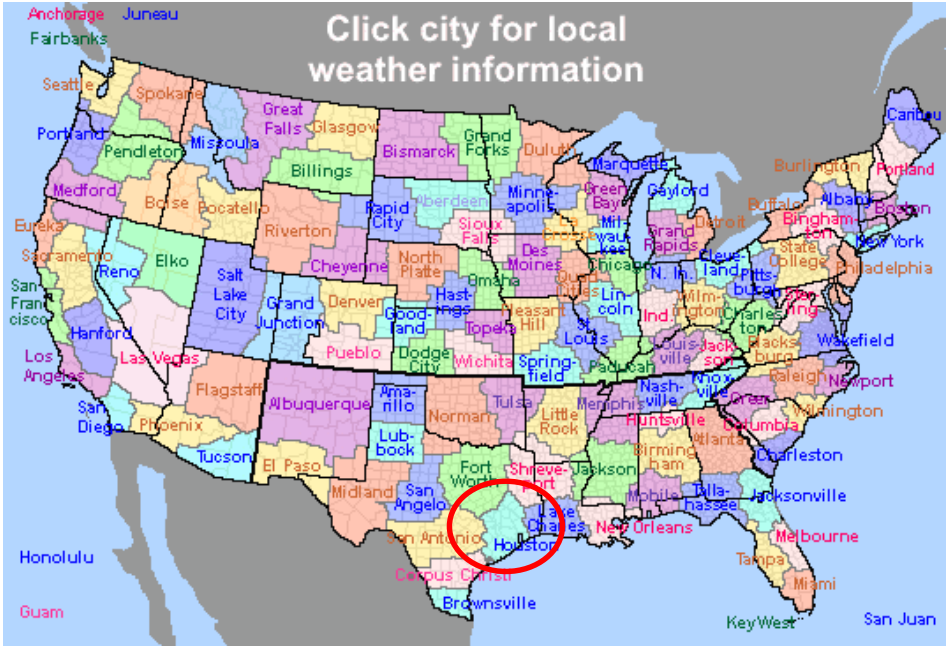
2018 FloodWarn Training

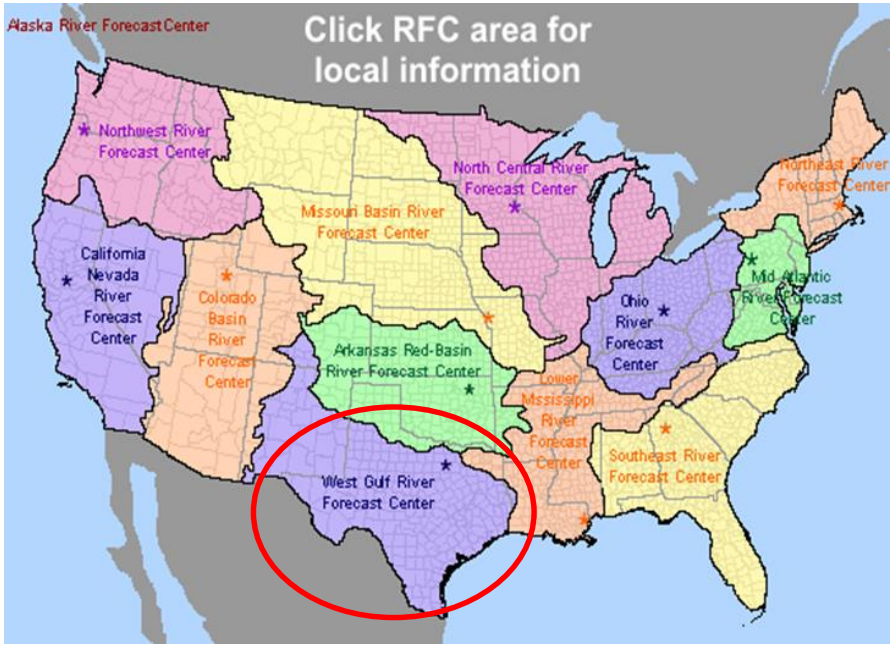
Katie Landry-Guyton
Senior Service Hydrologist/Meteorologist
National Weather Service- Houston/Galveston, TX

National Weather Service

Weather Forecast Offices



River Forecast Centers



Outline

Flooding Importance

Flooding Types and Causes

Flood Products

Coastal Flooding

River Flooding

Partners

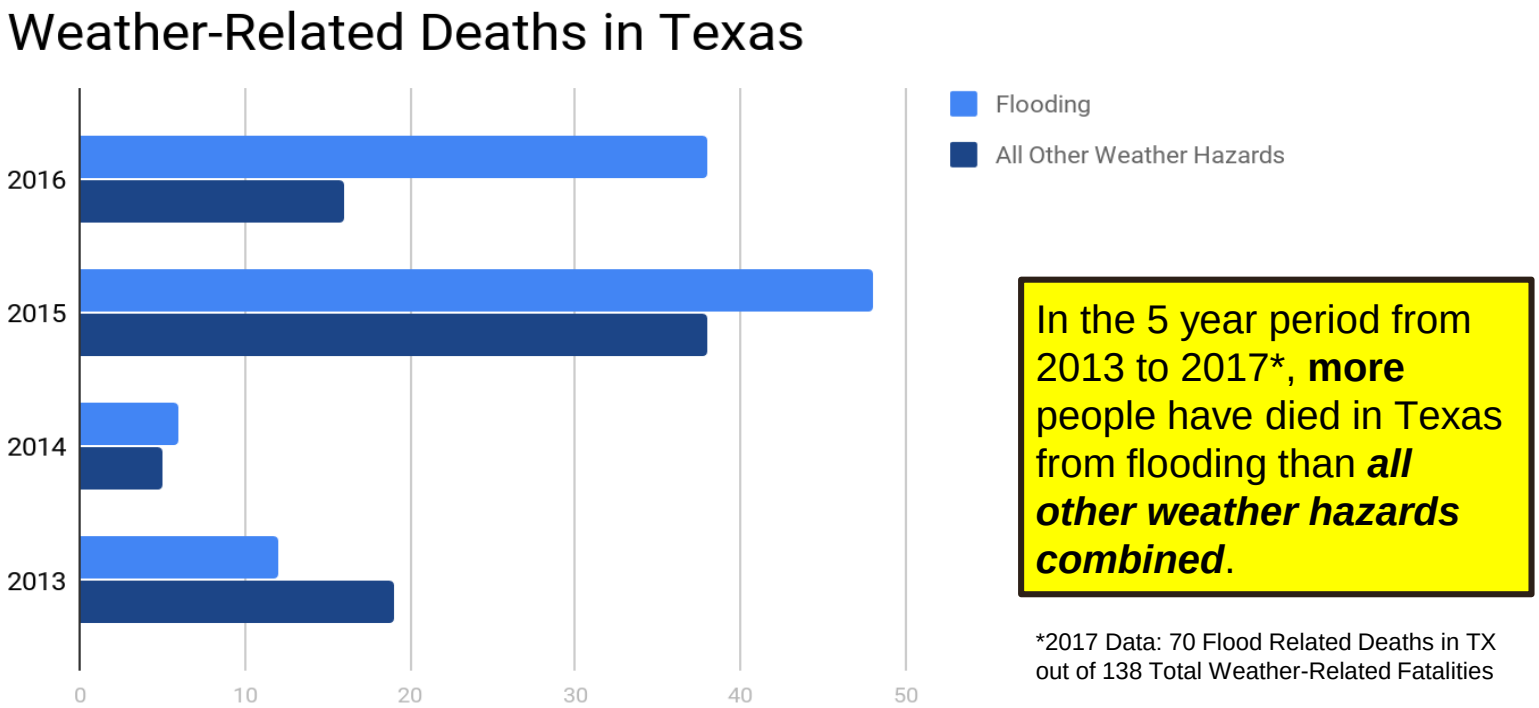
Flood Safety

Reporting Flooding

Flood Risk

Flooding Importance

Flooding is Deadly!

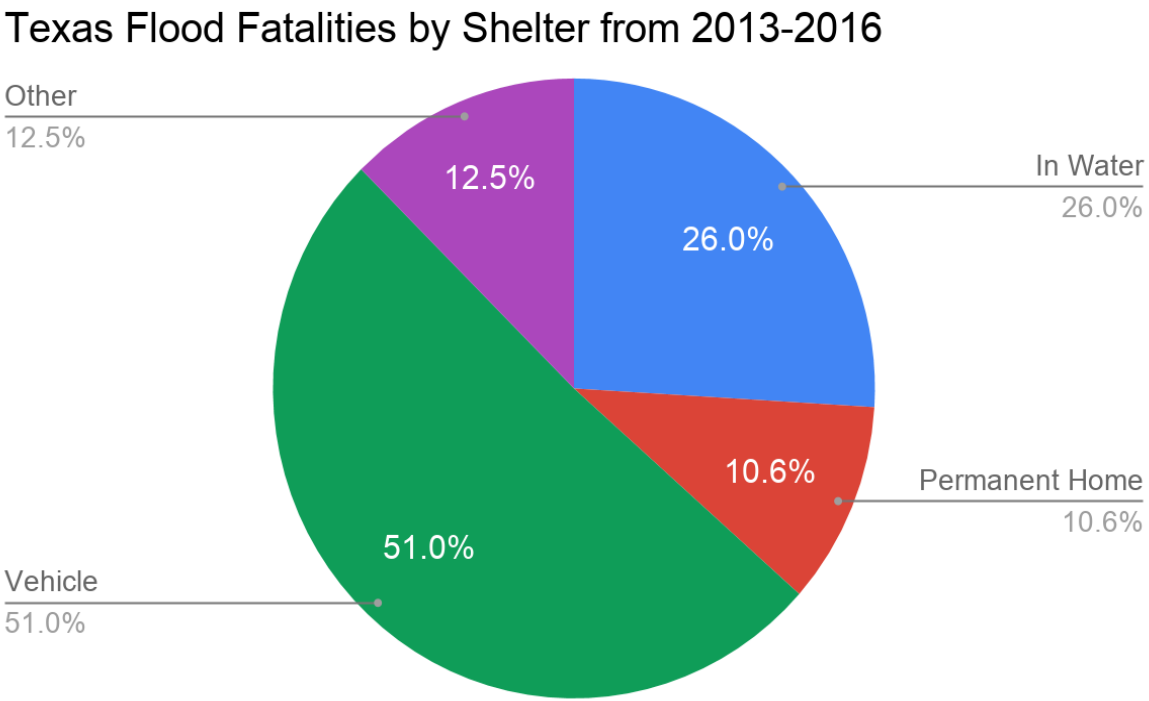


In the 5 year period from 2013 to 2017*, **more** people have died in Texas from flooding than ***all other weather hazards combined***.

*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


Tax Day 2016


Brenham 2016


Harvey 2017

And other historic floods…

Tropical Storm Allison

1994 Flood

Tropical Storm Claudette

Ike 2008

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

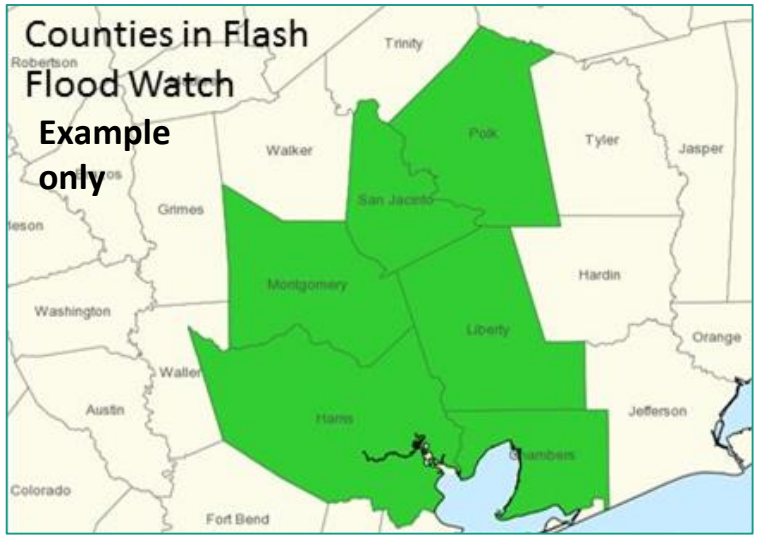
Flooding along a coastline either from high tides or storm surge during a tropical storm or hurricane

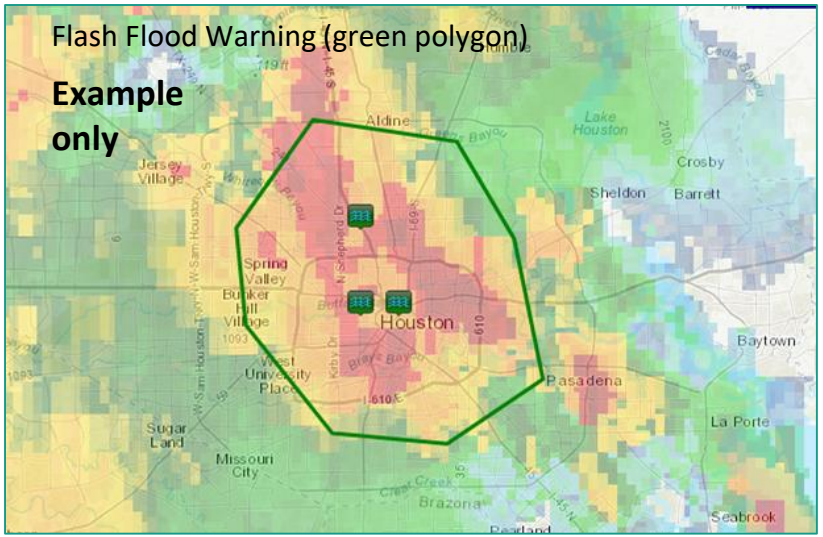
Flood Products

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/Coastal Flood 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?

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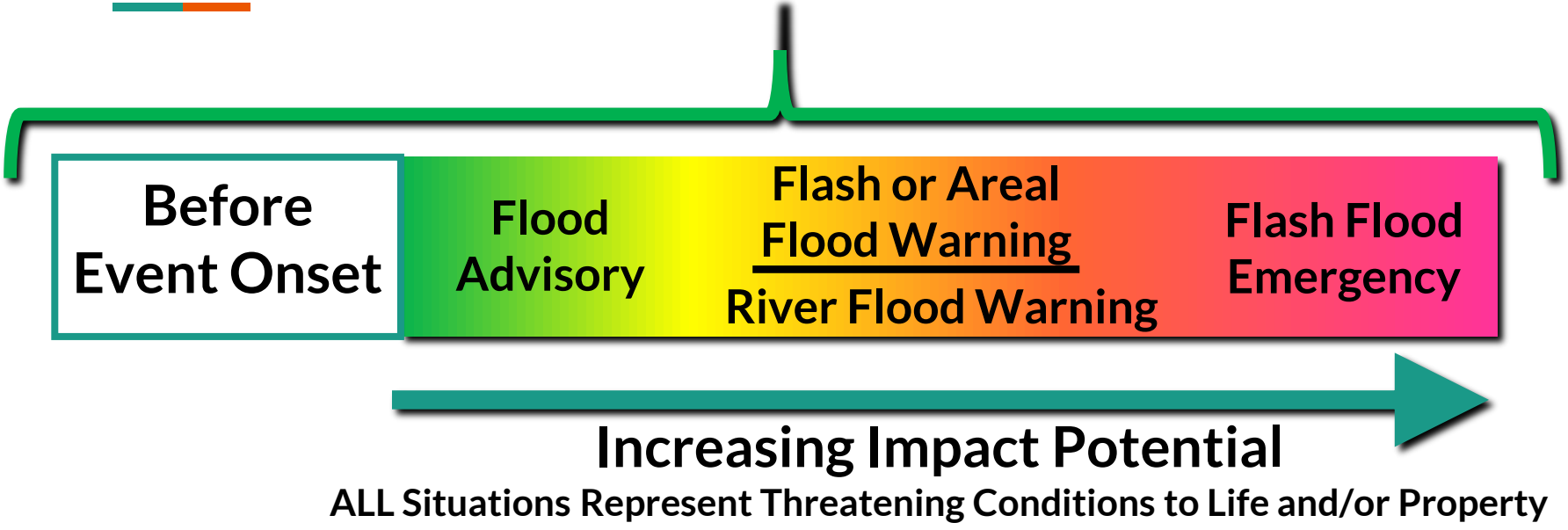
What type of flooding is this?

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

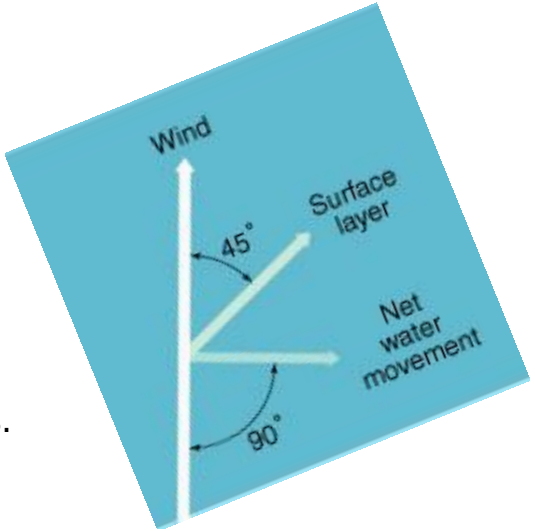
Social Media

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

Coastal Flooding

What impacts water levels locally?

- **Ekman Transport:** Water is deflected/transported 45° (at the surface) to 90° (330-500 feet) to the right of the wind.
- **Wind direction:** An easterly wind component will typically produce higher water levels. Opposite is true about northwesterly directions.
- **Wind speed:** Higher speeds have a more significant impact than lower speeds.
- **Duration:** The longer elevated winds persist, the more significant the impacts.
- **Fetch:** The longer the distance the elevated winds, the more significant the impacts.
- **Miscellaneous:** Astronomical tides, seas, shelf slope, shape of the coast, etc.



You make the call…

Which scenario is more likely to produce higher water levels?

