

"Not Gone with the Wind"

A Story of the Unexpected Storm: 2017 Hurricane Harvey

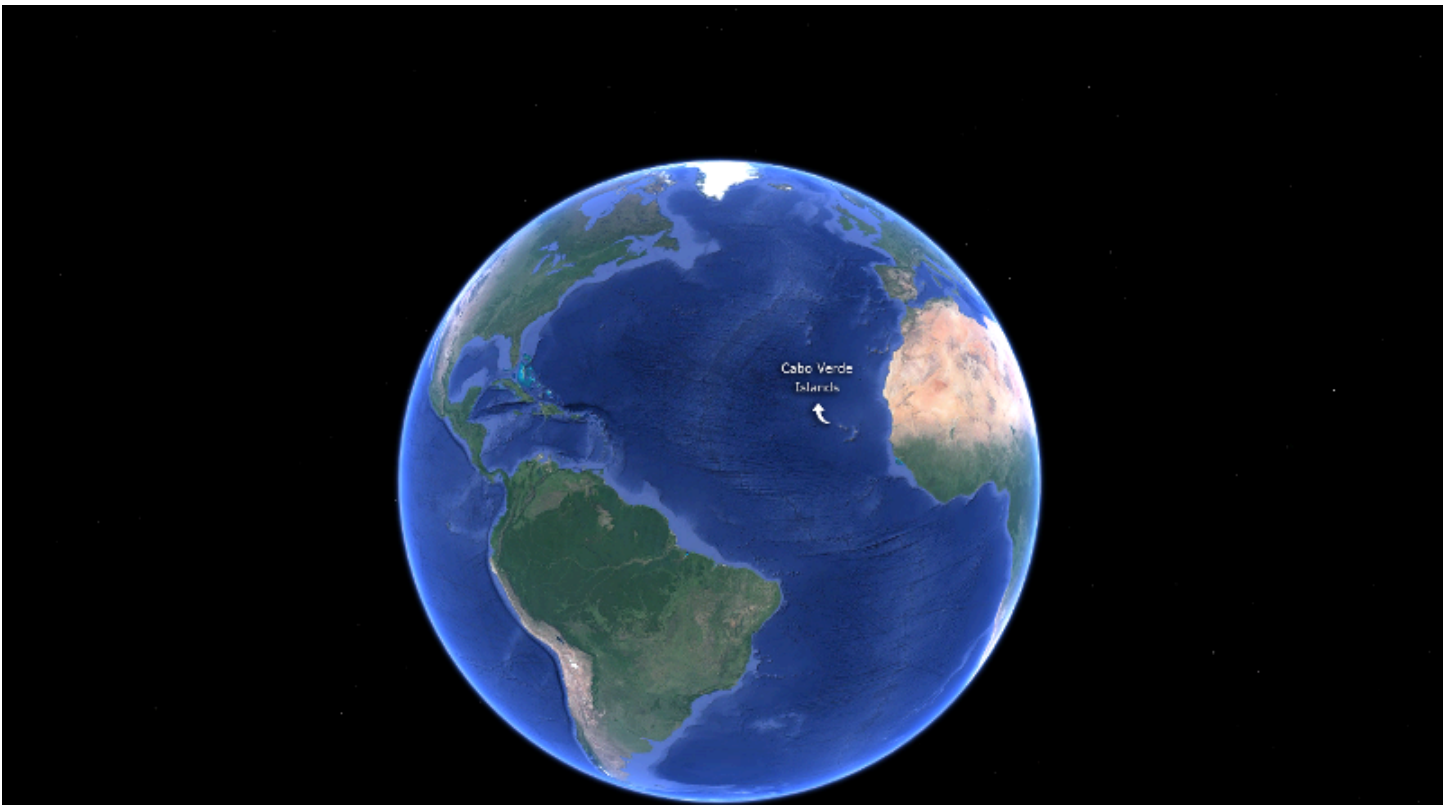
Chenxiao (Atlas) Guo

June 18, 2020

Aug 13: An Ordinary Beginning

Most hurricanes hit the U.S. start in the approximately same location. So does Harvey.

