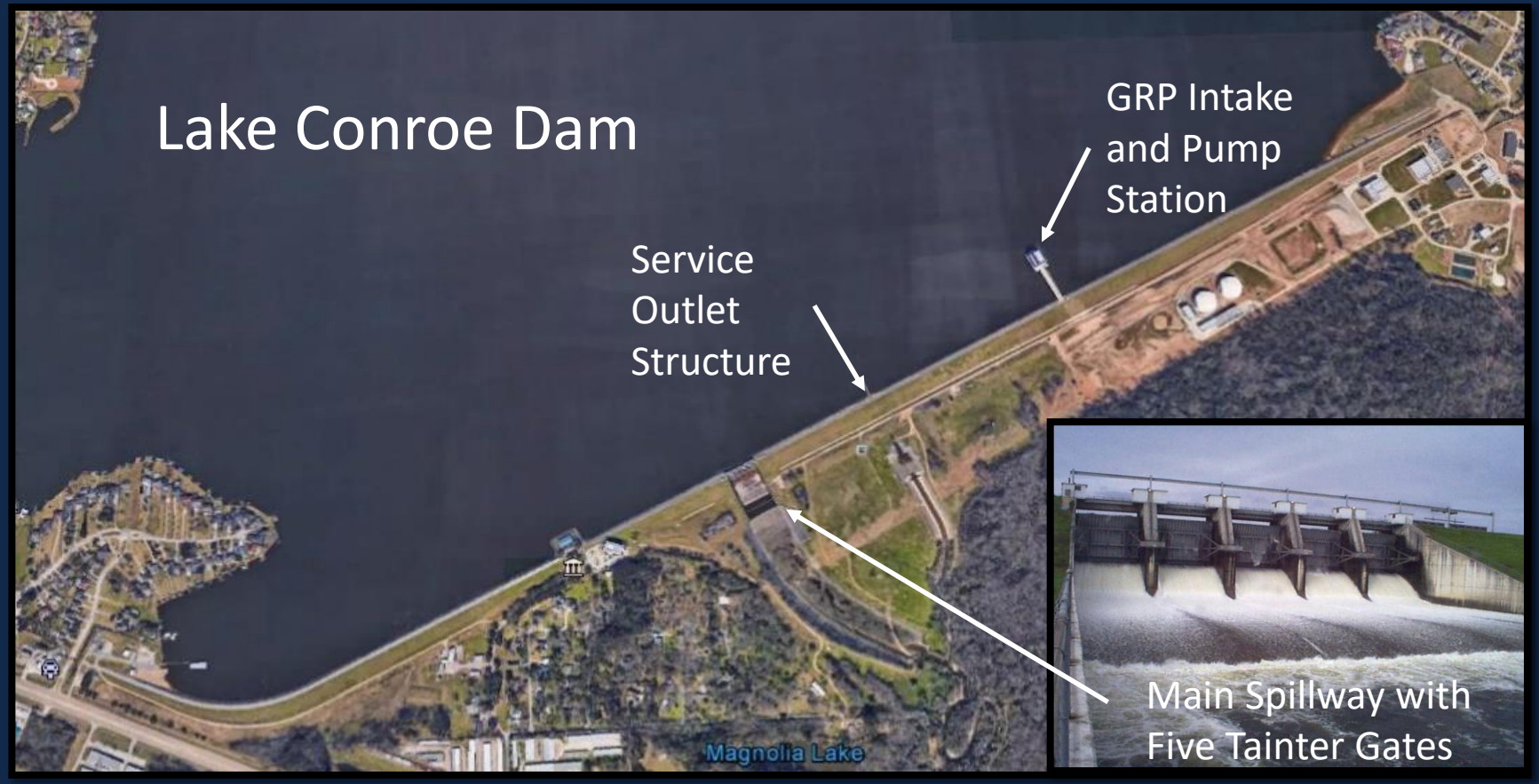
San Jacinto River Authority

- Created in 1937
- Statutory purpose – Long-term, regional water resource planning and development
- One of about two dozen river authorities in Texas
- Five operating divisions – Highlands, Woodlands, Lake Conroe, GRP, and Flood Management



