



Severe Weather Preparedness

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

National Weather Service

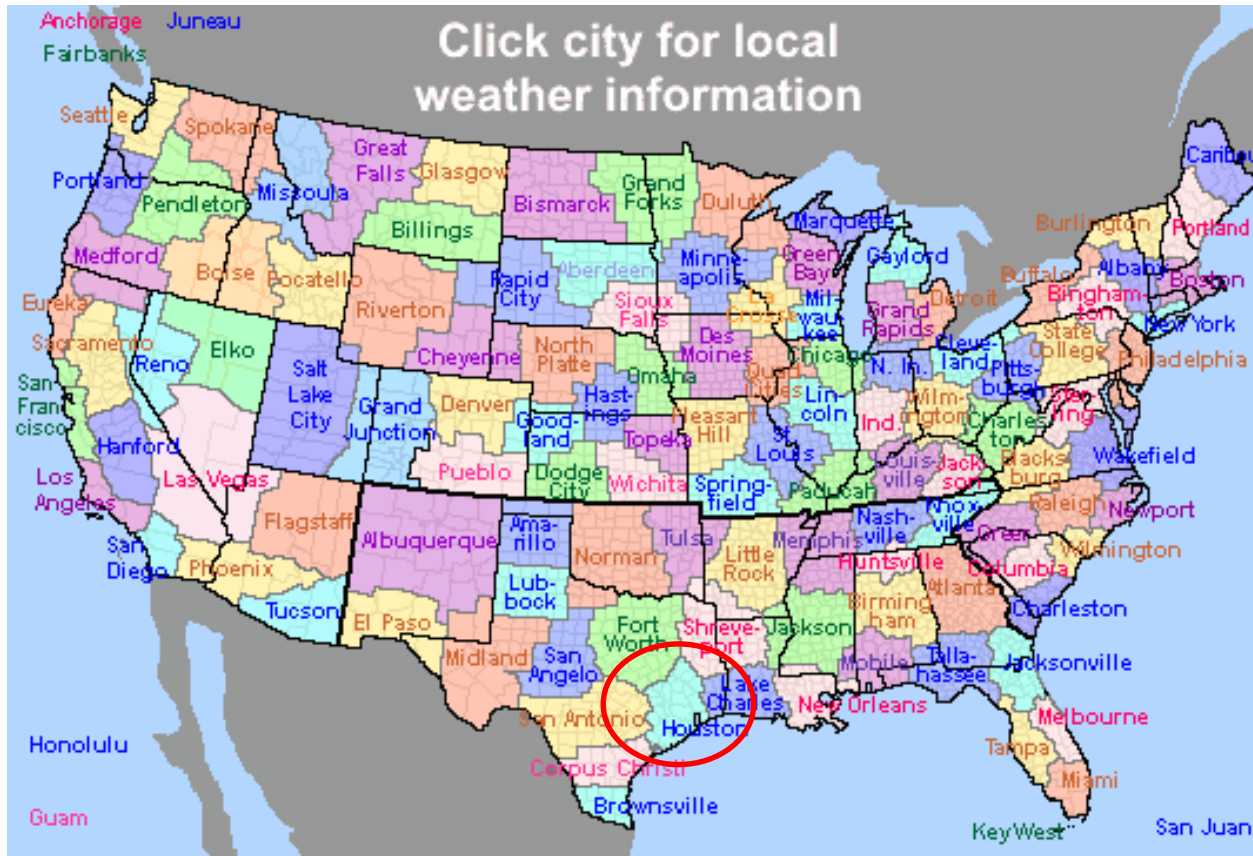
NWS Mission is to provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.



