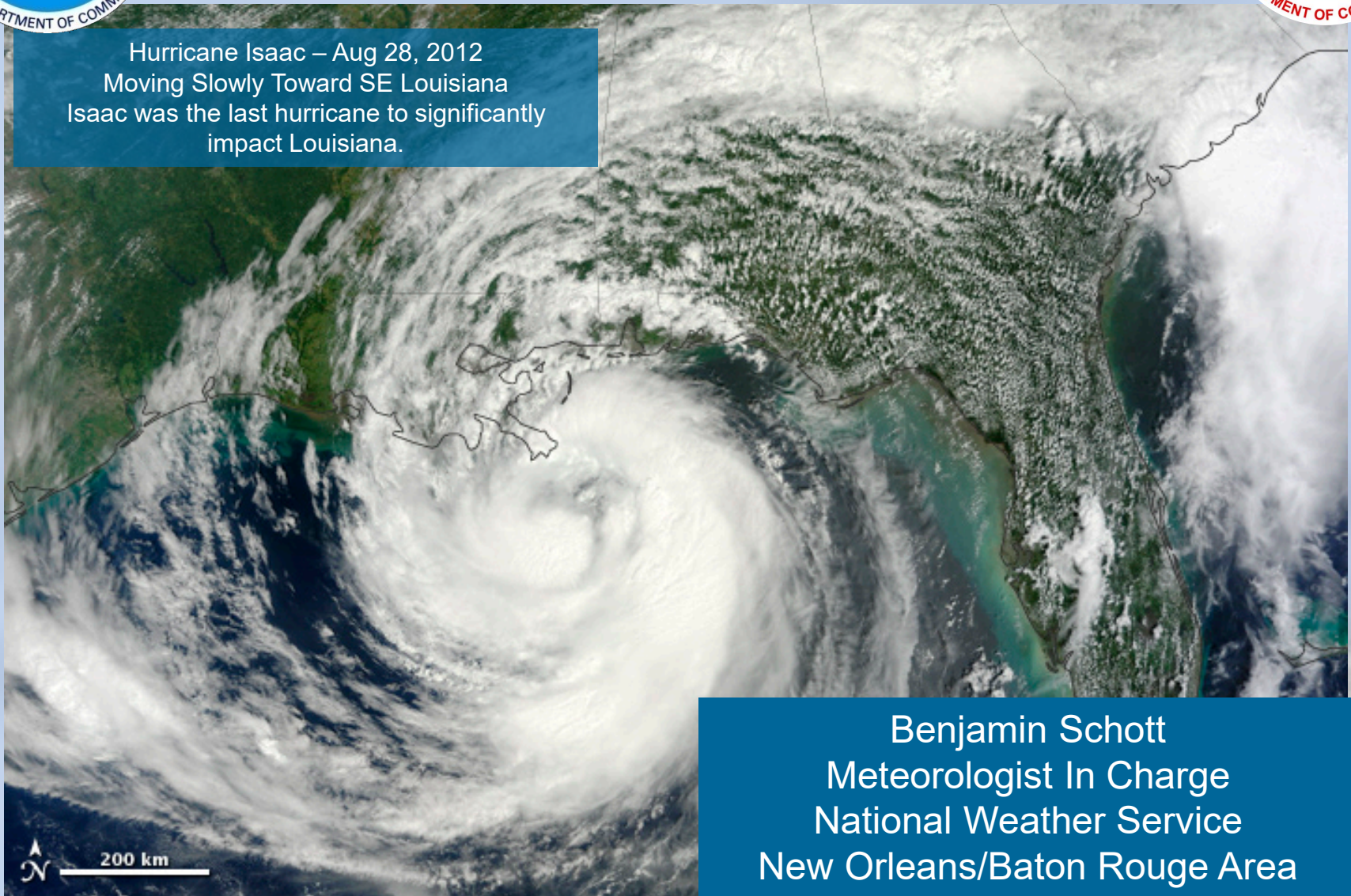




Weather Hazard Preparedness



Hurricane Isaac – Aug 28, 2012
Moving Slowly Toward SE Louisiana
Isaac was the last hurricane to significantly
impact Louisiana.



Benjamin Schott
Meteorologist In Charge
National Weather Service
New Orleans/Baton Rouge Area

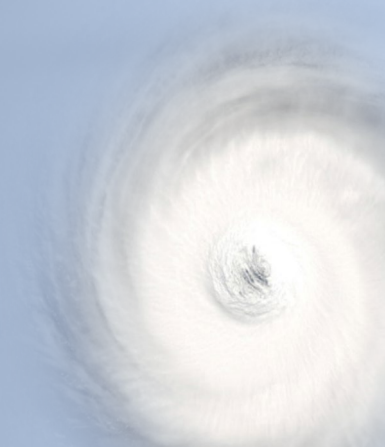


2019 Seasonal Outlook

	Average	Colorado State U. Forecast	NOAA forecast (Released May 23)
Named Storms	12	14	9 - 15
Hurricanes	6	6	4 - 8
Major Hurricanes	3	2	2 - 4

NOAA will issue updates during the season

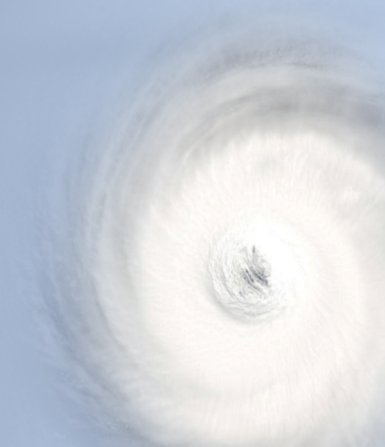
Caution: it only takes one





2019 Seasonal Forecast

- Seasonal forecasts do NOT tell you:
 - Where storms will make landfall
 - How strong they will be at landfall
- Seasonal forecasts only give a general idea of the potential for overall basin activity
- Reality: You have to plan as though you will be impacted **EVERY** year





Lead Time is Great, but...