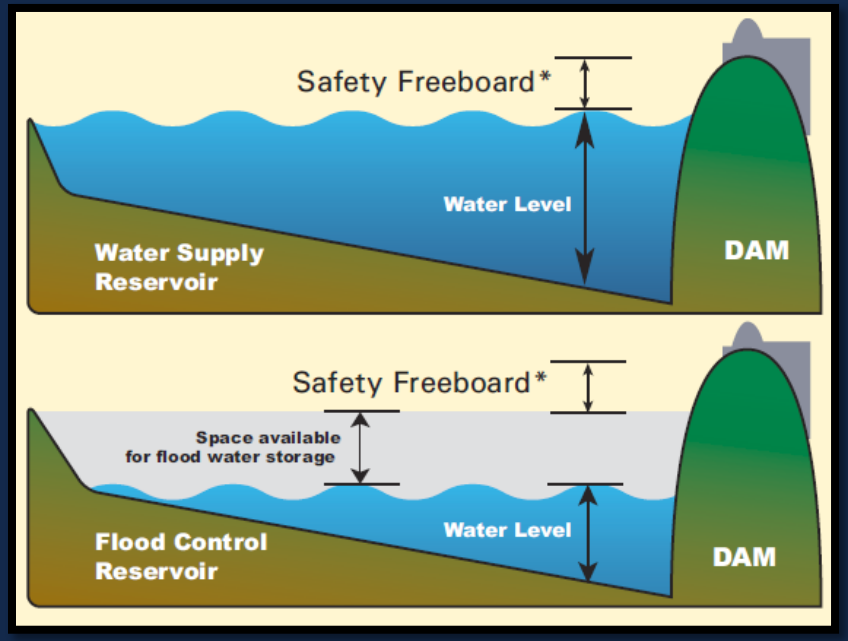

Watersheds of the San Jacinto River Basin
West Fork San Jacinto River
East Fork San Jacinto River
WALKER COUNTY
GRIMES COUNTY
SAN JACINTO COUNTY
MONTGOMERY COUNTY
LIBERTY COUNTY
WALLER COUNTY
HARRIS COUNTY
CHAMBERS COUNTY
FORT BEND COUNTY
Lake Creek
Peach Creek -Caney Creek
West Fork San Jacinto River
Luce Bayou
Spring Creek
Cypress Creek
Greens Bayou
Cedar Bayou
Addicks Reservoir
White Oak Bayou
Buffalo Bayou
Barker Reservoir
Brays Bayou
Sims Bayou
Lake Livingston
Lake Conroe
Dobbin
Conroe
Cleveland
The Woodlands
Tomball
Kingwood
Katy
Houston
Baytown
SW
LC
WO
HD
SJRA Jurisdictional Boundary
Counties
Data based on the United States Geological Survey (USGS) Hydrologic Unit Code (HUC) using the 2015 Watershed Boundary Dataset (WBD).
Galveston Bay

Key Points Regarding Lake Conroe Operations

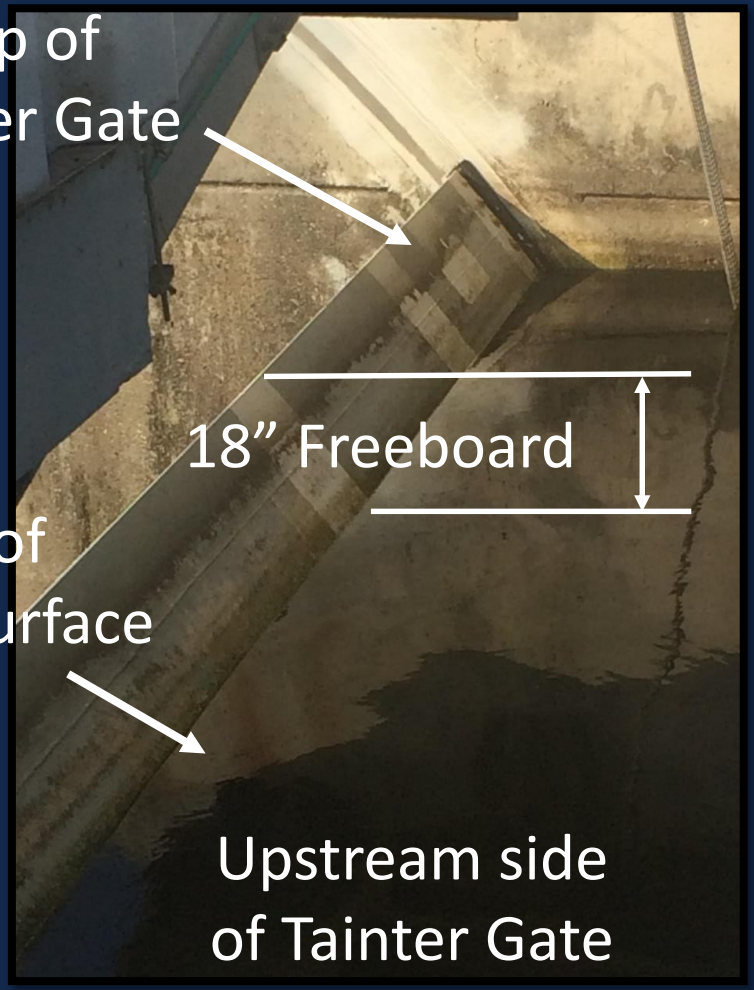


Water supply reservoirs are designed to stay full

- Lake Houston and Lake Conroe are both water supply reservoirs
- Very limited capacity to capture storm inflows
- Designed to pass inflows from storms (with some reduction in peak flow)
- Structurally, the gates must open gradually as lake rises