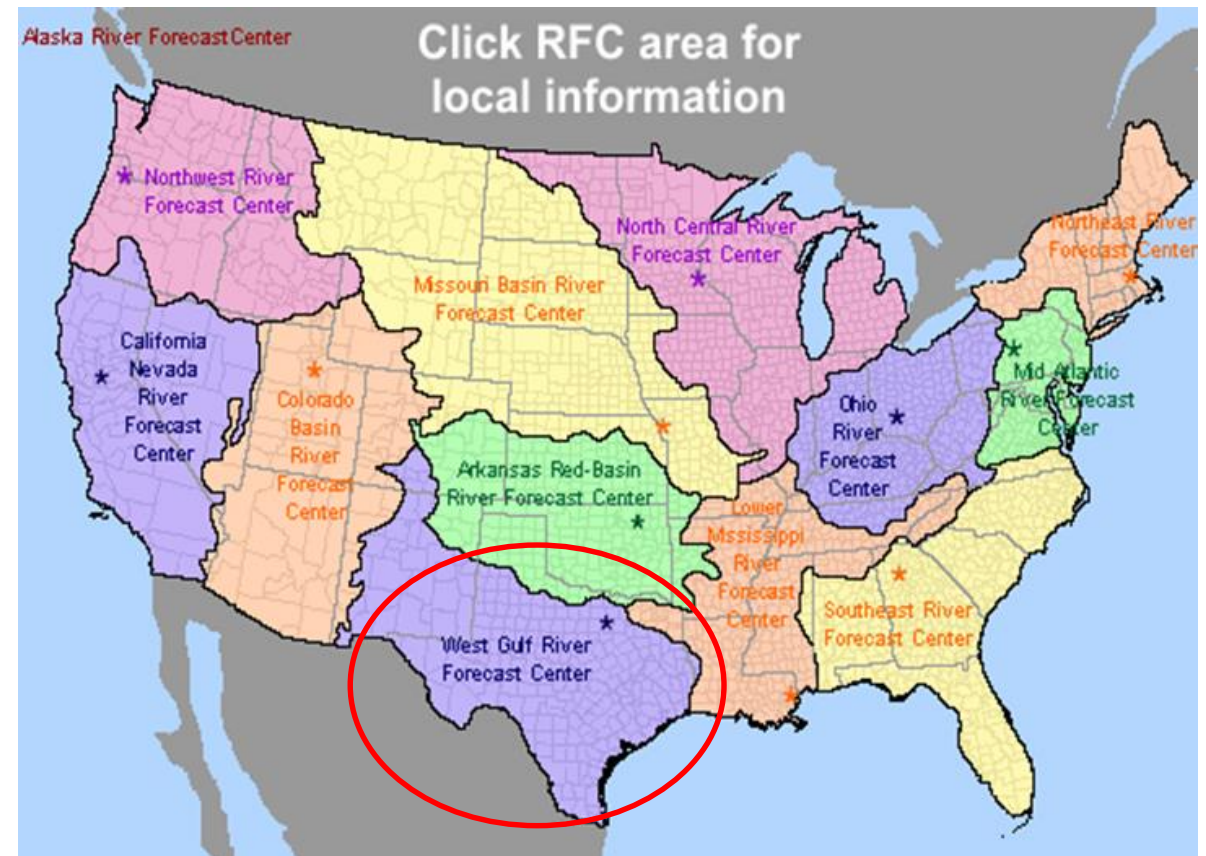
National Weather Service



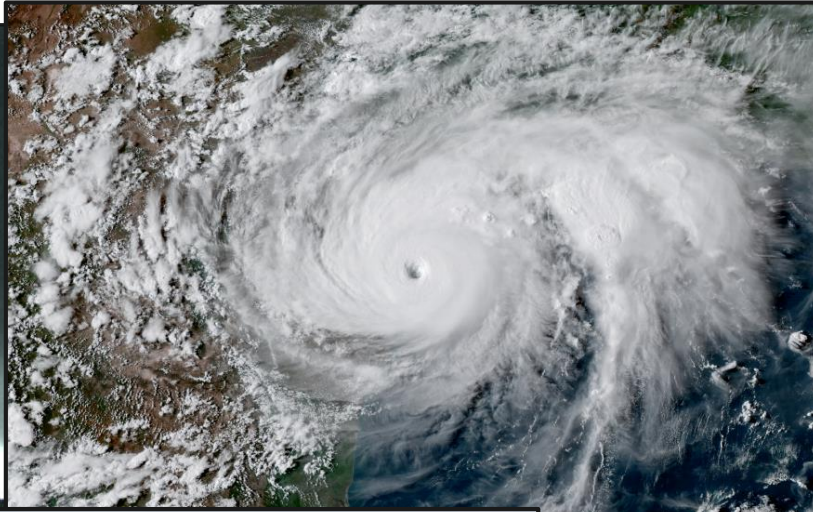
Weather Forecast Offices



River Forecast Centers



Weather Natural Disasters



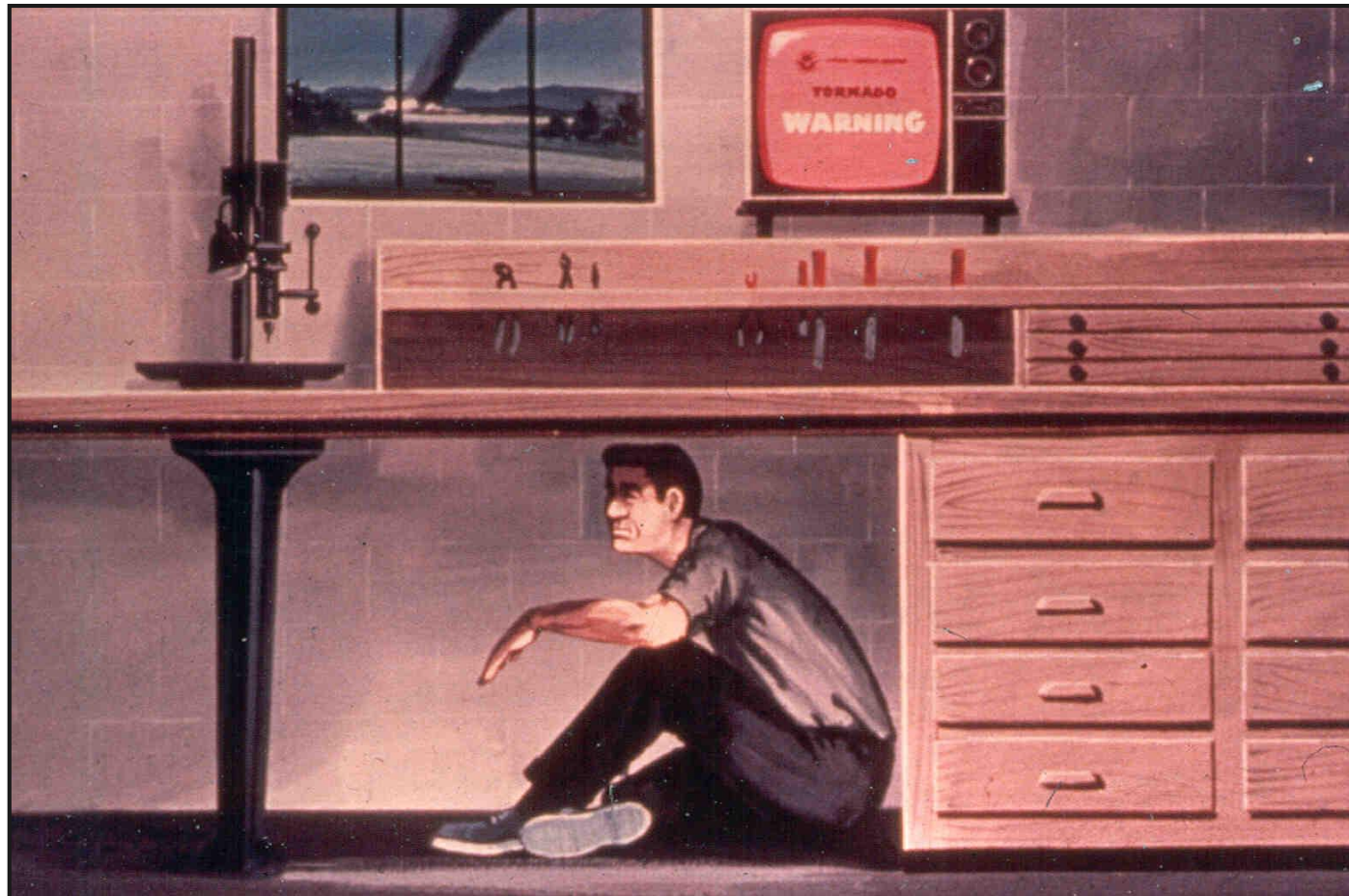
Watch

A watch means to stay aware. The conditions are favorable for a specified hazard to occur.



Warning

A warning means take cover! The specified hazard is occurring or imminent.



Tornado

- A violently-rotating column of air extending from a thunderstorm base to the ground
- A waterspout is just a tornado over water.
- Funnel clouds may look like a tornado but they do not touch the ground.
- How to tell the difference?
 - Look for swirling dust cloud near the ground under the funnel.



Funnel Cloud or Tornado?



Funnel Cloud or Tornado?



Tornado Safety

- Go to safe location away from windows on the lowest level of a sturdy building.
- Rule of thumb: Put as many walls between you and the outside as possible.
- Cover your head. Use cushions, blankets, coats, etc. as protection from debris.
- Go to a secure storm shelter if you are in a mobile home.
- If you are caught outside:
 - get in a car, buckle up, and try to drive to the closest sturdy shelter.
 - NEVER seek shelter under a bridge.
 - Only lie flat in a ditch as a last resort.



Severe Thunderstorms

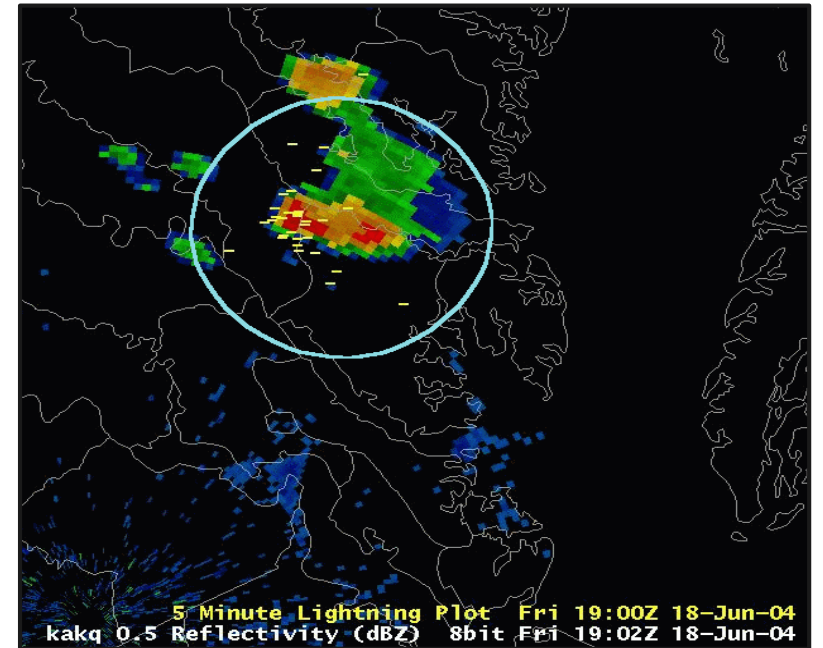
- A Severe Thunderstorm is defined as having
 - Large hail approximately 1 inch in diameter or greater (size of a quarter or larger)
 - Damaging winds (58 mph or higher)
 - Capable of producing tornadoes
- Did you know?
 - The severe thunderstorm definition does **NOT** include heavy rainfall or lightning.
 - Severe thunderstorms can produce winds 125+ mph and cause destruction equal to a tornado.
- Severe Thunderstorm Safety
 - Stay aware of the forecast.
 - Have a way to receive and pay attention to watches and warnings.
 - Take Severe Thunderstorm Warnings seriously as they pose a threat to life and property.
 - Go into a sturdy shelter and stay away from windows.