Five-day plans are great, but you won't always have five days of lead time on the Gulf Coast



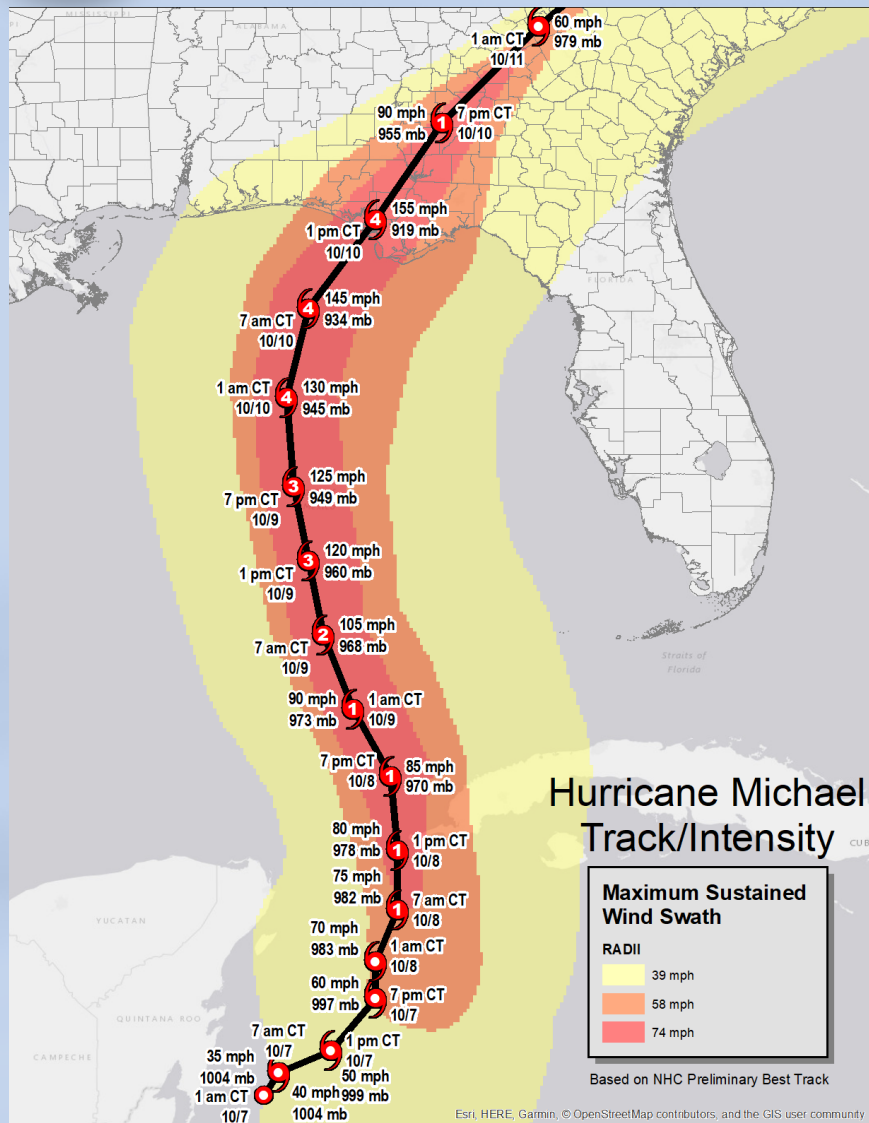
Hurricane Michael 2018

- Wasn't classified as a tropical storm until about 72 hrs before landfall as a category 5 hurricane
- Intensified from 75 mph winds (category 1) to 130 mph winds (category 4) in 42 hours





Hurricane Michael



Hurricane Michael

- Noted for Rapid Intensification - The time from Tropical Storm to Category 5 Hurricane landfall was 72 hours.
- Landfall Intensity – Cat 5 – 160 mph winds, highest since Hurricane Andrew 1992
- 3rd lowest pressure for landfalling hurricane.
 - 919 mb
 - Only Camille (1969) and Labor Day Hurricane has lower pressure for landfalling US hurricane
 - Katrina landfall pressure – 920 mb
- Storm Surge
 - 10 to 14 ft
 - Would have been much higher if hurricane had moved east of Apalachicola





Lead Time is Great, but...

Atlantic coastal areas may see something coming for a week or more...this will not always be the case in Gulf of Mexico!