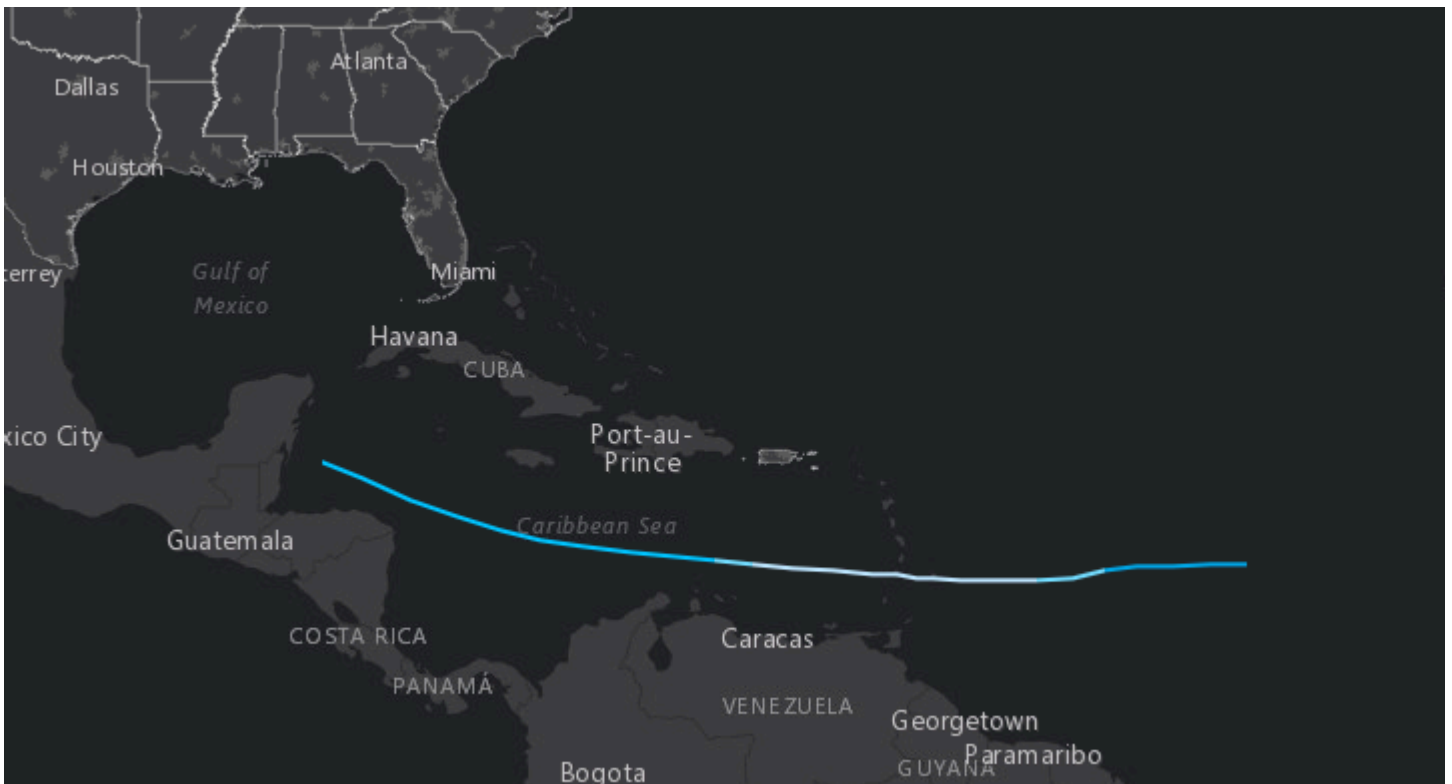
- ***Sunday, August 13th:*** A tropical wave emerges off west coast of Africa and merges with low pressure area near the Cabo Verde Islands. Then, it heads west over Atlantic Ocean.



Hurricane Harvey was initially generated around Cabo Verde Islands.
(Source: Screenshot from Google Earth)

Aug 14 - 21: Totally Reasonable Ignoring

- **Thursday, August 17th:** The National Hurricane Center issues advisories on Tropical Depression #9. By noon, it is a tropical storm named Harvey.
- **Friday, August 18th:** Harvey passed over the Windward Islands but with a max wind speed of only 40 mph. It was unclear where it would end up. No one could have known that the 19 trillion gallons of water that would soon fall over Texas.