Top of
Tainter Gate
Top of
Water Surface
Downstream side
of Tainter Gate

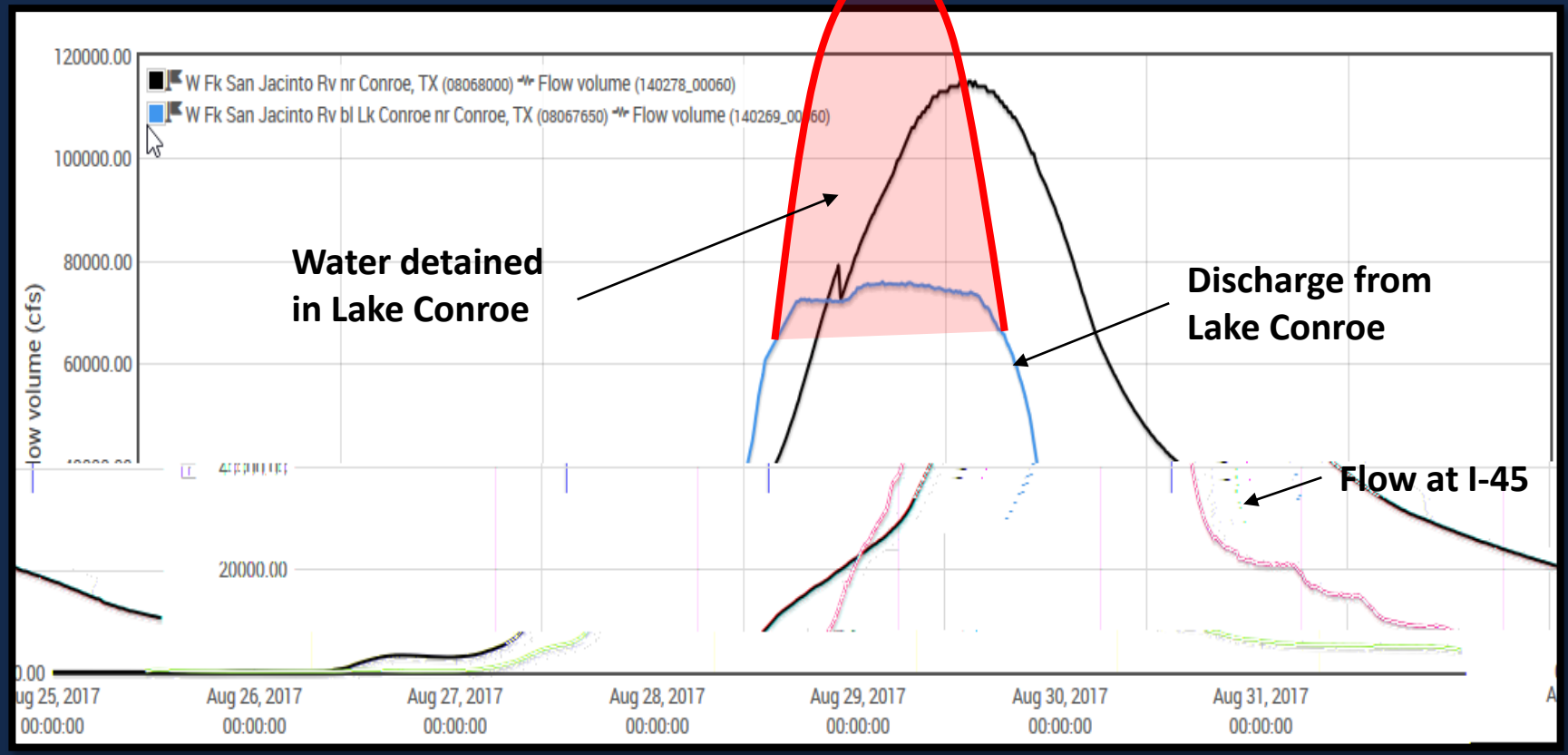

18” Freeboard
Upstream side
of Tainter Gate

Water supply reservoirs reduce peak flows downstream

- Even though there is no dedicated flood capacity, water supply reservoirs reduce peak flow via temporary storage
- Lake Conroe has a six-foot flowage easement for temporary flood storage
- Operating protocol balances inflow, lake level rise, and discharges

~130,000 cfs

Peak Flow Into Lake Conroe



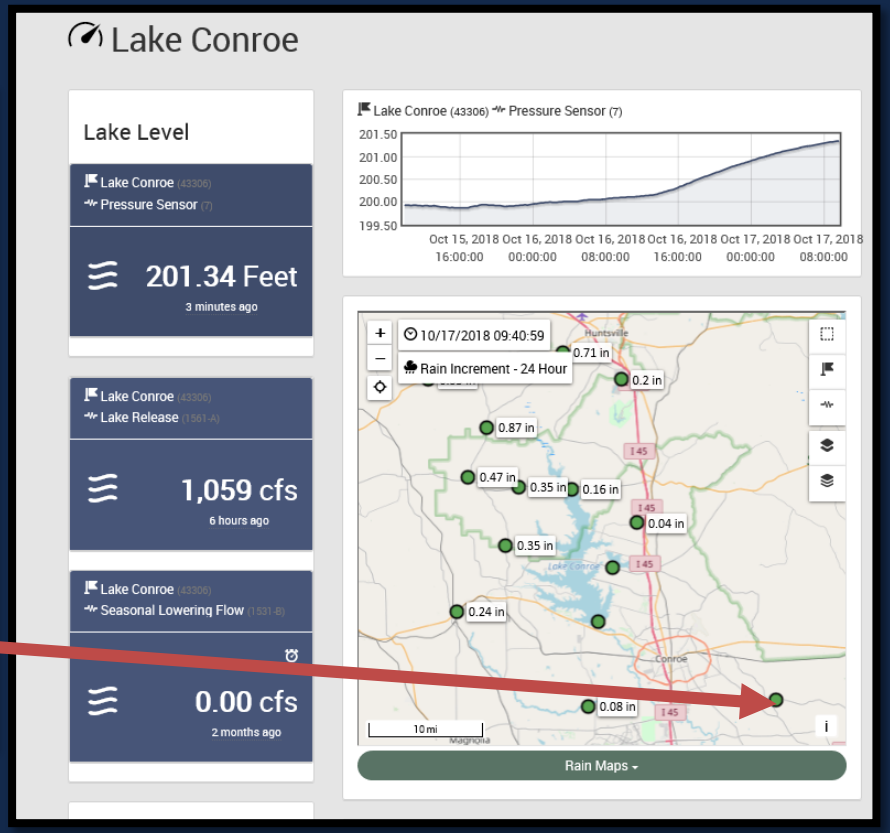
Lake Conroe used almost all of its authorized flowage easement

- Six-foot flowage easement acquired when lake was constructed
- Recorded in deed records
- Authorizes inundation up to 207’ msl
- During Harvey, peak elevation was 206.24’ msl

Reservoir operators follow pre-planned emergency communications protocols

- ROs partner with emergency response agencies who are the gatekeepers for emergency actions
- ROs have no authority to order or control evacuations or to serve as emergency response
- Role of ROs is to operate the dam and notify appropriate emergency officials
- ROs conduct periodic table top exercises with local emergency agencies