#1

#2

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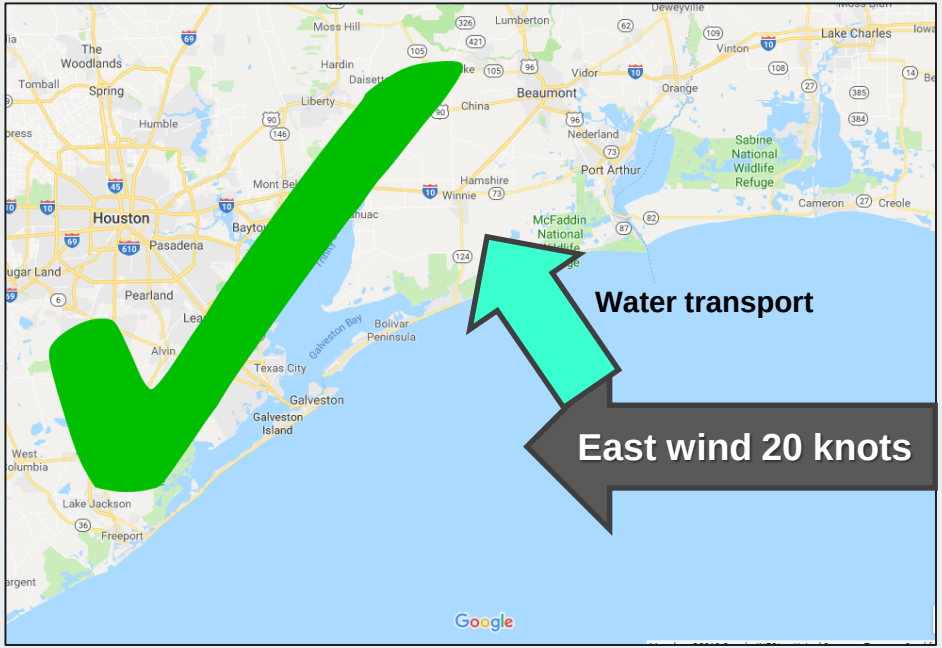
#1



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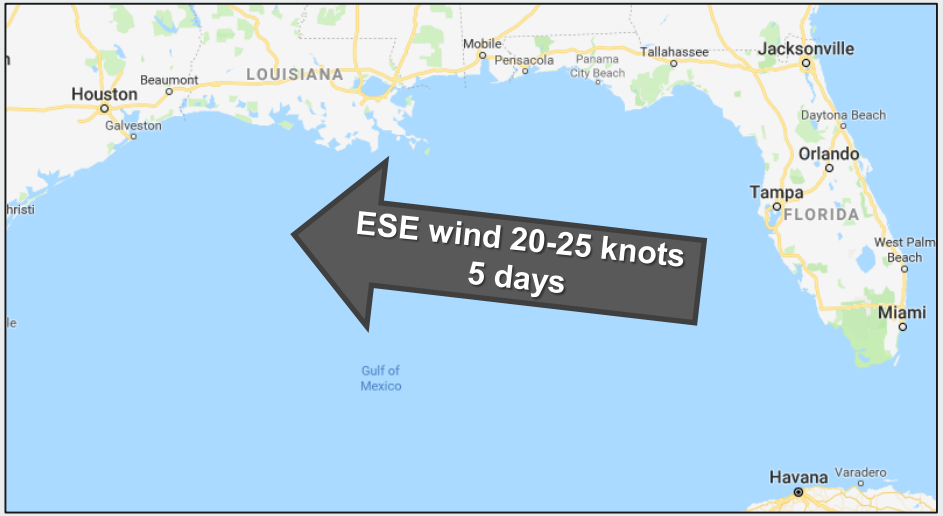

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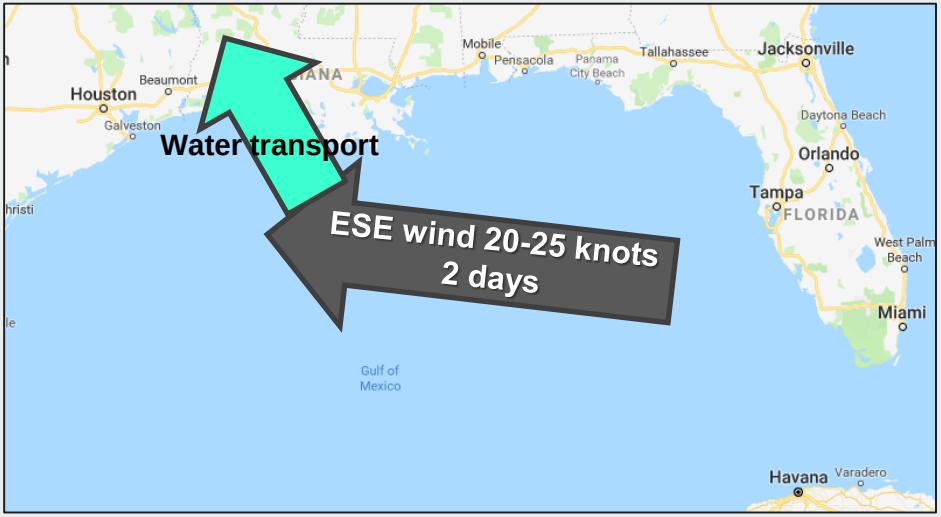

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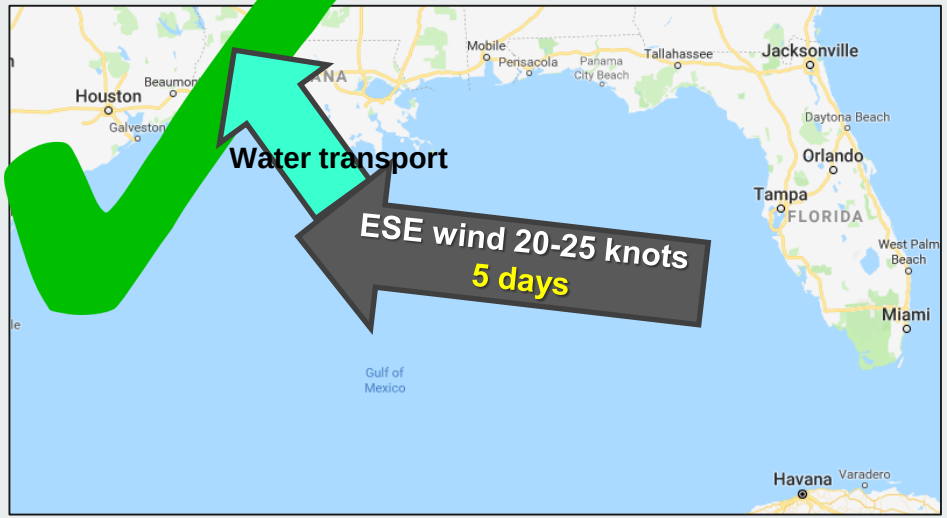

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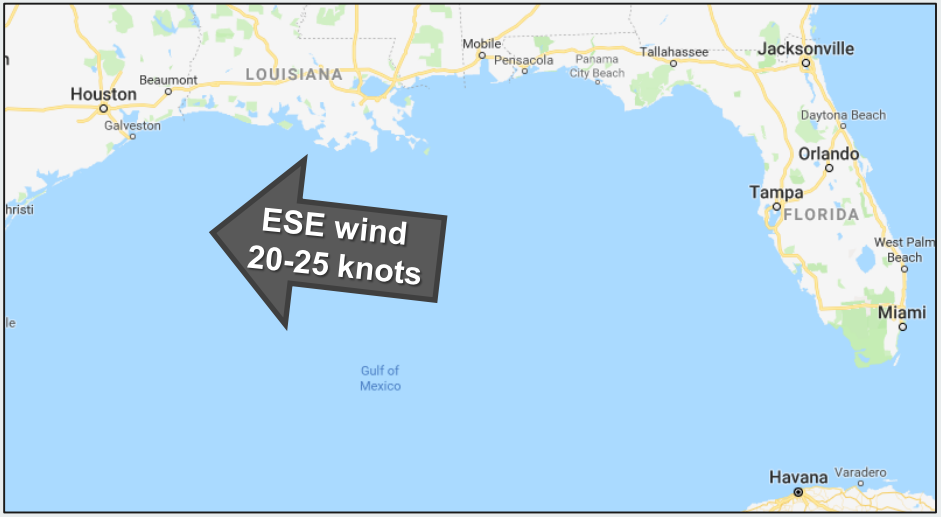

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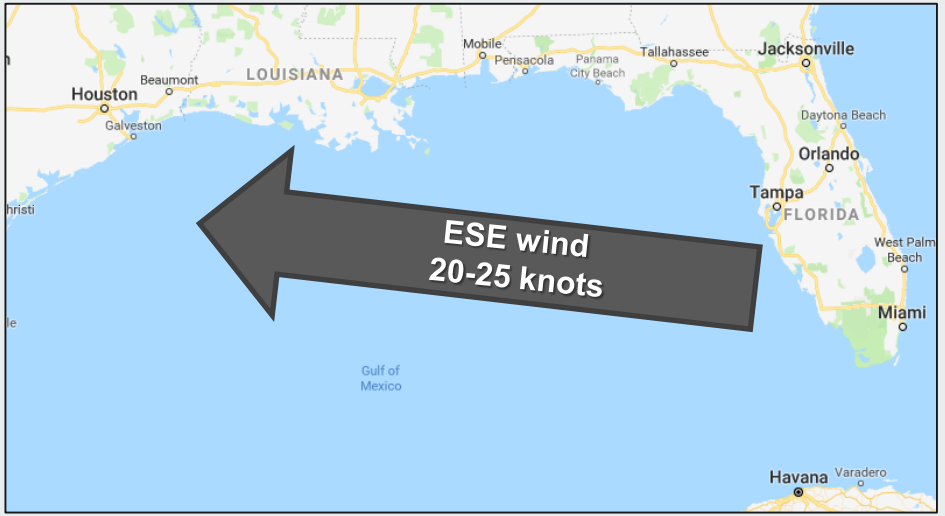

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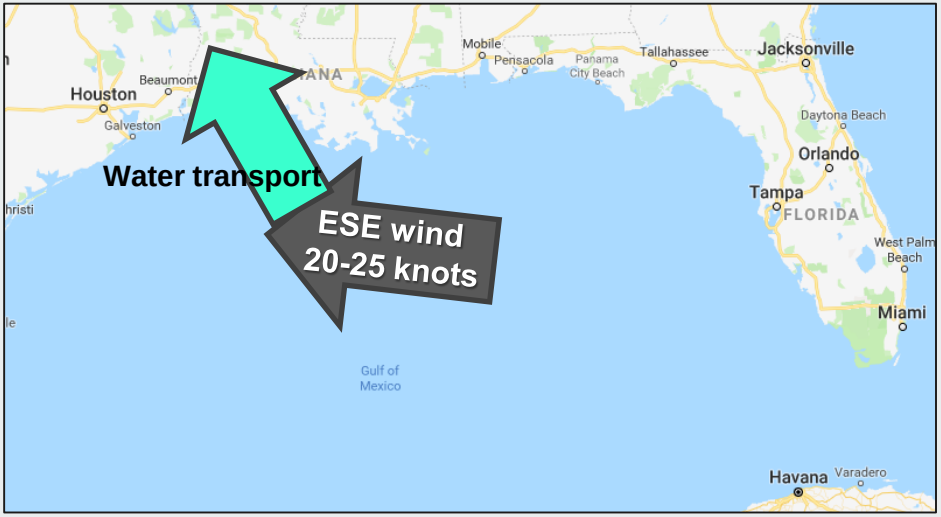

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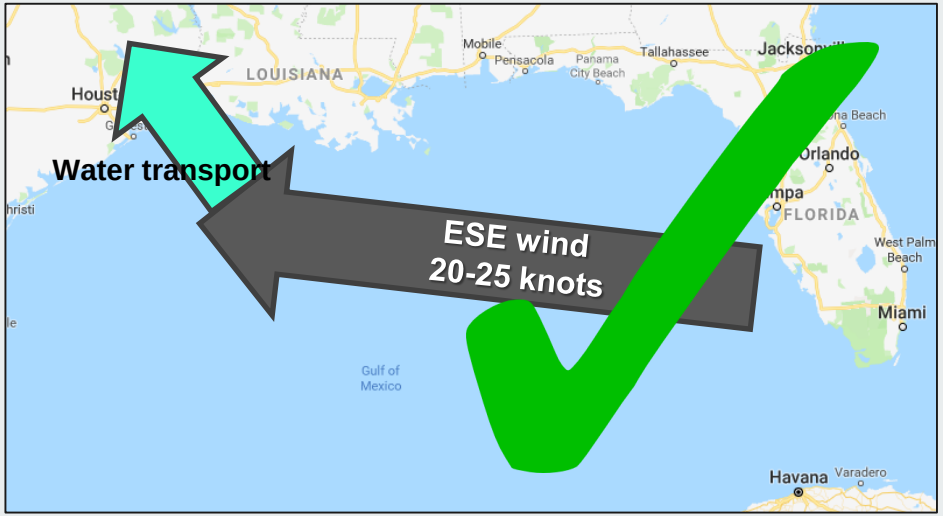
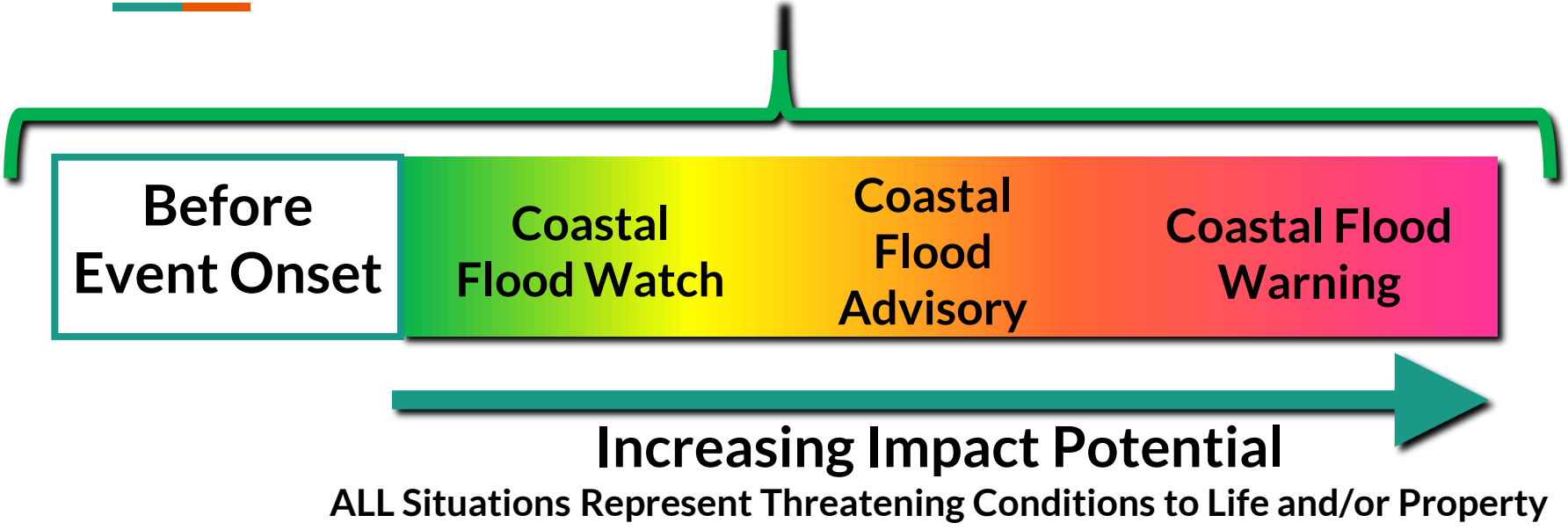
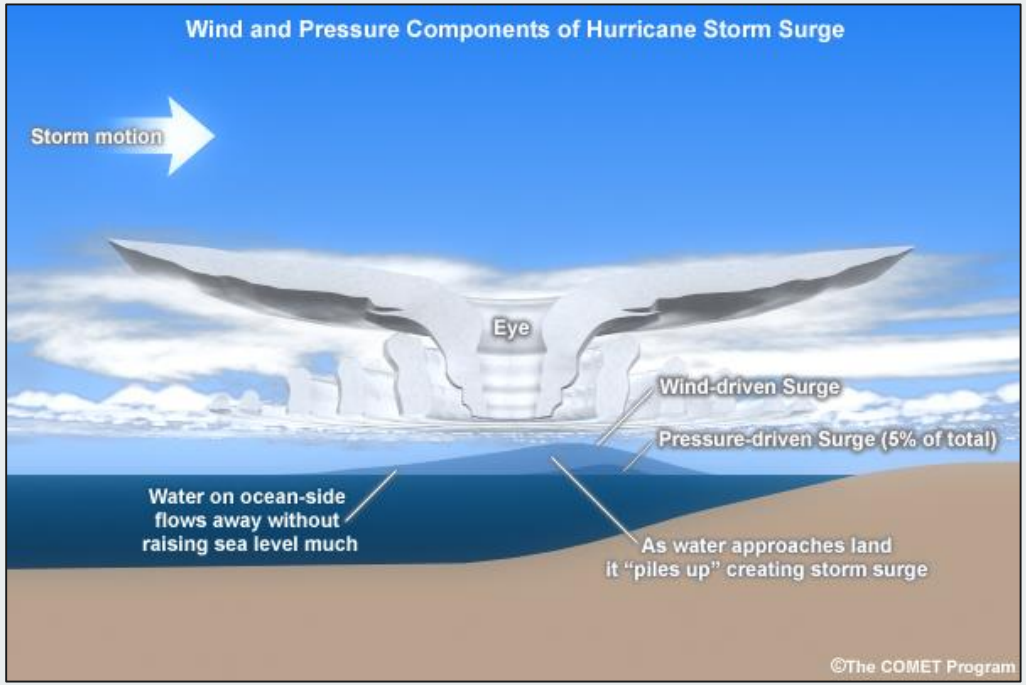