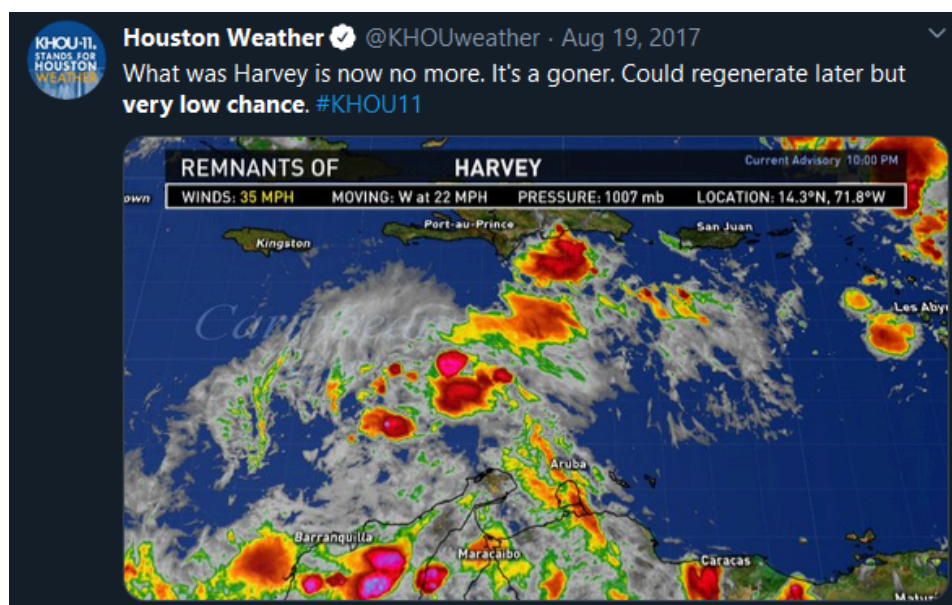
Esri, HERE, Garmin, USGS, EPA | Esri, HERE

500 mi

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The storm developed across the sea, and gradually got weakened.

- **Saturday, August 19th:** Harvey weakens and is only a “tropical wave”, which is even less than a tropical depression. Weather forecasters determine that there was only a “low chance” of regeneration.



The storm was forecasted and believed to be gone soon.

(Source: Twitter Account @KHOUweather)

Aug 22 - 23: Unexpected Comeback

- **Tuesday, August 22nd:** Remnants of Hurricane Harvey move across the Yucatan Peninsula.
- **Wednesday, August 23rd:** 10 a.m, Harvey reforms into a tropical depression. 11 p.m, Harvey strengthens to a tropical storm and is forecast to make landfall over the Texas coast. Texas Governor Gregg Abbott preemptively declares a state of disaster for 30 Texas counties.



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30 Texas counties were declared to be in a state of disaster on Aug 23rd.

