

# Excessive Rainfall Outlook High Risks (2010-2022)

Version 4: Updated statistics and new perspectives

## Points of Contact

Alex Lamers; Warning Coordination Meteorologist, WPC

[alex.lamers@noaa.gov](mailto:alex.lamers@noaa.gov)

Ashton Robinson Cook, PhD; Meteorologist, WPC

[ashton.robinson@noaa.gov](mailto:ashton.robinson@noaa.gov)

*Harvey Flooding; Wikimedia Commons, user Kaldari*



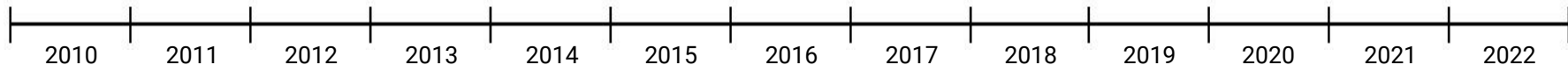
**WEATHER PREDICTION CENTER**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

ERO High Risk Statistics, Version 4  
Updated February 8, 2024

# What's New in Version 4?

Version 3: Previous data analysis conducted in February 2022

Version 4 adds



- This update of the ERO High Risk statistics extends the period of record by two years
- 2021 and 2022 had the fewest High Risks of any two-year stretch in the record
- Findings in version 4 are fairly consistent overall with previous versions; some of the High Risk stats ticked down very slightly due to an abundance of localized flash flood cases in 2021-2022

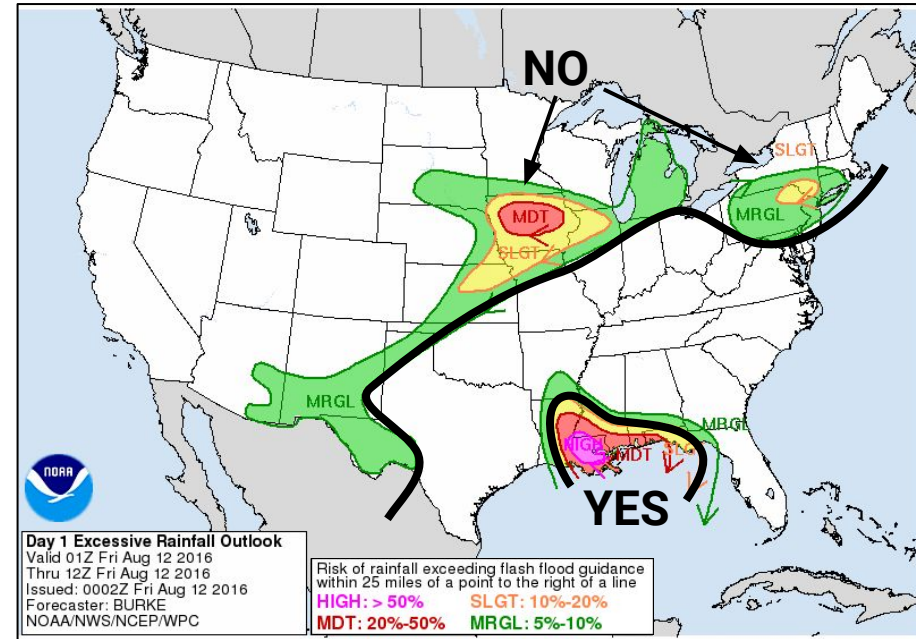
## I see more data on the ERO Climatology Web Page...why?

There is some data on the WPC website from 2009, but the available data for that year is only from April to December. Given 2009 is incomplete, it is not included in this analysis. For more recent years, counts of High Risk occurrences may be updated more frequently online, as this particular analysis requires Official NWS Storm Data, which is slower to update.

<https://www.wpc.ncep.noaa.gov/qpf/eroclimo/index.php>

# Methodology for High Risk Days Calculation

- Reports from High Risk areas and adjacent Slight and Moderate Risk areas are used.
- Measures the entire regional event or “flash flood outbreak” that occurs on a High Risk day.
- For High Risks issued after the beginning (12 GMT) of a forecast period, reports are not counted until the High Risk was in effect.
- Flooding is less discrete temporally than other weather hazards. It can linger and pose a threat hours after the heavy rain ends. Precise time of damage or fatalities in Storm Data can be unclear – using adjacent risk areas helps.
- Storm Data report types used include flash flood, flood, heavy rain, and debris flow.

