2018 FloodWarn Training

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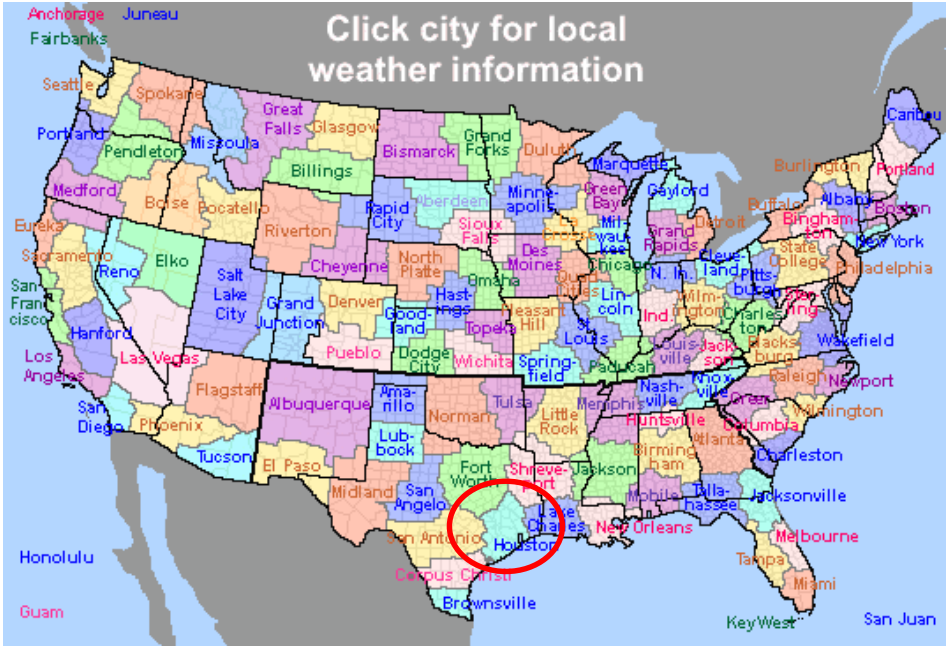
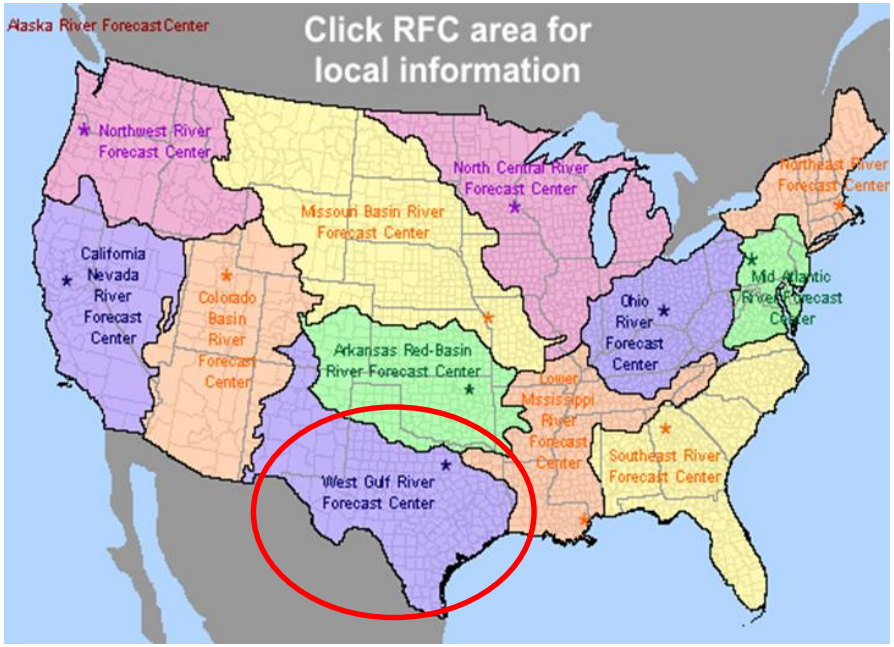
National Weather Service- Houston/Galveston, TX

National Weather Service

Weather Forecast Offices



River Forecast Centers



Outline

Flooding Importance

Flooding Types and Causes

Flood Products

River Flooding

Trinity River

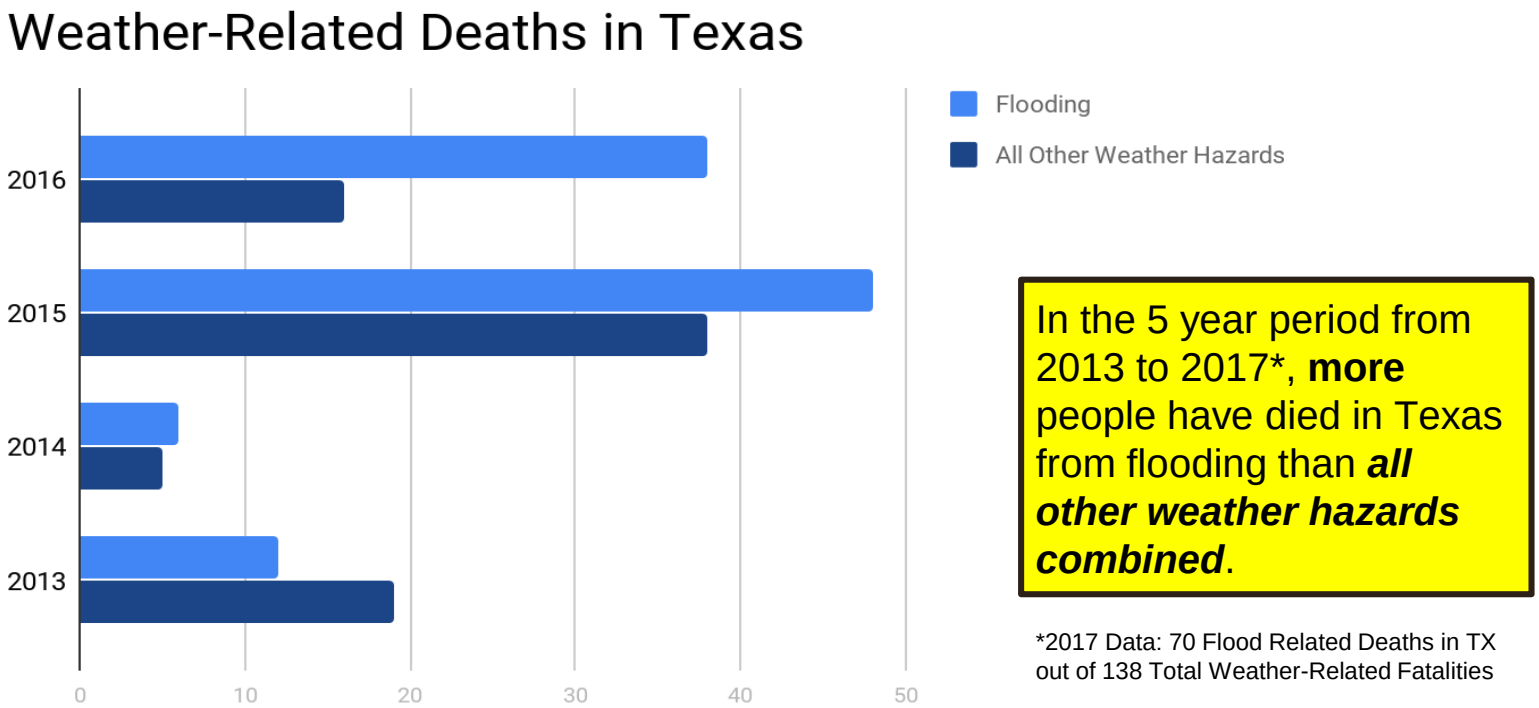
Flood Safety

Reporting Flooding

Flood Risk

Flooding Importance

Flooding is Deadly!

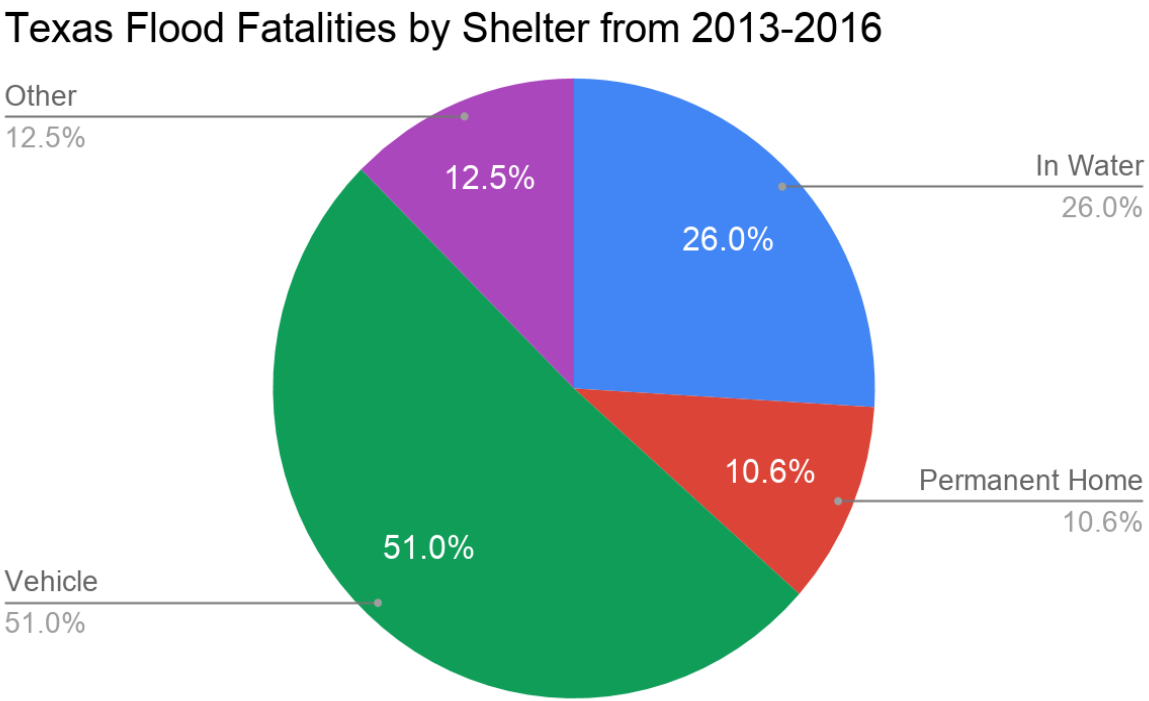


In the 5 year period from 2013 to 2017*, **more** people have died in Texas from flooding than ***all other weather hazards combined***.

*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

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

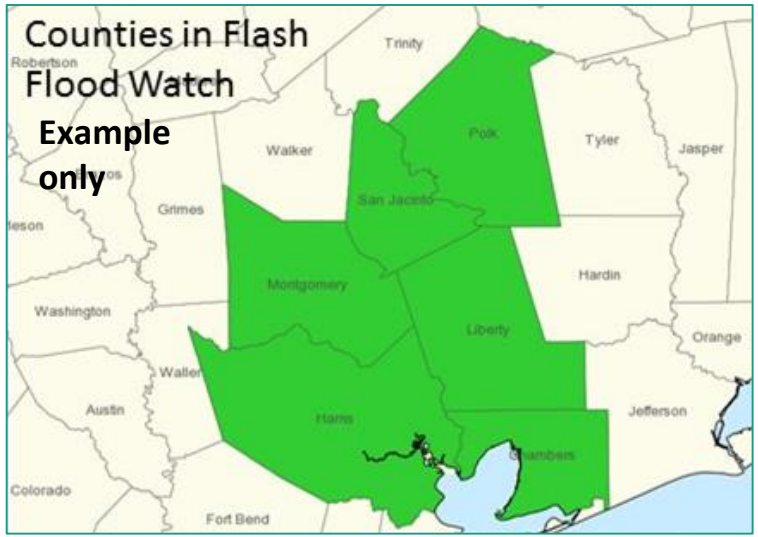
Flooding along a coastline either from high tides or storm surge during a tropical storm or hurricane