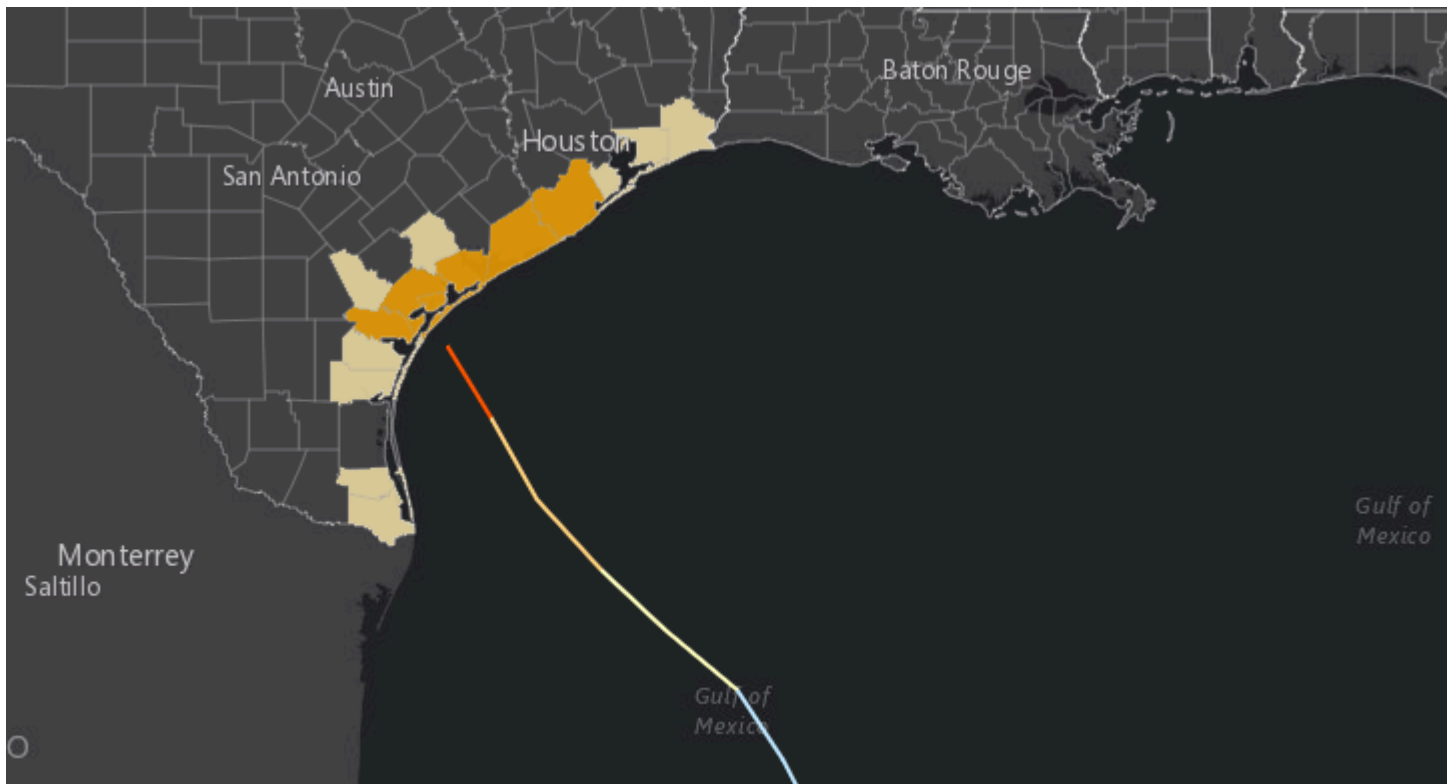


Texas Gov. Gregg Abbott preemptively declares a state of disaster for 30 Texas counties.

(Source: NBC News)

Aug 24 - 25: Preemptively Evacuating

- ***Thursday, August 24th:*** In responding to Gov. Gregg Abbott's declaration of disaster status, 6 counties issue mandatory evacuation, and 9 counties issue voluntary evacuation. At noon, Harvey strengthens to a Category-1 hurricane with 80 mph winds, and National Hurricane Center begins predicting a major hurricane — Category-3 or higher.



Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS

100 mi  Powered by Esri

By Aug 25th, 6 counties (orange) issue mandatory evacuation, and 9 counties (yellow) issue voluntary evacuation.

- **Friday, August 25th:** Things just change so rapidly today:

12 a.m, Harvey strengthens to a Category-2 hurricane with maximum sustained winds estimated at 100 mph.

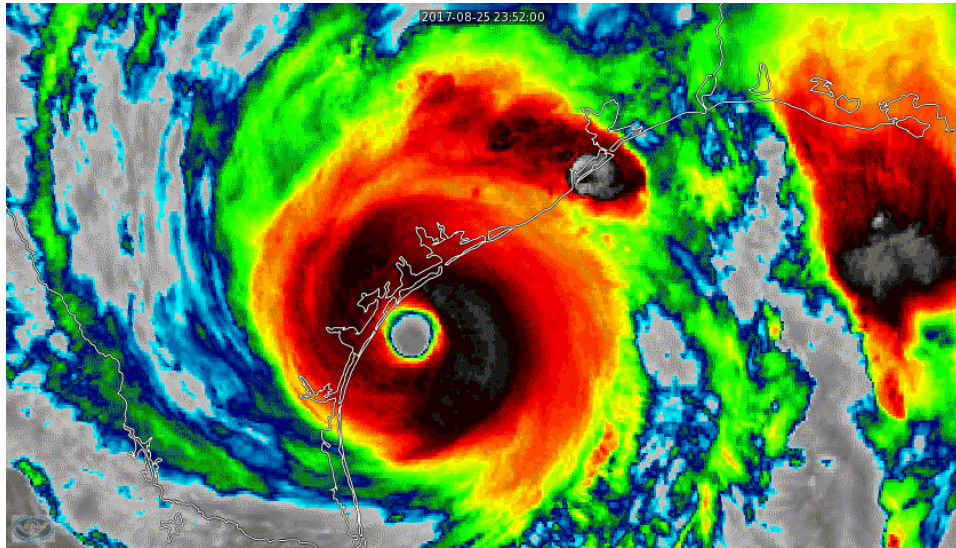
11 a.m, Gov. Greg Abbott requests presidential disaster declaration.