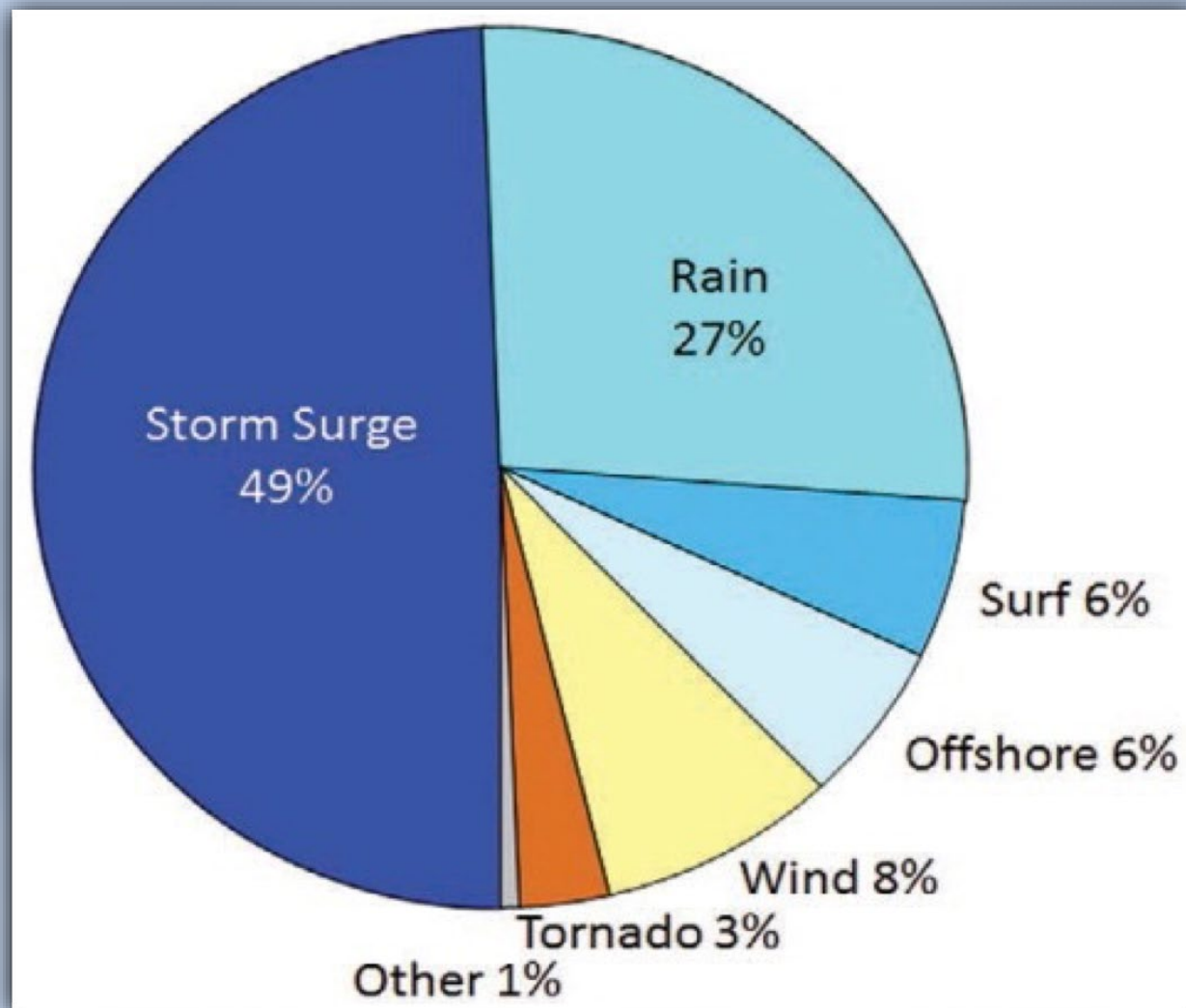
Bottom Line: You won't always have a 5 day lead time on most Gulf of Mexico storms, so timetables need to be adaptable!

For thought... Could you execute your plan in only 3 days? How about as few as 2?