Coastal Flood Timeline



ALL Situations Represent Threatening Conditions to Life and/or Property

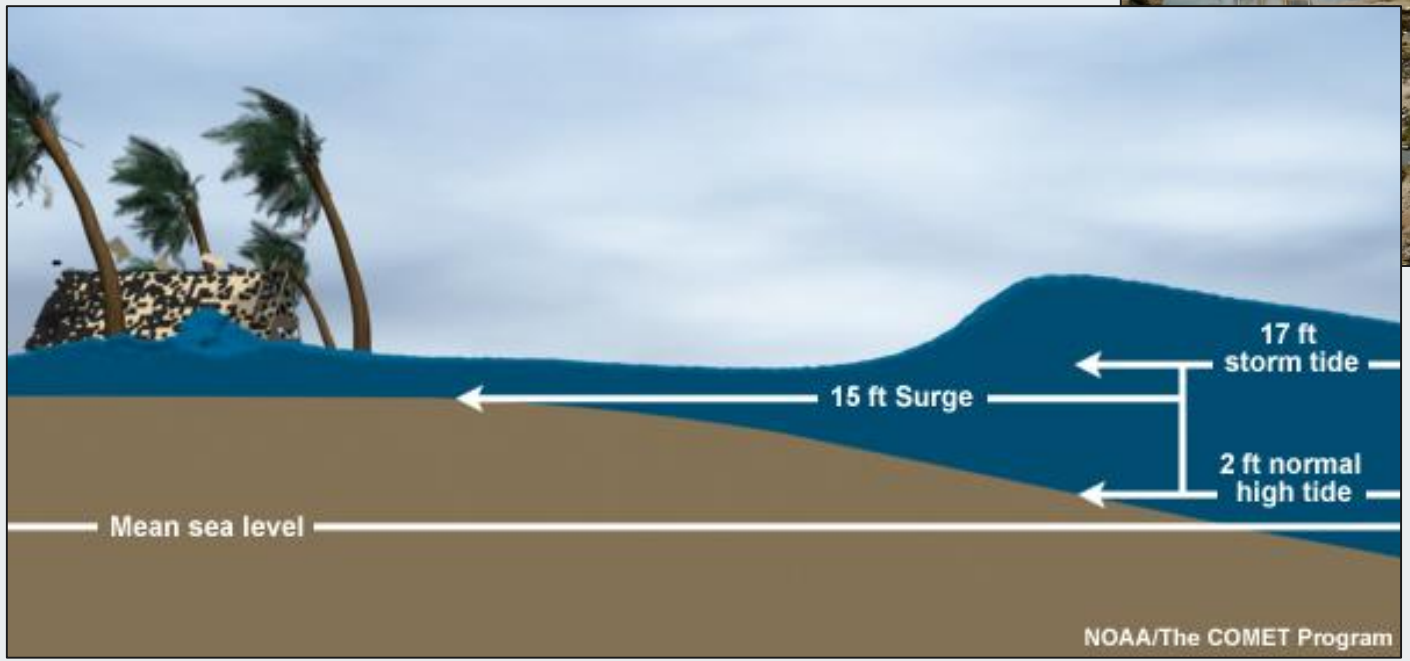
Storm surge



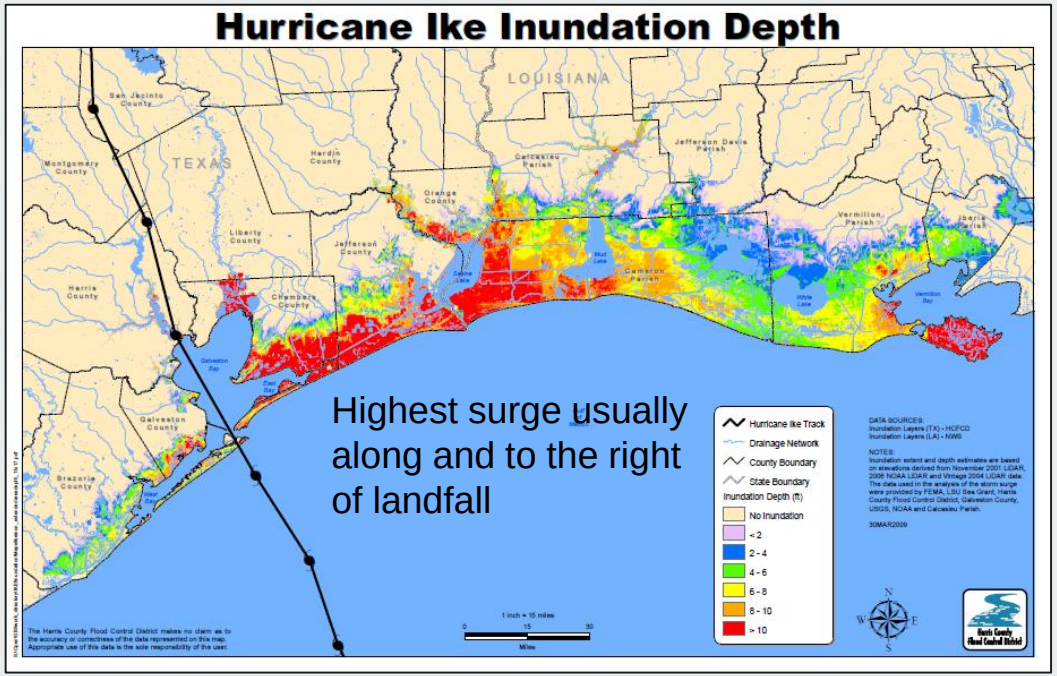
- Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides.
- Storm surge is produced by water being pushed toward the shore by the force of the winds moving counter-clockwise around the storm.
- Storm surge is often the greatest threat to life and property from a hurricane.

Storm Surge

Waves on top of surge are highly destructive. Water weighs approximately 1,700 pounds per cubic yard.



Storm Surge



Storm surge values many times do not correspond well to the hurricane wind categories (on the Saffir-Simpson Hurricane Wind Scale) that range from 1 to 5. These categories are based only on winds and do not account for storm surge. Ike was a category 2 storm that produced a 15-20 foot storm surge.

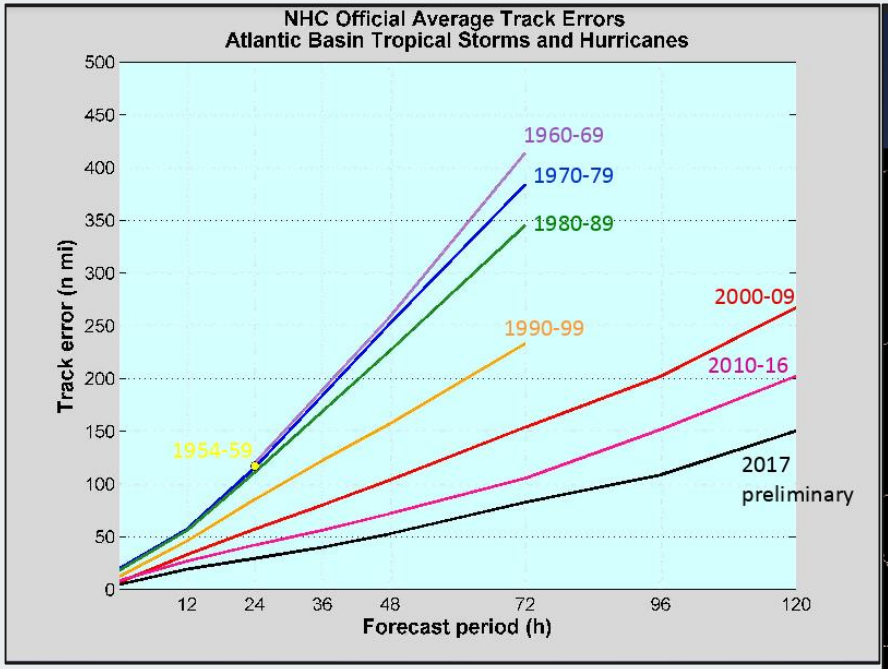
Sensitive to the slightest changes in:

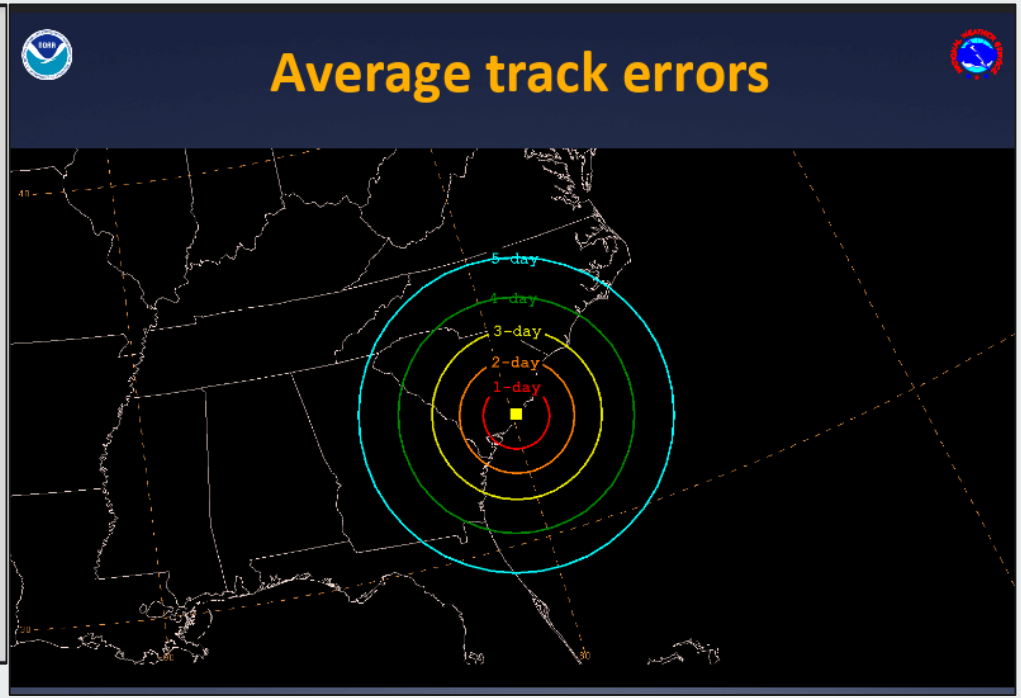
- ❑ Storm track.
- ❑ Storm intensity.
- ❑ Forward speed.
- ❑ Size (radius of maximum winds).
- ❑ Angle of approach to the coast.
- ❑ Shape and characteristics of coastal features such as bays and estuaries.
- ❑ Width and slope of the continental shelf. A shallow slope will potentially produce a greater storm surge than a steep shelf.

Storm Surge

Sometimes high water levels cut off communities well before (sometimes days) bad weather arrives. First responders need to be prepared for this and also ensure your personal family members have a plan in place.