Lightning Safety



- Lightning can strike up to 15 miles away from thunderstorm.
- Most lightning fatalities happen during outdoor activities, namely boating, swimming and other sports.
- Basic rule of thumb: If you hear thunder, lightning is close enough strike you.
- Seek safe shelter indoors or in a closed vehicle.
- A closed, hard top metal vehicle IS safe in a storm!
- Do not take shelter under trees or use electronics.
- Stay away from tall objects such as towers, antennae, power lines, telephone poles.
- Stay indoors for at least 30 mins after you last hear thunder.
- www.Lightningsafety.noaa.gov



Hail Safety

- Go indoors.
- Do not go out and pick up the hail!
- Stay away from windows.
- If in a car, stay in your vehicle and pull over to a safe location. When encountering hail at high speeds, you will likely end up with a cracked or broken windshield.
- Shelter your vehicle ahead of storm.
- Before hail storm close drapes, blinds, bring in pets, shelter vehicles.
- Cover any damaged windows, roof after storm to prevent water intrusion.





Flooding Importance

Recent Big Floods...

Memorial Day 2015

Tax Day 2016

Brenham 2016

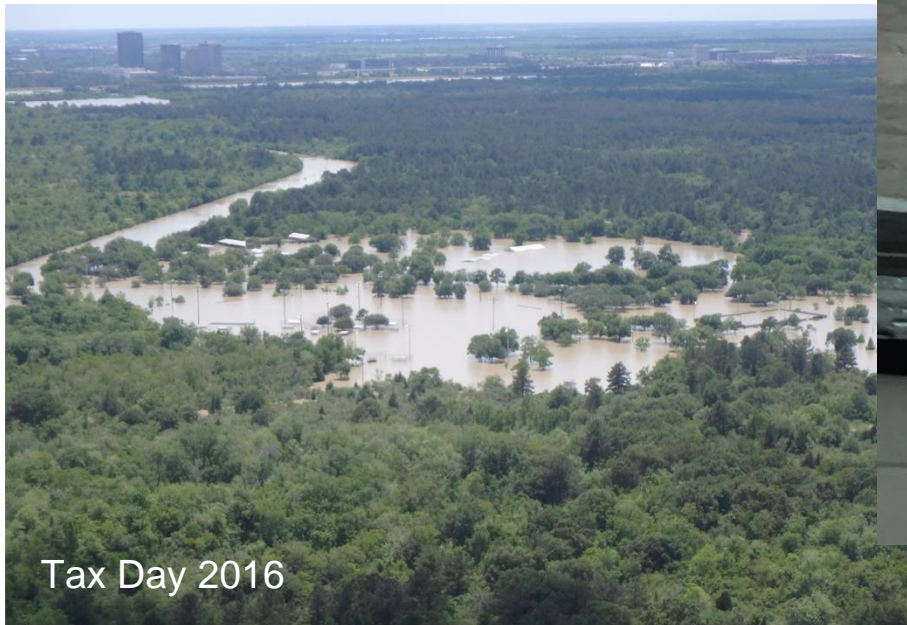
Harvey 2017



Harvey 2017



Brenham 2016



Tax Day 2016

**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



Understanding Flooding

Urban / Small Stream Advisory

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

Flood Watch

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

Flash Flood Watch

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

Flood Warning

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

Flash Flood Warning

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

Flash Flood Emergency

WHAT IS IT?

Flash flood situation that presents a clear threat to human life due to extremely dangerous flooding conditions

WHAT TO DO?

Immediately reach higher ground by any means possible

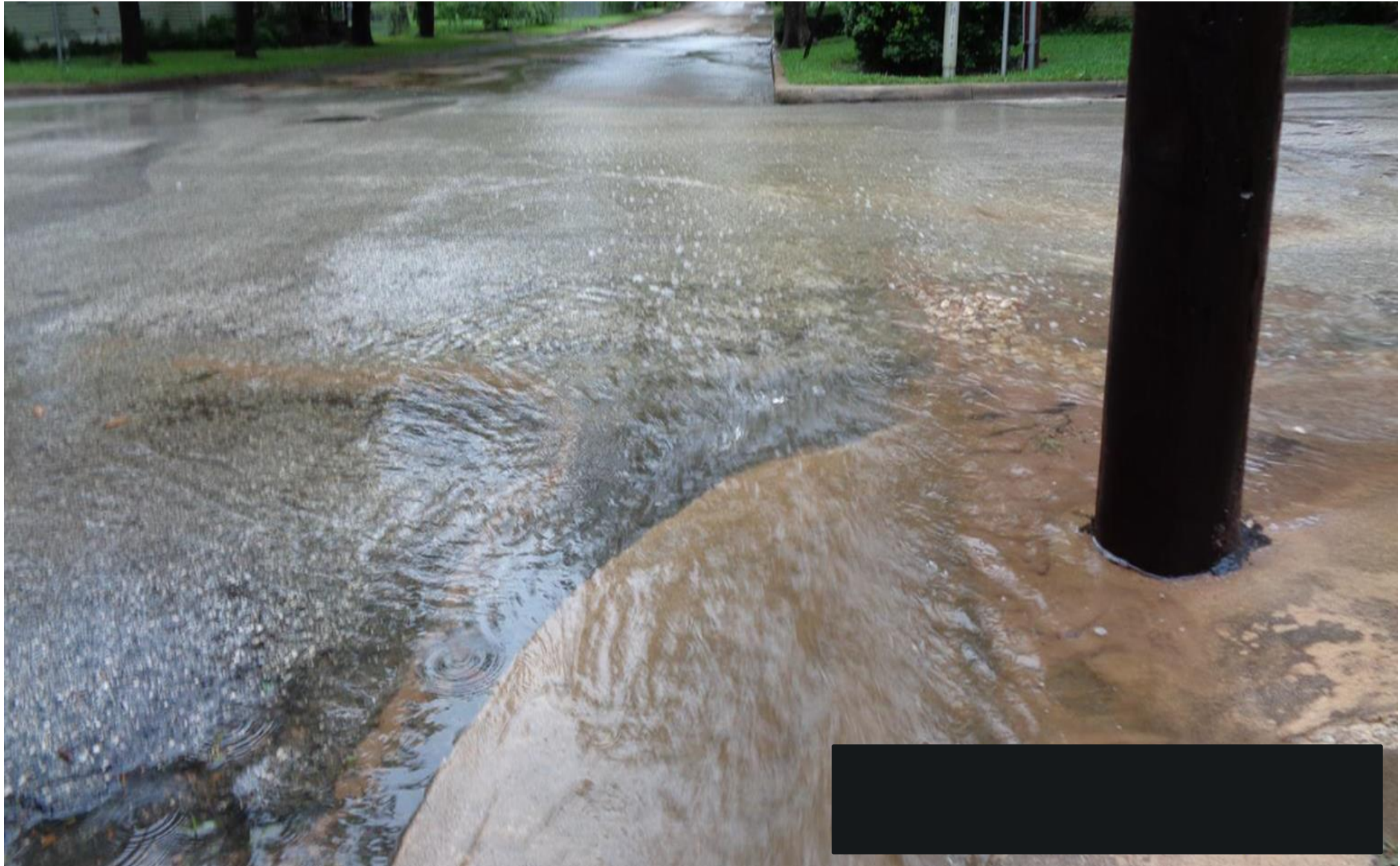


You make the call...