2 p.m, Harvey strengthens to a Category-3 hurricane with maximum sustained winds near 120 mph.

6 p.m, Harvey intensifies to a Category-4 hurricane with maximum sustained winds at 130 mph.

8 p.m, FEMA grants Gov. Abbott's request for disaster declaration.

10 p.m, Harvey makes landfall on San Jose Island, between Port Aransas and Port O'Connor. Aransas Pass station reports 111 mph sustained winds, 131 mph gust.



Category-4 Hurricane Harvey rapidly generated an incredibly complete structure before landfall.

(Source: texasstormchasers.com)

On Friday, before Harvey made landfall, Texas Gov. Greg Abbott encouraged residents to evacuate low lying and coastal areas, even if a mandatory evacuation order had not been issued.



Evacuation under hurricane warning in Corpus Christi.

(Source: www.texasmonthly.com)

Aug 26 - 30: Houston

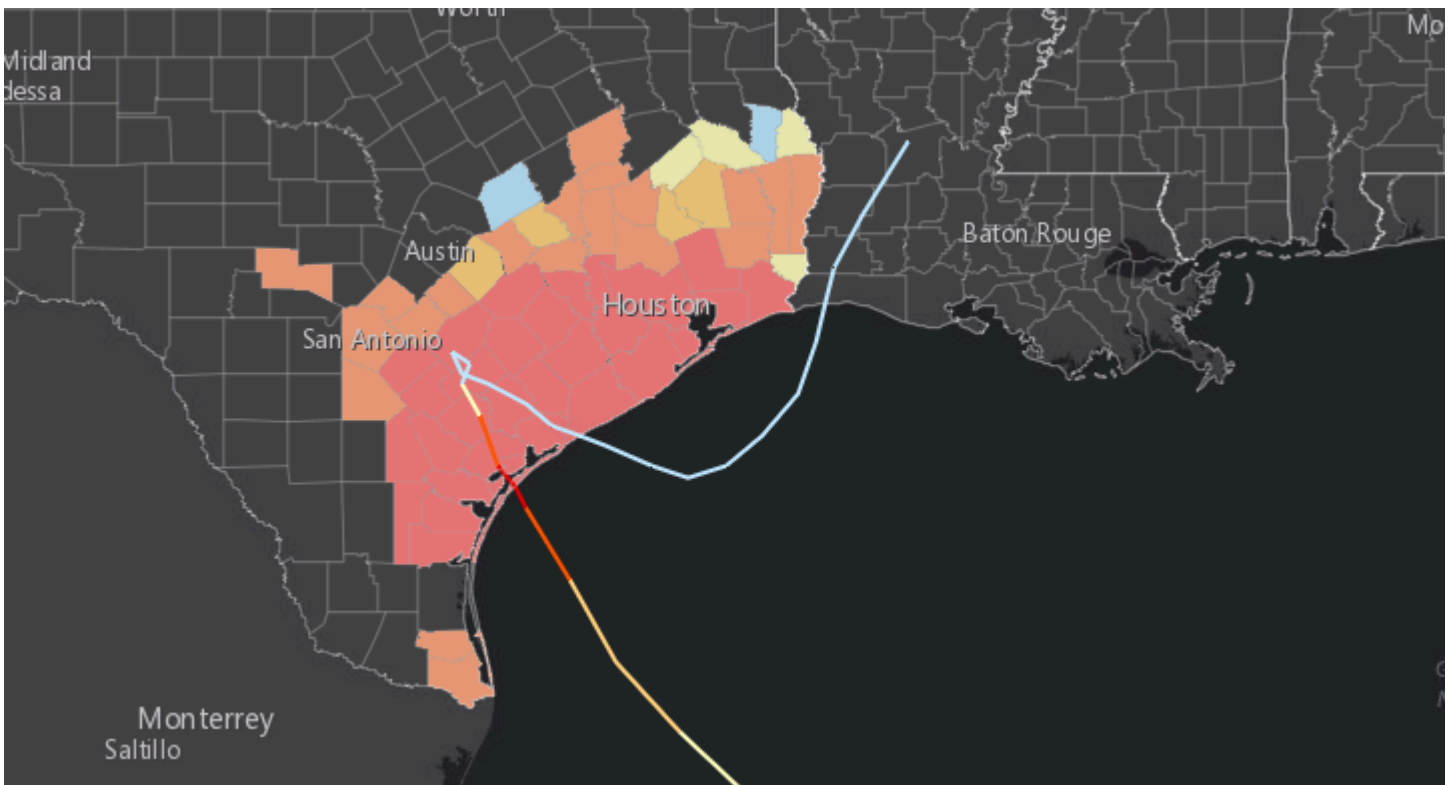
- **Saturday, August 26th:** 1 a.m, Harvey makes its second landfall on Copano Bay and is downgraded to a Category-3 hurricane with winds of 125 mph. Gov. Abbott adds 20 Texas counties to disaster proclamation.
- **Sunday, August 27th:** Harvey moves slowly southeast toward the Houston area, prompting flooding emergencies throughout southeast Texas. Gov. Abbott adds 4 more counties to the state disaster declaration.
- **Monday, August 28th:** Harvey's center moves into the Gulf of Mexico with winds of 45 mph. Rain and flooding continues in southeast Texas with tropical storm and storm surge warnings extending to Louisiana. Gov. Abbott adds 4 more counties to the state disaster declaration. Gov. Abbott visits Coastal Bend and activates entire Texas National Guard.