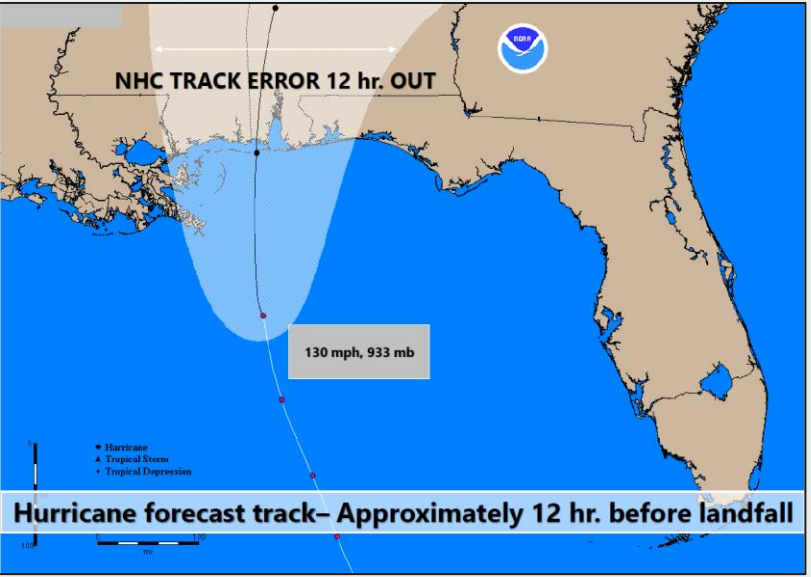
Track Errors



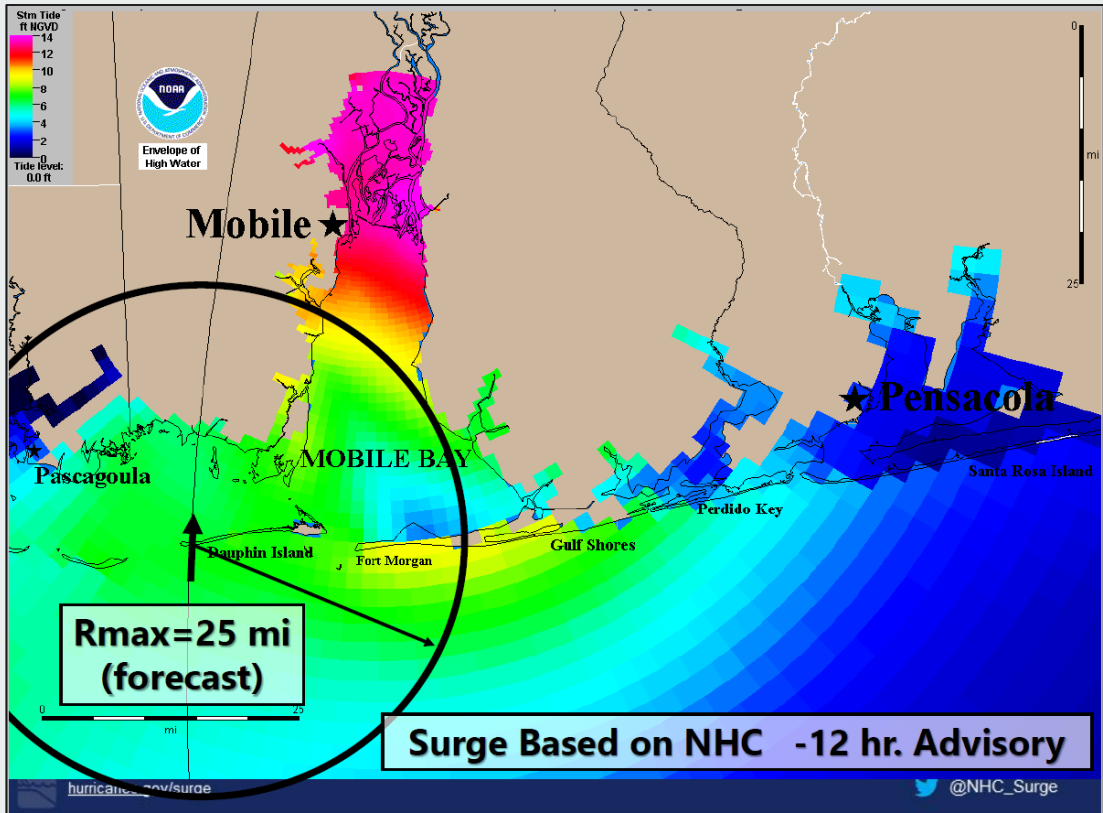


Storm Surge

Real scenario…NHC forecast track

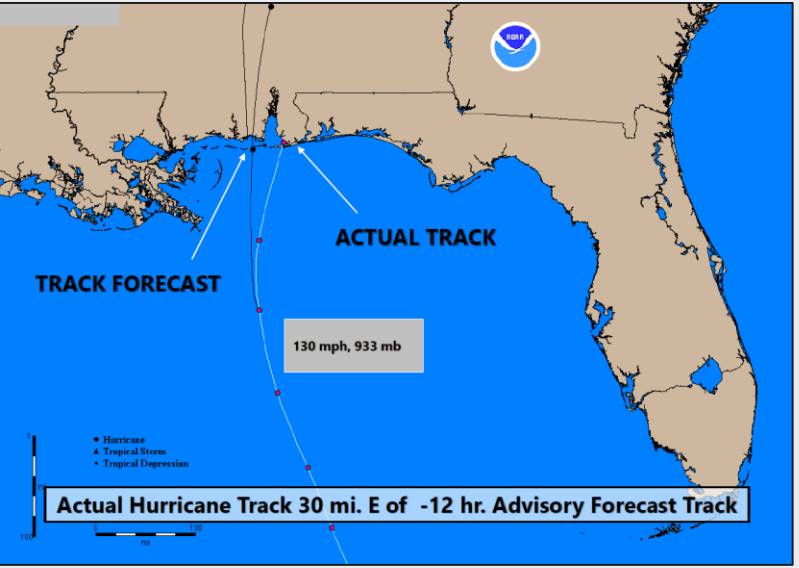


Forecast surge

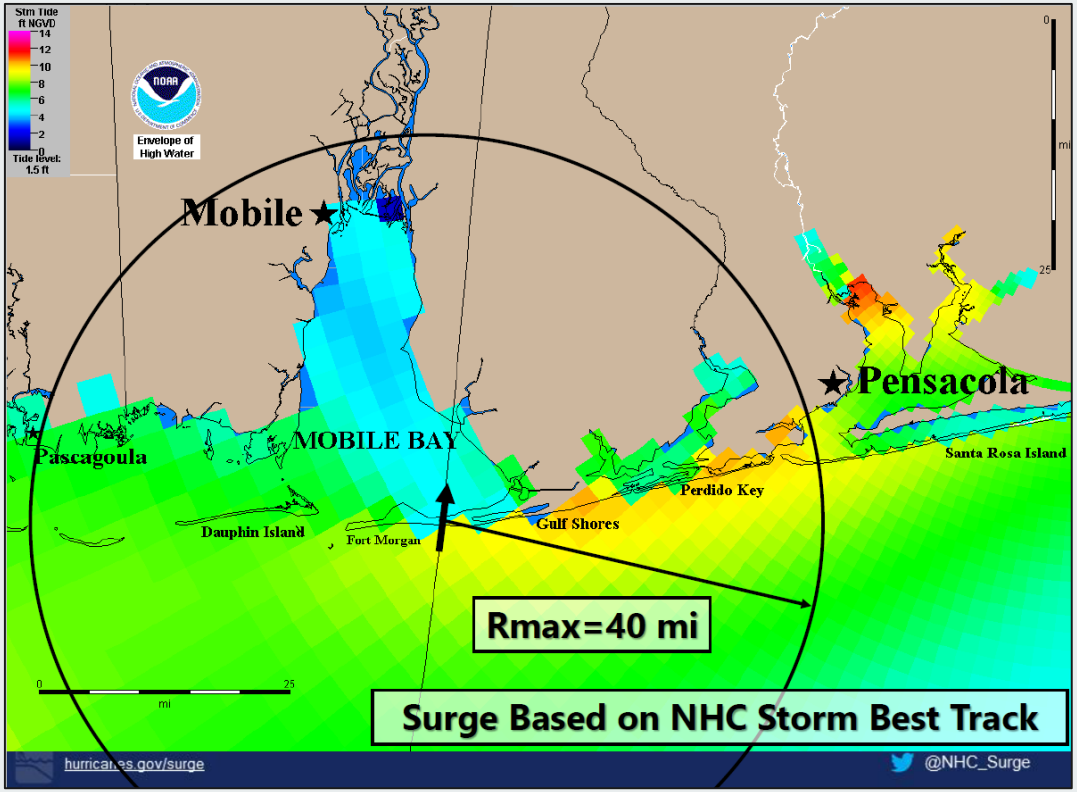


Storm Surge

Actual track

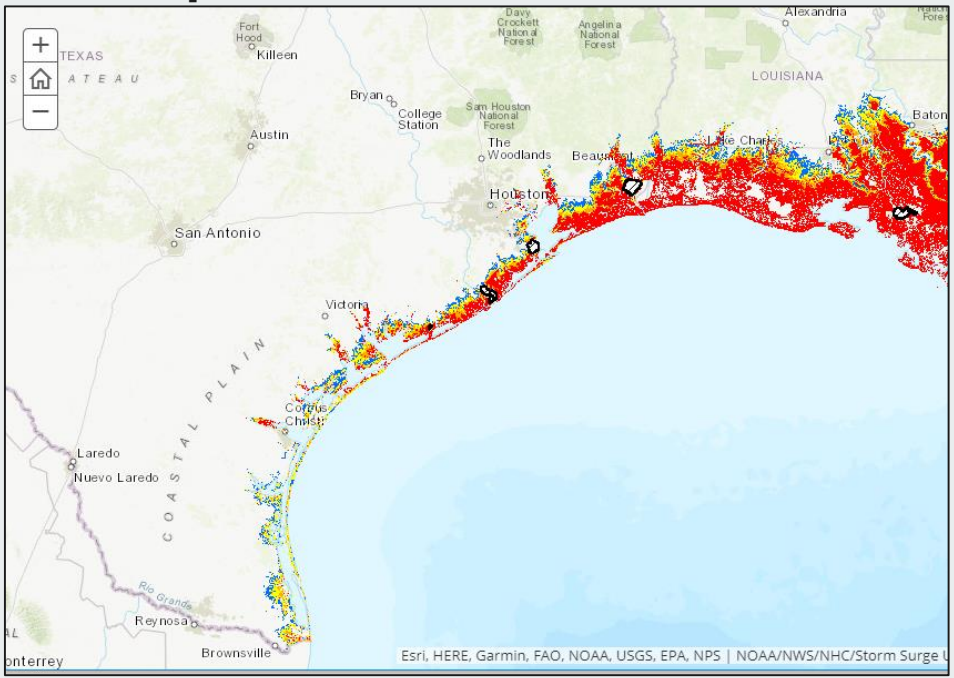


Observed surge



Storm Surge – Readiness, Planning & Mitigation

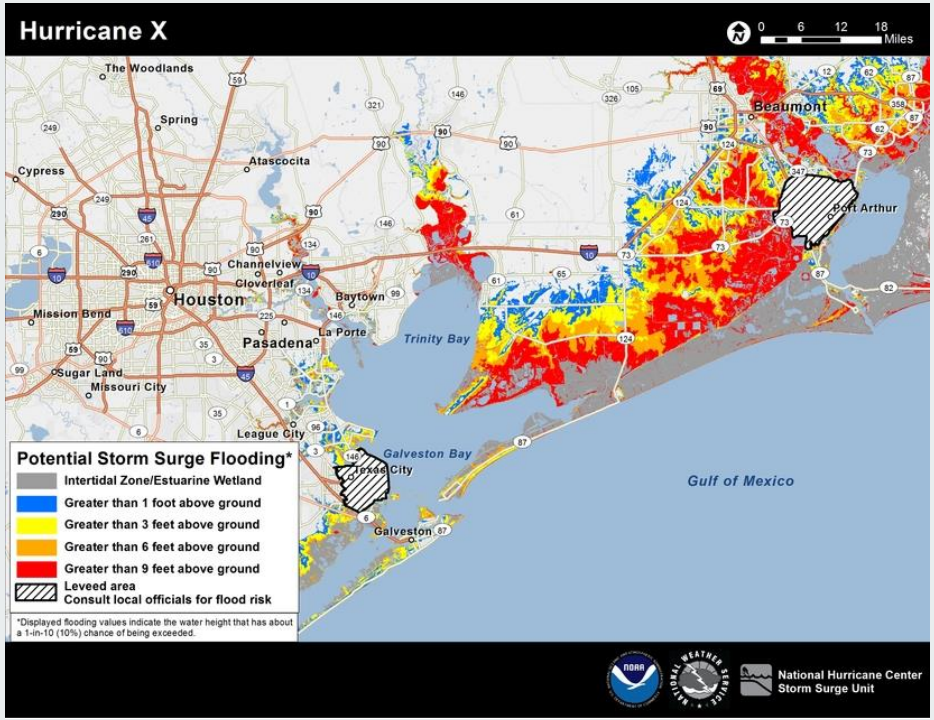
Landfall 48+ hours out: pre-computed *risk* maps (SLOSH MOMs and MEOWs).



- Maps made by using up to 100,000 hypothetical storms to compute the maximum storm surge at an individual point.
- Varying forward speed, radius of maximum wind, intensity, landfall location, tide level, and storm direction.
- Ask your local NWS where to find these maps and how to read them.

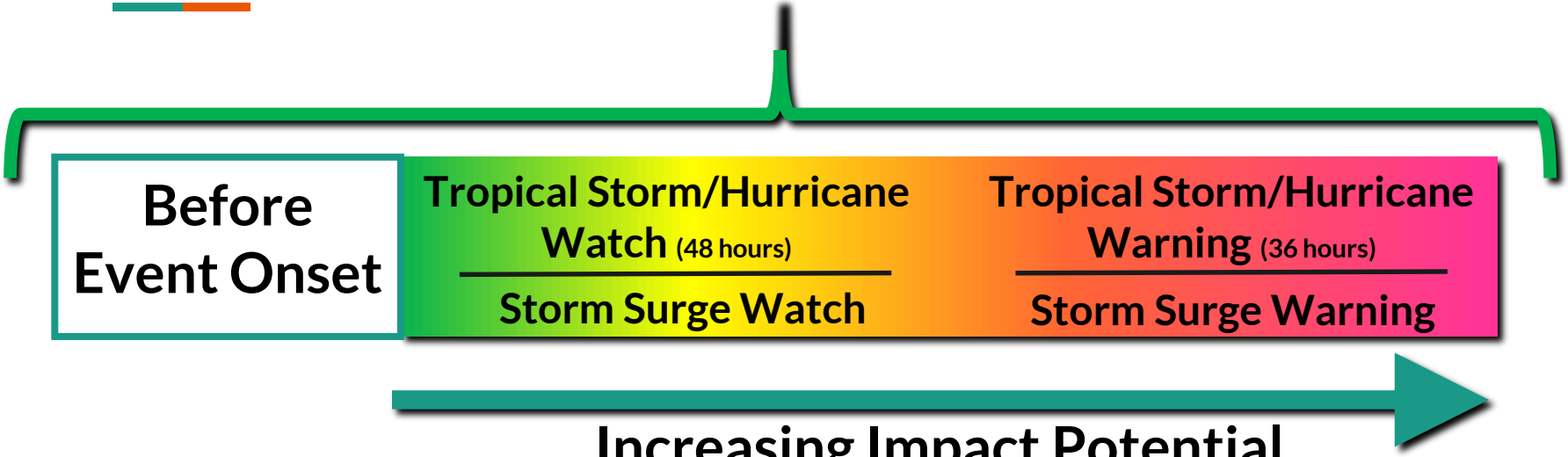
Storm Surge - Response

<48 hours before landfall: NHC Potential Storm Surge



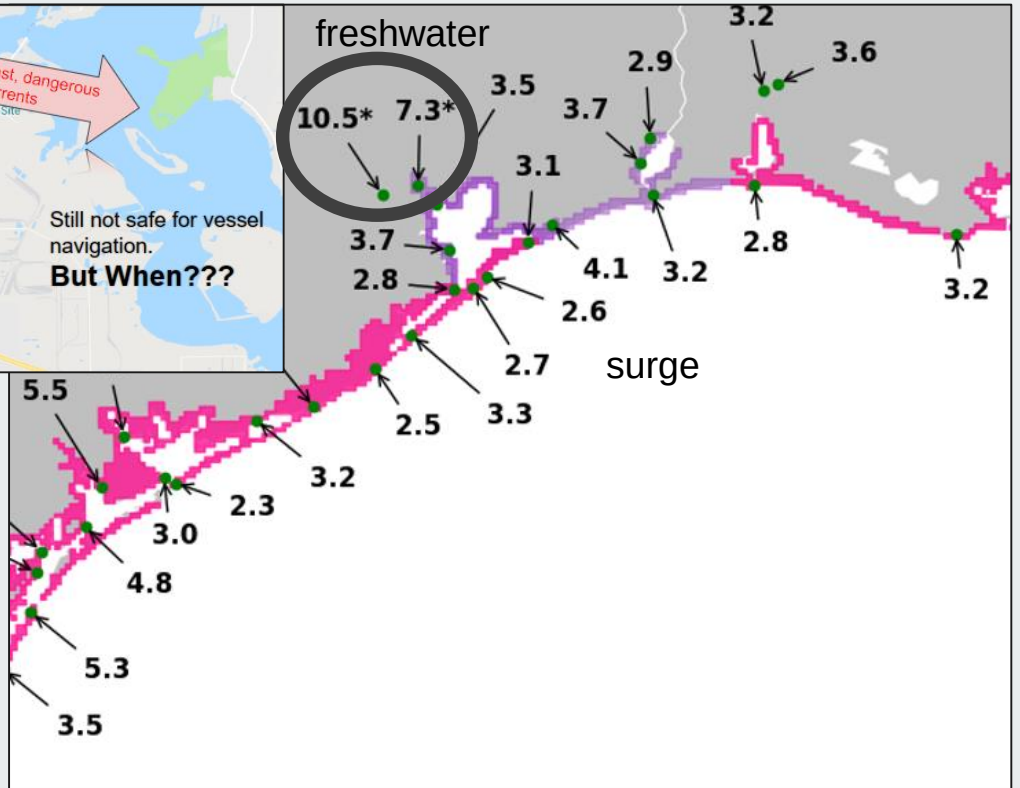
- Shows geographical areas where inundation from storm surge could occur and how high above ground the water could reach in those areas.
- Based on the latest forecast track and intensity of the tropical cyclone.
- Takes into account likely forecast errors.
- The shading represents inundation levels that have a 10 percent chance of being exceeded, which can therefore be thought of as representing a reasonable worst-case scenario for any individual location.
- Updated every six hours or so.

Tropical Cyclone Timeline



ALL Situations Represent Threatening Conditions to Life and/or Property

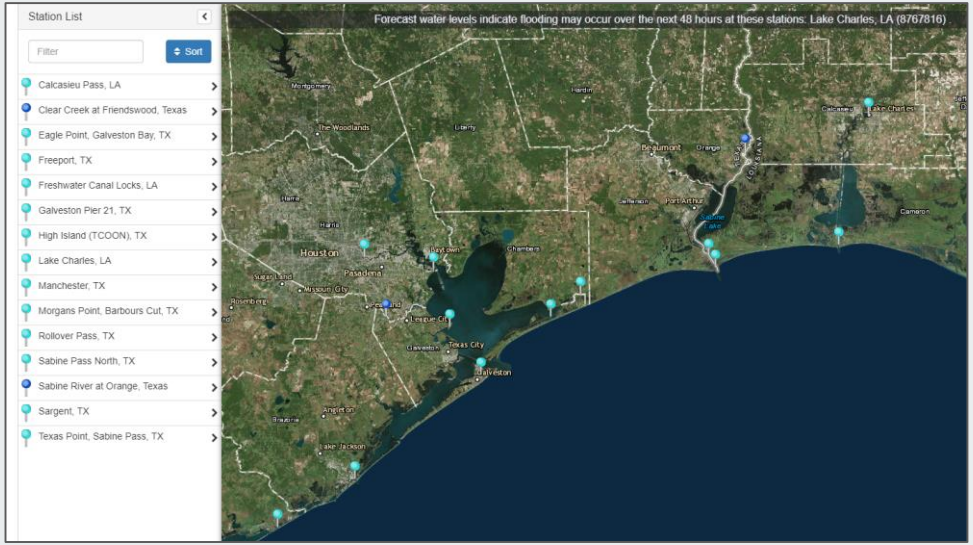
Storm Surge + Freshwater Flooding (Harvey)

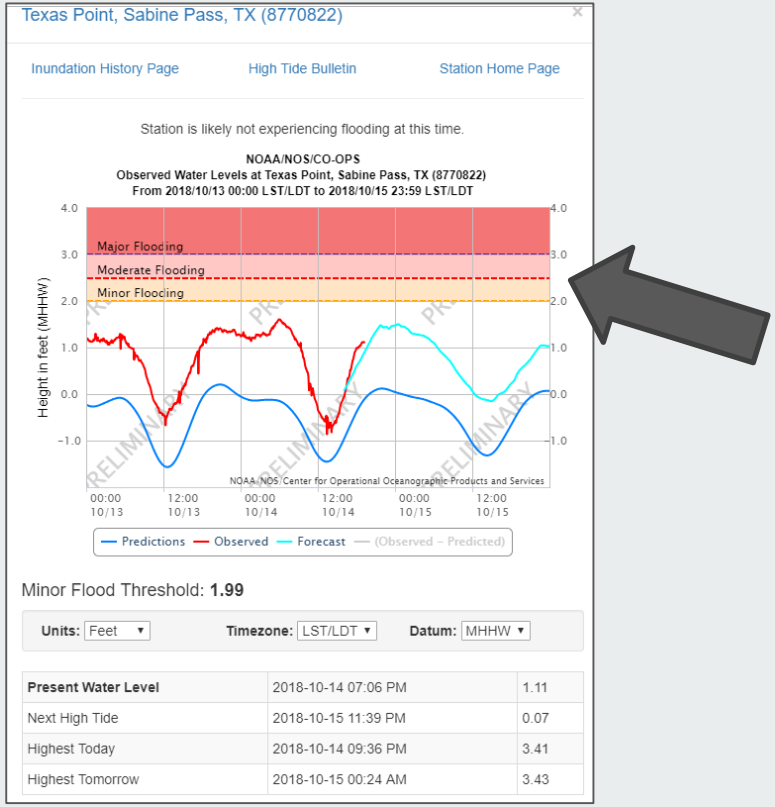


- Very difficult to forecast.
- Little guidance available.
- Cannot express how valuable local NWS hydrologists are in these complex situations!!!

Real Time Water Level Observations & Forecasts

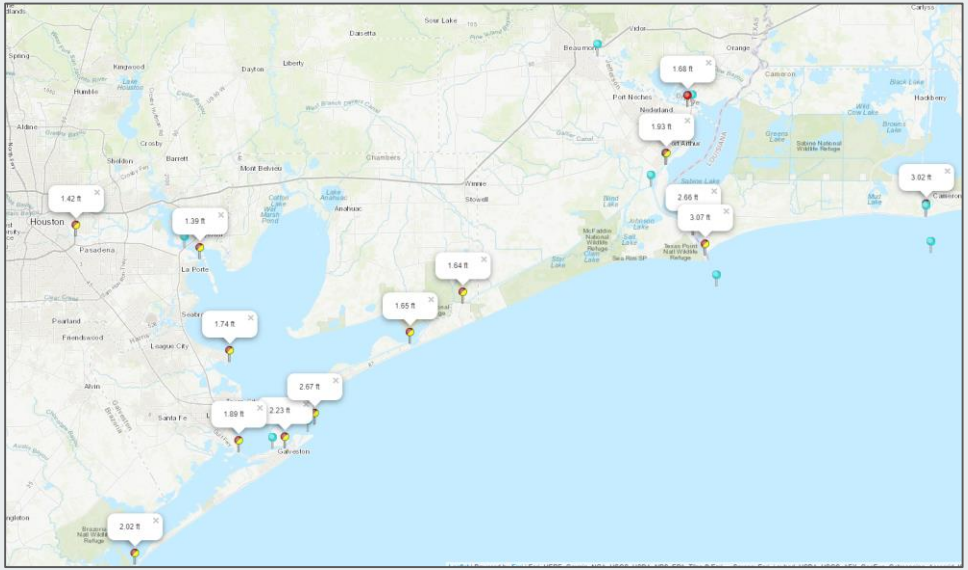
https://tidesandcurrents.noaa.gov/inundationdb/