Atlantic Tropical Cyclone Deaths by Hazard



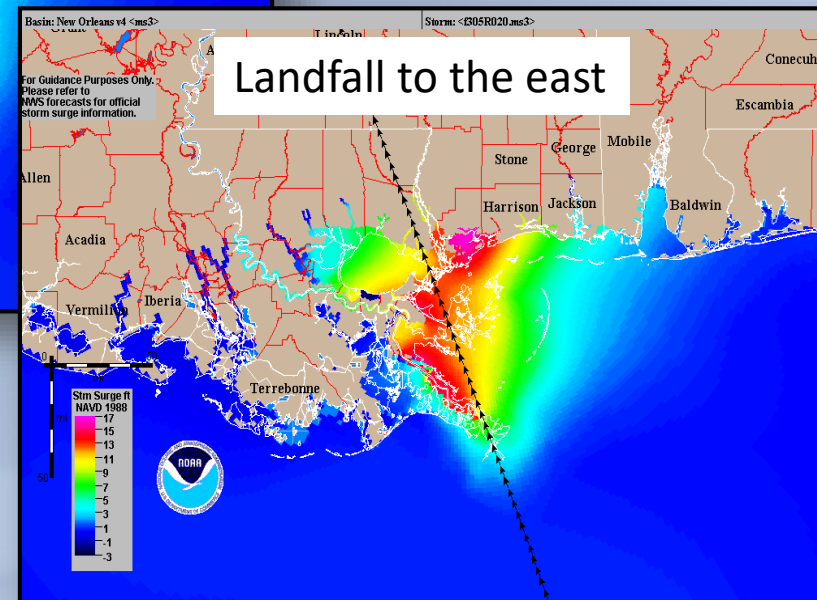
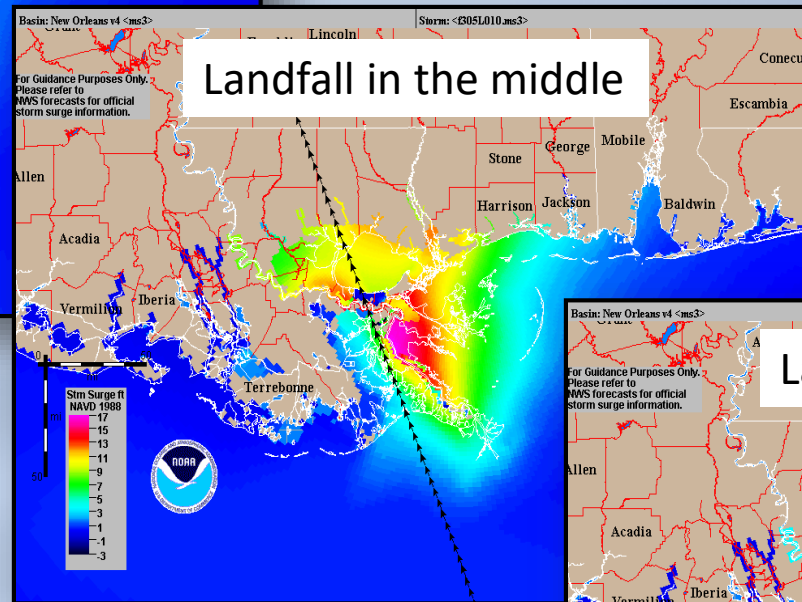
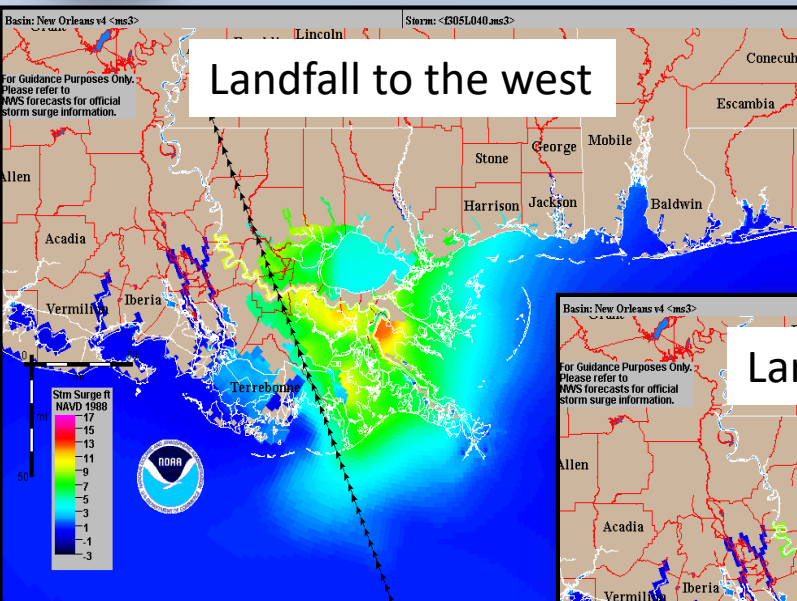
Flooding from storm surge and fresh water (rain) accounts for **over three quarters of deaths** directly attributable to Atlantic Basin Tropical Cyclones



The Storm Surge Threat



Landfall Location - Comparison



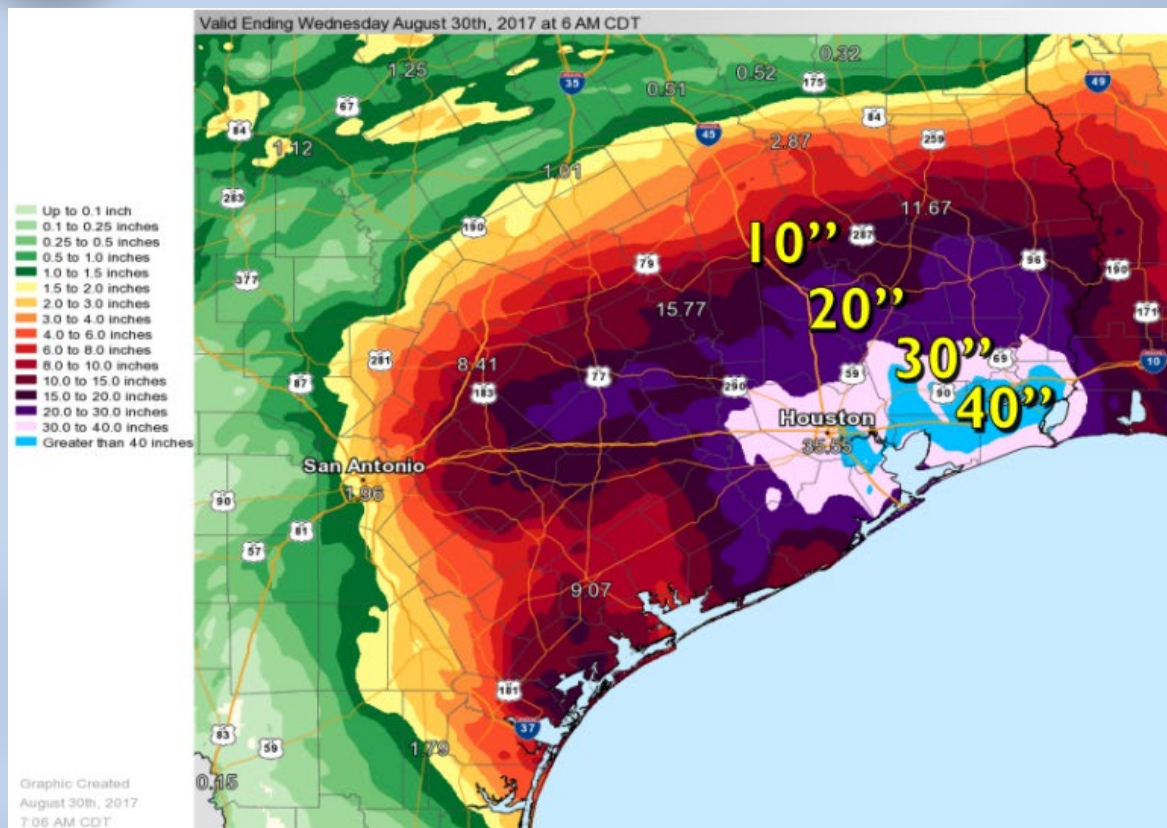
Bottom Line: Small changes in the storm can lead to big changes in the surge. NWS doesn't brief based on a single track approach