Troopers play an important role in the emergency rescuing work.

(Source: dw.com)

- **Tuesday, August 29th:** Rain, catastrophic flooding continues in southeastern Texas and extends into southwestern Louisiana. Harvey remains just offshore of middle and upper Texas coast. Gov. Abbott and President Donald Trump visit Corpus Christi, receive detailed briefing.
- **Wednesday, August 30th:** Tropical Storm Harvey makes its third landfall just west of Cameron, La., before weakening to a tropical depression. Beaumont and Port Arthur experiencing flash flood emergencies. Far east Texas and western Louisiana see flooding rains.



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100 mi  Powered by Esri

After Harvey's consistent precipitation, more areas are flooded, and more counties are declared to be in disaster state.

Different from Gov. Greg Abbott's advice, Houston Mayor Sylvester Turner told people to stay put. "Don't evacuate", he said. Local officials, in response, doubled down on their advice: "Don't go". Houston and Harris County officials who

urged people to stay home before the storm may have been remembering that the city government was strongly criticized after the disastrous evacuation before Hurricane Rita in 2005.



Houston mayor does not encourage people to evacuate.

(Source: abc NEWS)

On Saturday morning, as Hurricane Harvey's powerful winds and rain caused severe damage to coastal communities, the Houston mayor warned people there would be heavy rain and flooding in the city for the next four to five days — but once again emphasized they did not need to evacuate.