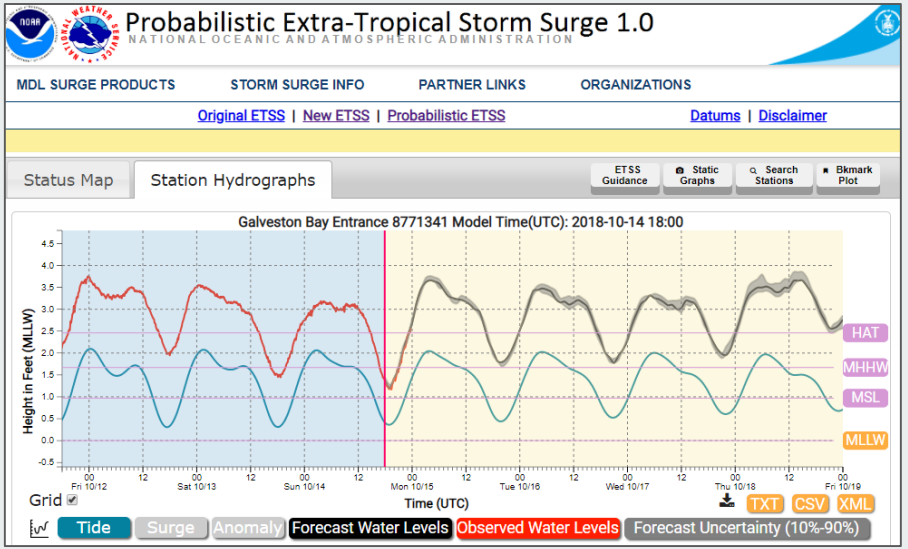


Real Time Water Level Observations & Forecasts

https://tidesandcurrents.noaa.gov/map/index.html?region=Texas



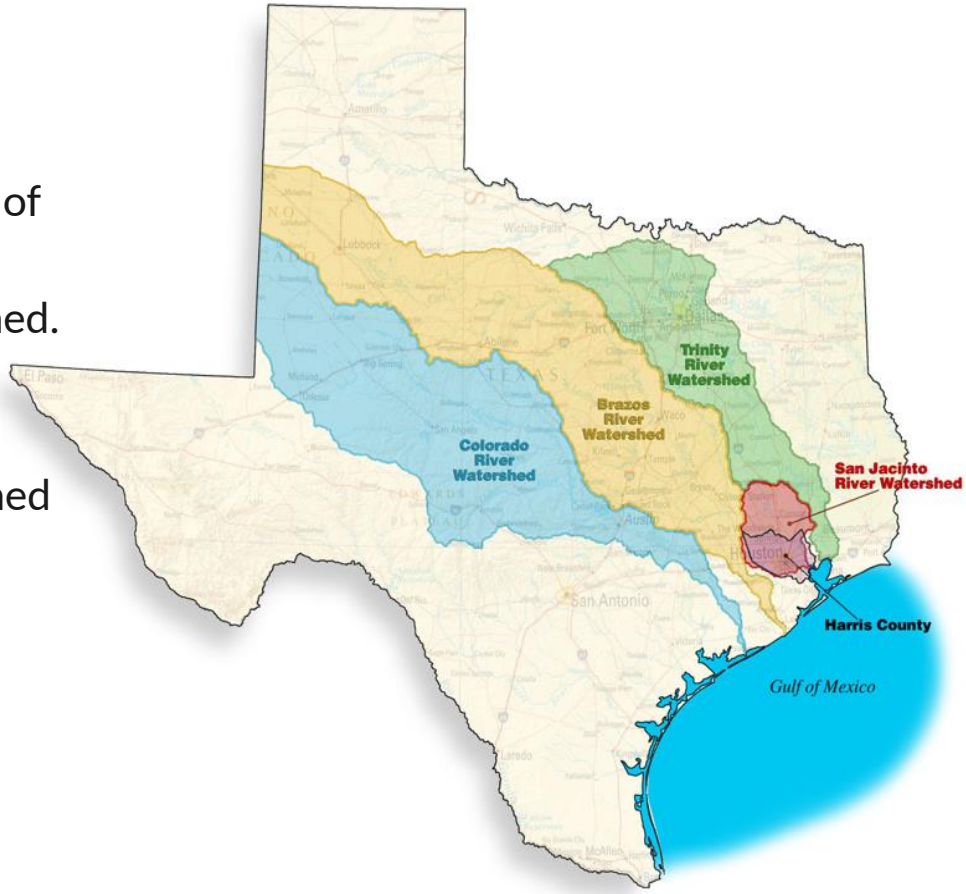
https://slosh.nws.noaa.gov/etsurge2.0



River Flooding

Watershed

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



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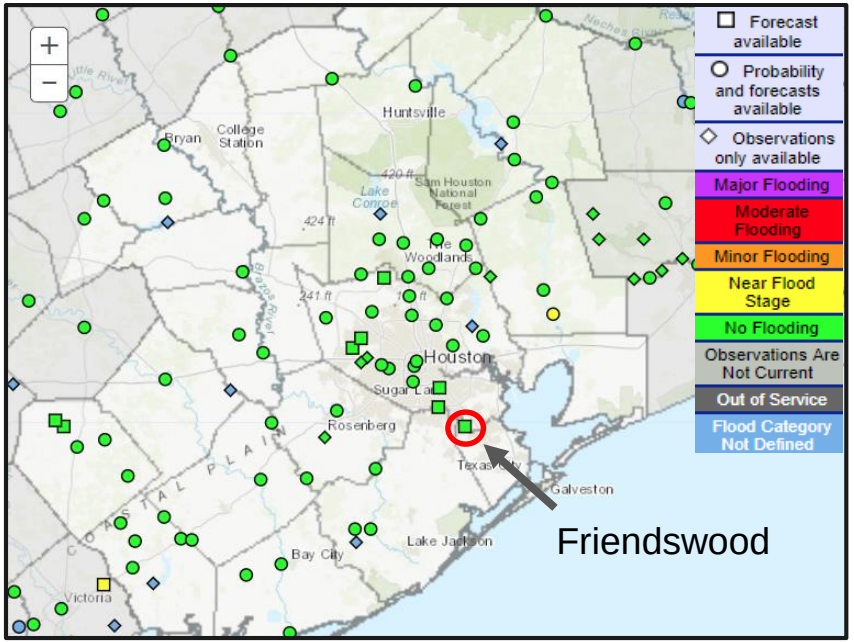
- Watersheds vary in shape and size which ultimately lead to unique challenges.
- Topography plays a big role in how watershed boundaries are defined.
- Galveston County deals with watersheds such as Clear Creek, Dickinson Bayou, and Highland Bayou
- NWS issues site specific river forecasts for 1 site in Galveston County.

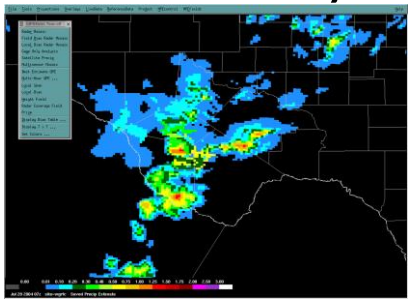


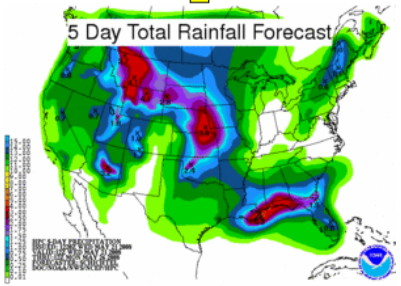
River Flooding

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.

River Forecast Process

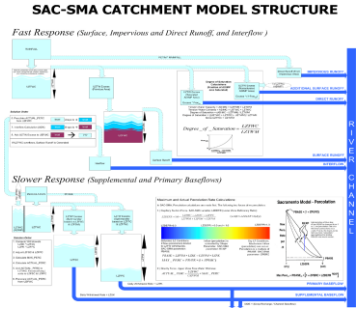
Rainfall Analysis

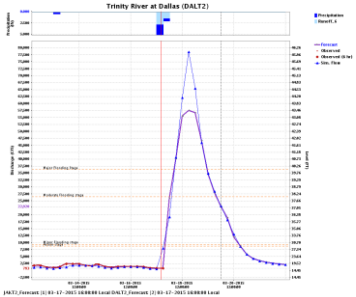




Rainfall estimates and forecasts merged into continuous dataset

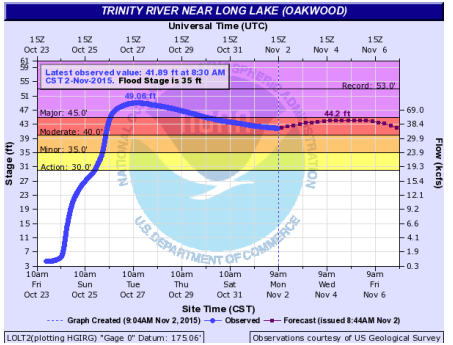
Hydrologic Modeling





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.
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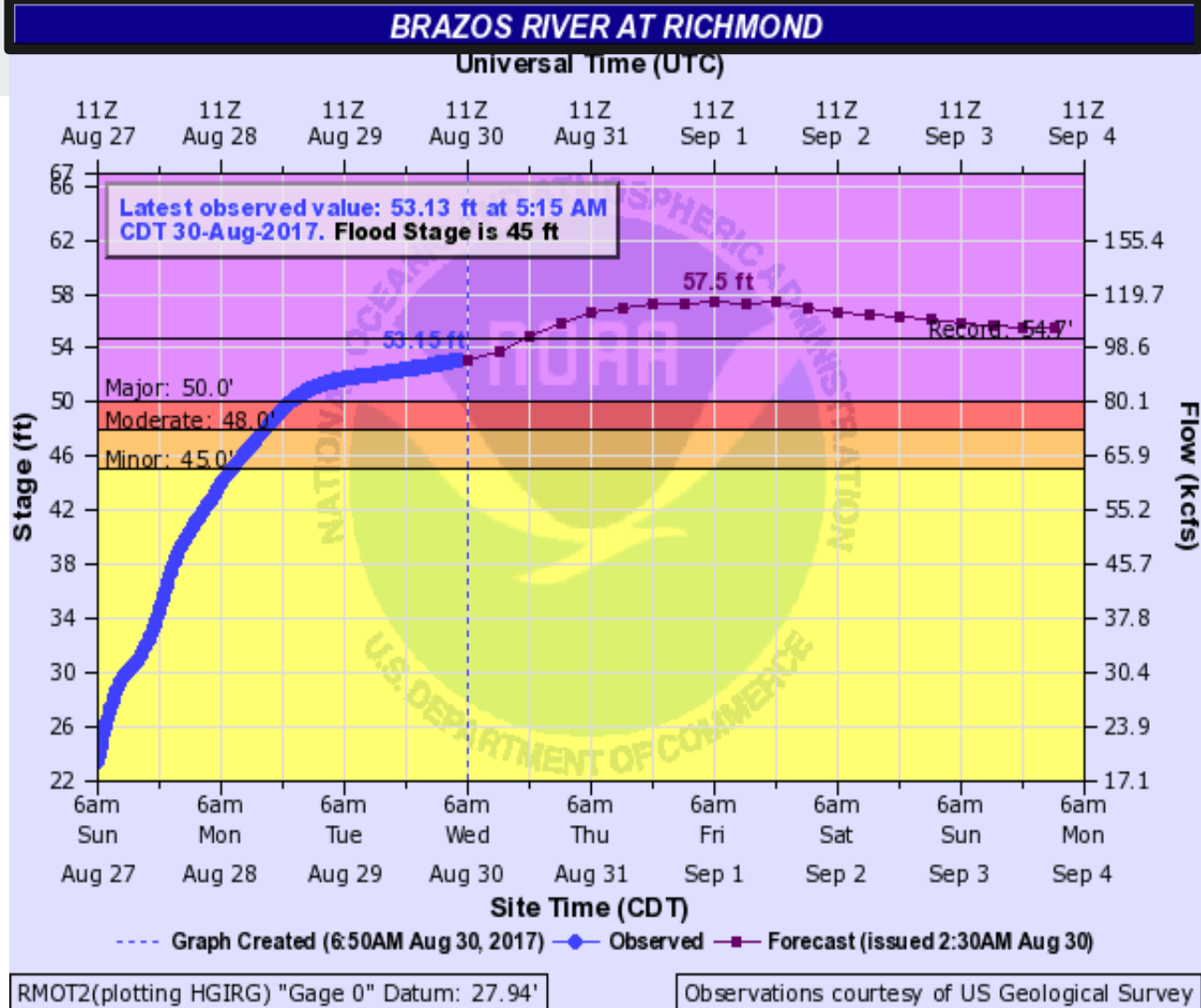
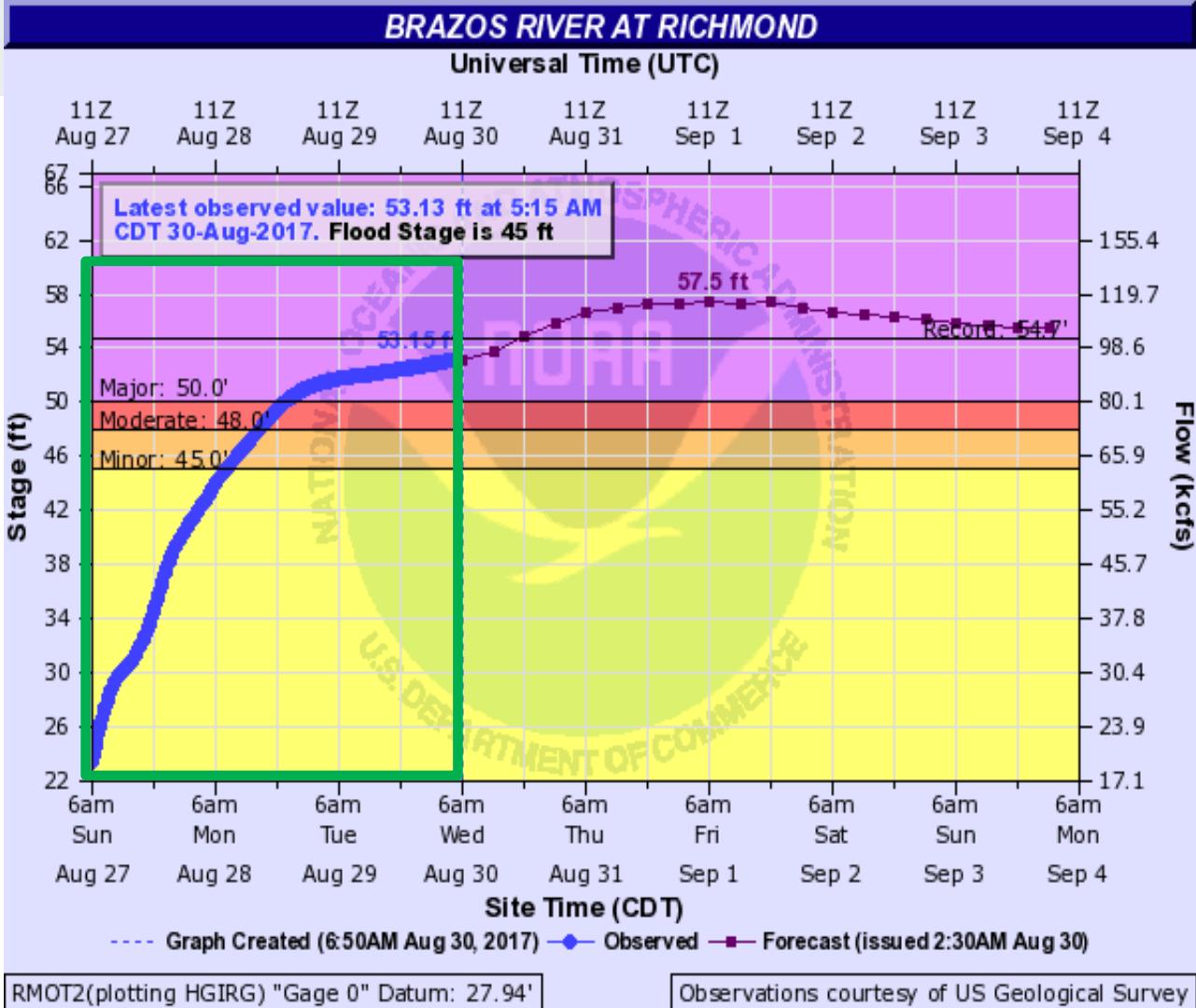
Hydrograph Basics