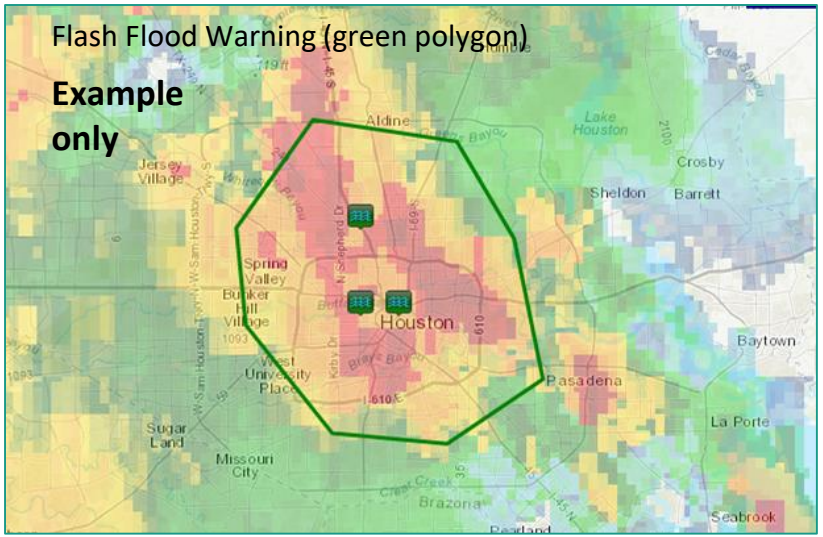
Flood Products

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

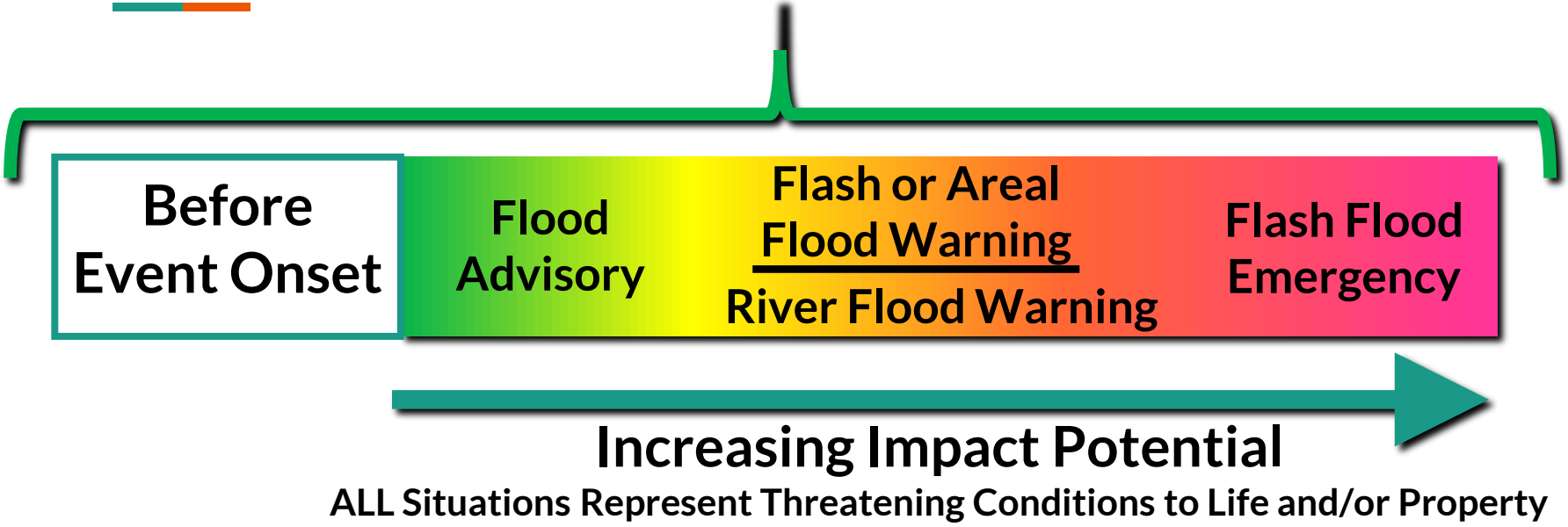
Urban / Small Stream Flood Advisory

Flash Flood Warning

Flash Flood Emergency

Flood Warning (Areal/ River/ Bayou)

Flood Timeline



ALL Situations Represent Threatening Conditions to Life and/or Property

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

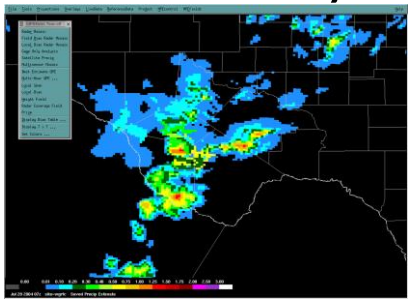
Llano River Flooding

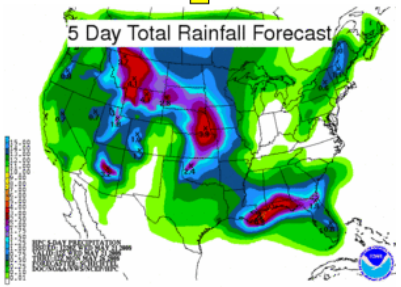
River Flooding

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.

River Forecast Process

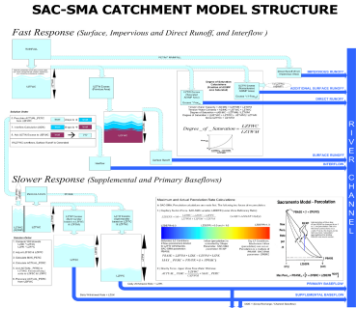
Rainfall Analysis

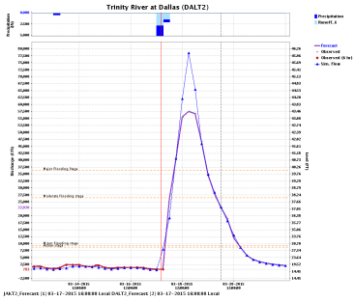




Rainfall estimates and forecasts merged into continuous dataset

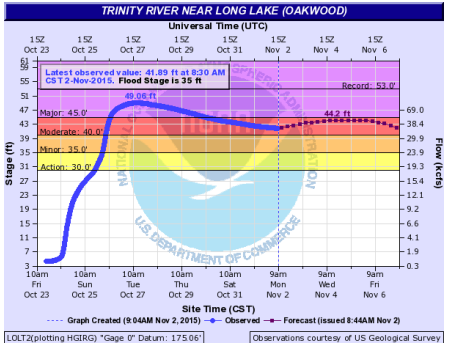
Hydrologic Modeling





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

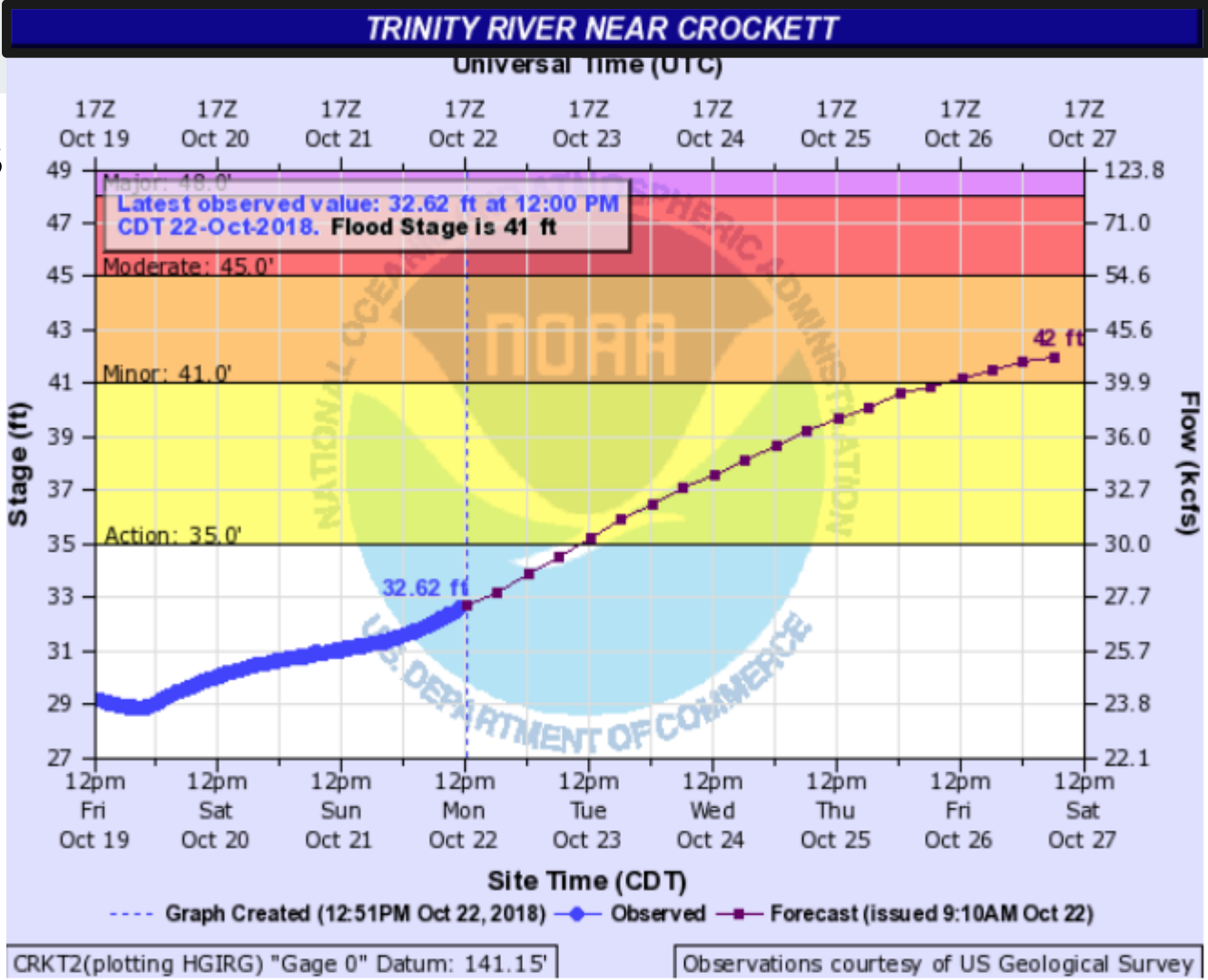
TXC015-039-157-473-271425-
/O.NEW.KHGX.FL.W.0149.160529T0730Z-000000T0000Z/
/RMOT2.1.ER.160529T0730Z.160531T0600Z.000000T0000Z.NO/
926 PM CDT THU MAY 26 2016