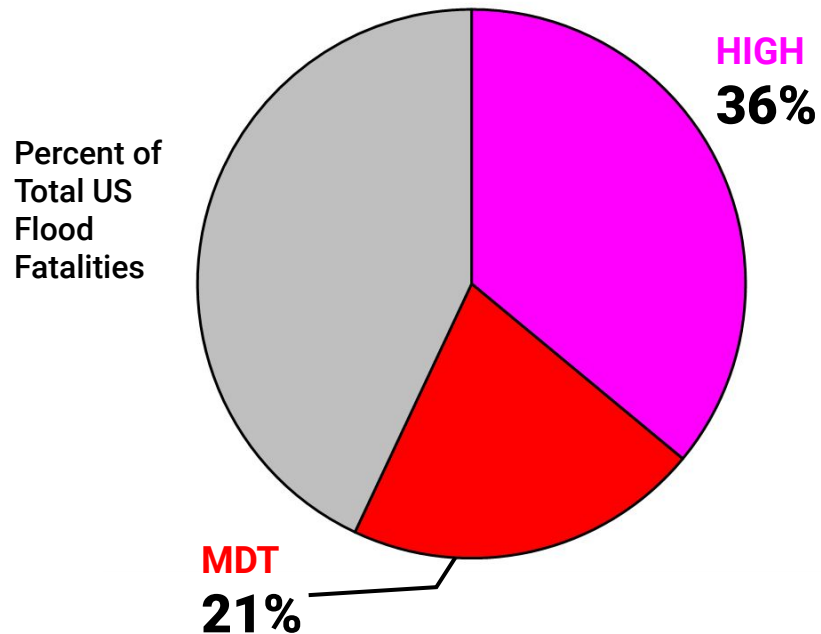


**Only evaluate risk areas contiguous to the High Risk to look at the same causative system**

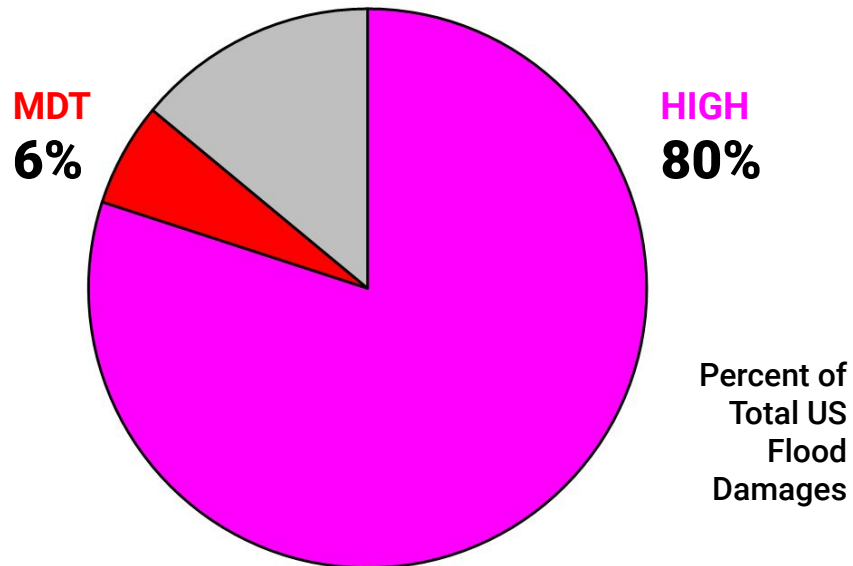
# WPC High Risk Days are a BIG DEAL

High Risks are only issued by WPC on ~4% of days, but “High Risk Days” have accounted<sup>1</sup> for:

**1/3** of ALL Flood-related **Fatalities**



**4/5** of ALL Flood-related **Damages**



<sup>1</sup> From 2010 to 2022. 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.