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

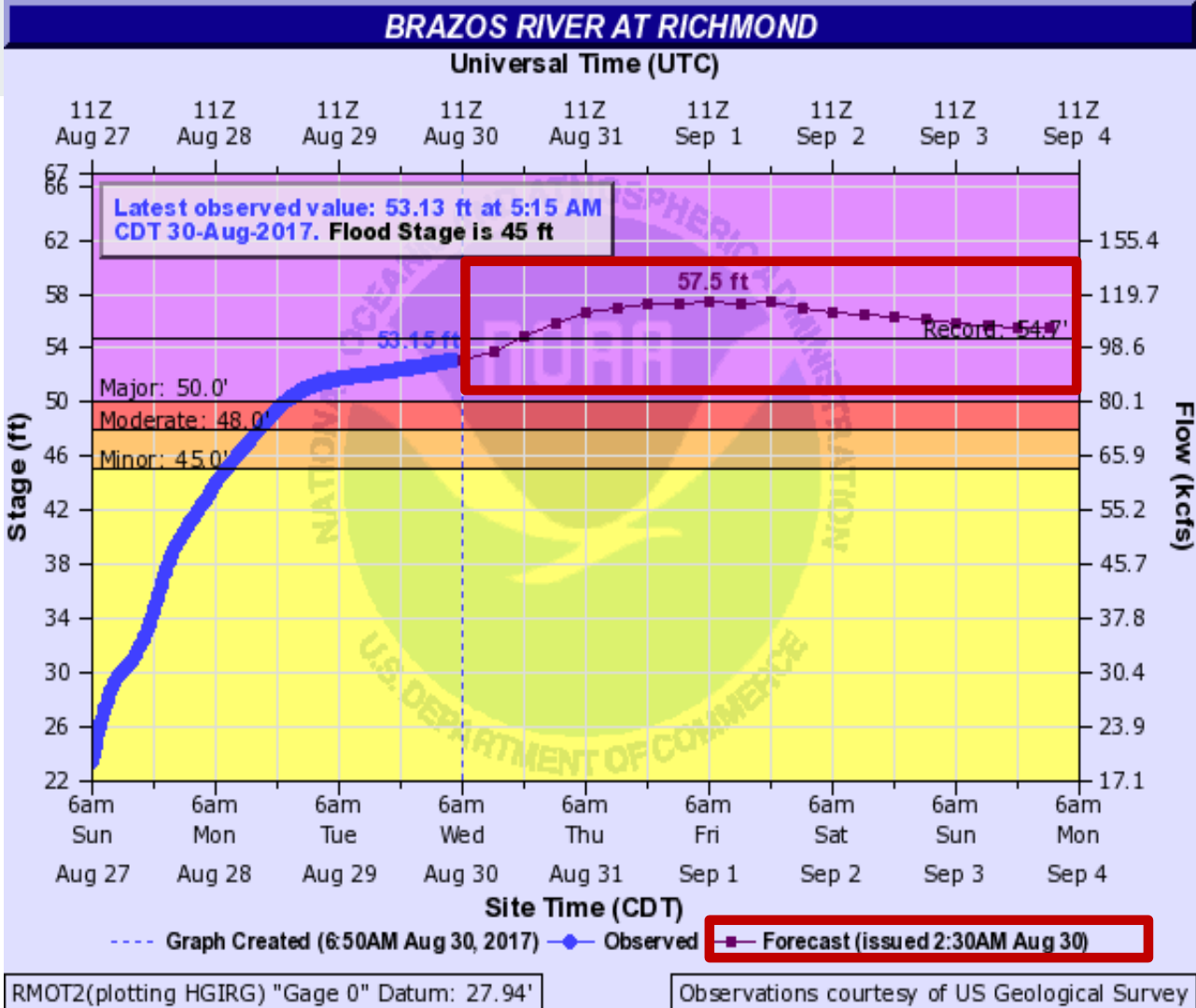
OBSERVATIONS:
Past river stages



Hydrograph Basics

FORECAST:
Forecast River Stages

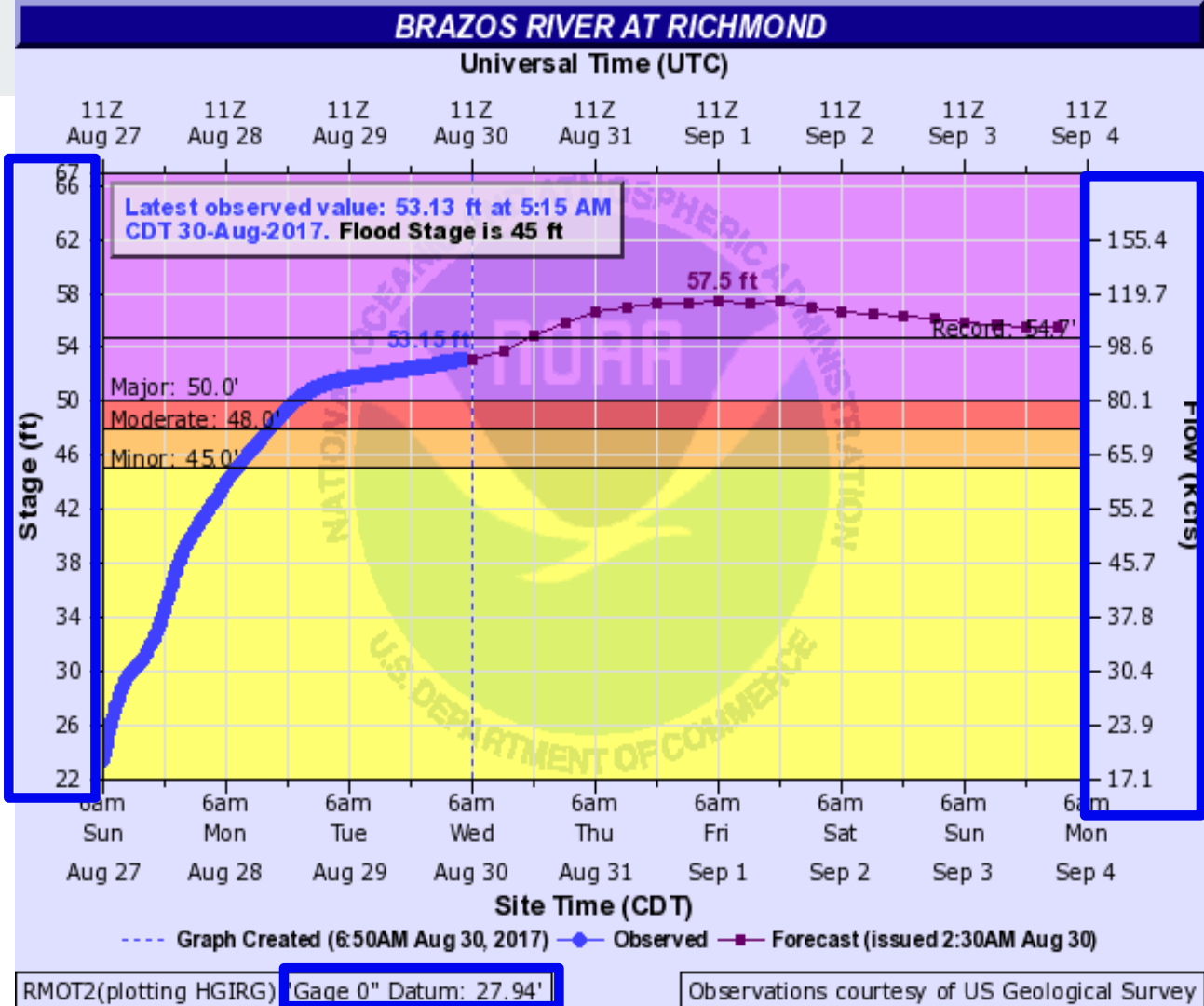
CREST:
Peak Stage



Hydrograph Basics

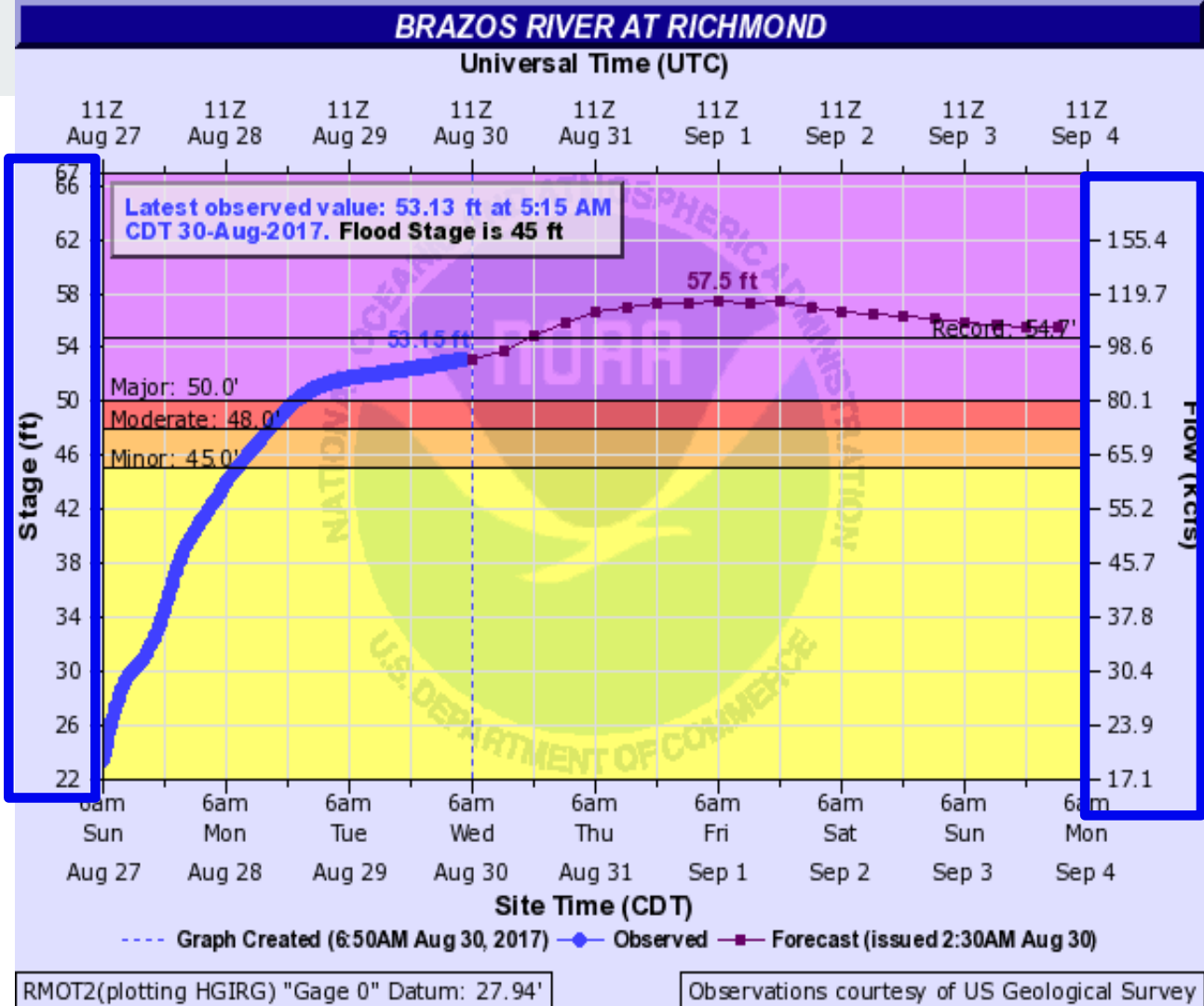
STAGE VS FLOW: Hydrologists, models, reservoirs work in flow. Emergency managers, media, general public work in stage.

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

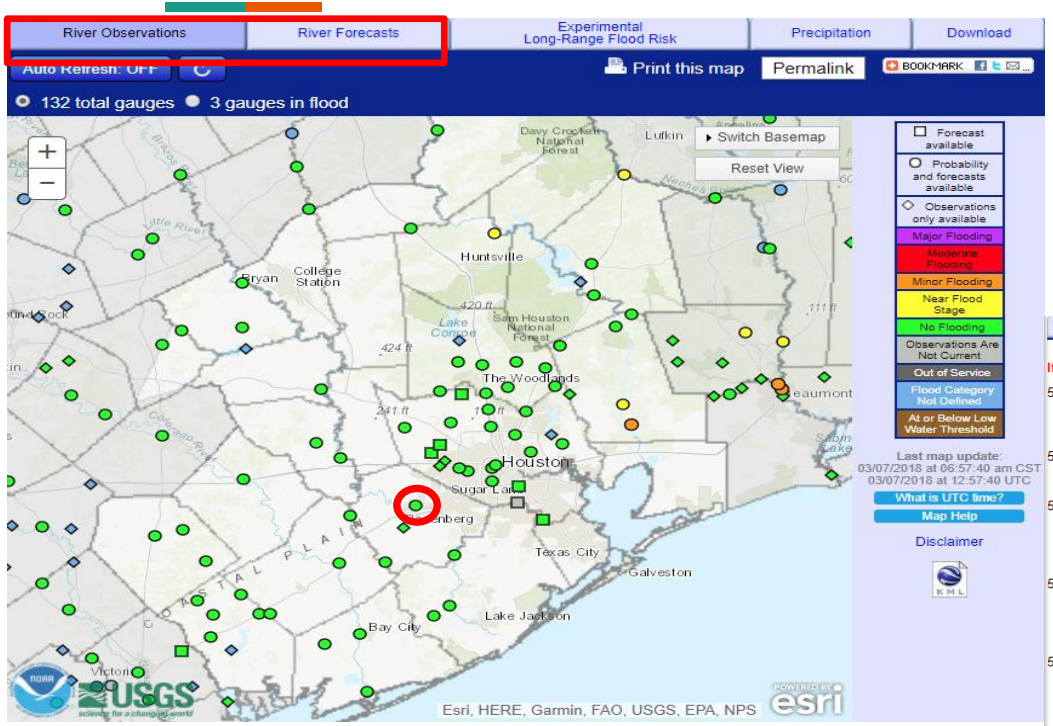
MODERATE

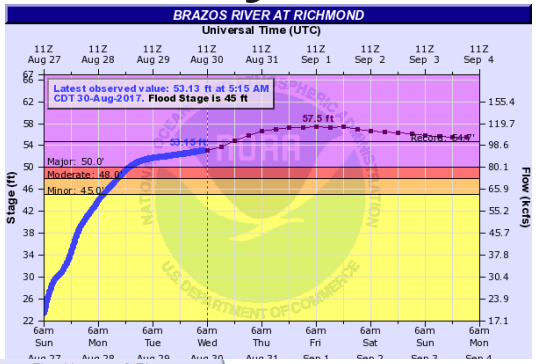
Impact: Water now reaching areas only impacted by significant rain events. Structures can be inundated, several roads covered with water, water may cut off certain areas, widespread agricultural flooding.

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.

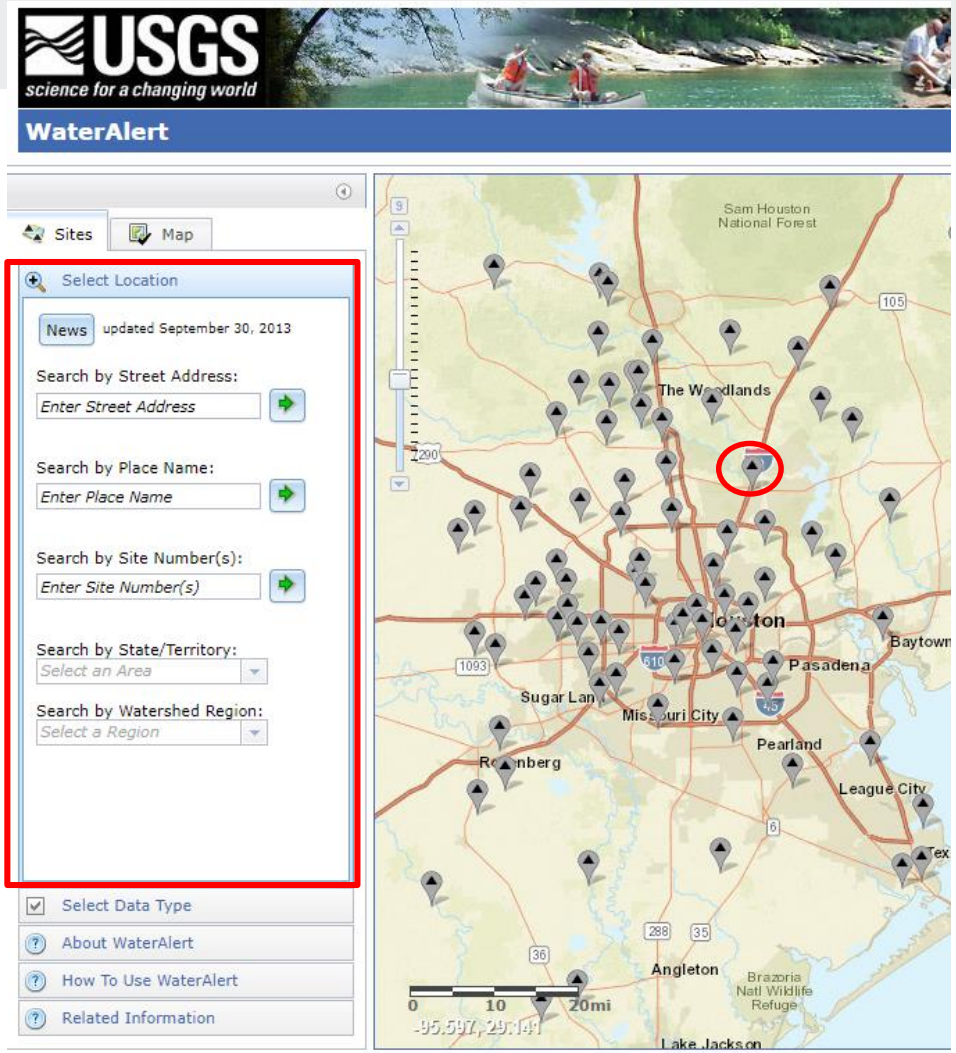
51 Major lowland flooding continues with homes flooding along Cumings/Baker Roads and in Rio Brazos north of Rosenberg. FM 1093 is inundated to Stansberry Rd in Simonton. Underpass at intersection of SH36/90A west of Rosenberg is inundated/impassible. Fort Bend County flood fight operations in Simonton 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

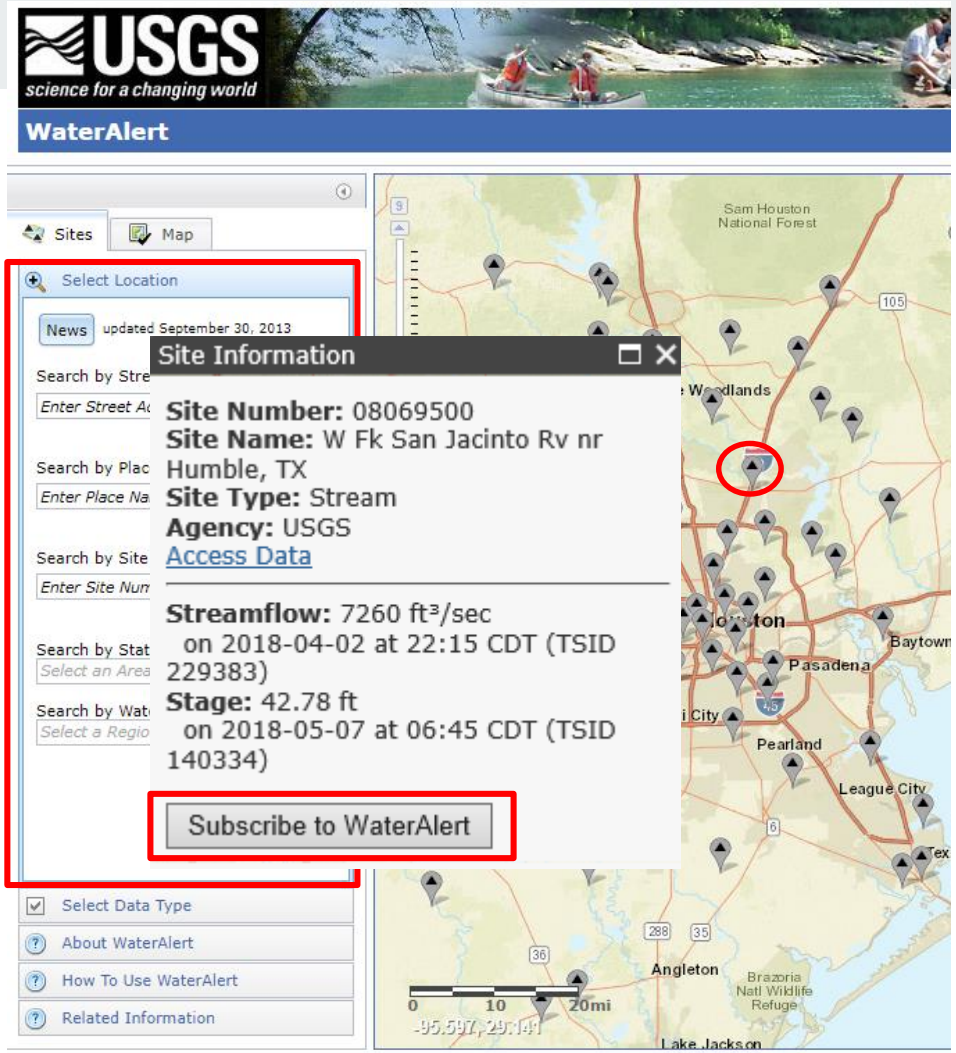
- Set alerts when a gauge reaches certain water surface elevations.
- Identify the gauge nearest you
- Click on the gauge