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.
```

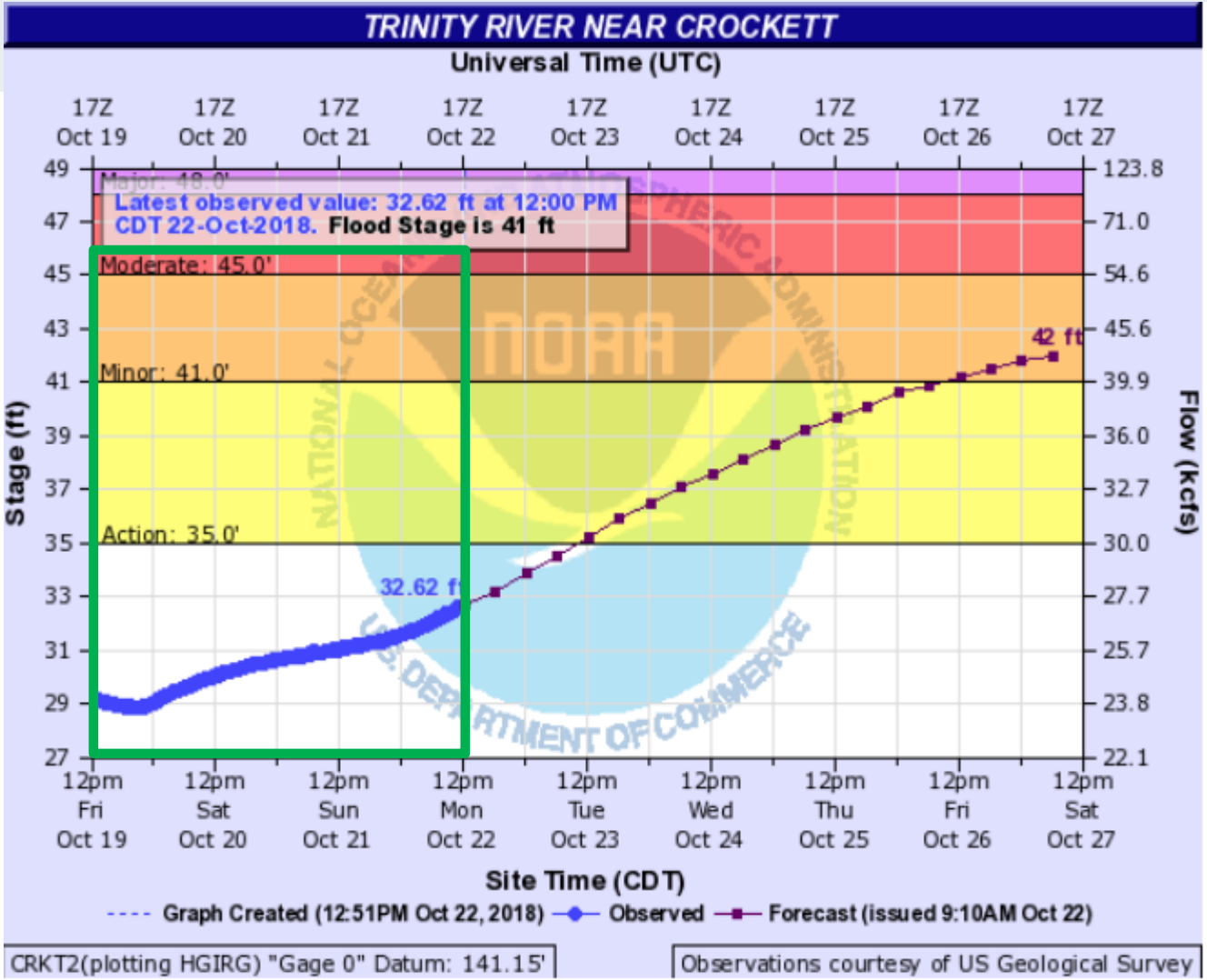
Hydrograph Basics

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

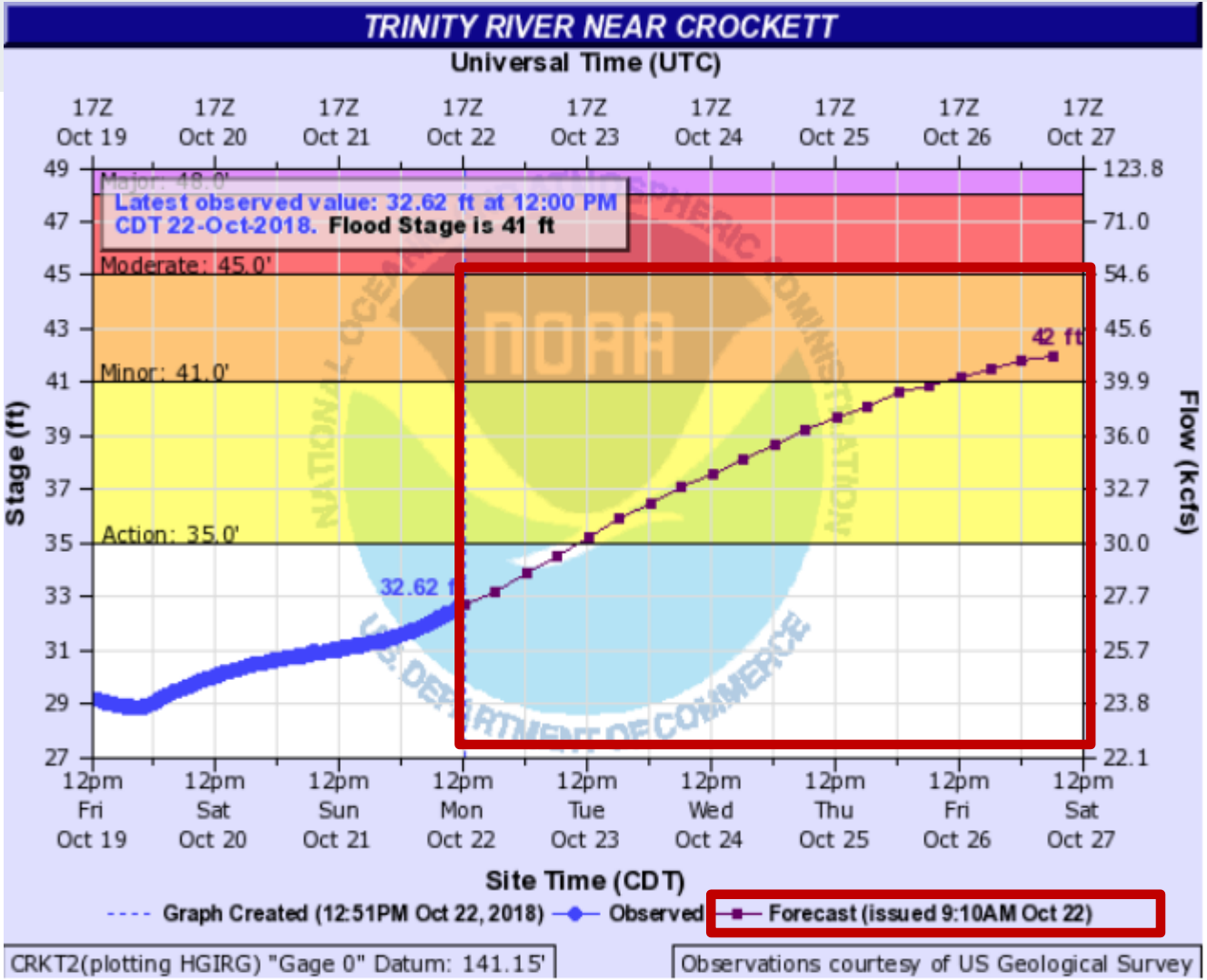
OBSERVATIONS:
Past river stages



Hydrograph Basics

FORECAST:
Forecast River Stages

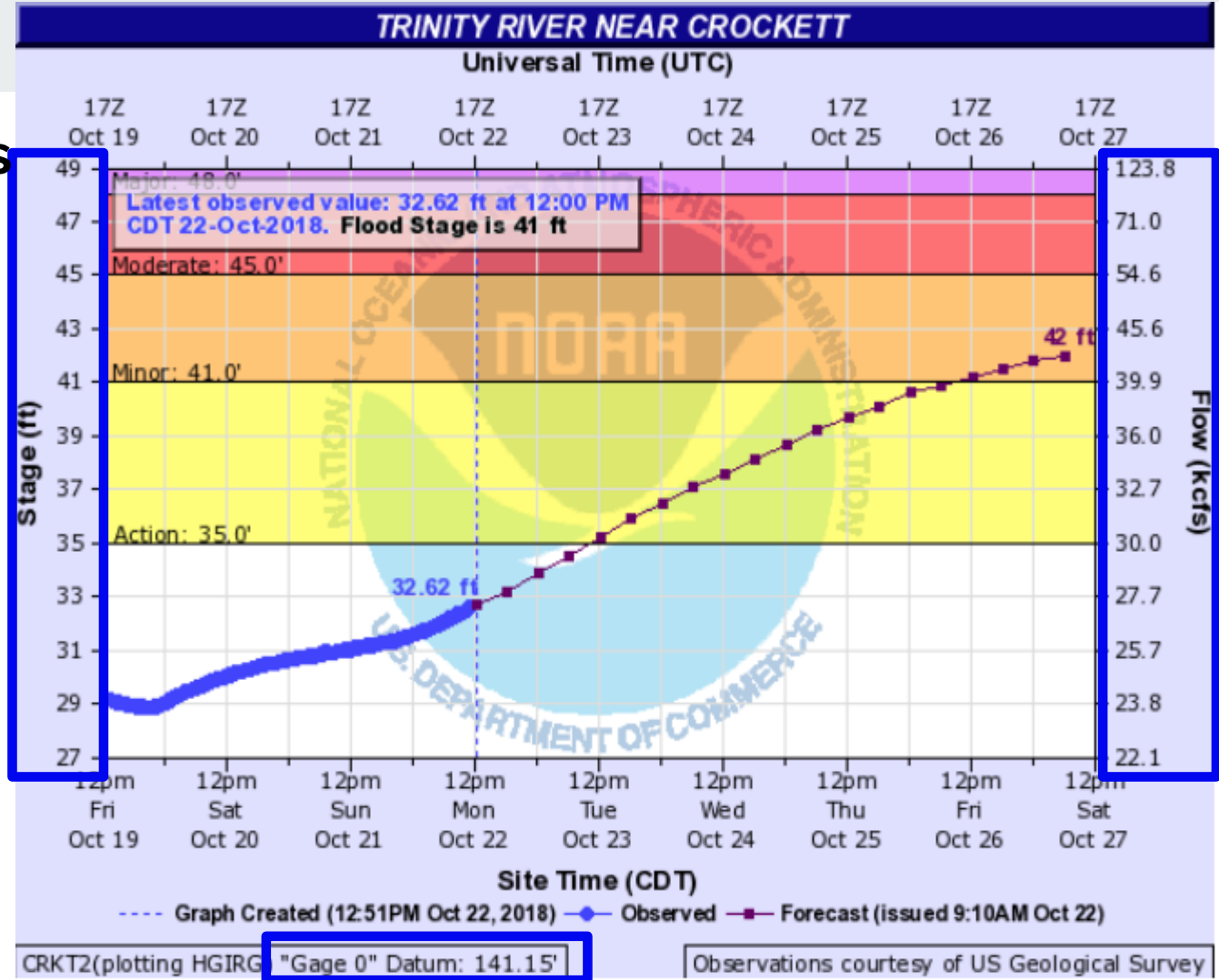
CREST:
Peak Stage



Hydrograph Basics

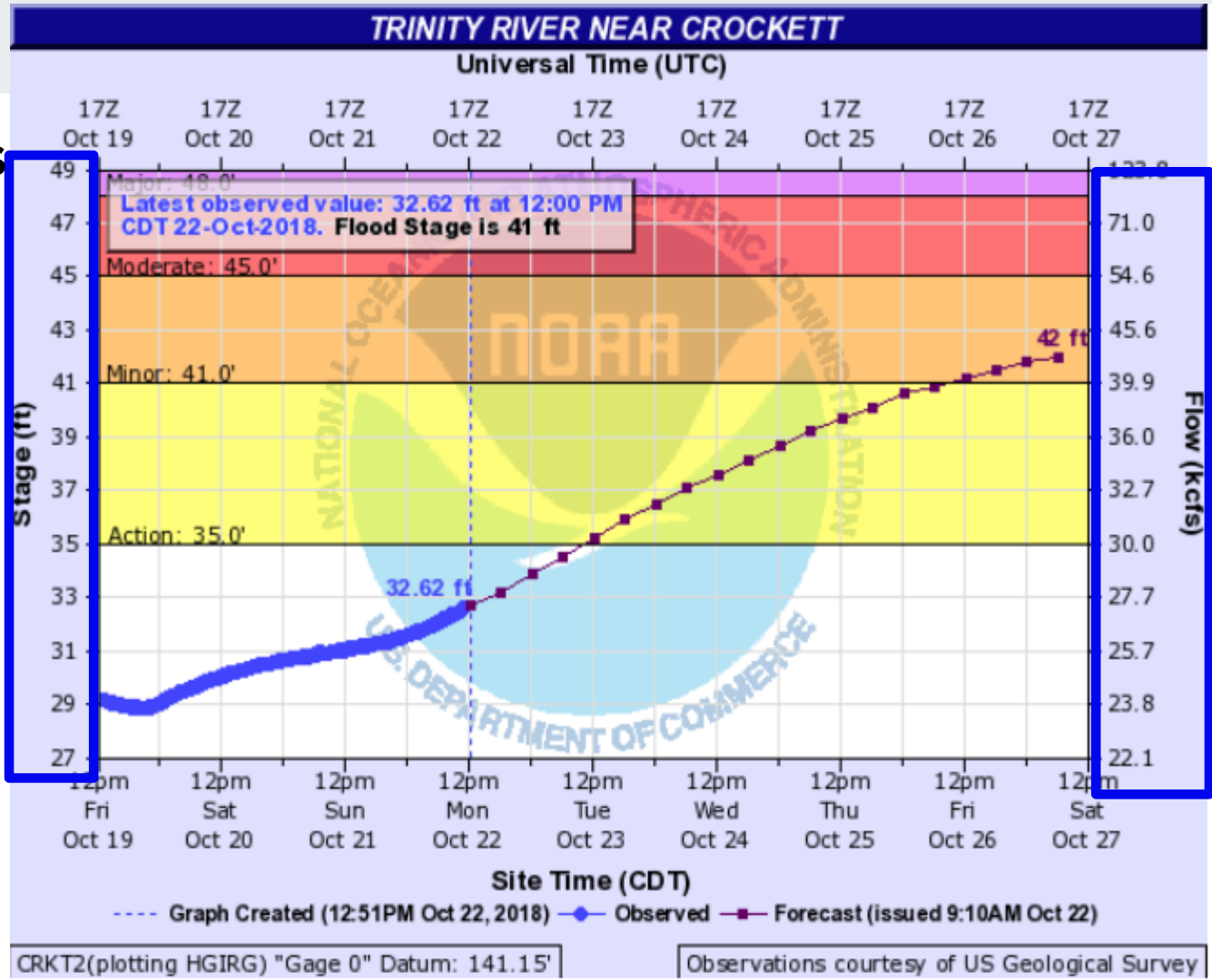
STAGE VS FLOW: Hydrologists, models, reservoirs work in flow. Emergency managers, media, general public work in stage.

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

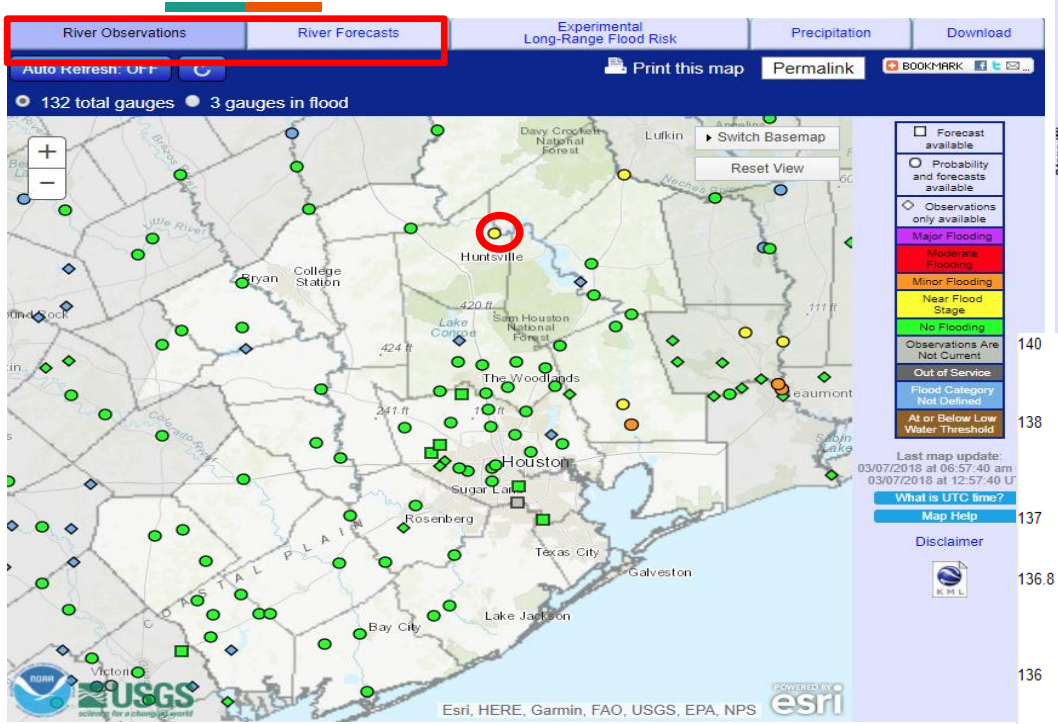
MODERATE

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.

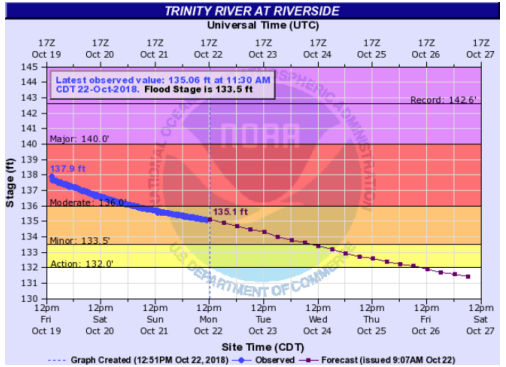
MAJOR

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



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



Flood Categories (in feet)	
Major Flood Stage:	140
Moderate Flood Stage:	136
Flood Stage:	133.5
Action Stage:	132
Low Stage (in feet):	0

Historic Crests

(1) 142.60 ft on 05/05/1942
(2) 141.70 ft on 04/09/1945
(3) 139.60 ft on 05/04/1957
(4) 138.12 ft on 06/06/2015
(5) 137.67 ft on 07/18/2007

Show More Historic Crests

140	Major lowland flooding begins with widespread flooding in Trinity and Walker Counties. Water is in several homes in the Deep River Plantation and Green Rich Shores subdivisions. Roads into several subdivisions in Walker and Trinity Counties and secondary roads along the river are inundated.
138	Moderate lowland flooding continues with water 3 to 4 feet below the State Highway 19 Bridge and Plantation Drive near FM 230 is inundated. FM 2978 is flooded and impassable. Up to one foot of water is flowing over Thomas Lake Road which remains impassable. Several roads into the Green Rich Shores and Deep River Plantation subdivisions are covered with up to one foot of water and homes in Deep River Plantation are threatened.
137	Moderate lowland flooding continues as several homes in the Green Rich Shores Subdivision in Walker County flood and water covers Thomas Lake Road. The lowest buildings off FM 980 northwest of Riverside flood.
136.8	Moderate lowland flooding continues as the approaches to the FM 3478 bridge upstream of the gage are inundated and impassable. The lowest homes in the Green Rich Shores Subdivision are flooded with up to one half foot of water. Thomas Lake Road remains flooded and the lowest roads into properties off FM 980 northwest of Riverside are inundated and impassable.