The Inland Flooding Threat



2017 Hurricane Harvey



5 Day Point Rainfall Amounts in Inches

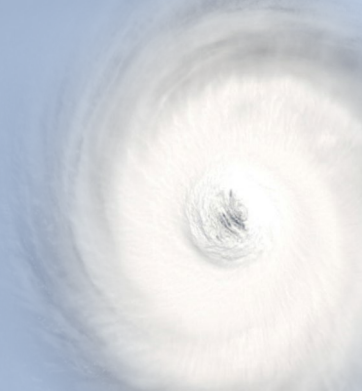
- Harvey continued to produce record breaking **rainfall totals** of **45 to over 50 inches**... with continued rainfall
- **Cedar Bayou - 51.88**
- **Berry Bayou - 44.88**
- **League City - 49.84**
- **Mary's Creek - 49.80**
- **Goose Creek - 44.08**
- **Greens Bayou - 41.36**
- **Buffalo Bayou - 35.60**
- **Addicks Dam - 33.44**

Agency View
An interactive map of the
Harris County Flood Control District

Point rainfall
data courtesy

Highest 6-day storm totals:

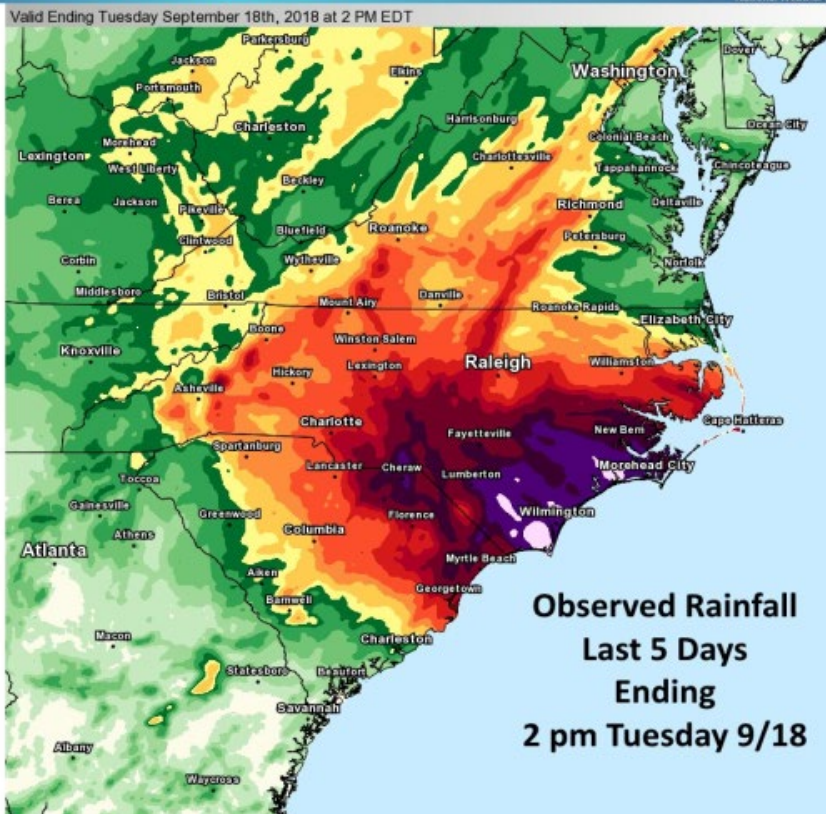
- Nederland, TX: 60.58" – new US record!
- Groves, TX: 60.54"