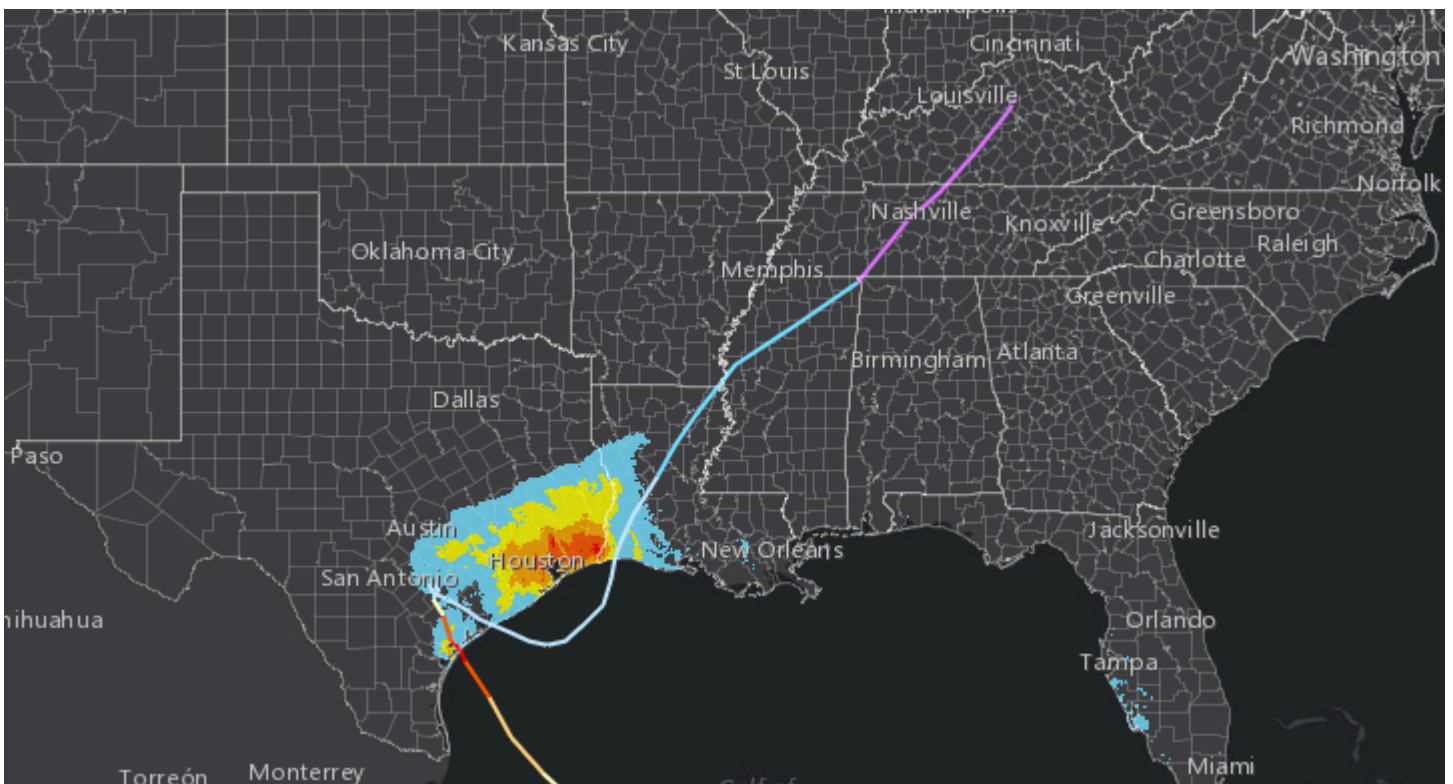
Aug 31 and Future: Prolonged Recovery

- **Thursday, August 31th:** NHC stops tracking Harvey's remnants. Gov. Abbott increases the National Guard deployment to 24,000. Gov. Abbott and Vice President Mike Pence visit Rockport and Victoria, speak with residents and participate in recovery efforts.



Heavy precipitation has caused serious flood in Texas.
(Source: dw.com)

From August 25 to August 31, Harvey has brought extremely heavy precipitation, as displayed in the following map. All colored areas received more than 10 inch of rain, and areas in red color even have more than 50 inch of rain, just within this single week.