136	Moderate lowland flooding begins in the vicinity of the gage. The lowest homes in the Green Rich Shores Subdivision are flooded and Thomas Lake Road is inundated and impassable. Low roads in the Deep River Plantation Subdivision are inundated. The lowest roads into properties off FM 980 northwest of Riverside are inundated and the lowest buildings are threatened.
135	Minor lowland flooding continues as significant backwater up Thomas Lake floods the lowest areas in the Green Rich Shore Subdivision in Walker County with the boat ramp completely inundated. The lowest lying areas in the Deep River Plantation Subdivision and FM 980 northwest of Riverside are threatened.

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

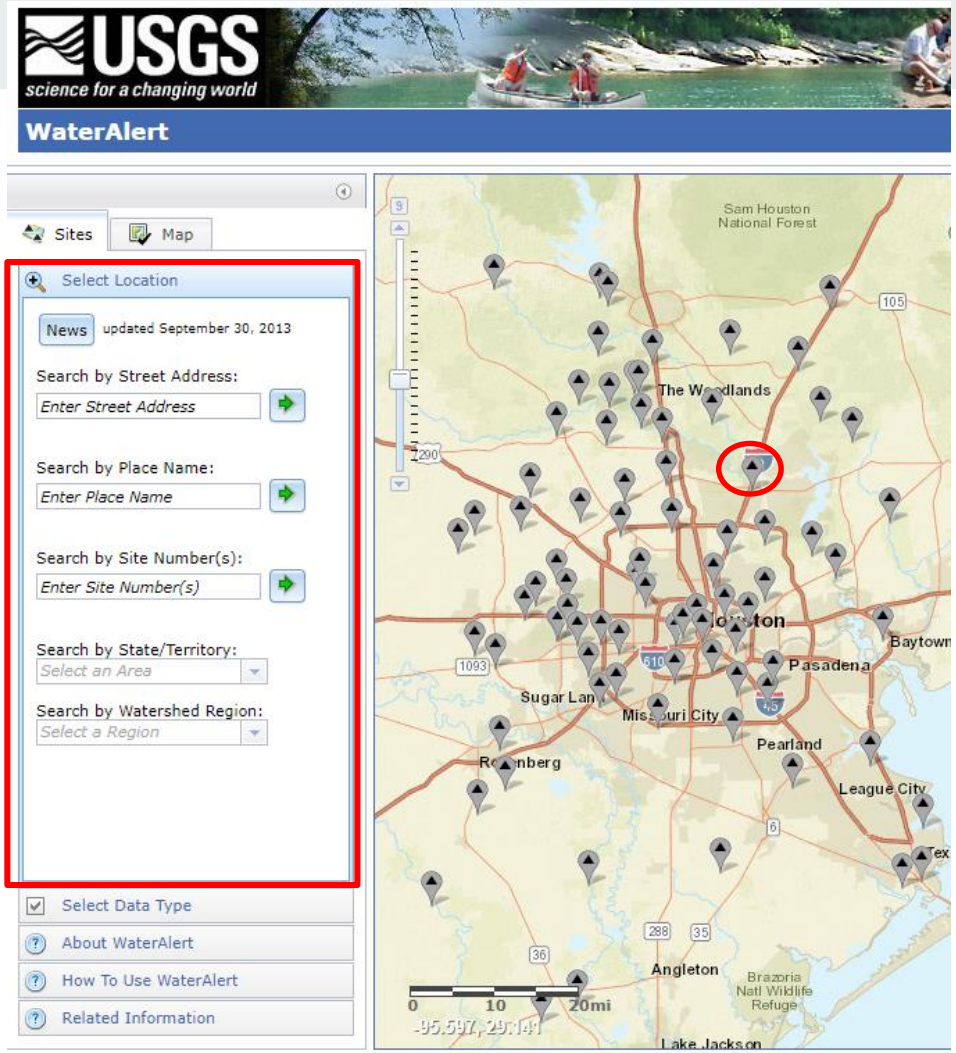
- Gage Maintenance
- Stream Measurements
- Focus Stream Gage Network

National Weather Service

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

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/

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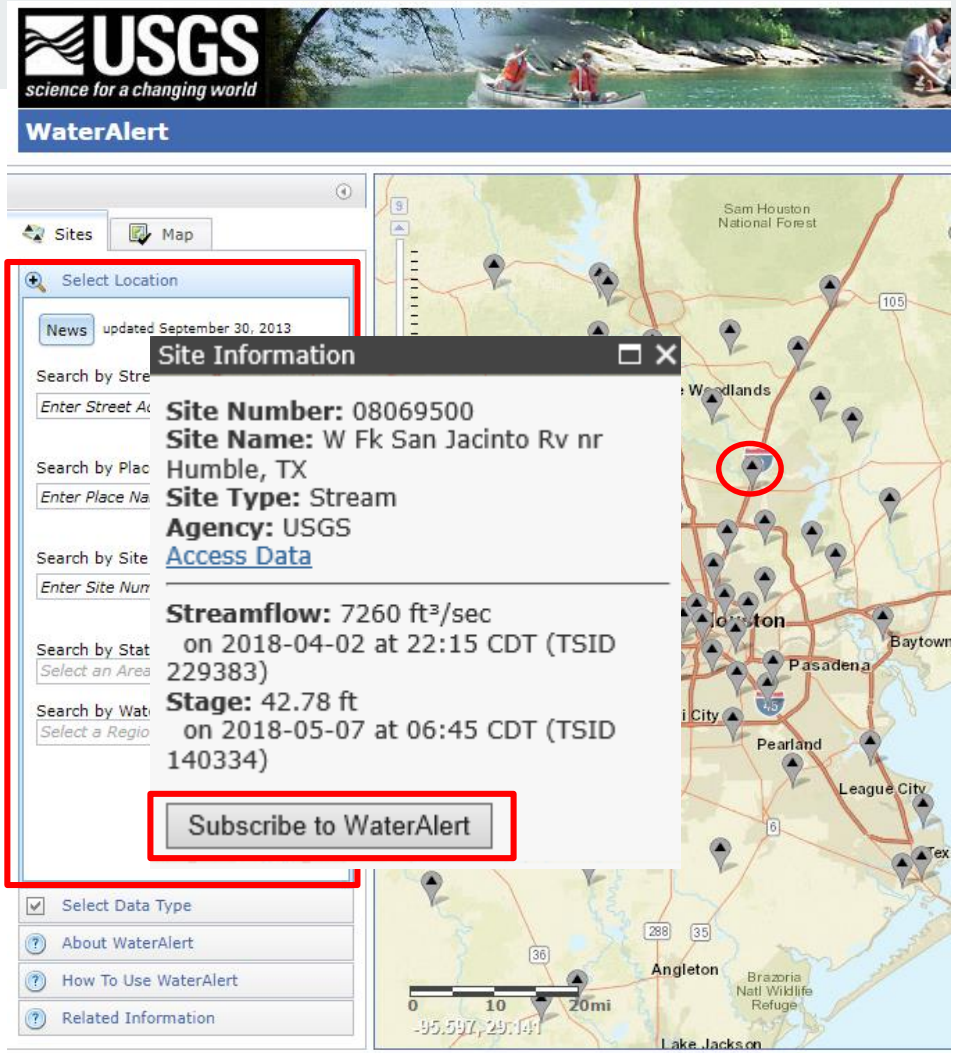

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USGS Water Alerts

- 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

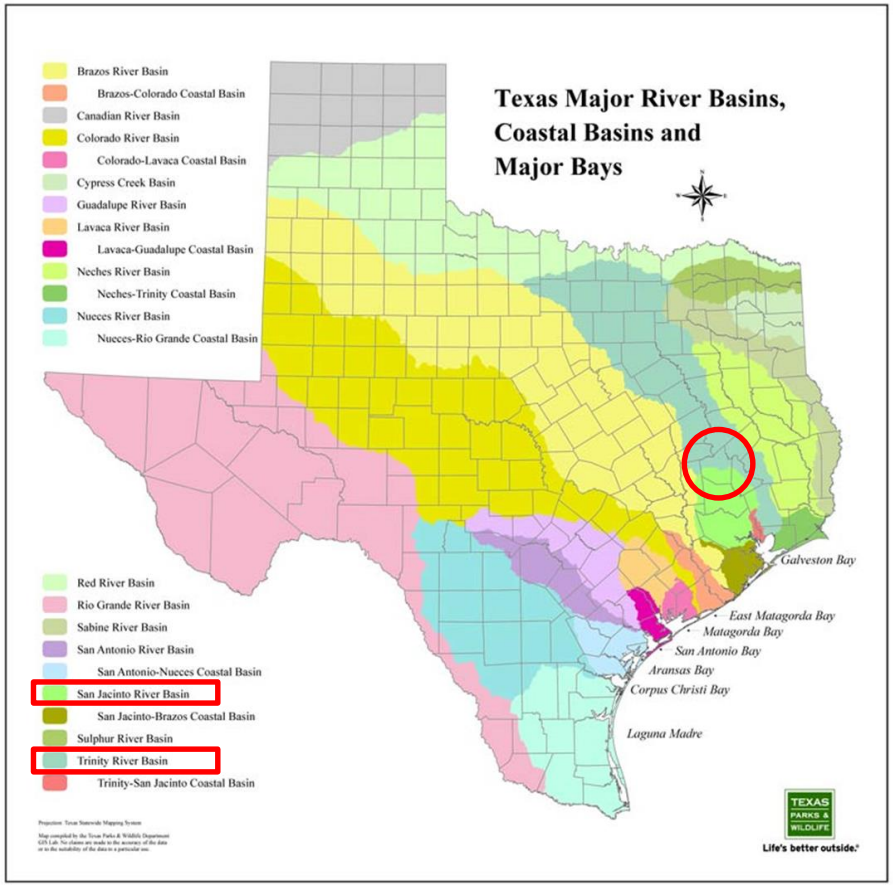
Natl Wildlife Refuge

Lake Jackson

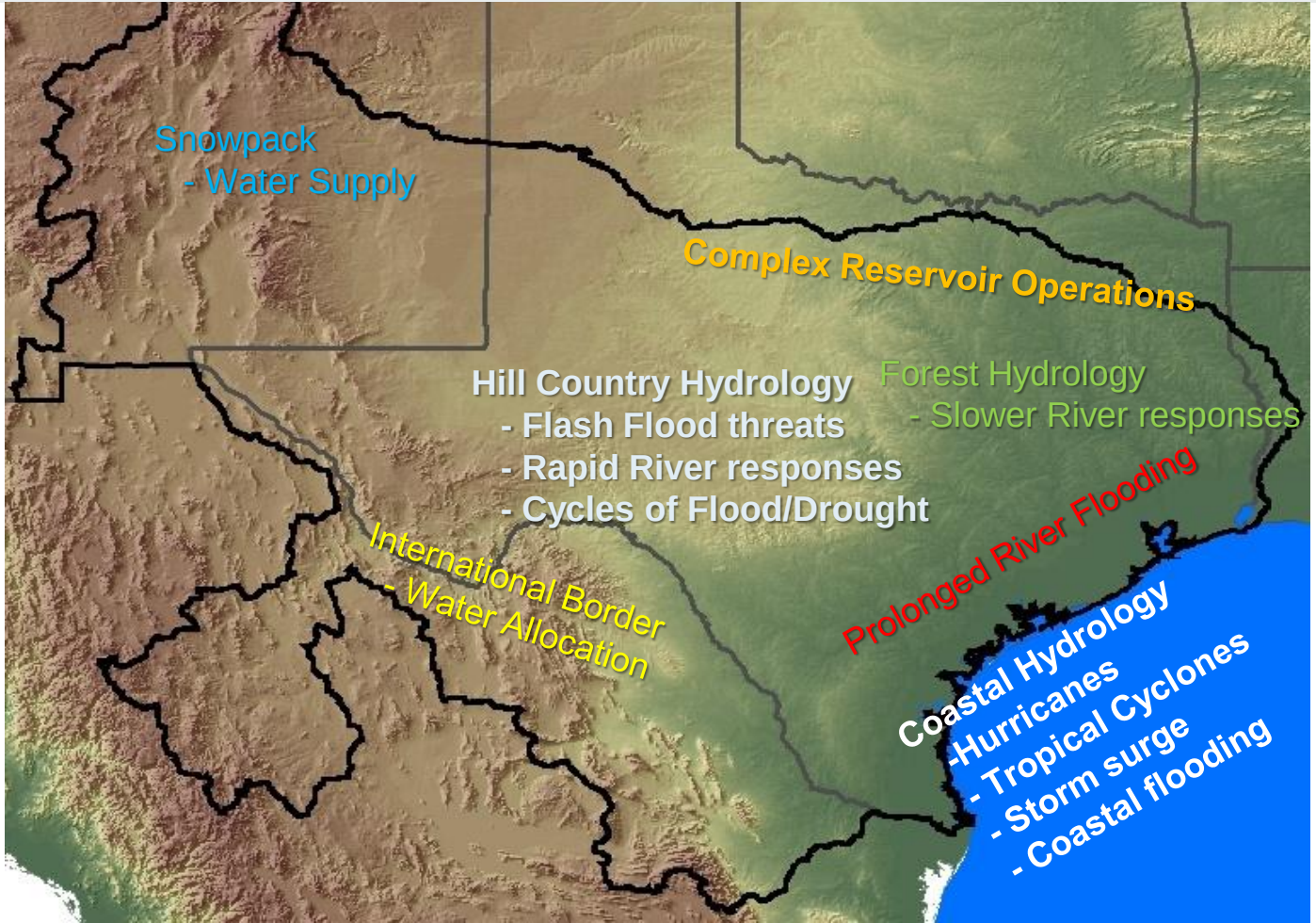
USGS Water Alerts:
https://maps.waterdata.usgs.gov/mapper/wateralert/

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.
- 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.
- Walker County deals with 2 primary watersheds: Trinity River and San Jacinto River



Diverse Watershed Characteristics in Texas



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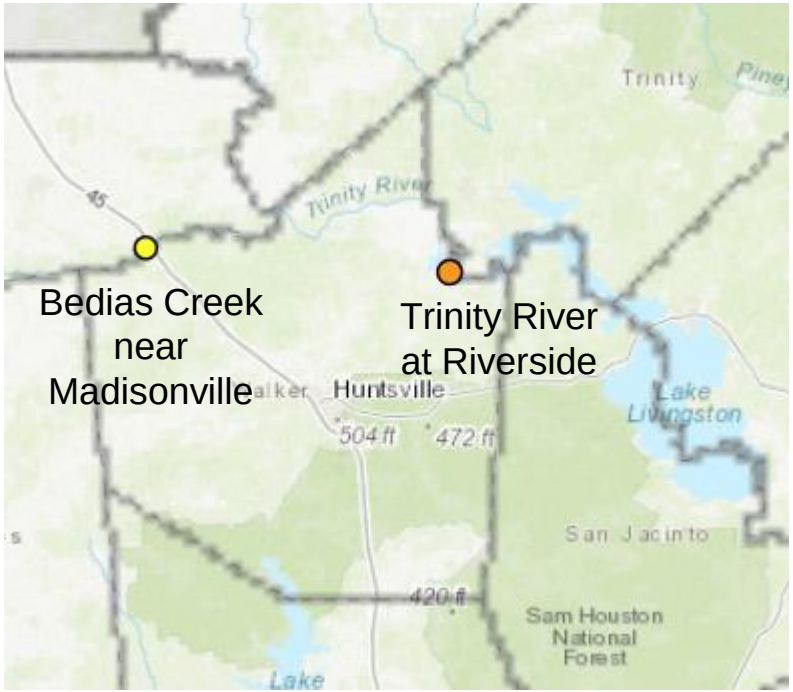
- NWS issues river forecasts for 2 sites in Walker County.

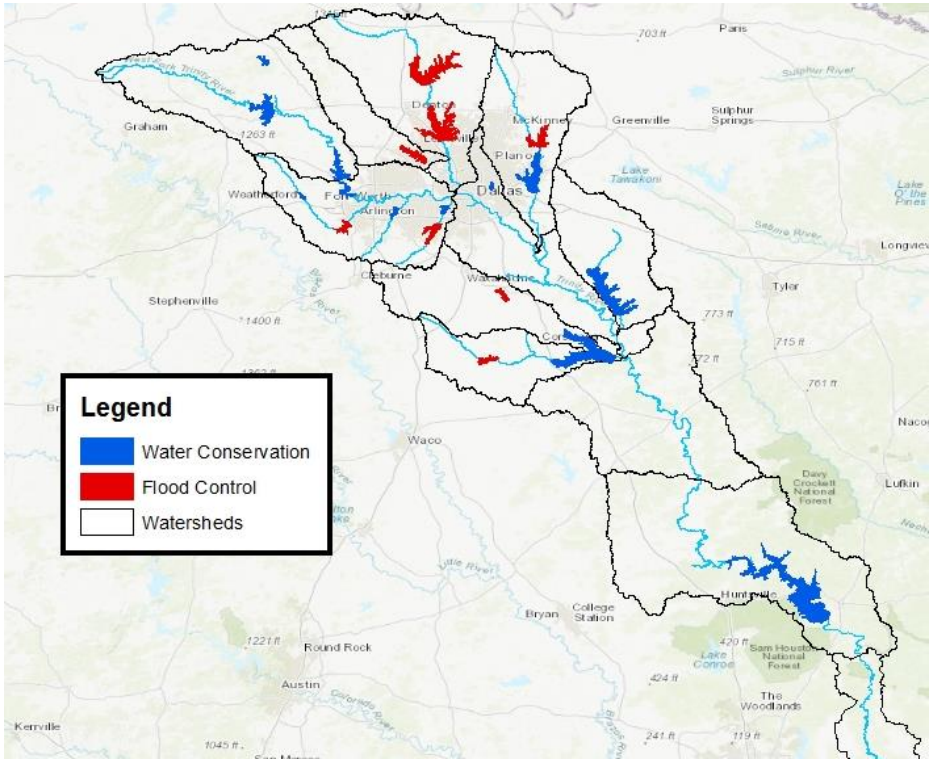


Trinity River Basin Over View

Basin Facts

- Nearly 18,000 square miles
- More water storage than any other river system in Texas

Basin Facts



20 reservoirs ranging from 1,000 to 83,000 acres

- 12 Water Conservation
- 8 Flood Control

Basic Components of a Dam

Flood Control Reservoir

Flood Control Reservoir

- Built to regulate flood waters
- Examples:

1. Lake Grapevine
   - Storage-535 MSL
   - Flood Pool-560 MSL
   - Surcharge-582 MSL
