2018 FloodWarn Training

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National Weather Service - Houston/Galveston, TX
National Weather Service

Weather Forecast Offices

Click city for local weather information

River Forecast Centers

Click RFC area for local information
Outline

Flooding Importance
Flooding Types and Causes
Flood Products
River Flooding
Partners
Flood Safety
Reporting Flooding
Flood Risk
Flooding Importance
Flooding is Deadly!

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

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

Data from NWS National Hazard Statistics
Flood Fatalities

Texas Flood Fatalities by Shelter from 2013-2016

- Vehicle: 51.0%
- In Water: 26.0%
- Permanent Home: 10.6%
- Other: 12.5%

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

Data from NWS National Hazard Statistics
Houston Floods: April 18, 2016
Recent Big Floods...

Memorial Day 2015
Tax Day 2016
Brenham 2016
Harvey 2017

And other historic floods...
Tropical Storm Allison
1994 Flood
Tropical Storm Claudette
Flooding Types and Causes
What Causes Flooding?

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

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

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

River Flooding
Flooding that occurs from water escaping river banks.

Coastal Flooding
Flooding along a coastline either from high tides or storm surge during a tropical storm or hurricane.
Flood Products
Watch vs Warning

A **Watch** is issued when conditions are favorable to occur.

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

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

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

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

<table>
<thead>
<tr>
<th>Urban / Small Stream Advisory</th>
<th>Flood Watch</th>
<th>Flash Flood Watch</th>
<th>Flood Warning</th>
<th>Flash Flood Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WHAT IS IT?</strong></td>
<td>Flooding is possible – typically within a 6 to 48 hours before rain is expected to reach the area.</td>
<td>Flooding impacts are occurring or imminent.</td>
<td>Flash flooding impacts are occurring or imminent.</td>
<td>Flash flood situation that presents a clear threat to human life due to extremely dangerous flooding conditions</td>
</tr>
<tr>
<td><strong>WHAT TO DO?</strong></td>
<td>Stay away from areas that are prone to flooding and stay clear of rapidly moving water</td>
<td>Stay tuned to local river forecasts; prepare for areas near rivers to spread towards nearby roads and buildings</td>
<td>Have a way to receive local warnings, expect hazardous travel conditions and have alternate routes available</td>
<td>Conditions will rapidly become hazardous! Do not cross flooded roadways or approach inundated areas as water may still be rising</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>WHAT TO DO?</strong></td>
</tr>
</tbody>
</table>

**Flash Flood Emergency**

Flash flood situation that presents a clear threat to human life due to extremely dangerous flooding conditions.
Urban / Small Stream Flood Advisory

This image depicts what conditions may look like during a flood advisory.
This image depicts what conditions may look like during a Flash Flood Warning.
Flash Flood Emergency

This image depicts what impacts may result from a Flash Flood Emergency. A rapidly moving flood wave resulted in this roadway being completely washed out.
Flood Warning
(Areal/River/Bayou)

This image depicts what conditions may look like during an Areal Flood Warning.
Flood Timeline

Before Event Onset

Flood Advisory

Flash or Areal Flood Warning
River Flood Warning

Flash Flood Emergency

Increasing Impact Potential
ALL Situations Represent Threatening Conditions to Life and/or Property

Note: Flooding can (and does) occur without a Flash Flood Watch!
Ways to Receive a Warning

- NOAA Weather Radio
- Wireless Emergency Alerts and Weather Apps
- TV and Radio
- Social Media

Be sure to have multiple ways to receive warnings.

NWS Website: https://www.weather.gov/hgx/
River Flooding
Llano 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.
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.
Hydrograph

Latest observed value: 42.77 ft at 8:15 AM CDT 29-Aug-2017. Flood Stage is 39 ft

Major: 43.0'
Moderate: 41.0'
Minor: 39.0'
Action: 30.0'

Record: 51.9'
Flow (cfs)

Site Time (CDT)

Graph Created (8:50AM Aug 29, 2017) - Observed - Forecast (issued 8:10AM Aug 29)

WHAT2(plotting HGIRG) "Gage 0" Datum: 52.42'

Observations courtesy of US Geological Survey
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.
Diverse Watershed Characteristics in Texas