Esri, HERE, Garmin, USGS, EPA | Esri, HERE

200 mi  Powered by Esri

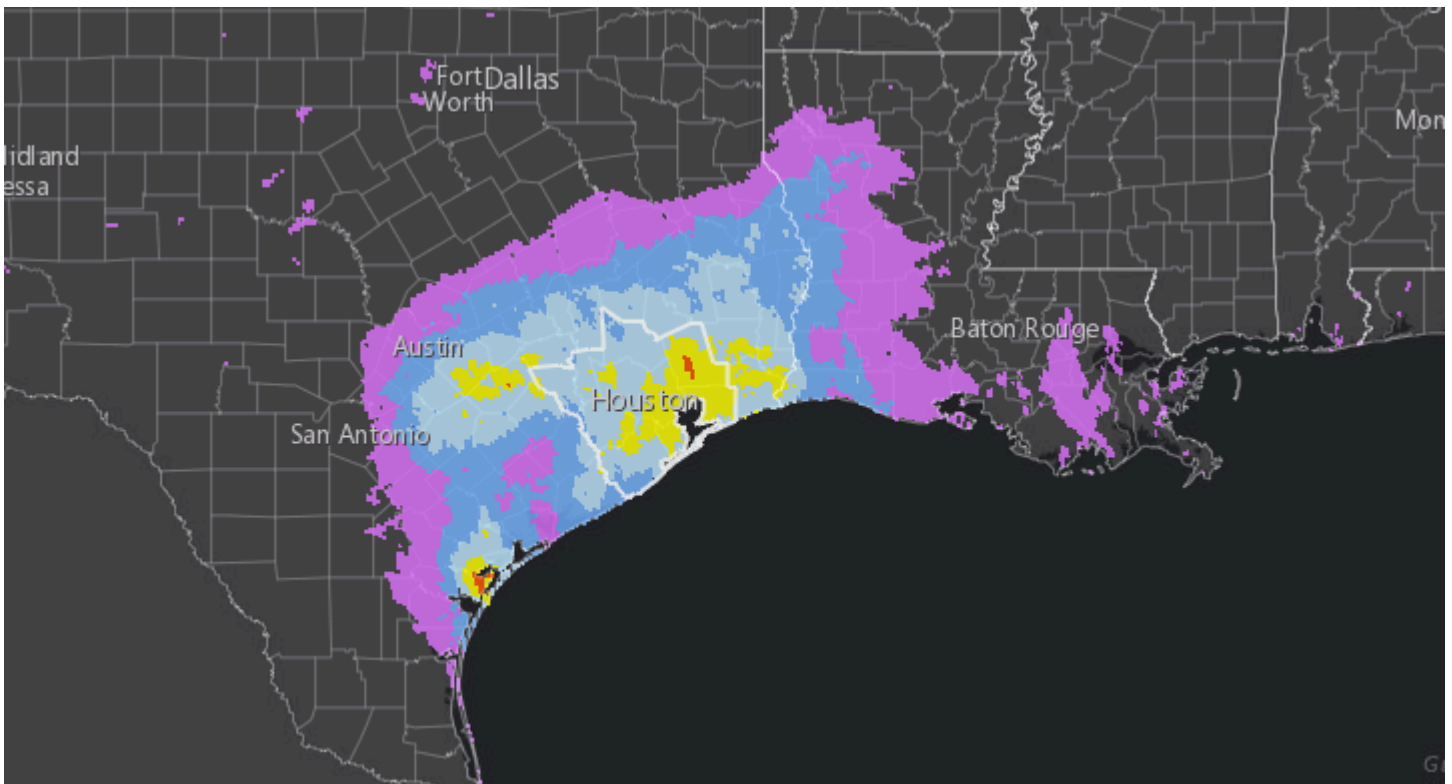
Hurricane Harvey gradually dismiss after causing a huge amount of precipitation from Aug 25 to 31.

- ***Saturday, September 2nd:*** Hurricane Harvey entirely dismisses.

Hurricane Harvey has become the costliest Atlantic hurricane so far (tied with Hurricane Katrina), with an economic loss of 125 billion dollar, as well as a fatality of 107 people. It also breaks the record of hurricane with the most rainfall in the United States.

From local heroes in boats to others to forming a human chain, to social media pleas for help, and news anchors stopping to help trapped victims, the stories of rescue out of Houston have been of powerful acts of bravery and selflessness. Celebrities, athletes and corporations have donated to the relief, and victims have turned to crowdfunding for help.

As displayed in the following map showing the percentage of percipitation of this week in the entire year of 2017, it is so just hard to imagine how terrible the disaster is, knowing the fact that about half of Greater Houston received almost half of the percipitation in the whole year!



Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS

100 mi Powered by Esri

Percentage of precipitation from Aug 25 to 31 in the entire year of 2017.
 (Source: NOAA's National Weather Service)

In the state of Texas, the declaration of disaster status of the impacting 60 counties are renewed again and again every month, even till today.

It is a prolonged procedure of recovery...



Governor Abbott Extends Disaster Declaration In June 2020 For Texas Counties Affected By Hurricane Harvey

June 11, 2020 | Austin, Texas | Proclamation

The latest extension of disaster declaration in Texas was in June 11, 2020.

(Source: gov.texas.gov)

Data Source:

- *Precipitation Data: NOAA's National Weather Service*
- *Hurricane Track: National Hurricane Center HURDAT2 Data*
- *Cover Video: Hurricane Harvey Radar History*
(<https://www.youtube.com/watch?v=ljt0hQV6xxI>)