2. Lake Lewisville
   - Storage-522 MSL
   - Flood Pool-532 MSL
   - Surcharge-552 MSL

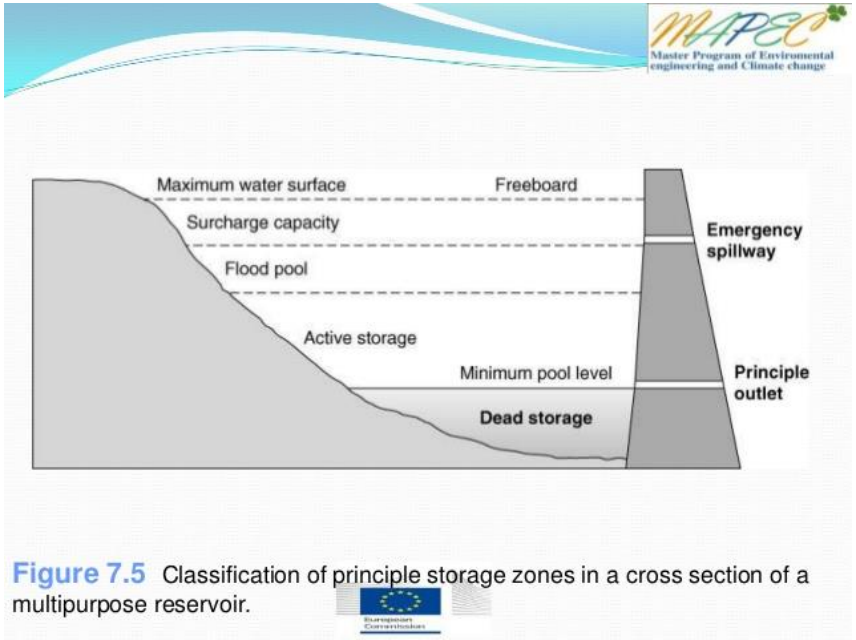
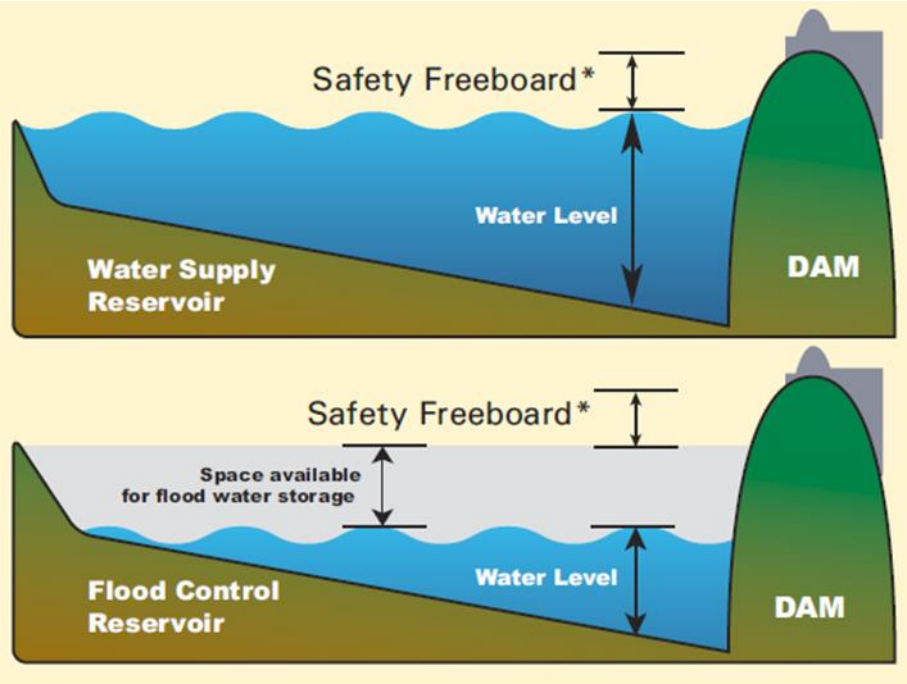


Figure 7.5 Classification of principle storage zones in a cross section of a multipurpose reservoir.

Water Conservation Reservoir

Water Supply Reservoir

- Designed to stay near full
- Have 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
- Still reduces flooding downstream



Lake Livingston

WATER CONSERVATION RESERVOIR is responsible for the safe storage of water and providing drinking water to more than two million southeast Texans.

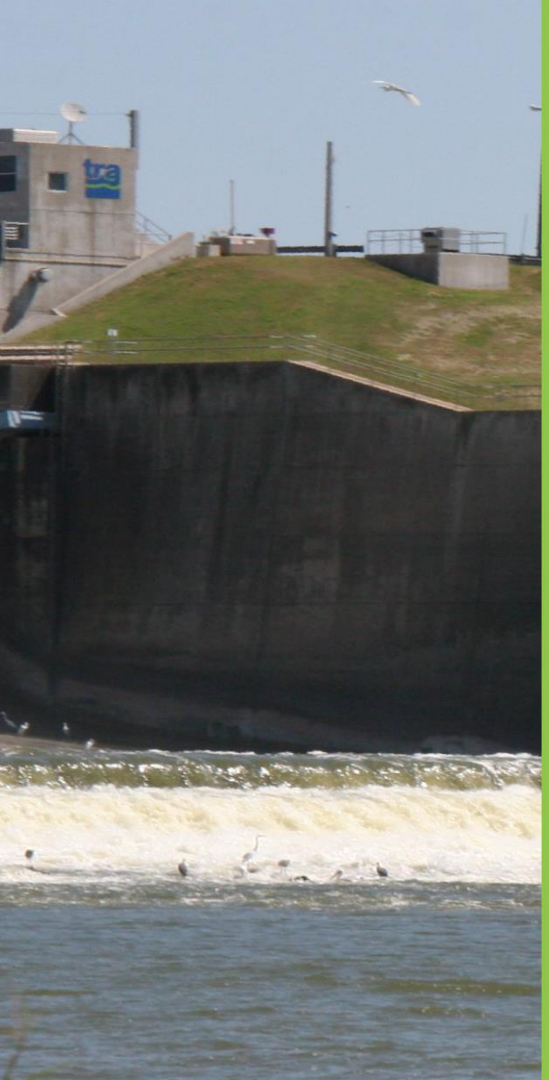
- 83,000 surface acres
- 1,750,000 acre feet
- More than 350,000 CFS spillway discharge capacity
- Conservation Pool – 131 MSL
- Flowage Easement –135 to 140 MSL

Gate Operations

- Manage outflow in order to mimic river flows
- Calculate releases adequate to keep pace with increasing inflows without causing sudden surges and without exceeding computed inflows until the peak inflow has been reached.
- Once reservoir elevation has peaked, excess inflow will be released from surcharge storage in an orderly fashion to reduce pool to conservation pool of 131 MSL.

Lake Livingston Emergency Action Plan

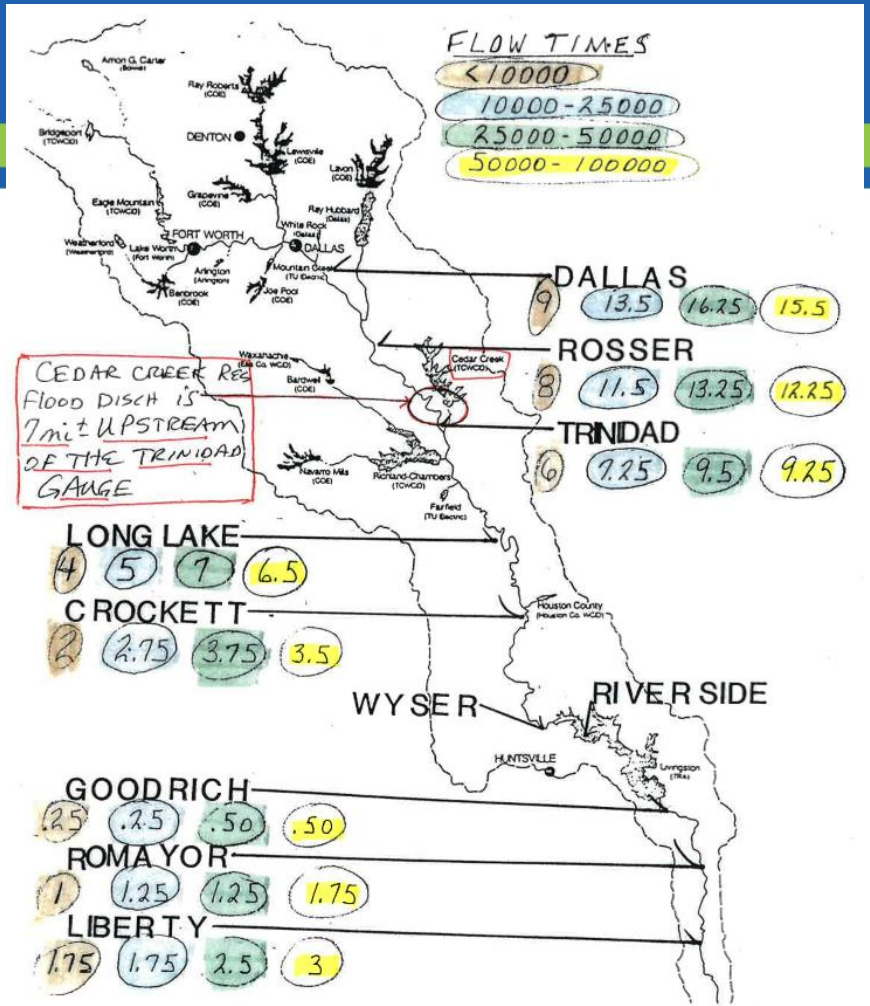
- Implemented at discharge of 20,000 cubic feet/second (CFS)
- Who do we contact?
  - ✓ Emergency Management Coordinator for Walker, Polk, San Jacinto, Trinity, Liberty and Chambers counties
  - ✓ NWS and WGRFC
  - ✓ DPS-Lufkin
  - ✓ Liberty radio
- Methods of notification
  - ✓ Phone
  - ✓ Email
  - ✓ Twitter



Hydrology and History of the Trinity River

Trinity River Travel Times

- Travel times are to/from Lake Livingston



Historic Flood Stages at Riverside

RANK	YEAR	STAGE
1	1942	142.61
2	1945	141.69
3	1957	139.61
4	1908	139.56
	1968	GATES AT DAM CLOSED
5	1990	139.08

Riverside 1942

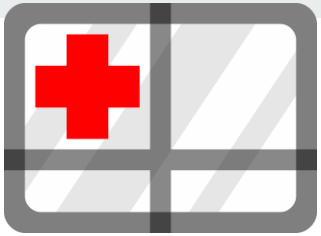
No Two Floods Are The Same

- What part of the watershed is the flood event originating?
  - Rain event in Dallas
  - Local Rain
- How much of the watershed was covered by precipitation?
- What are the current conditions?

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.)

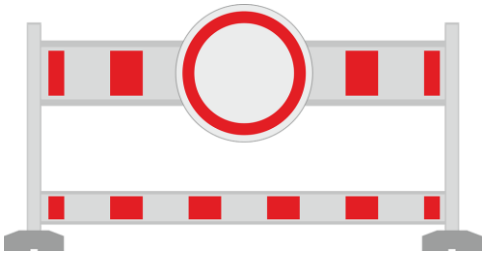
Turn Around, Don't Drown!

- 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

- 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