- Snowpack - Water Supply
- Complex Reservoir Operations
- Hill Country Hydrology
  - Flash Flood threats
  - Rapid River responses
  - Cycles of Flood/Drought
- Forest Hydrology
  - Slower River responses
- International Border Water Allocation
- Coastal Hydrology
  - Hurricanes
  - Tropical Cyclones
  - Storm surge
  - Coastal flooding
- Prolonged River Flooding
Watershed

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- Topography plays a big role in how watershed boundaries are defined.
- Wharton County deals with 4 primary watersheds: Colorado River, San Bernand River, Lavaca River, and Tres Palacios River
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. Wharton County deals with 4 primary watersheds: Colorado River, San Bernard River, Lavaca River, and Tres Palacios River. NWS issues river forecasts for 4 sites in Wharton County.
Rainfall Analysis

Hydrologic Modeling

Forecast

Rainfall estimates and forecasts merged into continuous dataset

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

Warning
HYDROGRAPHS 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
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 20,000 cfs is 20,000 basketballs of water passing the gage every second.
Advanced Hydrologic Prediction System

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

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

Roles of Primary River Forecast Partners

- Operate Flood Control Reservoirs
- Manage Other WR Projects

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

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

Shared Data and Resources

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

- Gage Maintenance
- Stream Measurements
- Focus Stream Gage Network

- Cooperative Data Network
- NOAA/NWS Satellite Transmission
- Forecasts/Data for Operations
LCRA FLOOD OPERATIONS AND HYDROMET SYSTEM
Colorado River Forecast Locations
Flood Operations on the Highland Lakes
Lake Travis Elevation

714 feet msl
Top of Mansfield Dam spillway

681 feet msl
Full

Lake Travis

33 feet tall
787,000 acre-feet of capacity

Lake Austin

MANSFIELD DAM

FLOOD POOL
Key Elevations for Mansfield Dam

- **750 feet msl**
  - Top of Mansfield Dam
  - LCRA may release water as needed to maintain the safety of Mansfield Dam. The release is not limited by the downstream conditions.

- **722 feet msl**
  - Eight feet above the spillway
  - LCRA may release up to 90,000 cubic feet per second (cfs). The release is not limited by downstream conditions.

- **714 feet msl**
  - Top of the spillway
  - LCRA may release up to 50,000 cfs. The release may be limited by downstream conditions.

- **710 feet msl**
  - Four feet below the spillway
  - LCRA may release up to 30,000 cfs. The release may be limited by downstream conditions.

- **683 feet msl**
  - Lake Travis enters the flood pool above this level
  - LCRA may release up to 7,500 cfs. The release may be limited by downstream conditions.

- **681 feet msl**
  - LCRA may release up to 7,500 cfs. The release may be limited by downstream conditions.
Flood Releases and Downstream Controls

• Maximum flood release when Lake Travis forecast is 681-683 feet msl: 7,500 cfs

• Downstream controls:
  - 30,000 cfs at Austin
  - 45,000 cfs at Bastrop
  - 50,000 cfs at Columbus
Flood Releases and Downstream Controls

• Maximum flood release when Lake Travis forecast is 683-710 feet msl: 30,000 cfs

• Downstream controls:
  - 30,000 cfs at Austin
  - 45,000 cfs at Bastrop
  - 50,000 cfs at Columbus
Flood Releases and Downstream Controls

• Maximum flood release when Lake Travis forecast is 710-714 feet msl: 50,000 cfs

• Downstream controls:
  - 50,000 cfs at Austin
  - 50,000 cfs at Bastrop
  - 50,000 cfs at Columbus
Flood Releases and Downstream Controls

• Maximum flood release when Lake Travis forecast is 714-722 feet msl: 90,000 cfs

• Releases are not limited by conditions at Austin, Bastrop or Columbus.
Flood Releases and Downstream Controls

• Maximum flood release when Lake Travis forecast is higher than 722 feet msl: inflow into the lake

• Releases are not limited by conditions at Austin, Bastrop or Columbus.
Hydromet System

- Critical for flood management
- LCRA’s eyes and ears for water
- Data is shared with many others
Typical Hydromet Station

Redundant - Reliable
Flood Response

Team work
- U.S. Geological Survey
- National Weather Service
- U.S. Army Corps of Engineers
- Lower Colorado River Authority
- Emergency Management Officials
- Local elected officials