—
**What
type of
flooding
is this?**

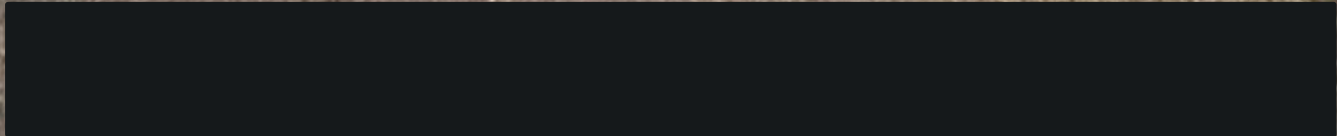
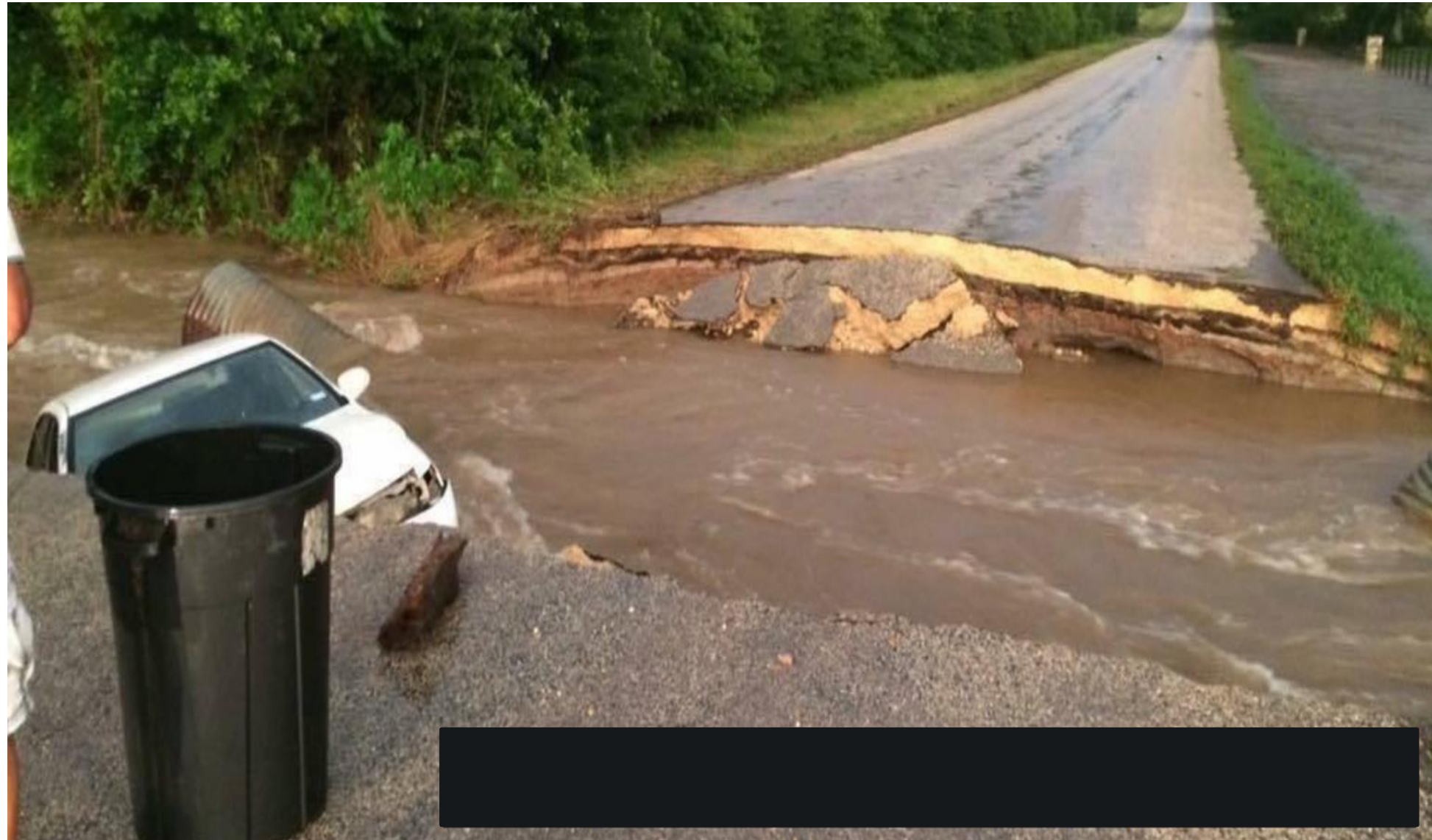