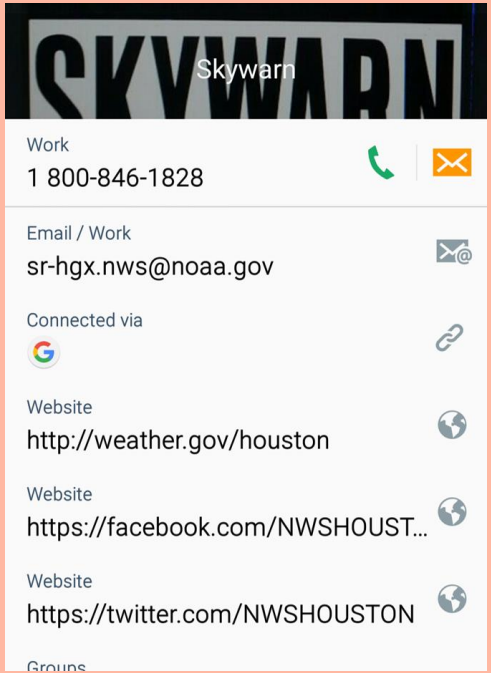
Email

sr-hgx.nws@noaa.gov

Social Media

Twitter: @NWSHouston

Facebook: NWSHouston

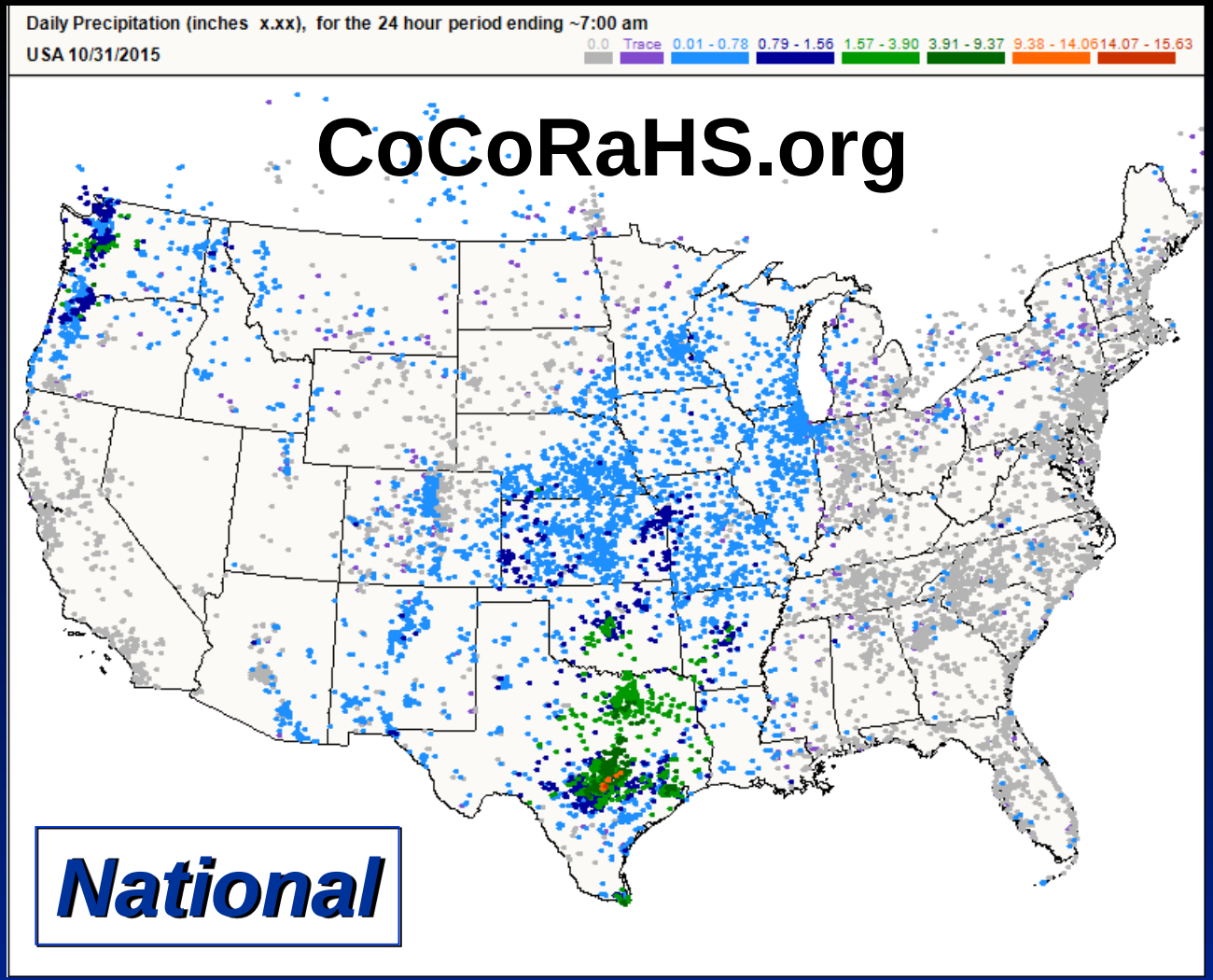


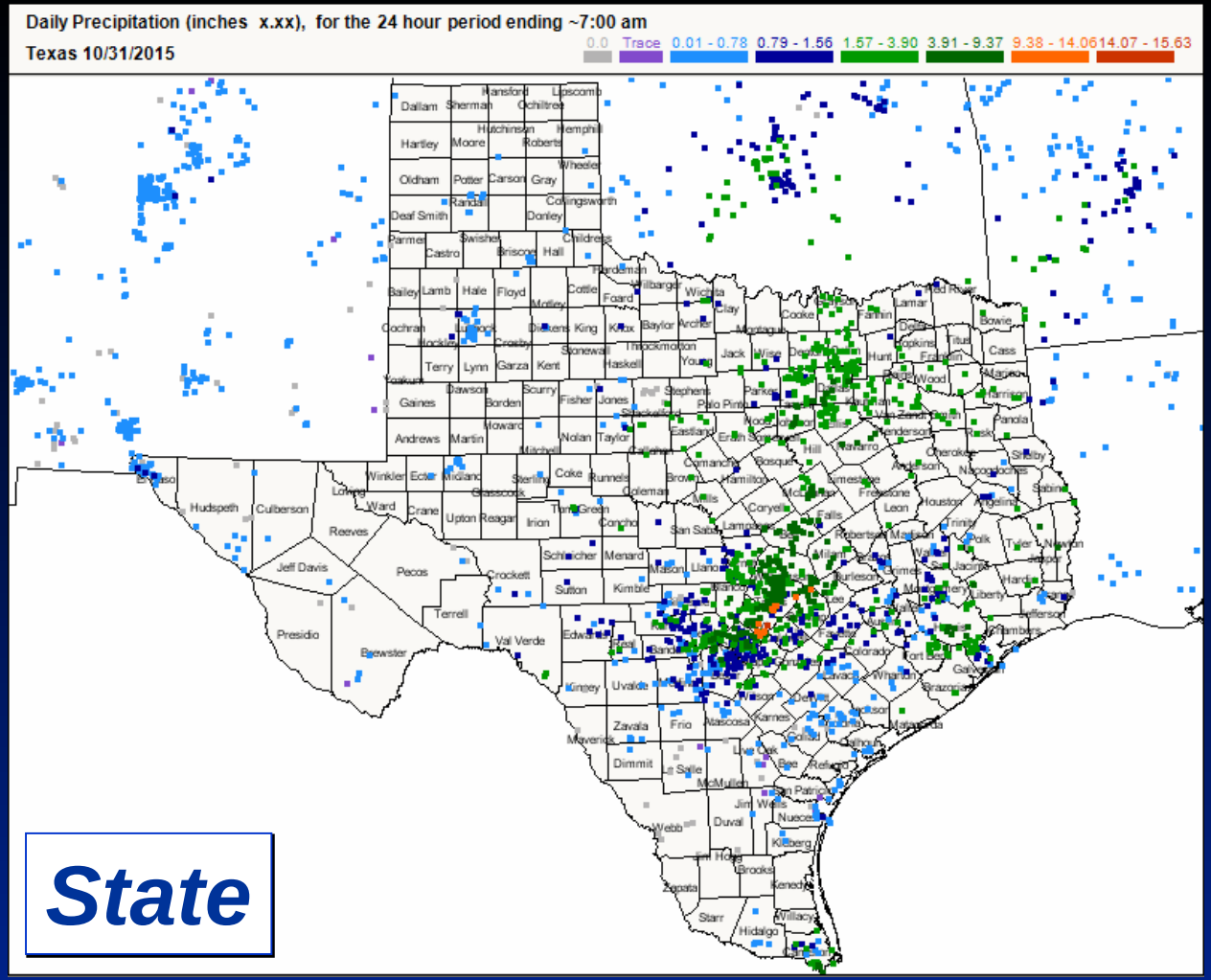
Spotter Tip

Set up SKYWARN as a contact in your smartphone

CoCoRaHS

"Because every drop counts"


Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am
USA 10/31/2015
0.0
Trace
0.01 - 0.78
0.79 - 1.56
1.57 - 3.90
3.91 - 9.37
9.38 - 14.06
14.07 - 15.63
CoCoRaHS.org
National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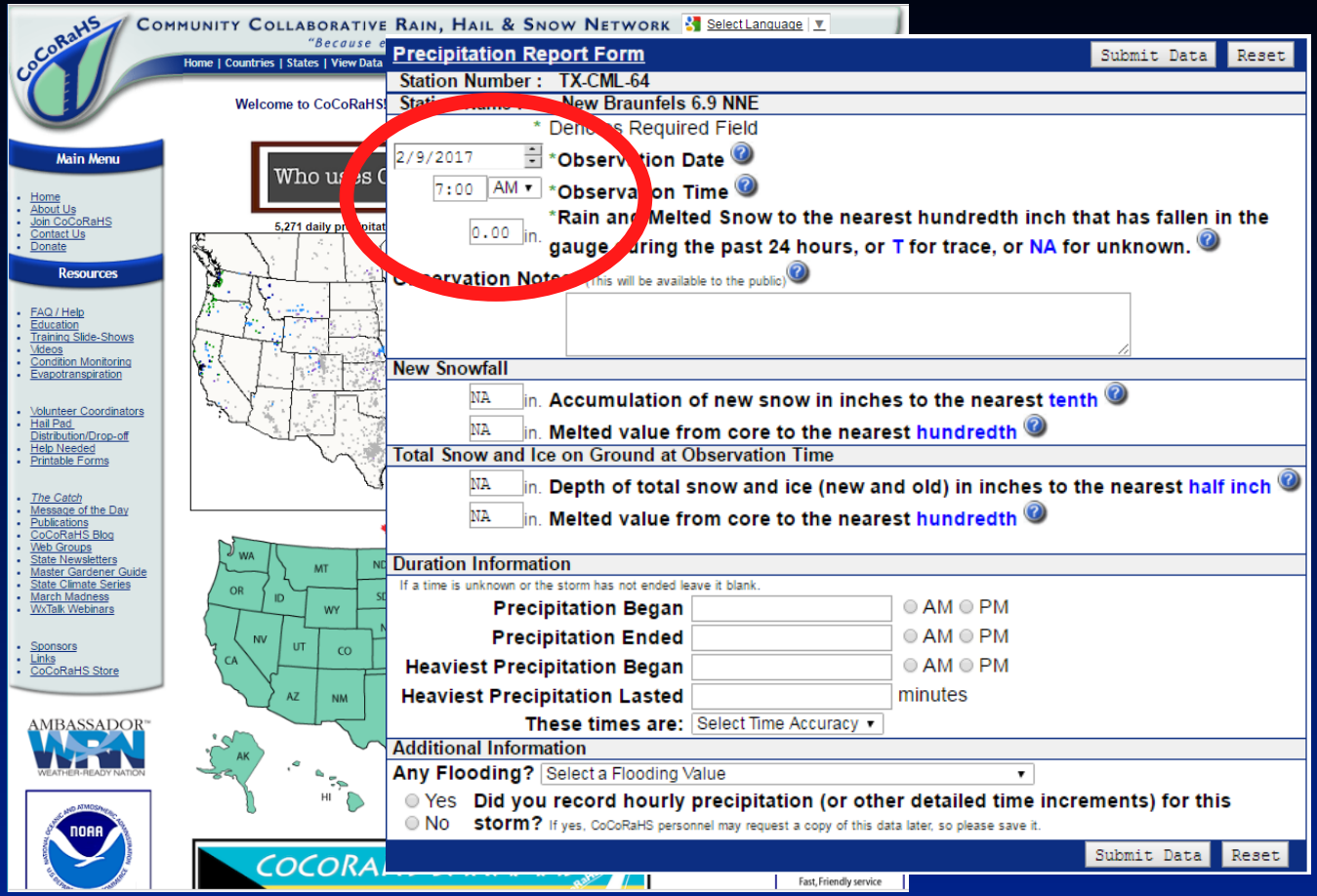
14.07 - 15.63
State

Measure & Report Daily Rainfall on Interactive Web site: www.cocorahs.org



Flood Risk

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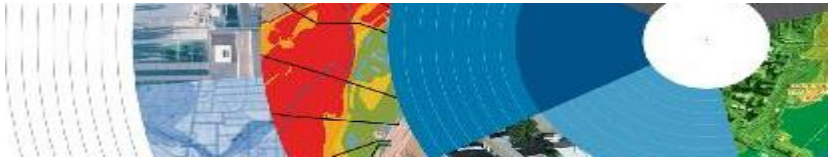
FloodWarn Workshop

Topics



- NFIP – National Flood Insurance Program.
- What is Flood Risk?
- Flood Hazard Mapping and FIRMs

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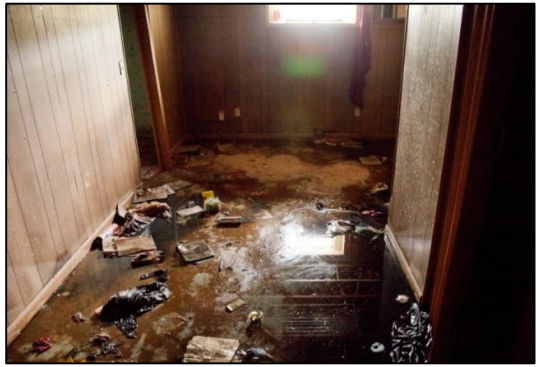
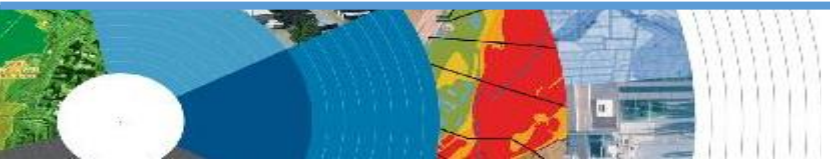
Flood Insurance

A tool for individuals to manage risk.

- Everyone is at risk for flooding.
  - *For most events 26% of NFIP claims are outside the SHFA.*
- A few inches can cause tens of thousands in damage.
- If you mortgage company “forced” you to buy flood insurance, check that structure and CONTENTS are covered. Most cover structure only.

NATIONAL FLOOD INSURANCE PROGRAM





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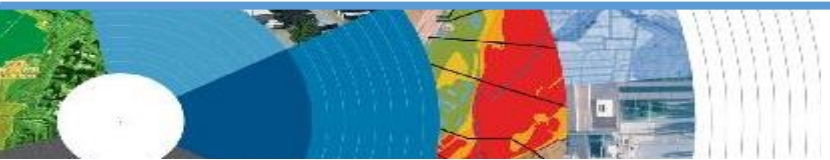
What is the NFIP definition of A Flood Defined?

Inundation of 2 or more acres of normally dry land or of two or more properties (one of which is your property) from:

- Overflow of inland or tidal waters;
- Unusual, rapid accumulation or runoff of surface waters from *any source*;
- Mudflow; or
- Collapse or sinking of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated levels that result in a flood.



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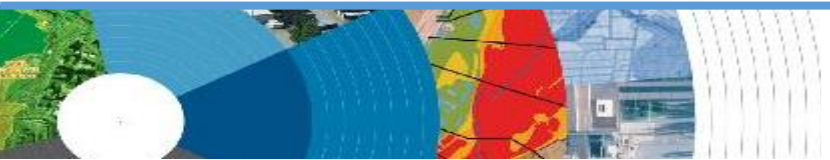
NFIP Flood Insurance Coverages

- **Structure Coverage**
  - Replacement Cost on single-family, primary residence (structure) if insured to at least 80% of replacement cost.
  - 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 (depreciation applies.)

- **Wait Period**
  - Typically - 30-days from purchase until effective.
  - Exceptions:
    - Flood Insurance required by a federally regulated and insured lender—0 days.
    - Wildfire 30-day waiting period exception—0 days.
    - Initial purchase of flood insurance as the result of a map revision—1 day.



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Misconception: Homeowners Insurance is Enough

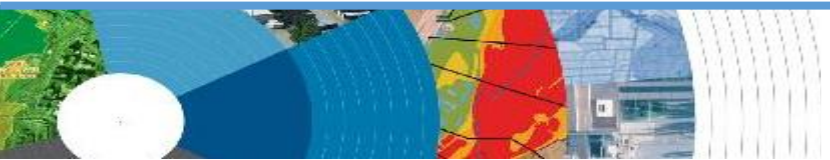
- **Misconception:**

  "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.



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Group Flood Insurance Policy (GFIP)

IF in the 1% risk area (100yr floodplain)

AND received FEMA Individual Assistance(IA),

A GFIP policy was purchased

(if they did not have flood insurance.)

GFIP is a 3 yr. abridged Flood Insurance Policy. The policy is paid for from the IA funds.

You can purchase the standard NFIP policy to increase your coverage. *(GFIP cancels)*

Group Flood Insurance Policy (GFIP)

FEMA Group Flood Insurance Policy
Making Survivors More Resilient

Requirement *- property owner MUST purchase and maintain a traditional NFIP policy when GFIP expires.*

If not…they are not eligible for IA that would cover the replacement of real or personal property for the damaged location with a future event.

The insurance requirement is forever – including new homeowners.

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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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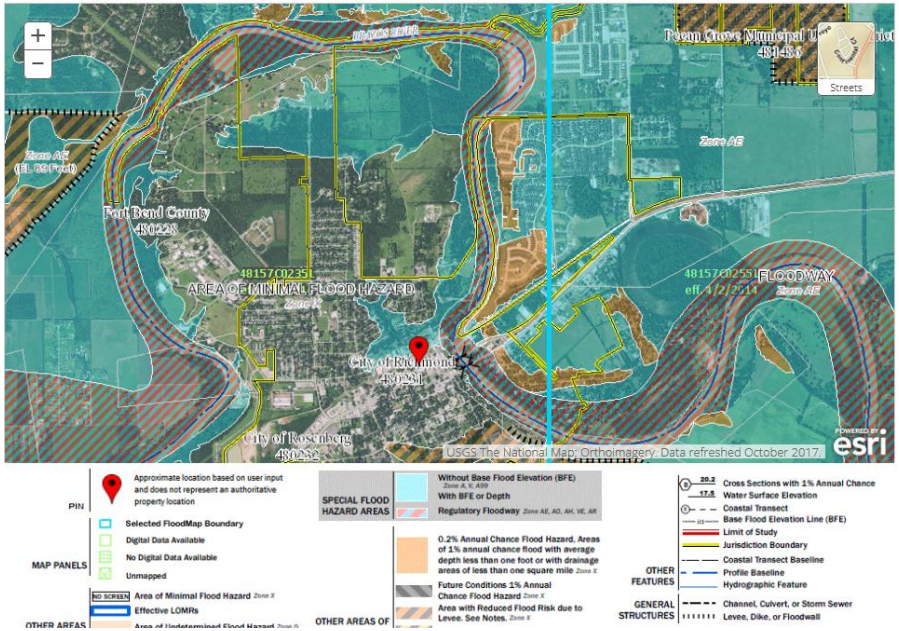
What is a FIRM?

Flood Insurance **Rate** Map

- Identifies the Special Flood Hazard Area (SFHA) and Non-SFHA's
- Used for rating flood insurance policies
- Mandatory purchase requirement if property is in SHFA **AND** is a federally backed mortgage.



FIRM's show Coastal and Riverine flood risk.

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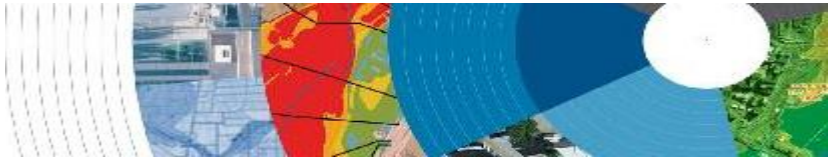
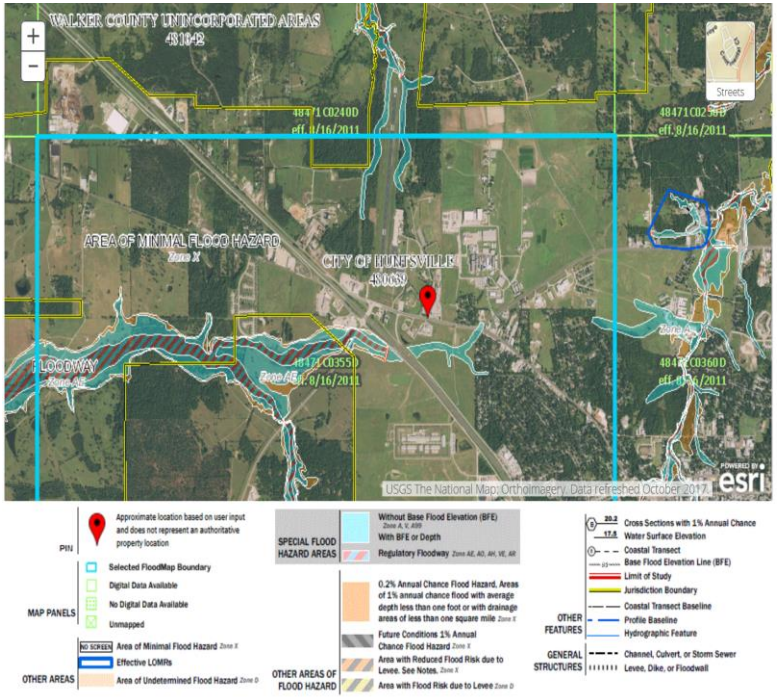
What is a Flood Zone?



Zones on a FIRM:

- SFHA (high risk)
  - A, AE, AO, AH, VE, V etc. (Aqua)
    - 1% annual chance flood
    - 26% chance of flooding in a 30-yr mortgage
- 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.



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

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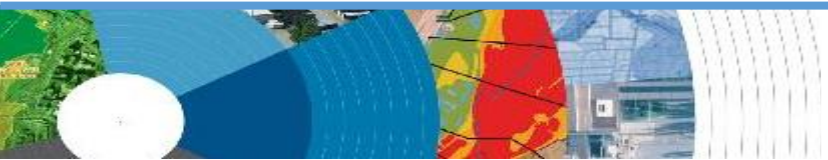
Flood Hazard Mapping

- The maps are **NOT** a prediction or forecast.