SJRA provides real-time data



Lake Level per USGS site ID: 08067600 LK Conroe nr Conroe, TX
201.01ft. as of 9-22 11:15 (Normal Pool=201ft)
Lake Release
0 CFS
Air Temperature
77 DEG. F
Wind Direction
158 DEG.
Wind Speed
4.93 MPH
Barometric Pressure
25.1 in
Water Temperature
87.4 deg F
Lake & River Conditions

Flood Forecasting & Reservoir Operations Tool

- Develop an operational tool for the Lake Conroe watershed:
  - Real-time data from the rain gauges
  - Precipitation forecasts from NWS
  - Stream flow
  - Current lake level
  - Current gate position

- Provide more accurate predictions for future gate operations during rainfall events (provided to regional stakeholders)

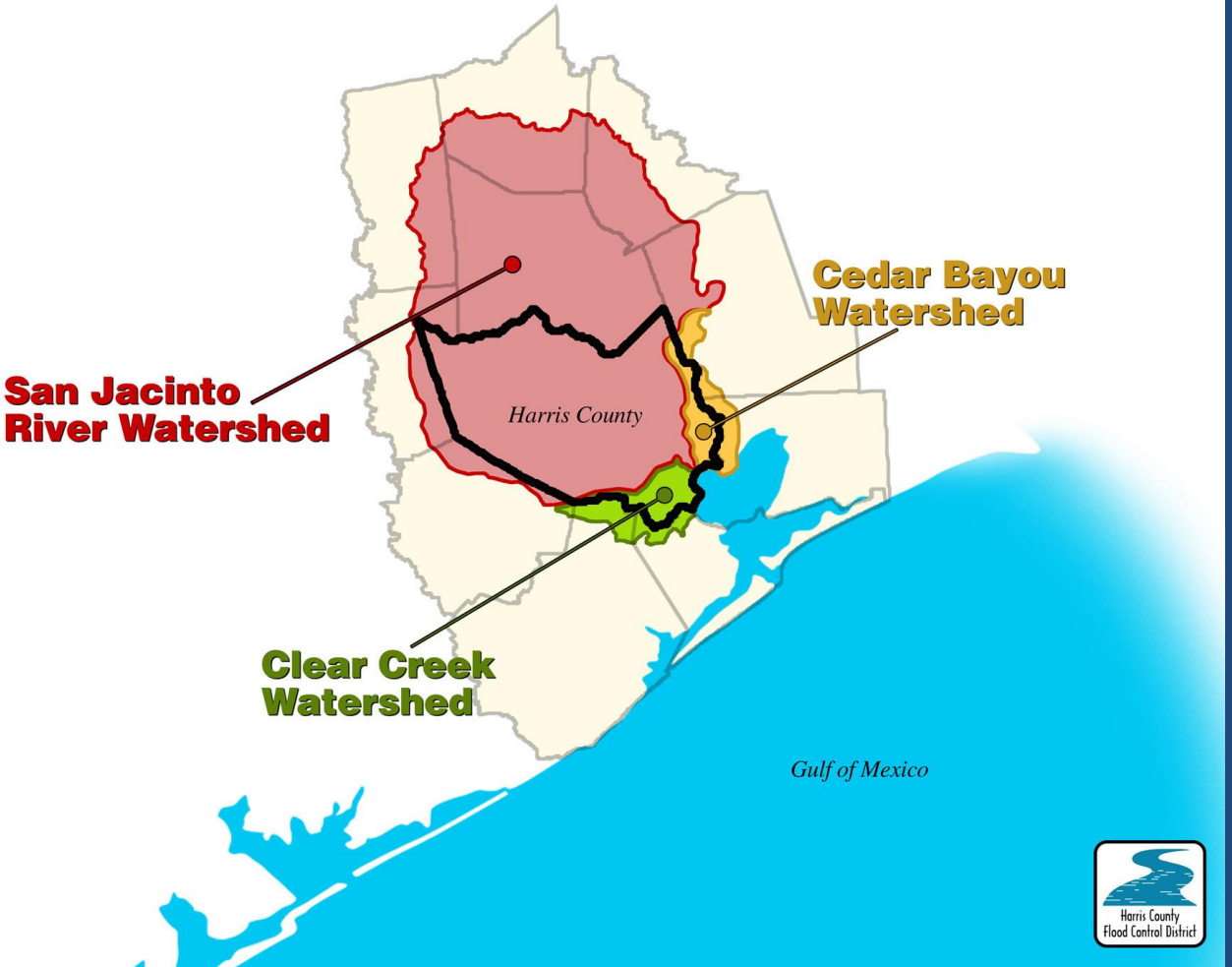
Civic Plus Mass Communication Tool

- SJRA implementing new Mass Communications Tool, Civic Ready
- Receive time-sensitive updates and notifications by:
    - Email
    - Phone-in
    - Text
    - Mobile application
- Supplements current updates on SJRA website and social media platforms