Communications
- LCRA Flood Operations Notification Service (FONS)
- Internet and social media
- NOAA All Hazard Radios
- LCRA Emergency Hotline
- News media
Flood Resources:
• Flood guide
• Fact sheets
• Historic floods on the Colorado River
• Links to floodplain resources

Monitor Flooding:
• Flood Operations Report
• Hydromet
• LCRA on social media
• Flood Operations Notification Service (FONS)
LCRA Flood Operations Report

Flood Operations

- Current Lake Levels at Dams and Gate Operations
- Lake Levels Over the Last 14 Days and Forecasts
- River Levels - Current Conditions
- River Levels - Forecast Conditions
- Links
- Words and Definitions

Summary

This report provides the latest information when LCRA conducts flood operations, and is updated when conditions warrant. Flood operations are not anticipated at this time.

Unscheduled releases from the Highland Lakes dams may occur suddenly and unexpectedly due to emergency hydroelectric generation or other reasons. The public should exercise caution and avoid being in the water near the dams.

For information about current water supply operations, including long-range forecasts for lakes Buchanan and Travis, see the River Operations Report.

Current Lake Levels at Dams and Gate Operations

<table>
<thead>
<tr>
<th>Lake/Dam</th>
<th>Time</th>
<th>Head Elevation (Above Dam)</th>
<th>Tail Elevation (Below Dam)</th>
<th>Gate Operations/Spillway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buchanan/Buchanan</td>
<td>Apr 25 2018 10:15AM</td>
<td>1015.82</td>
<td>887.43</td>
<td>Mar 30 2018 4:23PM No gate operations to pass floodwaters are expected at Buchanan Dam at this time.</td>
</tr>
<tr>
<td>Inks/Inks</td>
<td>Apr 25 2018 10:15AM</td>
<td>887.38</td>
<td>625.01</td>
<td>Mar 30 2018 4:23PM Flow over the spillway of Inks Dam is not expected at this time. (Inks Dam has no floodgates.)</td>
</tr>
<tr>
<td>Wirtz/LBJ</td>
<td>Apr 25 2018 10:15AM</td>
<td>824.77</td>
<td>736.75</td>
<td>Mar 30 2018 4:23PM No gate operations to pass floodwaters are expected at Wirtz Dam at this time.</td>
</tr>
<tr>
<td>Starcke/Marble Falls</td>
<td>Apr 25 2018 10:15AM</td>
<td>736.42</td>
<td>675.93</td>
<td>Mar 30 2018 4:23PM No gate operations to pass floodwaters are expected at Starcke Dam at this time.</td>
</tr>
<tr>
<td>Mansfield/Travis</td>
<td>Apr 25 2018 10:15AM</td>
<td>667.71</td>
<td>491.73</td>
<td>Mar 30 2018 4:23PM No gate operations to pass floodwaters are expected at Mansfield Dam at this time.</td>
</tr>
</tbody>
</table>
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.

weather.gov/flood
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.
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
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”
Measure & Report Daily Rainfall on Interactive Web site: www.cocorahs.org
Flood Risk
Topics

• What is Flood Risk?

• NFIP – National Flood Insurance Program.

• Flood Hazard Mapping and FIRMs
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.”
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 your mortgage company “forced” you to buy flood insurance, check that structure and CONTENTS are covered. Most cover structure only.
What is the NFIP Definition of a Flood?

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.
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.
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.
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)*
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.
What is a FIRM?

Firm 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.
What is a Flood Zone?

Zones on a FIRM:

- **SFHA (high risk)**
  - A, AE, AO, AH, VE, V etc. (Aqua)
    - 1% annual chance of 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/home
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.”
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.
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.
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.
# Cost of Flood Damage?

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

<table>
<thead>
<tr>
<th>Interior Water Depth (Inches)</th>
<th>Cost to Home</th>
<th>Cost to Personal Property</th>
<th>Combined Loss Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>$23,635</td>
<td>$3,172</td>
<td>$26,807</td>
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<tr>
<td>2&quot;</td>
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<td>$53,355</td>
<td>$50,000</td>
<td>$103,355</td>
</tr>
</tbody>
</table>

FEMA
Structure Elevation Impact Insurance Rates

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

High Risk = $$$
Medium Risk = $$
Lower Risk = $

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**
- Wharton County (unincorporated only) – 68 (Losses over 125K)

New GFIP’s Due to Harvey
- Wharton County – 147

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.

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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