- Flood waters are not confined to the at the 1% risk line (aka 100yr flood) on the FIRM.

"Yes, this is a beautiful river. But it wasn't here when we purchased the land. Maybe we should've checked to see if it was in a flood zone before investing in it."



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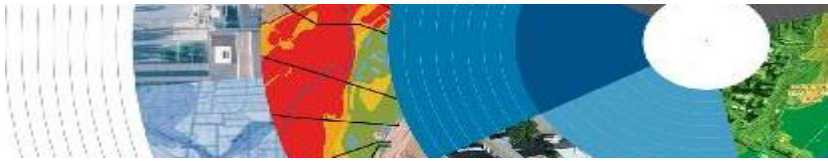
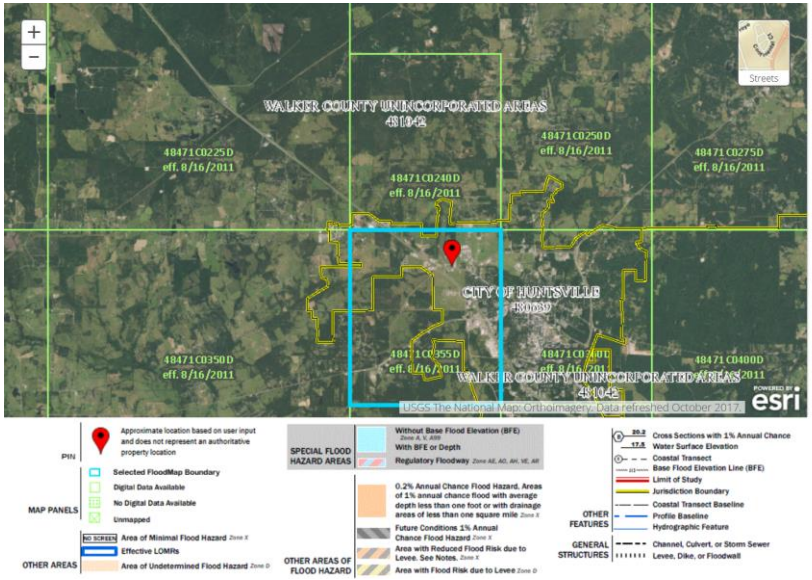
Flood Hazard Mapping



- FIRMs are subdivided by panels to cover a jurisdictional boundary (each has a unique panel number.)
  - Each panel has a specific code and effective date.
  - FIRMs are a single snapshot for one scenario.



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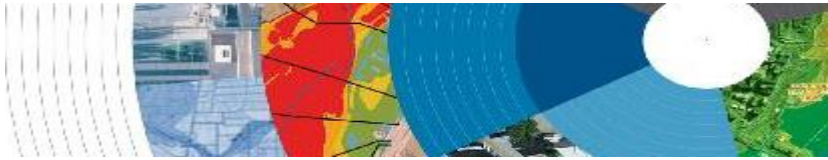
Flood Hazard Mapping



- Assumptions are made in the river modeling
  - Precipitation input the 100 year/24 hr. design storm *(actual events rain intensities vary - not consistent rate over a 24 hr. period.)*
  - Assumptions about the vegetation in the flood plain – do NOT differentiate dead vs growing vegetation (increased friction during growing season)
  - Snapshot of land use when the models were developed – a challenge in rapidly developing areas
- One event is never the same as another, FIRMs will not exactly match an individual event.

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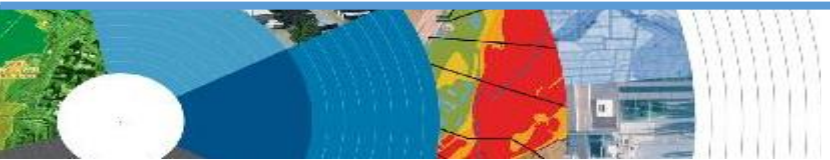
Misconception: Only 100yr Floodplain is at Risk

- **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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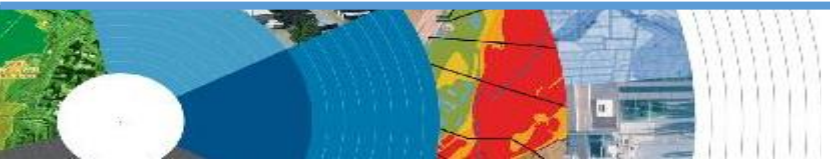
Cost of Flood Damage?

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**
- Walker County (unincorporated only) – 1 (Losses over 125K)

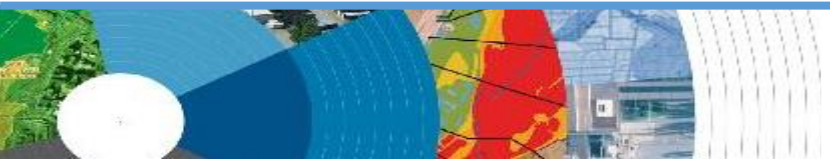
New GFIP's Due to Harvey

- Walker County –6

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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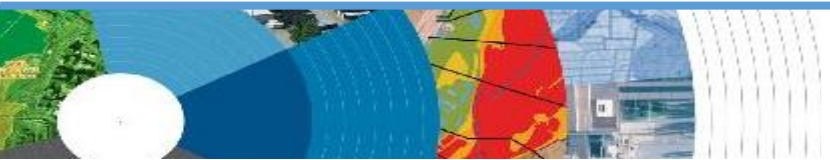
Summary

- 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.
  - FIRMs focus on river flooding and some overland flow.
- Flood insurance allows individual property owners to manage their risk.
  - **Buy policies that cover the structure AND contents**.



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Contact Information

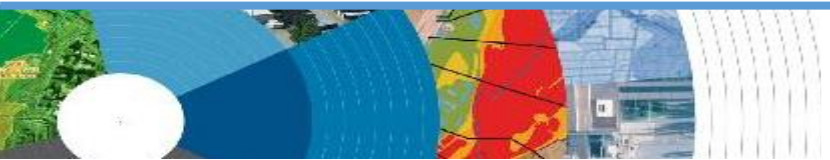
NFIP Hotline
1-800-427-4661
www.fema.gov/nfip

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
FEMA