SAN JACINTO RIVER AUTHORITY
SJRA
www.SJRA.net

Harris County Flood Control District

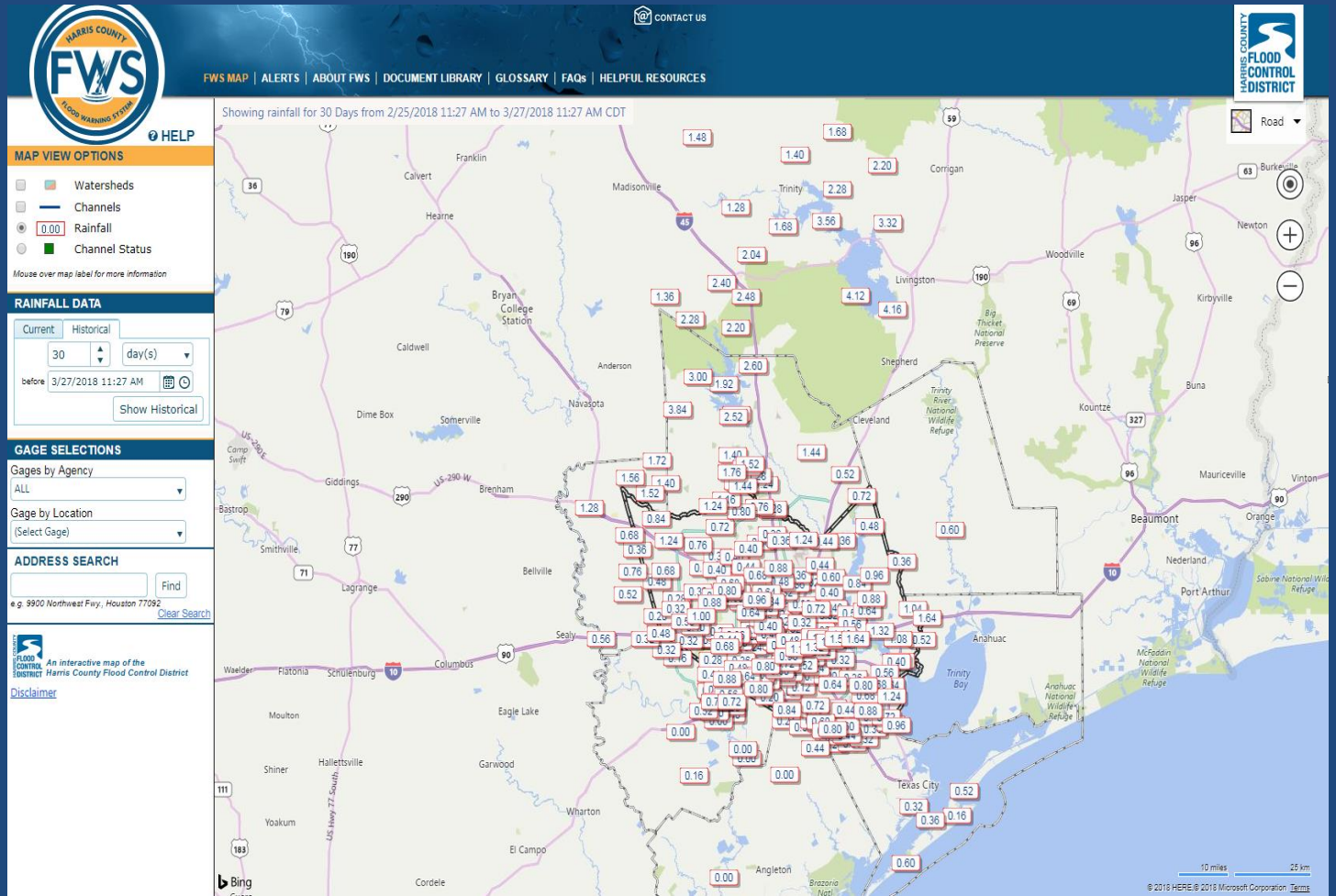
Harris County Local Watersheds



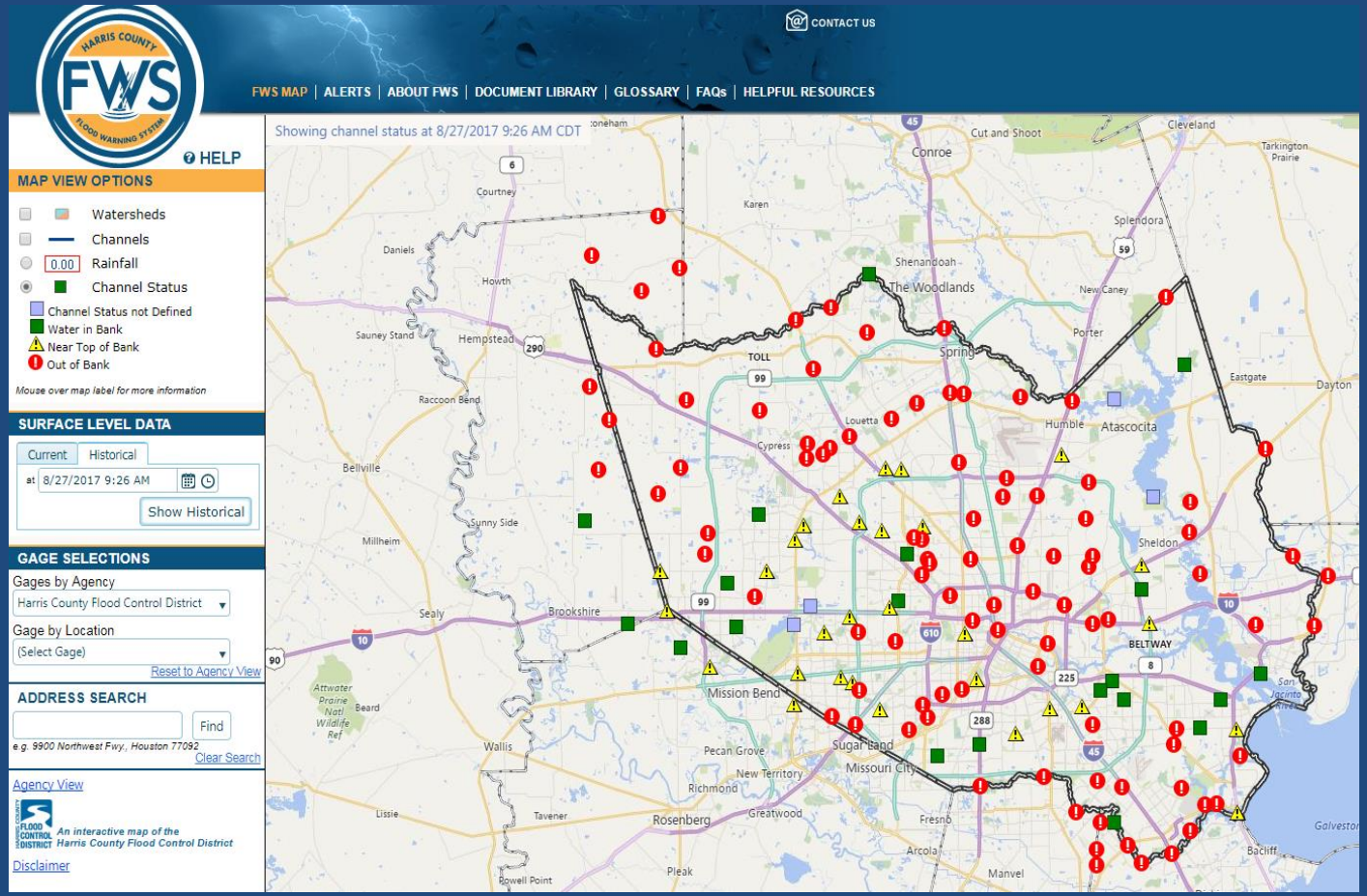
Flood Warning System


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
© 2017 HERE © 2017 Microsoft Corporation Terms
www.harriscountyfws.org