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

USGS Water Alerts

- Set alerts when a gauge reaches certain water surface elevations.
- Identify the gauge nearest you
- Click on the gauge and select “Subscribe to WaterAlert"



USGS Water Alerts:
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

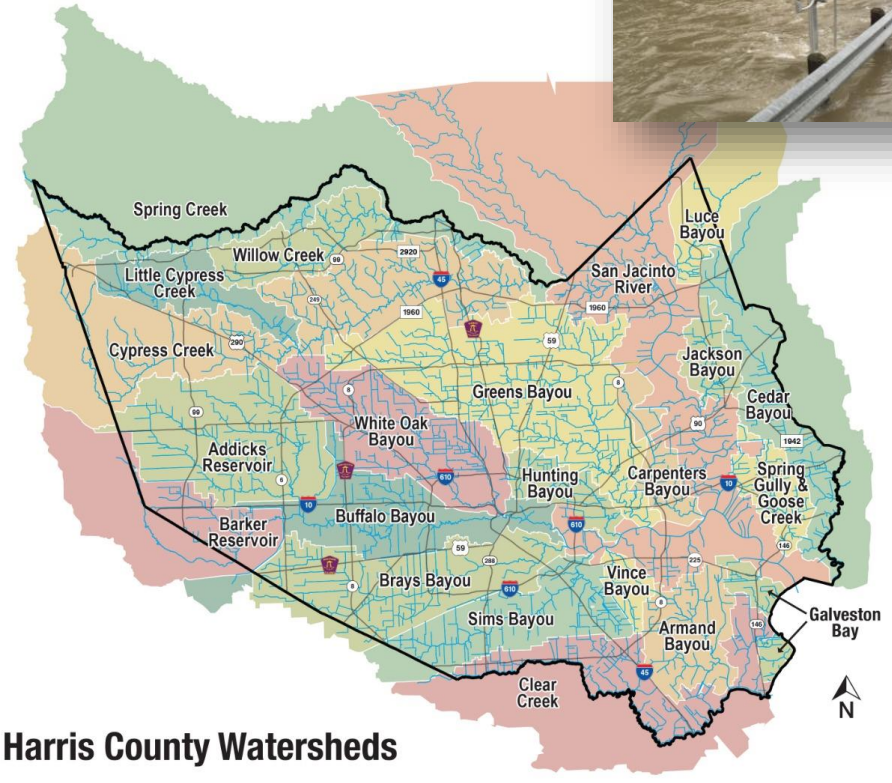
Lake Jackson

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

Partners

Harris County Flood Control District

- HCFCD's mission is to provide flood damage reduction projects that work, with appropriate regard for community and natural values.
  - Devise flood damage reduction plans
  - Implement the plans
  - Maintain the infrastructure
- Flood Warning System
- Public Website: www.harriscountyfws.org



HELP

MAP VIEW OPTIONS

- Watersheds
- Channels
- Inundation Map
- 0.00 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: ALL

Gage by Location: (Select Gage)

ADDRESS SEARCH

Find

e.g. 9900 Northwest Fwy., Houston 77092

Clear Search

An interactive map of the Harris County Flood Control District

Disclaimer

Showing rainfall for the last 24 Hours (before 10/10/2018 10:37 AM CDT)

Road

HELP

MAP VIEW OPTIONS

- Watersheds
- Channels
- Inundation Map
- 0.00 Rainfall
- Channel Status
  - Channel Status not Defined
  - Water in Bank
  - Near Top of Bank
  - Out of Bank

Mouse over map label for more information

SURFACE LEVEL DATA

Current | Historical

Showing the latest surface levels
Refresh Data

GAGE SELECTIONS

Gages by Agency
ALL

Gage by Location
(Select Gage)

ADDRESS SEARCH

Find

e.g. 9900 Northwest Fwy., Houston 77092

Clear Search

An interactive map of the Harris County Flood Control District

Disclaimer

Showing channel status at 10/10/2018 10:37 AM CDT

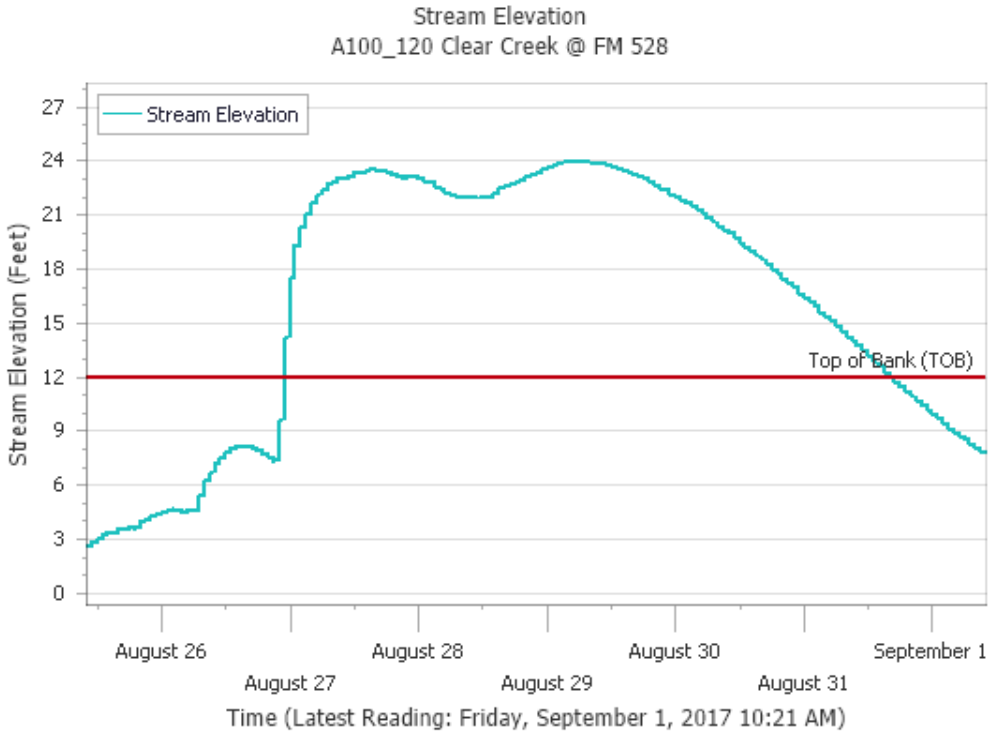
Road

Hudson, Sheldon, Fannett, Hankamer, Winnie, Stowell, Brookshire, Anahuac, BELTWAY, Sabine Pass, Mission Bend, Pecan Grove, Wallis, Trinity Bay, Oak Island, Tavener, Rosenberg, Fresno, Galveston Bay, High Island, Bacliff, East Bay, Caplen, Bowell Point, Pleak, Manvel, Dickinson, Goat Island, Needville, Alvin, Texas City, Santa Fe, La Marque, Hitchcock, Cochridge, Chocolate Bayou, Newgulf, Danbury, Lane City, Danciger, Angleton, Magnet, West Bay, Mims, Mud Island, Sweeny, Brazoria, Lake Jackson, Van Vleck, Clute

Bing

5 miles 10 km

Flood Warning System



Flood Frequency	Elevation
10% (10-year)	17.50'
2% (50-year)	20.10'
1% (100-year)	21.00'
.2% (500-year)	23.10'

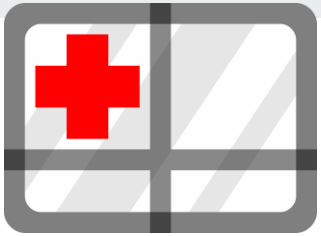
Date	Event	Elevation
6/20/1973		16.88'
9/20/1979		18.48'
5/3/1981		13.78'
8/18/1983	Alicia	14.38'
8/1/1989	Chantal	18.78'
10/18/1994		15.98'
6/9/2001	Allison	18.28'
10/16/2006		15.40'
8/16/2007	Erin	7.20'
4/18/2009		14.80'
8/27/2017	Harvey	24.20'

High water mark elevations are approximate.

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.)

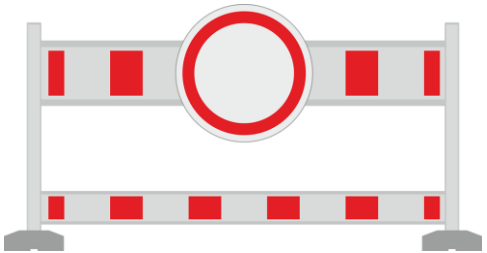
Turn Around, Don't Drown!

- 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

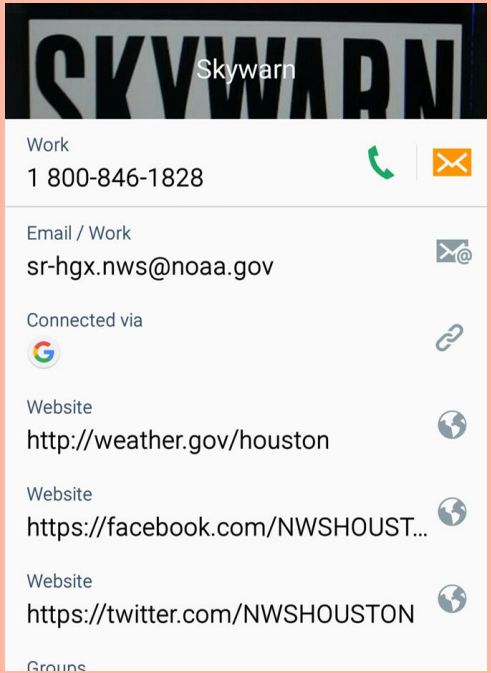
Email

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."

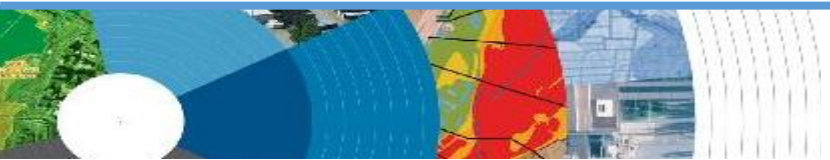
FEMA

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:**

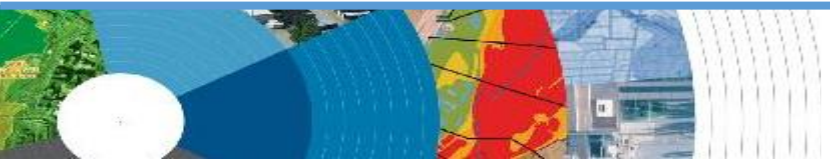
  Most insurance policies do not cover flooding; only flood insurance covers flood damage.

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

- **Misconception:**

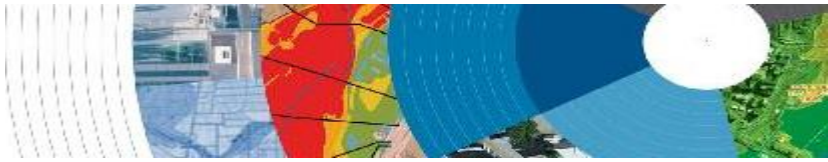
  "I don't live in a flood zone."

- **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.



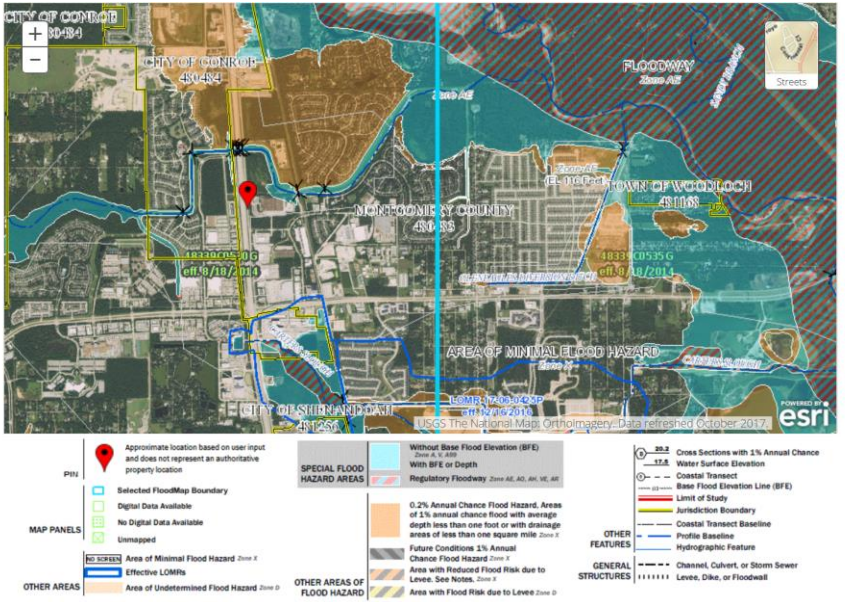
FEMA

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



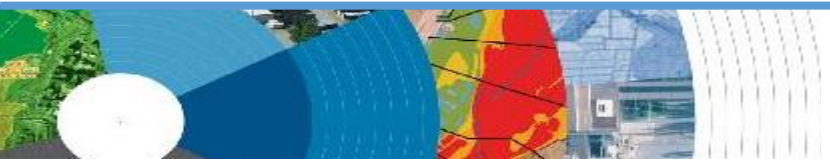
Find your zone at https://msc.fema.gov/portal/home

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



FEMA

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**
- Matagorda County(unincorporated only) 16 (Losses over 125K)
- Bay City (unincorporated only) 1 Loss over 125K

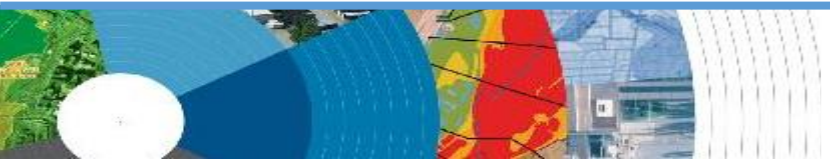
New GFIP's Due to Harvey

- Galveston County – 107

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.**

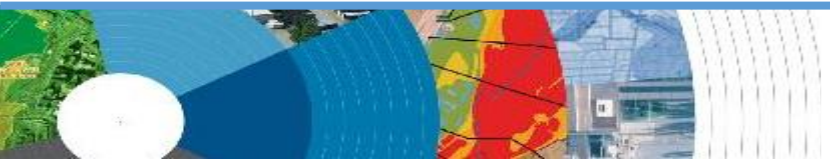
**Data HCFCD Finale Hurricane Harvey Storm and Flood Information – https://www.hcfcd.org/media/2678/immediate-flood-report-final-hurricane-harvey-2017.pdf



FEMA

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

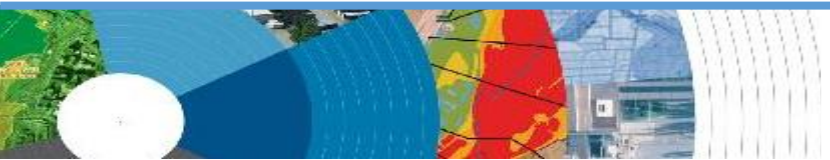
NFIP Hotline
1-800-427-4661
www.fema.gov/nfip

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

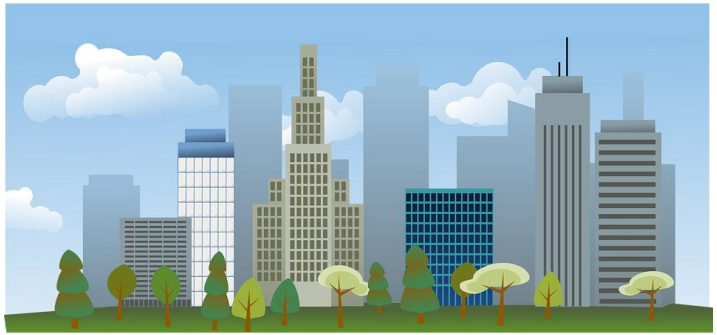


FEMA

Here to Help You

What Can We Do For Your Community?

Texas Floodplain Management Association



What Can We Do For Your Community?