**What
type of
flooding
is this?**

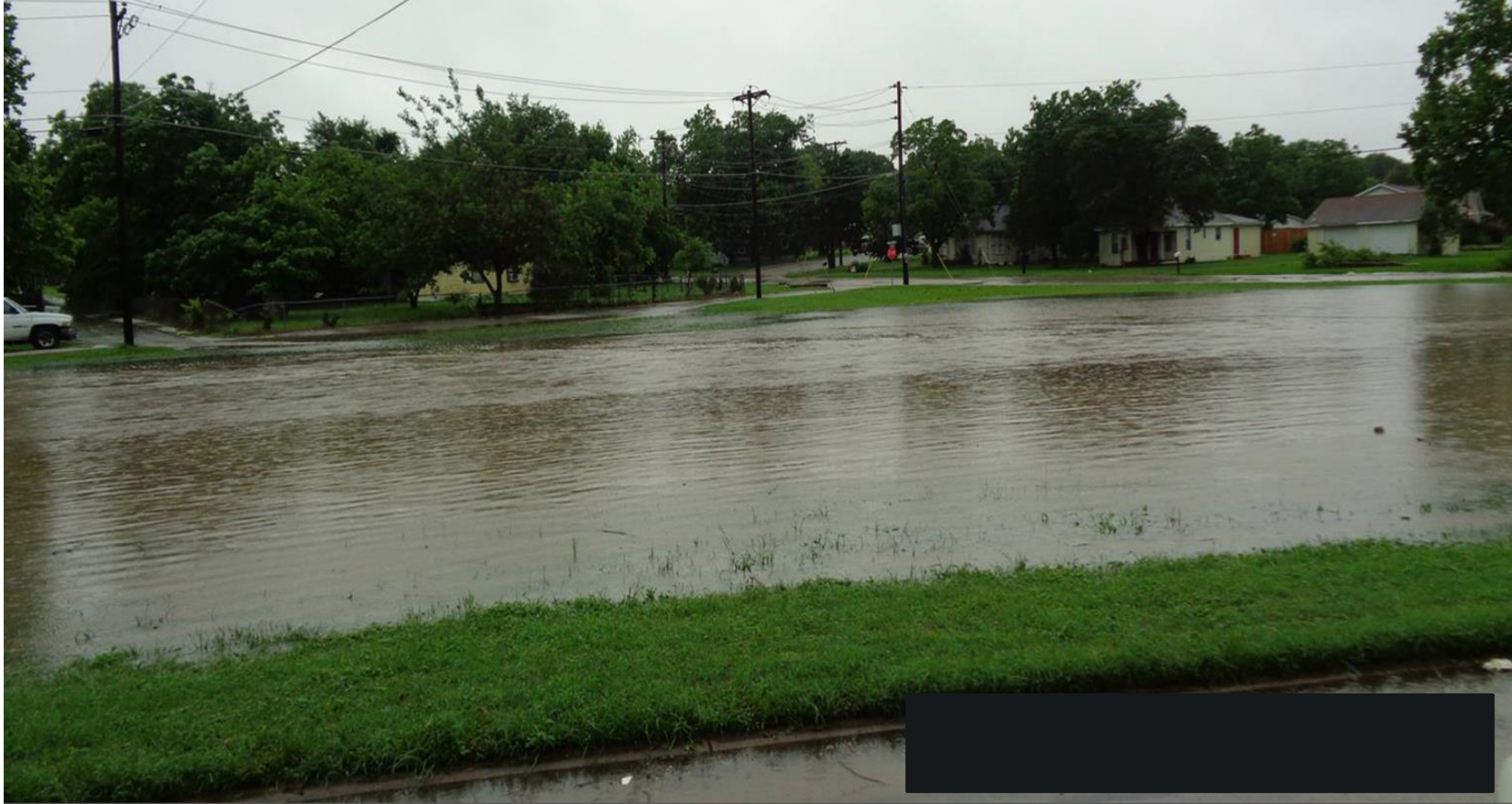




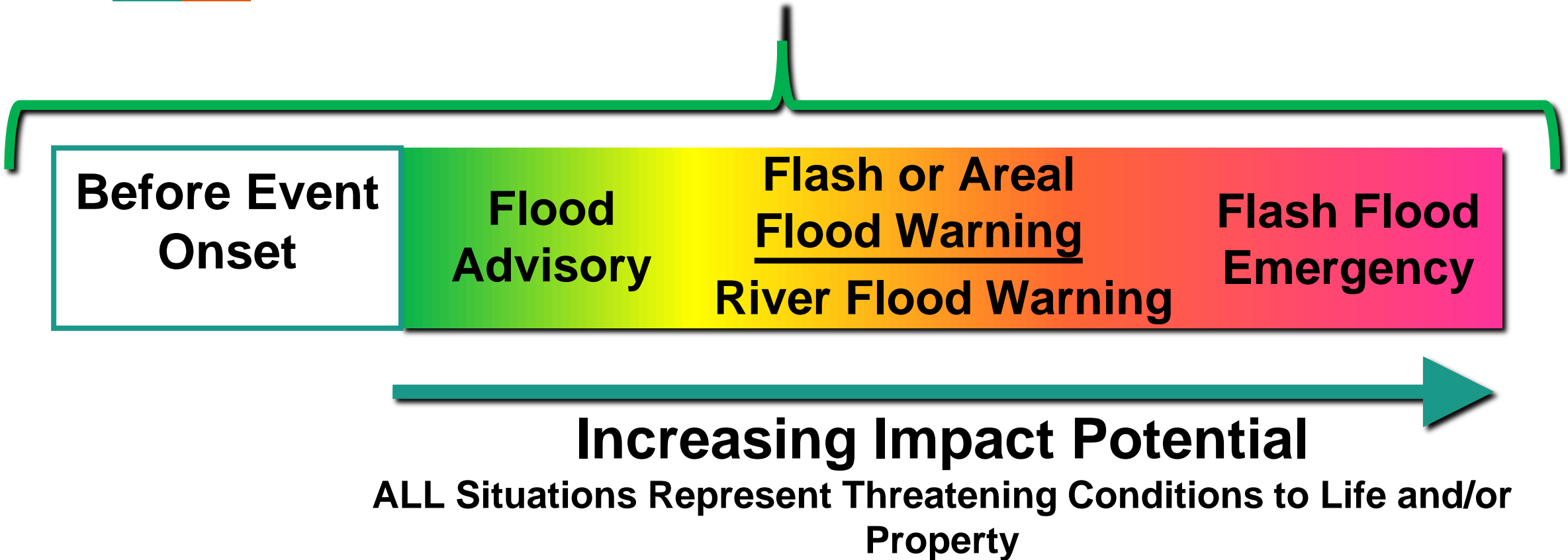
**What type
of
flooding
is this?**



—
**What
type of
flooding
is this?**



Flood Timeline



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

Be sure to have multiple ways to receive

Ways to Receive a Warning

NOAA Weather Radio



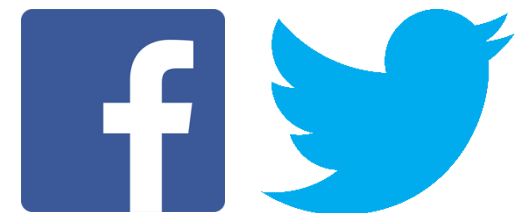
Wireless Emergency Alerts and Weather



TV and Radio



Social Media



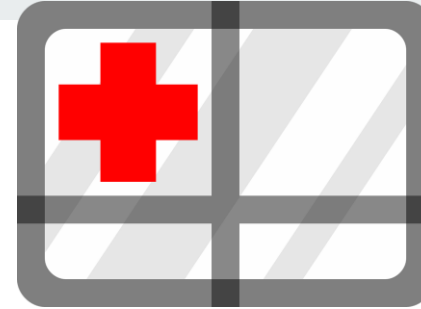
NWS Website: <https://www.weather.gov/hgx/>



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!

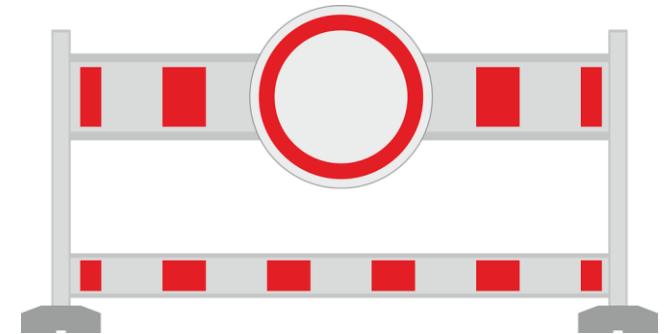
- Most flood deaths occur in vehicles.
- It only takes **six inches of water** for a vehicle to lose contact with the road surface.
- Most vehicles can be swept away in just 18 to 24 inches of water!
- Don't Rely on Your Big Vehicles
- Flooded roads may have hidden dangers, such as washed out road beds 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.

Flooding Resources

Flood Safety

Turn Around Don't Drown

State Flood Information

Flood Hazards

NWS Flood Related Products

Forecasts and Observations

National Water Center

Education and Outreach Materials

Partner Agencies

[weather.gov/flood](https://www.weather.gov/flood)



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.”

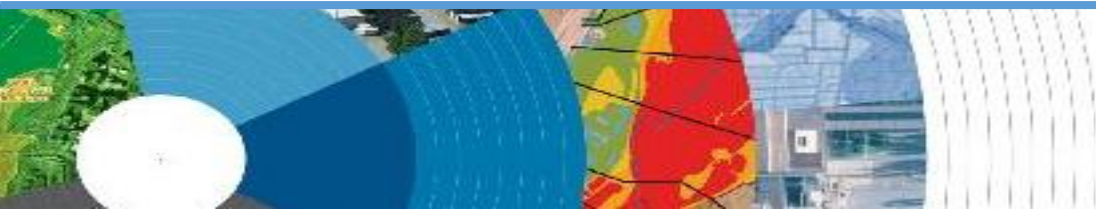


FEMA

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.

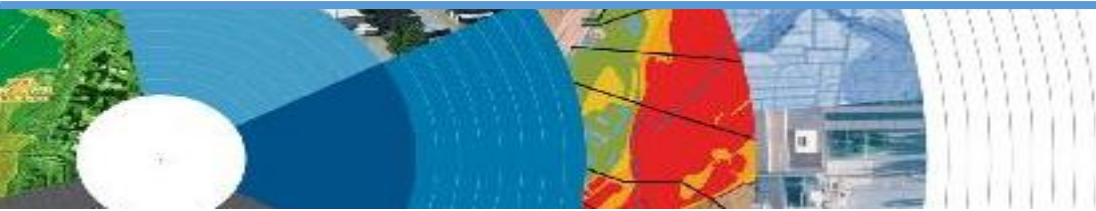
Renters and Business owners should also consider flood insurance for contents.

■ 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.