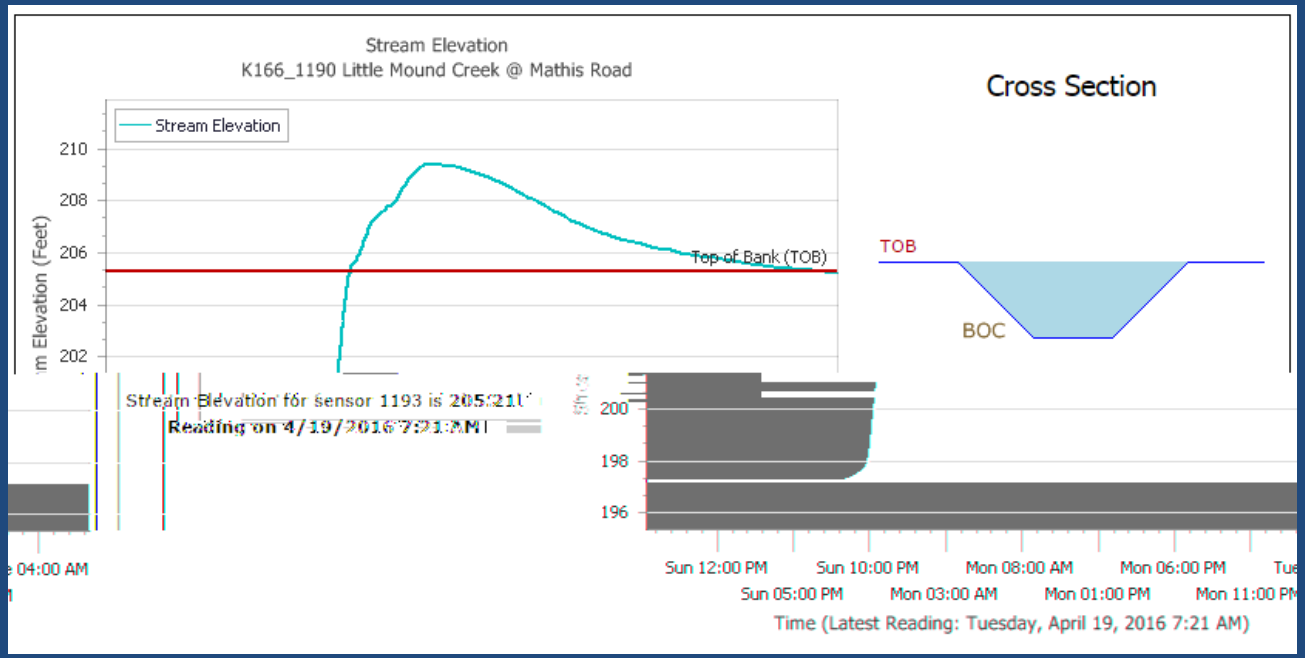
All FWS Gages



Public Website – Channel Status



Public Website – Water Level



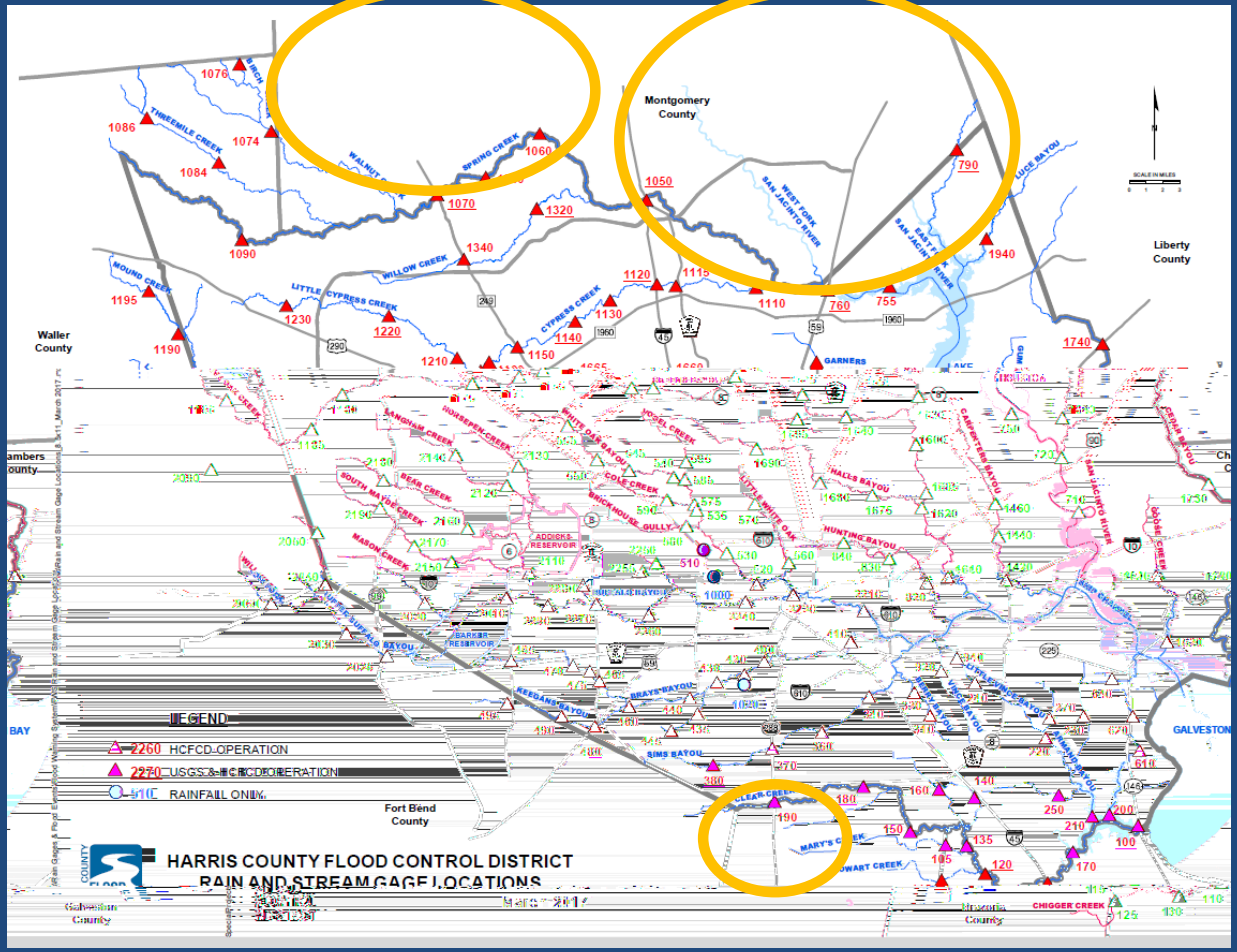
Flood Frequency	Elevation
10% (10-year)	208.80'
2% (50-year)	209.70'
1% (100-year)	210.10'
.2% (500-year)	211.10'

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.

Gage Network Expansion



Flood Preparedness

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

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."

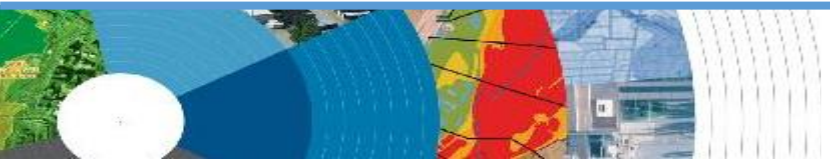