Hurricane Florence

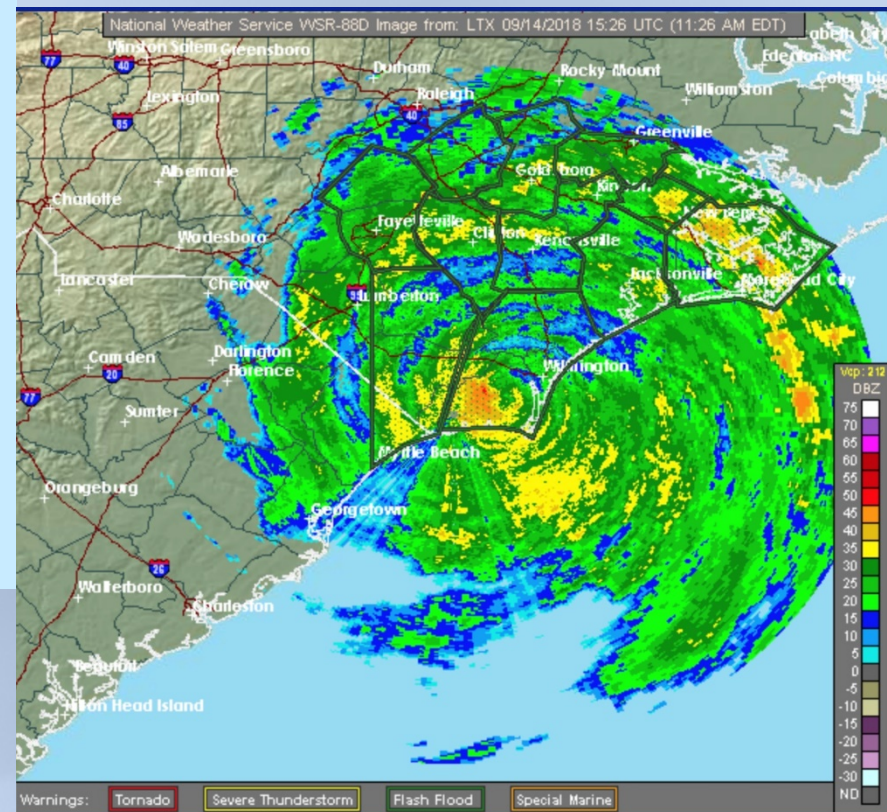
Observed Precipitation



- Large, and slow moving hurricane
- Rainfall of 20 to 30 inches, locally around 35+ inches

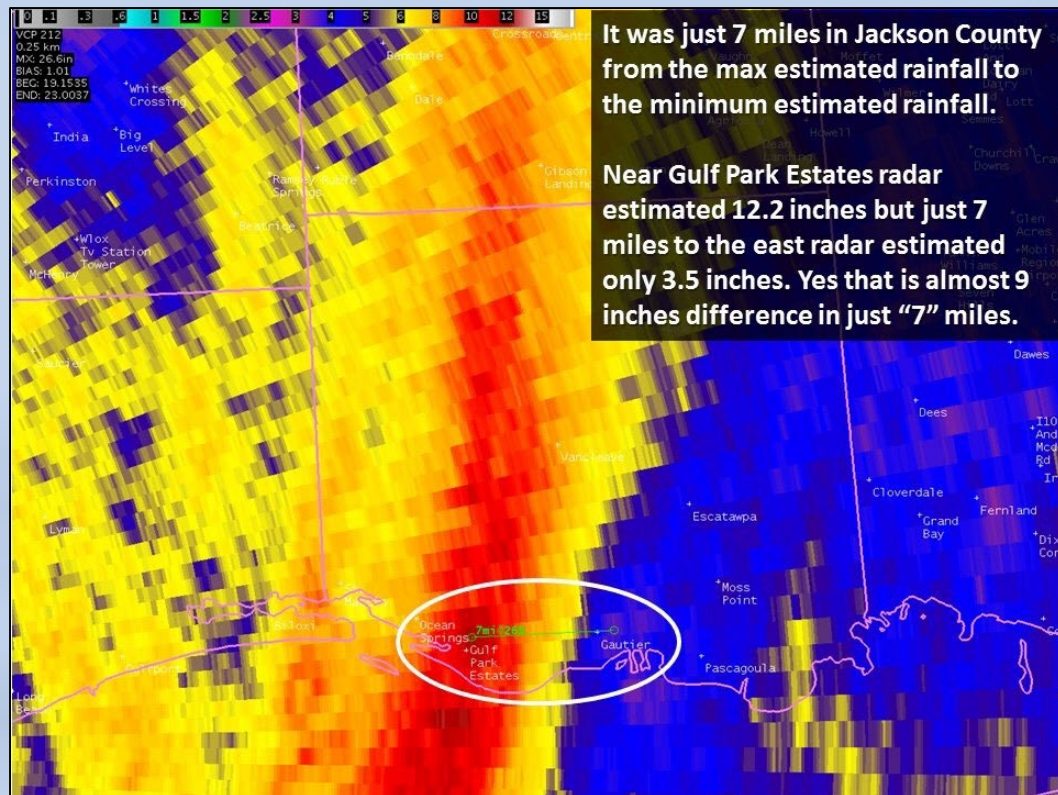
Hurricane Florence

Sep 14, 2018 Cat 1 at landfall



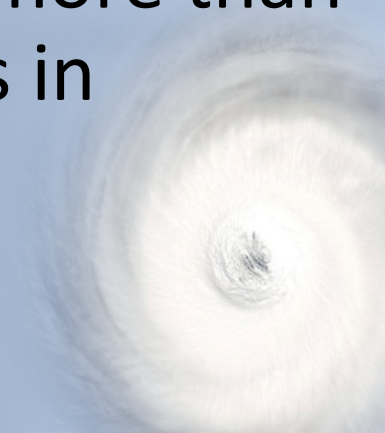


2017 Tropical Storm Cindy



Heavy rain often falls in "bands" and can mean sharp gradients in recorded rainfall

It's difficult to predict where these bands will set up more than a few hours in advance





Other Weather Hazards





Severe Thunderstorm / Tornado

TORNADO TERMINOLOGY

Tornado Watch

Weather conditions could lead to the formation of severe storms and tornadoes. **BE PREPARED:** Know your safe location. Be ready to act quickly if a Warning is issued or you suspect a tornado is approaching.