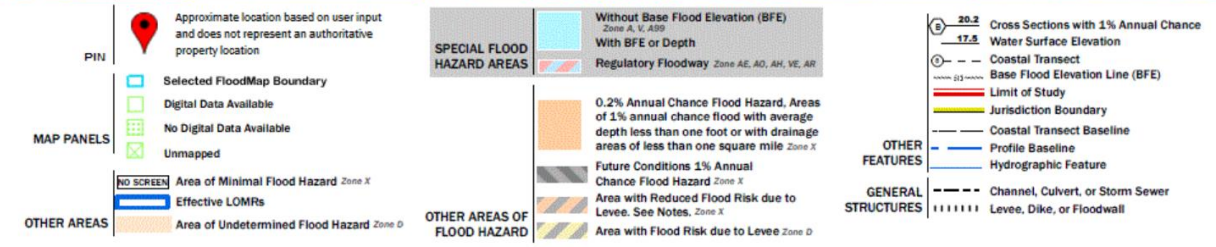
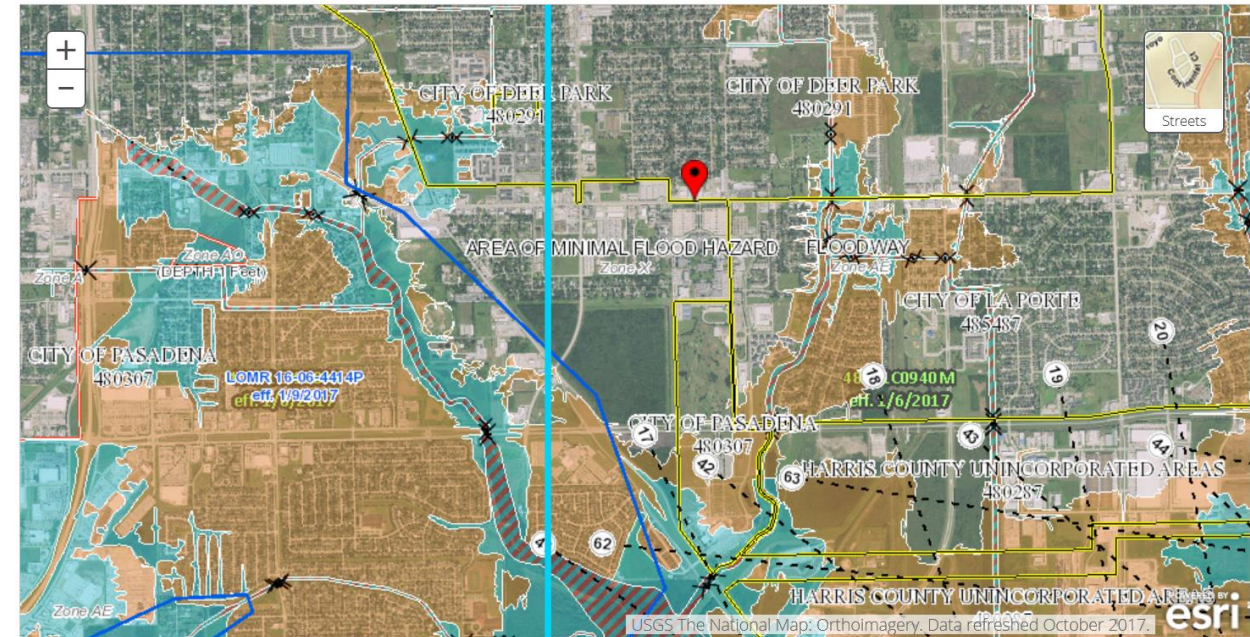


FEMA

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 Levee
 - 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 Coastal and Riverine flood risk



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

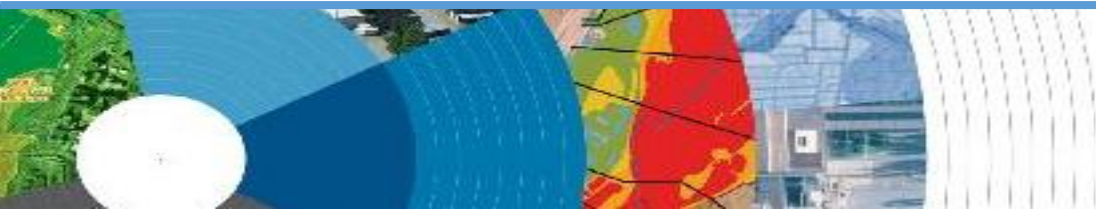


FEMA

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



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

EVERY Structure has a risk...
generally the higher the structure the less the risk.

Harvey Numbers

Insurance claims

- Harris Co (includes cities such as Houston) – all claims 55,570**
- City of Pasadena (unincorporated only) 1467 (Losses over 125K)

New GFIP's Due to Harvey

- City of Pasadena - 61

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.**

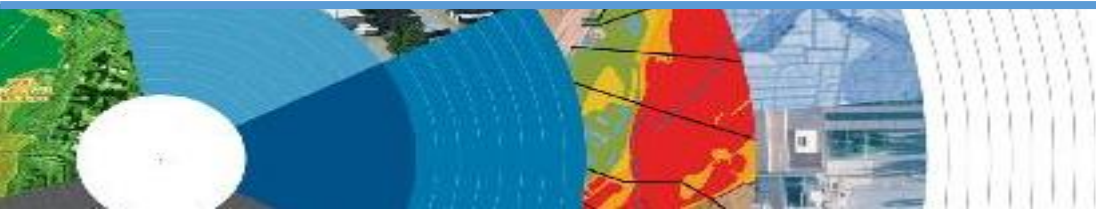
**Data HCFCD Finale Hurricane Harvey Storm and Flood Information –
<https://www.hcfcd.org/media/2678/immediate-flood-report-final-hurricane-harvey-2017.pdf>



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 AND contents.**



FEMA

Contact Information

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

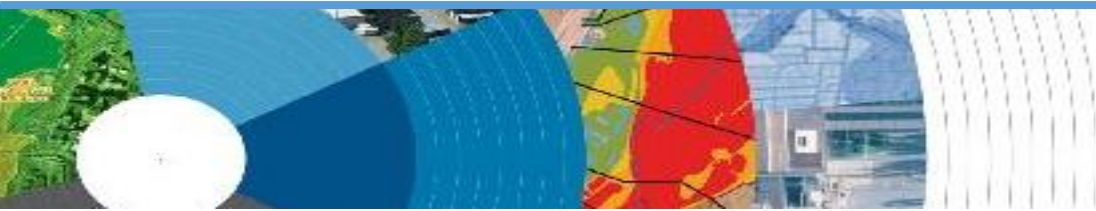
Phone: 940-383-7253 | Cell: 202-394-4483

[|Larry.Fordham@fema.dhs.gov](mailto:Larry.Fordham@fema.dhs.gov)