FEMA

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



FEMA

Insurance Misconception

- **Misconception:**

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

- **Fact:**

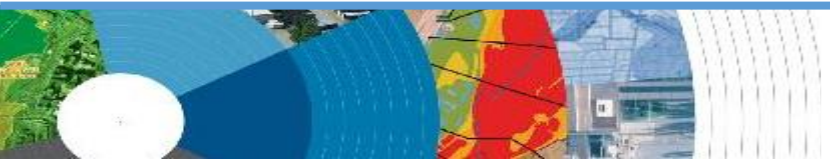
  Most insurance policies do not cover flooding; only flood insurance covers flood damage.

  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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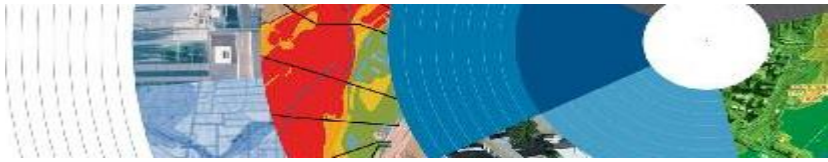
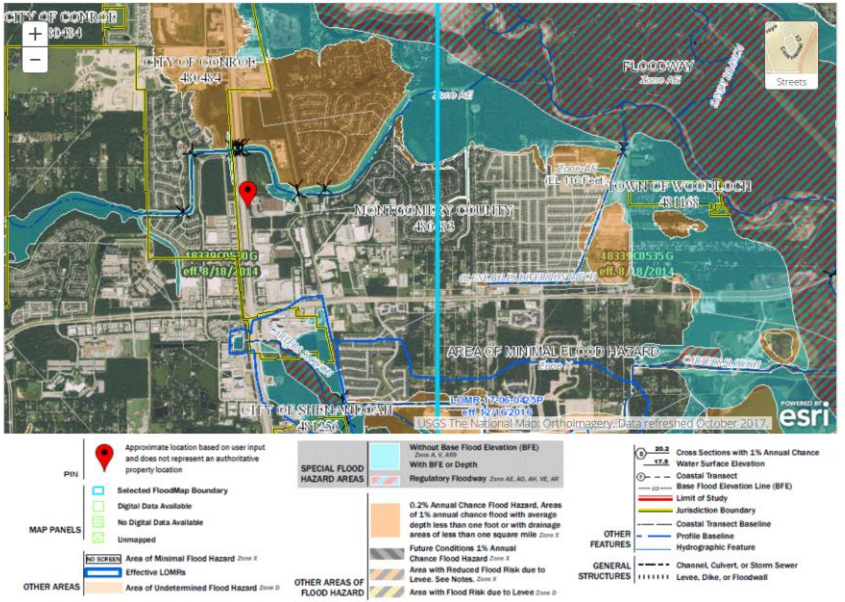
What is a FIRM?