Photo courtesy of Lynn Post, Bandera Texas

State History of Devastating Rainfall

TFMA Purpose

- Promote public awareness of proper floodplain management
- Promote professional status of floodplain management
- Enhance cooperation and exchange information among individuals, private organizations and public agencies
- Promote floodplain management education
- Inform members of floodplain management legislation

TFMA Regional Training (professional)

- Contact the TFMA office if your Region needs training opportunities
- TFMA will provide speakers
- TFMA will publish training on the TFMA website
- TFMA will provide trainers
- Luncheons

27% (331) of1240 NFIP Communities responded

85% (282) require a +1’ or more freeboard for new development

44% (145) require a +1’ or more freeboard based on fully developed conditions

48% (159) require detention, require mitigation of downstream impacts or that development to be setback from Floodway Boundary (NAI)

83% require a study to establish the BFE and/or floodway in Zone A

38% (127) require a Zone X Freeboard (1’ to 3’ above nearest street)

78% require Elevation Certificates

73% (243) have community floodplain administrators that are CFM

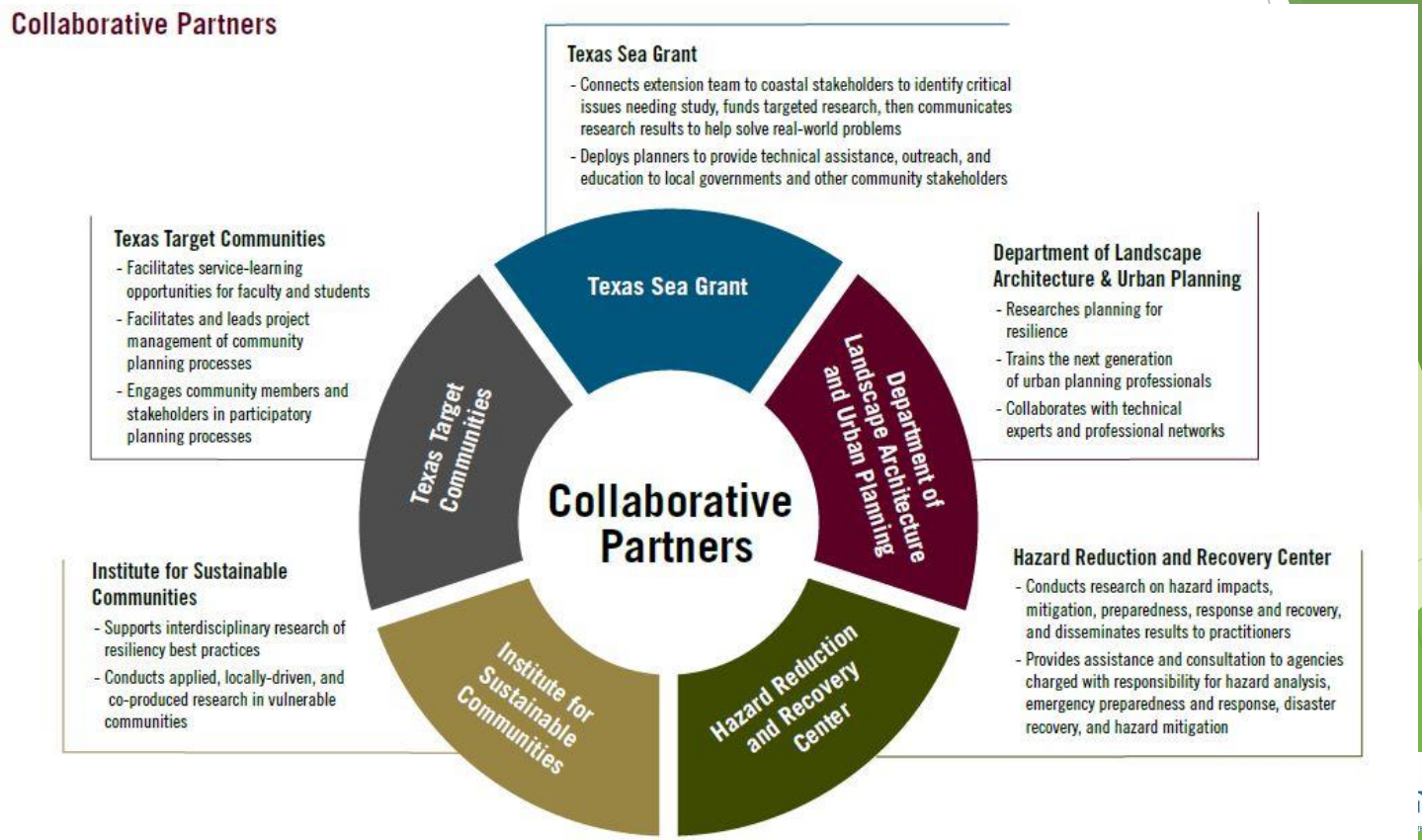
Public Outreach

- Exhibit Booths
- Physical Flood Model
- Teachers
  - DVD with PowerPoint on “Natural Hazards in Texas”
- School Children
  - Coloring Books
- Calendars
- TADD Bumper Stickers
- Weather Advisories
- Radio Ads (TADD)

Mitigation Resources:

- Collaboration and partnerships
- Sharing success and troubleshooting stories
- Relocation of repetitive loss properties
- Buyout/Acquisition
- Multi-jurisdictional hazard mitigation plans
- Ordinances and codes
  - Compare regionally
- Wetland and other riparian area protection
- Drainage Canal
- Pump Improvements
- Elevation of repetitive loss properties

Collaborative



Goals of the program:

1. Communities adopt high-quality plans to achieve locally defined visions of sustainable development.

2. Communities increase resilience to natural and technological hazards.

3. Habitat, ecosystems and the services they provide are monitored, enhanced and/or restored.

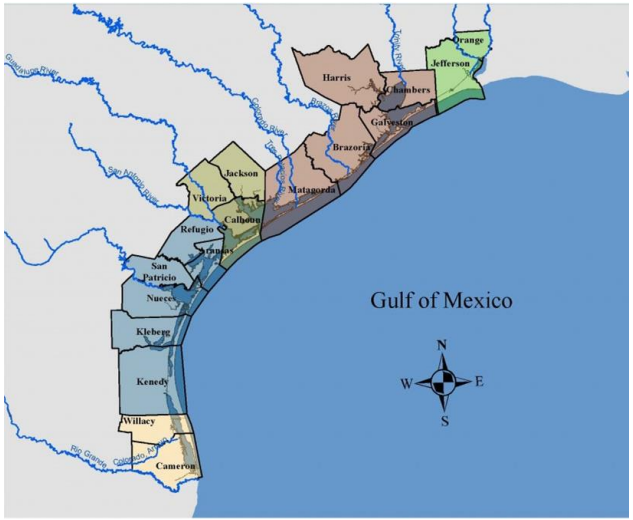
4. Local and scientific knowledge is leveraged in planning and other decision-making processes.

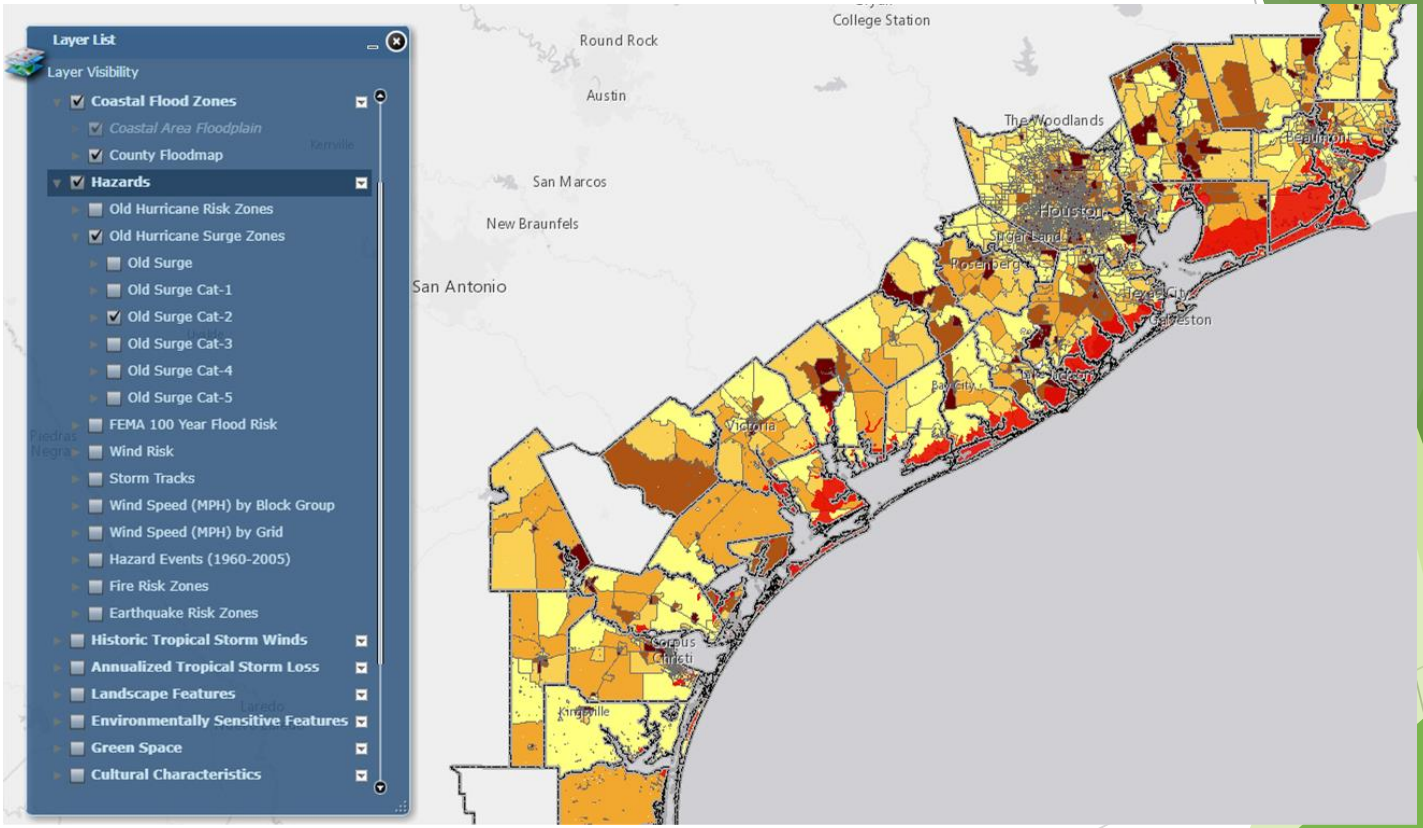
Current Projects and Partners

- Aransas County Long Term Recovery Plan
  - Began: December 2017
  - Status: currently posted for public comment
- Texas Homeowners Handbook for Coastal Natural Hazards
  - Partner: GLO
  - Status: currently revising first edition, reprinting Spring 2019
- Hitchcock, Texas
  - City Comprehensive Plan - Began June 2018
- Rockport, Texas
  - City Comprehensive Plan- Began June 2018
- Climate Science and Resilience Curriculum
  - Houston Independent School District
    - Jones Futures Academy & E.L. Furr High School
- Strengthening Coastal Counties Resilience Challenge
  - Organized by the National Association of Counties (NACo)
  - Assisting Willacy+Cameron County partnership
  - Status: Beginning October 2018

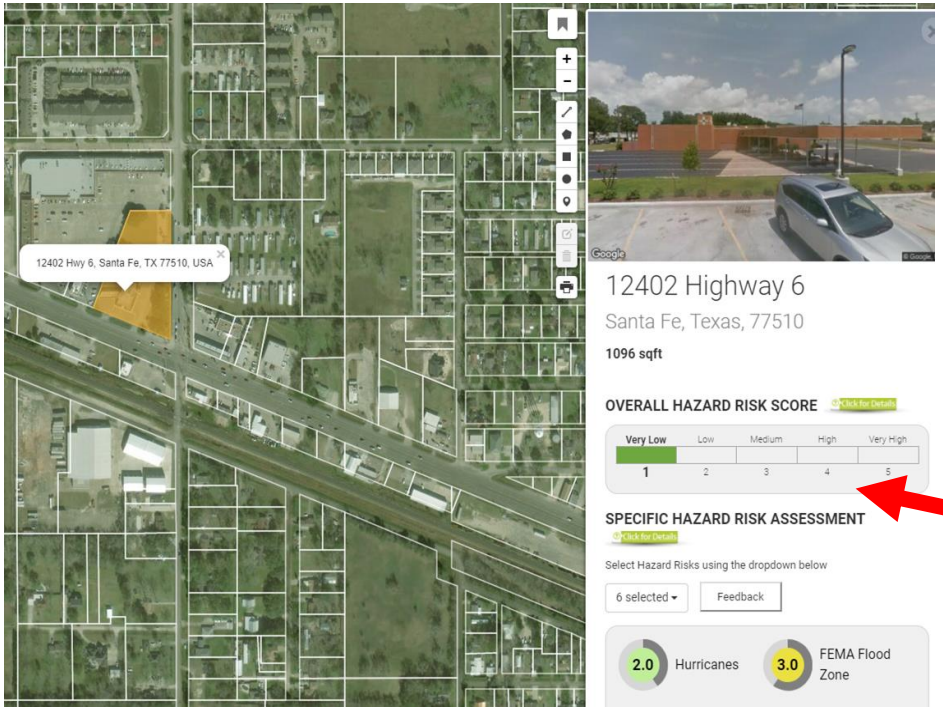
Texas Coastal Community Planning Atlas

- Allows users to visualize and identify critical issues related to numerous dimensions of development.
- Planners/Elected Officials can seek info about:
  - Environmental Degradation
  - Significant changes in land use patterns
  - Natural hazard risks
  - http://www.texascoastalatlas.com/




Layer List
Layer Visibility
Coastal Flood Zones
Coastal Area Floodplain
County Floodmap
Hazards
Old Hurricane Risk Zones
Old Hurricane Surge Zones
Old Surge
Old Surge Cat-1
Old Surge Cat-2
Old Surge Cat-3
Old Surge Cat-4
Old Surge Cat-5
FEMA 100 Year Flood Risk
Wind Risk
Storm Tracks
Wind Speed (MPH) by Block Group
Wind Speed (MPH) by Grid
Hazard Events (1960-2005)
Fire Risk Zones
Earthquake Risk Zones
Historic Tropical Storm Winds
Annualized Tropical Storm Loss
Landscape Features
Environmentally Sensitive Features
Green Space
Cultural Characteristics
College Station
Round Rock
Austin
San Marcos
New Braunfels
San Antonio
The Woodlands
Houston
Victoria
Corpus Christi
Kingsville

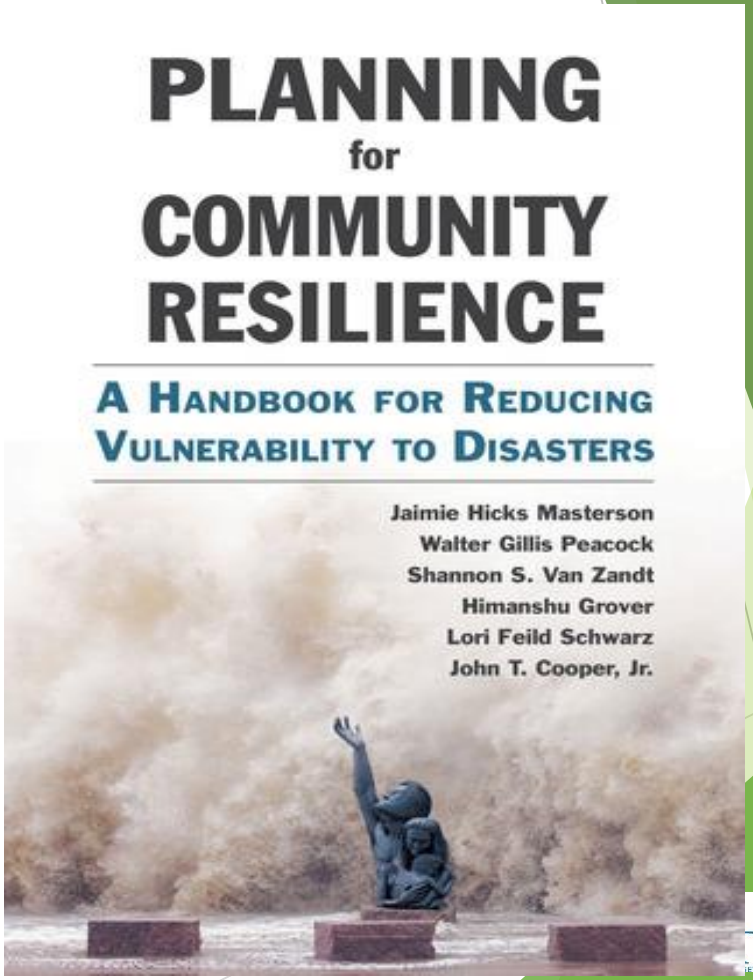
Buyers Be-Where



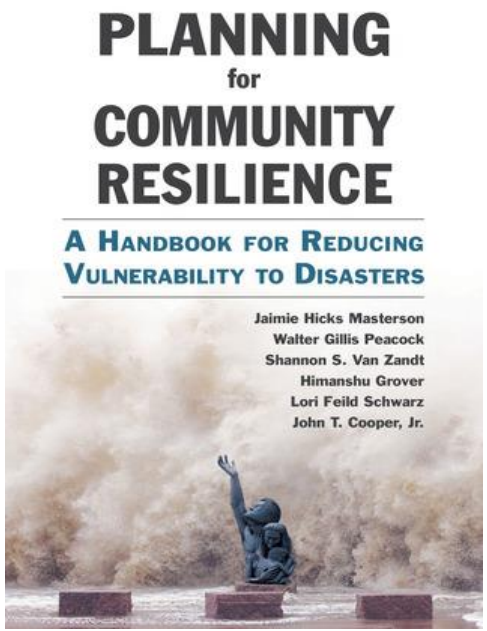
- Access to Critical info about a property's risk and potential long-term value
- Selected property evaluated along multiple natural and human induced hazards.
  - Color-coded risk score
  - Risk Data
  - Scoring Scale

http://www.texascoastalatlas.com/

A Handbook for Reducing Vulnerability to Disasters



Planning for Community Resilience: A Handbook for Reducing Vulnerability to Disasters



Strategy	Goals	Tools
Development regulations and land use management	Restrict occupancy in hazardous zones. Regulate density Discourage development in environmentally sensitive areas.	Res Subdivision Ordinances Planned Unit Dev. Special Overlay district Ag or Open Space zoning Hazard setback ordinances SW retention requirements
Building Standard	Design regulations that reduce loss and damage	Building codes Wind hazard resistance standards Flood hazard resistance for new homes Retrofit for existing buildings Special utility codes
Natural resource protection	Preserve ecologically sensitive areas	Wetland Protection Habitat Protection and restoration

Questions or Comments?

Questions

National Weather Service
FEMA
TFMA

Links

- NWS Houston/Galveston: https://www.weather.gov/hgx/
- West Gulf River Forecast Center: https://www.weather.gov/wgrfc/
- Advanced Hydrologic Prediction Center: https://water.weather.gov/ahps2/index.php?wfo=HGX
- National Hurricane Center: https://www.nhc.noaa.gov/
- NOAA Tides Predictions: https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1413#listing
- Extratropical Surge Guidance: https://slosh.nws.noaa.gov/etsurge/
- Harris County Flood Control District Flood Warning System: https://www.harriscountyfws.org/
- FEMA Flood Map Service Center: https://msc.fema.gov/portal/home
- USGS Water Alerts: https://maps.waterdata.usgs.gov/mapper/wateralert/
- NWS Flood Safety: https://www.weather.gov/safety/flood