Tornado Warning

A tornado has been spotted or indicated by weather radar, meaning a tornado is occurring or expected soon. **TAKE ACTION:** There is imminent danger to life and property. Immediately seek refuge in the safest location possible.

Tornado Emergency

An exceedingly rare situation with a severe threat to human life and catastrophic damage due to a confirmed violent tornado. **TAKE ACTION:** There is imminent danger to life and property. Immediately seek refuge in the safest location possible.

- How are you getting the warning?
- Do you have way to let everyone know?
- Where will people shelter?
- How much time does it take to secure your product or inventory?





Severe Storm Considerations

Severe Thunderstorm Risk Categories

Thunderstorms (no label)

No severe* thunderstorms expected
Lightning/flooding threats exist with all thunderstorms
Winds to 40 mph and small hail possible



1 Marginal Risk (MRGL)

Isolated severe thunderstorms possible
Limited in duration and/or coverage and/or intensity
Wind to 40-60 mph, hail up to 1", and low tornado risk



2 Slight Risk (SLGT)

Scattered severe storms possible
Short-lived and/or not widespread, isolated intense storms
One or two tornadoes
Reports of strong winds and wind damage
Hail ~1", isolated 2"



3 Enhanced Risk (ENH)

Numerous severe storms possible
More persistent and/or widespread, a few intense
A few tornadoes
Several wind damage reports
Damaging hail, 1"-2"



4 Moderate Risk (MDT)

Widespread severe storms likely
Long-lived, widespread and intense
Strong tornadoes
Widespread wind damage
Destructive hail, 2" or greater



5 High Risk (HIGH)

Widespread severe storms expected
Long-lived, very widespread and particularly intense
Tornado outbreak
Derecho



*NWS defines a severe thunderstorm as measured wind gusts of at least 58 mph, and/or hail of at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.



National Weather Service - www.weather.gov - www.spc.noaa.gov

Hail Size Chart

While the National Weather Service encourages the actual measurement of hail size, oftentimes, an object-to-size conversion can provide important information about hail that fall from thunderstorms. Below you will find a list of common objects used to describe the diameter of observed hail.



0.25 inches

Pea



2.00 inches

Lime



0.75 inches

Penny



2.50 inches

Tennis Ball



1.00 inches

Quarter



2.75 inches

Baseball



1.50 inches

Ping Pong Ball



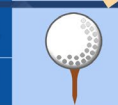
4.00 inches

Softball



1.75 inches

Golf Ball



4.50 inches

Grapefruit



weather.gov

Website: spc.noaa.gov



Heavy Rainfall / Flash Flooding

- Are you located in a floodplain?
- What roadways nearby are most likely to flood?
- What storage containers could be “floated”?
- What storage containers could be impacted/ moved?

What are the impacts of 15-25 inches of rain?

Homes and businesses will be flooded.

Flooding will prompt evacuations and rescues.

Flooded roads could make travel and potential evacuations difficult.

Some roads may erode from underneath creating hidden dangers.

Locations that normally don't flood will be covered in water.

Photo: U.S. Army National Guard



FLOOD WARNING

A Flood Warning is issued when flooding is **happening** or will happen soon. Some roads will be **flooded**.

Move to higher ground.

Never drive through flooded roads.

take action.

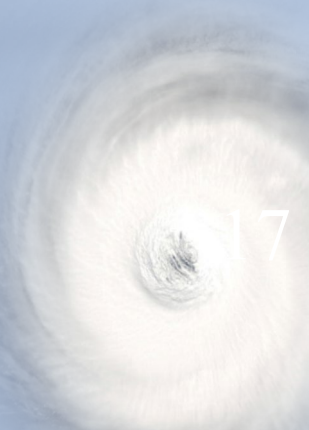
FLOOD WATCH

A Flood Watch is issued when flooding is possible.

Stay tuned to radio/TV, follow **weather.gov** and be ready to seek higher ground.

Learn more at **weather.gov/flood**.

be prepared.

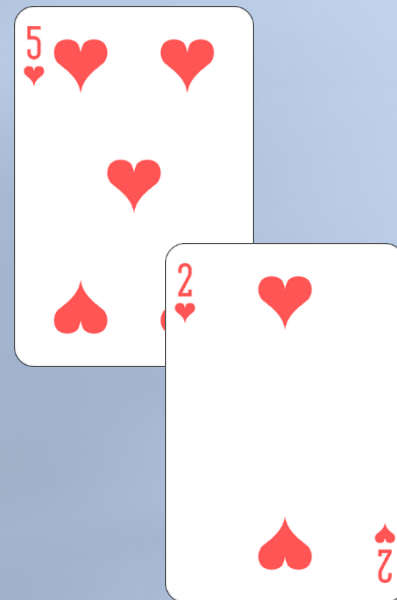




Rainfall Risk Considerations

Flood risk is cumulative!