NFIP Hotline

1-800-427-4661

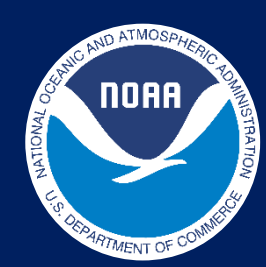
www.fema.gov/nfip



FEMA



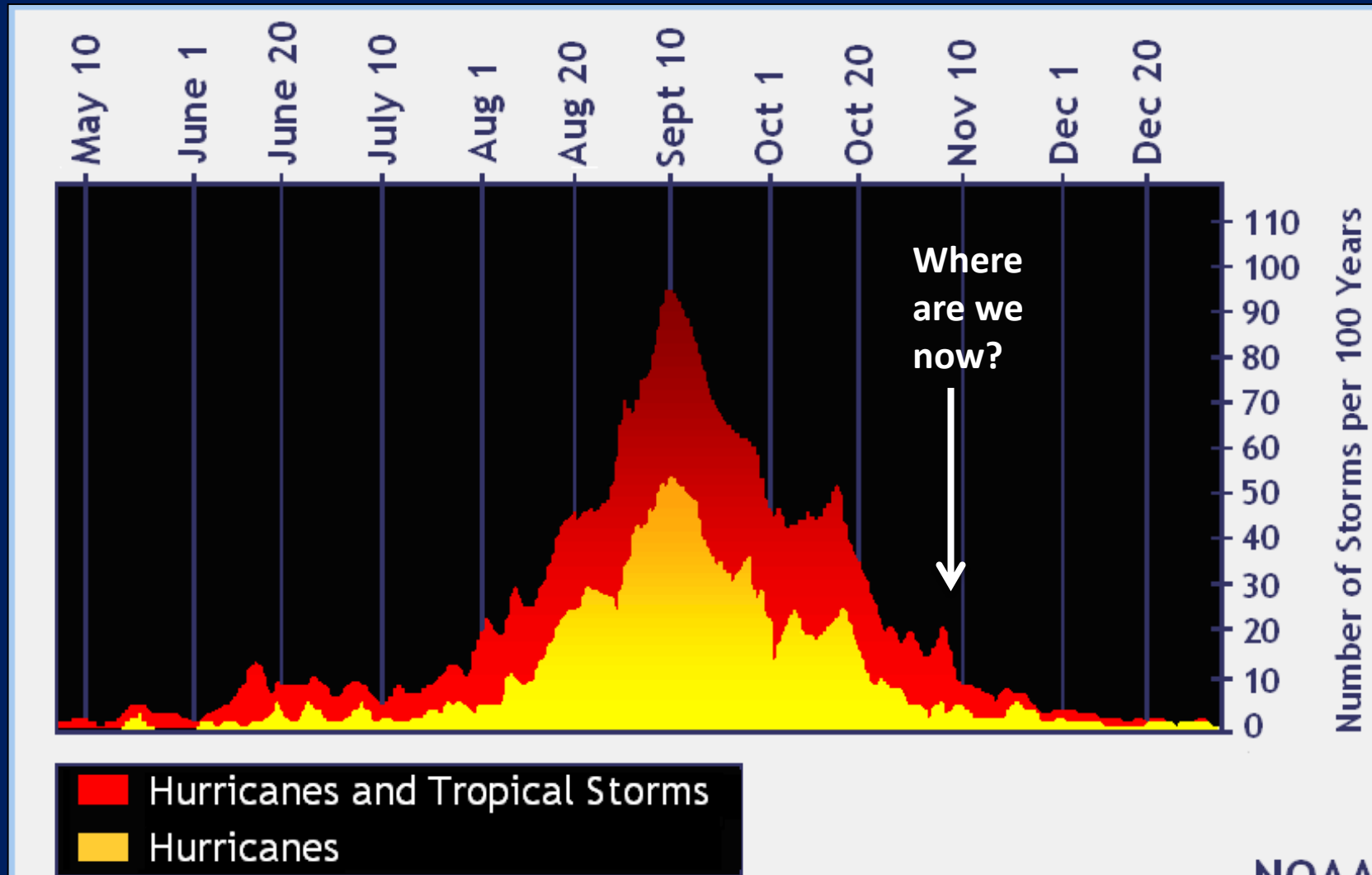
Hurricanes



When is the Hurricane Season?



- ☐ Atlantic Hurricane Season: June 1 – November 30th
- ☐ Peak of season August and September





Hurricane/Tropical Storm Potential Hazards



Every storm will have a different set of hazards

Storm Surge Flooding

Ike (2008), Carla (1961)



Tornadoes

Buelah (1967)
Harvey (2017)



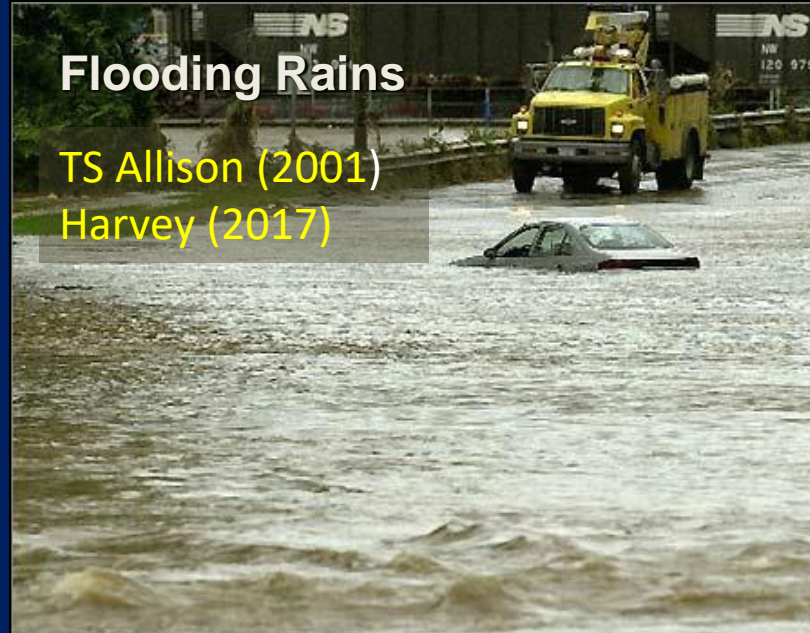
Damaging Winds

Alicia (1983)
Andrew (1992)
Camille (1969)
Carla (1961)



Flooding Rains

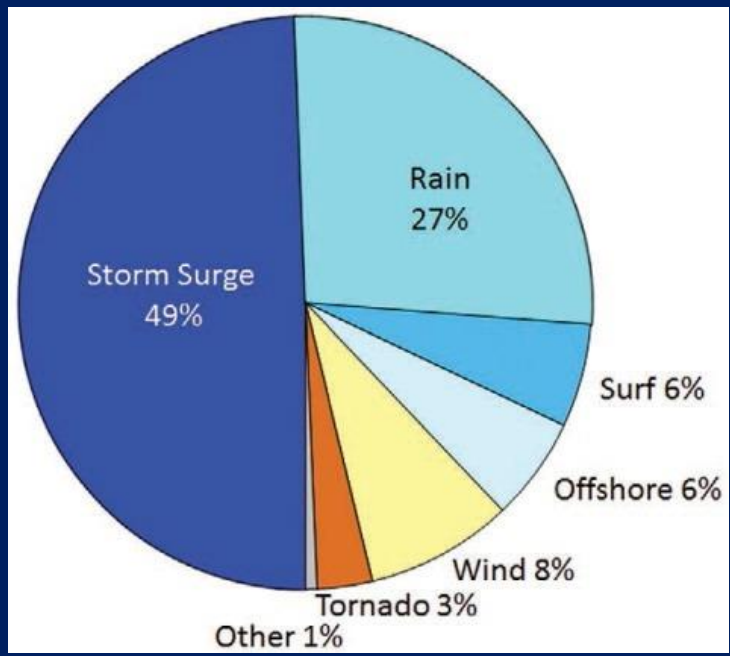
TS Allison (2001)
Harvey (2017)