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



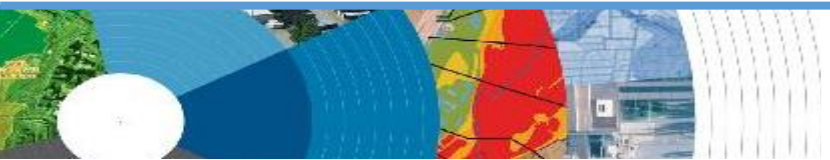
Find your zone at https://msc.fema.gov/portal/home

FEMA

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.

EMA

Harvey Numbers

Insurance claims

- Harris Co (includes cities such as Houston) – all claims 55,570**
- Montgomery (unincorporated only) 739 (Losses over 125K)

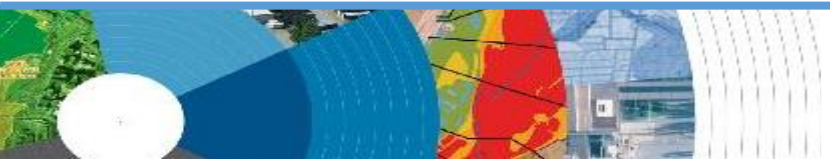
New GFIP's Due to Harvey

- Montgomery County –271

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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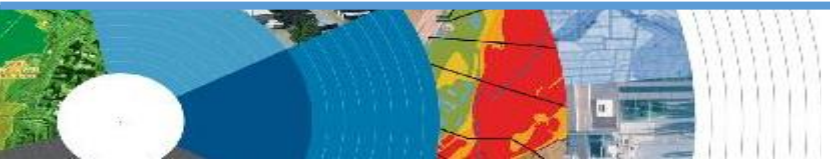
Summary

- 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**.



FEMA

Contact Information

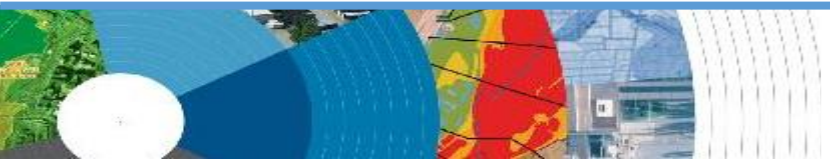
NFIP Hotline
1-800-427-4661
www.fema.gov/nfip

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

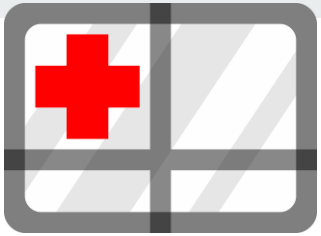
Lauren Schmied, PE, Floodplain Management
Cell 202-812-6164 | Lauren.Schmied@fema.dhs.gov

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



FEMA

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.)

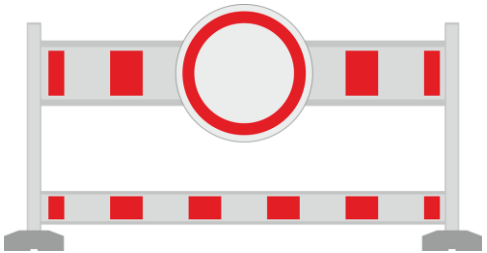
Turn Around, Don't Drown!

- 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

- Have multiple ways to receive weather information (cell phone, NOAA weather radio, television, etc.)
- 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.
- 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 During a Flood

- Stay out of the flood waters!
- Floodwaters can contain chemicals, sewage, disease, and animals
- Unseen underwater debris can be sharp and cause injury
- Downed power lines under the water could lead to death or injury from electrocution
- Water depth can change unexpectedly (storm drains, washed-out roads)

Safety After a Flood

- Don’t put yourself in danger.
- Return home only when authorities indicate it is safe.
- Stay away from damaged areas unless your assistance has been specifically requested by police, fire, or a relief organization.
- Use extreme caution when entering buildings; there may be hidden damage, particularly in foundations.

weather.gov/flood

Safety After a Flood

- Don’t leave lit candles unattended
- Cut power to flooded areas of your home
- Only use generators in well-ventilated areas—never in a closed garage!
- Take breaks and drink plenty of fluids
- Do not use power tools while standing in water
- If you smell or hear gas, call the Fire Department.

Reporting/Wrap Up

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

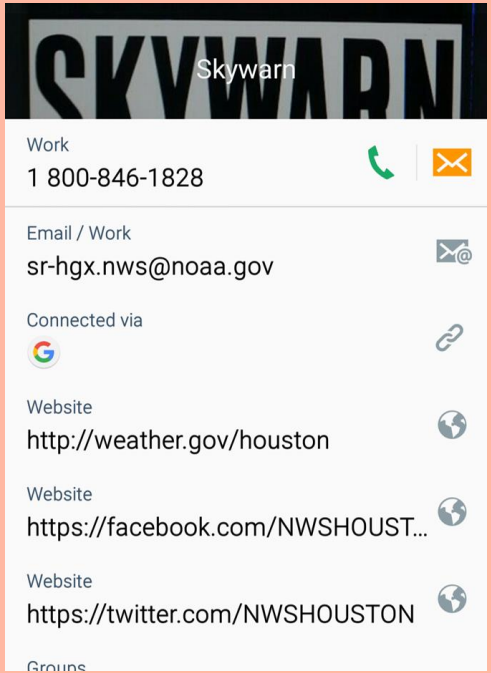
Email

sr-hgx.nws@noaa.gov

Social Media

Twitter: @NWSHouston

Facebook: NWSHouston



Spotter Tip

Set up SKYWARN as a contact in your smartphone

Questions

National Weather Service
San Jacinto River Authority
FEMA