Annual Risk	Cumulative Risk over 30 years	Approximate Statistical Equivalent
2% (50-year flood)	45.5%	Draw a red card from a deck of cards
1% (100-year flood)	26%	Draw a heart from a deck of cards
0.5% (200-year flood)	14%	Draw a heart with a value of 8 or less from a deck of cards
0.2% (500-year flood)	5.8%	Draw a 2 of hearts from a deck of cards
0.1% (1,000-year flood)	3%	Draw a red Ace from a deck of cards





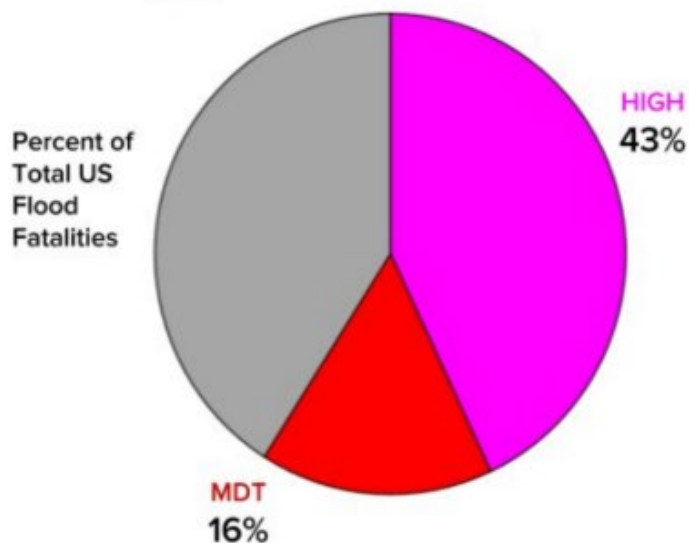
Rainfall Risk Considerations

High Risk Days – *Be Especially Vigilant*

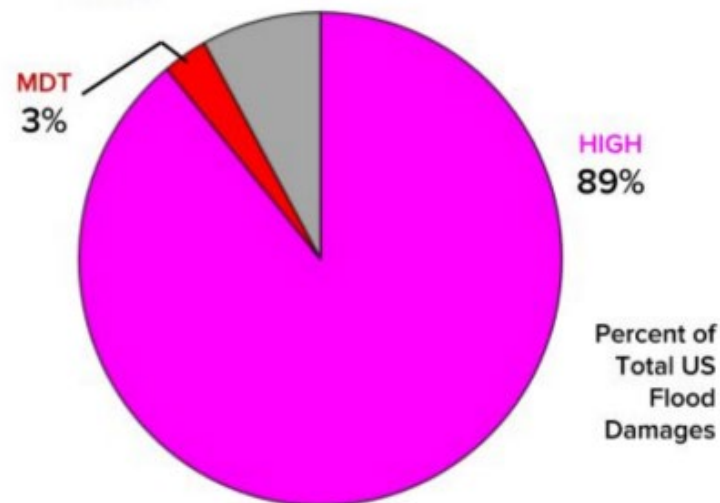
WPC High Risks are Verifying as Deadly Events

High Risks are only issued by WPC on ~4% of days, but “High Risk Days” have accounted¹ for:

2/5 of ALL Flood-related **Fatalities**



9/10 of ALL Flood-related **Damages**



¹ From 2014 to 2018. Includes flood, flash flood, heavy rain, and debris flow Storm Data. Excludes Oso, WA landslide which occurred well after rainfall and on a sunny day.

Even **Moderate Risk** days carry an increased risk of life threatening heavy rainfall - flooding.



Other Considerations

Blizzard Warning

Severe winter weather is expected within the next **12 to 36 hours** or is occurring -- including whiteout conditions.

Do not travel.

take action.

Winter Storm Warning

Dangerous winter weather is expected within the next **12 to 36 hours** or is occurring. **Considerable travel problems** are expected.

take action.

Winter Weather Advisory

Potentially dangerous winter weather is expected within the next **12 to 36 hours** or is occurring. **Travel difficulties** are expected.

be aware.



WILDFIRE

Statistics

In 2017, wildfires...

...burned over 10 million acres.

...destroyed over 12,000 structures.

...killed over 40 people (estimated).



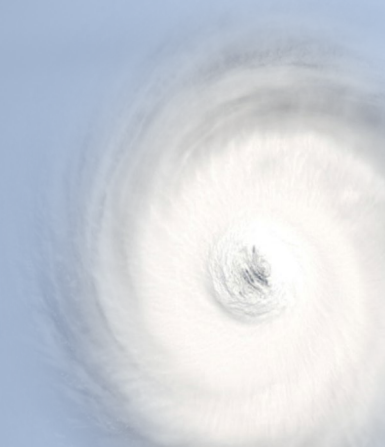
weather.gov/wildfire

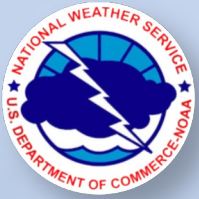


Get information for your area:



- www.weather.gov
- Facebook: @NWS (ex: @NWSHouston)
- Twitter: @NWS (ex: @NWSNewOrleans)
- Contact your local office.
Warning Coordination Meteorologist
- Become a Weather-Ready Nation Ambassador





Thank you!

Be Weather Aware!