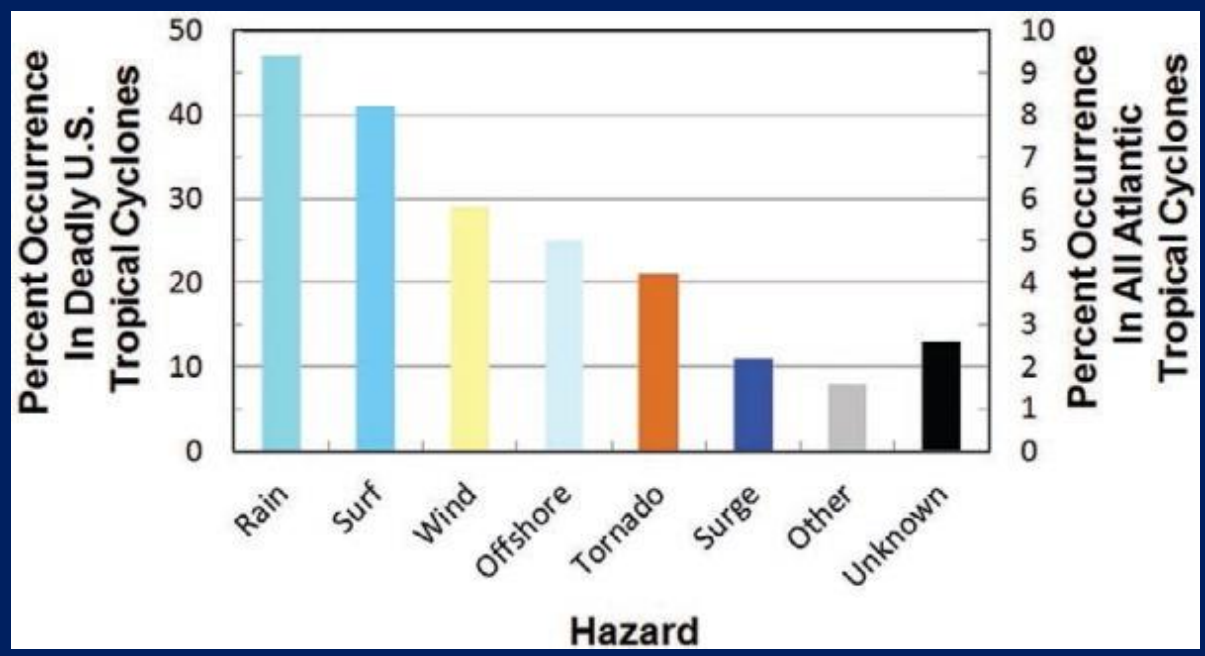


Which Hazards are the Most Dangerous?

Old Adage in Emergency Management:
Run from the Water, Hide from the Wind



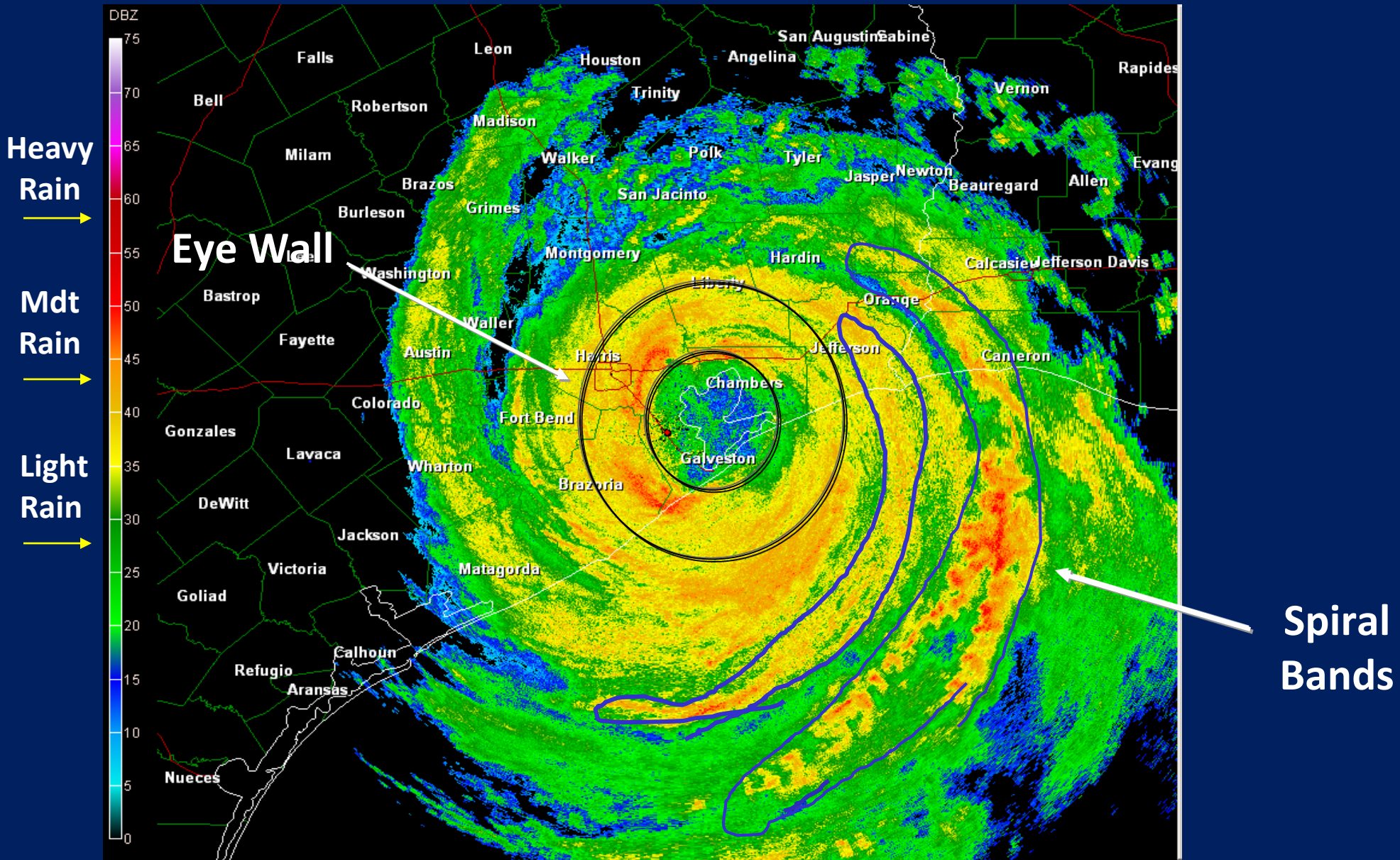
Cause of death in the United States directly attributable to Atlantic tropical cyclones, 1963–2012.

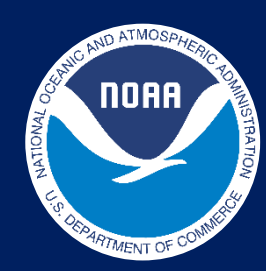


Percentage of 1963–2012 Atlantic tropical cyclones (right scale) and deadly U.S. tropical cyclones (left scale) in which noted types of fatalities occurred in the United States.



Hurricane Ike View from Radar





Saffir-Simpson Hurricane Wind Scale



<i>Category</i>	<i>1-min. Sustained Winds (mph)</i>	<i>Storm Examples</i>	<i>Wind Impacts</i>
Tropical Depression	Less than 39 mph		Relatively minor
Tropical Storm	Between 39 and 73	Allison	Can be significant
Hurricane Cat 1	74 - 95	Jerry 1989 Claudette 2003 Humberto 2007	Very dangerous; will produce some damage
Cat 2	96 - 110	Georges 1998 Ike 2008	Extremely dangerous; will produce extensive damage
Cat 3 (major)	111 - 130	Alicia 1983 Rita 2005	Devastating damage
Cat 4 (major)	131 - 155	1900 - Galveston Carla 1961 Harvey 2017	Catastrophic damage
Cat 5 (major)	> 156	Andrew 1992 Camille 1969	Catastrophic damage



How to Connect to NWS

- **Web:** <https://www.weather.gov/houston>
– <https://www.hurricanes.gov>
- **Twitter:** @NWSHouston
- **Facebook:**
<https://www.facebook.com/NWSHouston>
- **Youtube:**
<https://www.youtube.com/user/NWSHouston>



Questions?

Dan.Reilly@noaa.gov or Katie.landry@noaa.gov



Questions

Katie Landry-Guyton
Katie.landry@noaa.gov