**The scale of damage in Hurricane Harvey can affect the analysis of damage statistics. By itself, Harvey accounted for 48% of total U.S. flood damages (*Storm Data*) and 60% of damages on High Risk days from 2010-2022.**



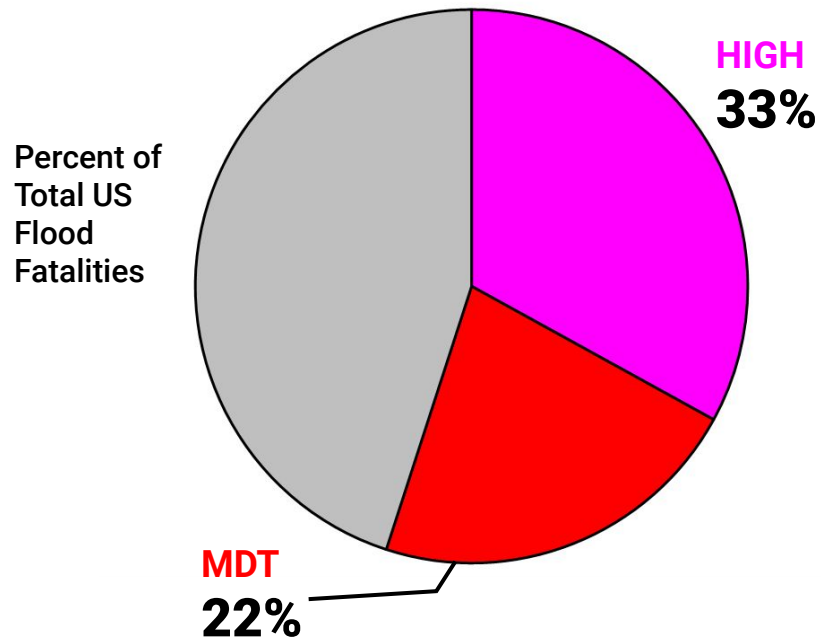
*Southeast Texas; Air National Guard photo by Staff Sgt. Daniel J. Martinez*



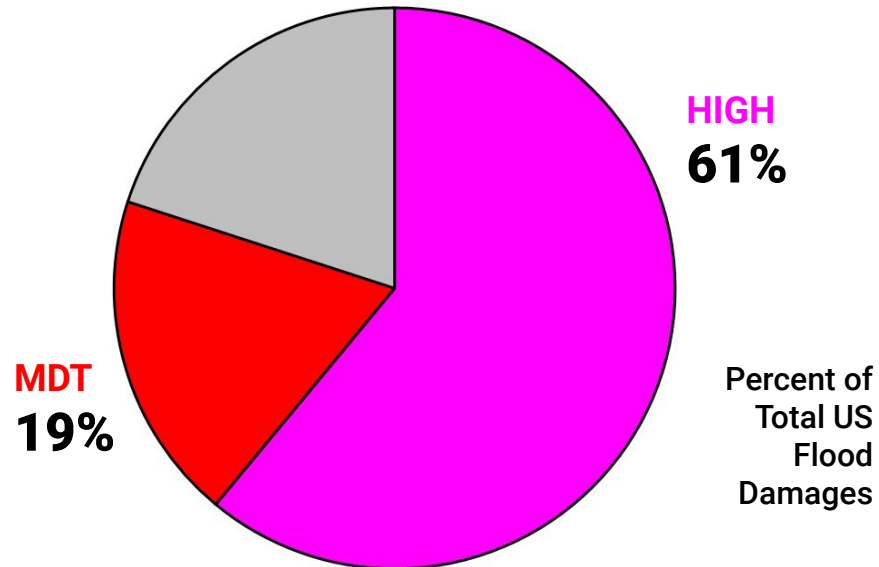
# Numbers Still Significant When Removing Harvey

*Hurricane Harvey fatality and damage figures (and associated High Risks) do skew the percentages slightly*

**1/3** of ALL Flood-related **Fatalities**



**3/5** of ALL Flood-related **Damages**



<sup>1</sup> From 2010 to 2022. 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.



# 13 Years of High Risk Days by the Numbers

**186**  
**\$72.8B**  
**467**  
**33**

High Risk Days  
Damages in NWS Storm Data  
Total Fatalities  
NOAA Billion Dollar Disasters  
*(High Risk Day occurred during a Billion Dollar Disaster in which flooding was a significant factor)*



A High Risk on the ERO is present in about  
**1 out of every 6** U.S. Billion Dollar Disasters

Nichols, SC; Flickr, S.C. Air National Guard

# Characterizing High Risk Days



Hurricane Matthew SAR; FEMA Photo

*Based on records over the past 13 years, we can say:*

**WPC High Risks are a strong indicator of a potentially deadly and damaging flash flood day**

**46%** have at least 1 fatality or injury

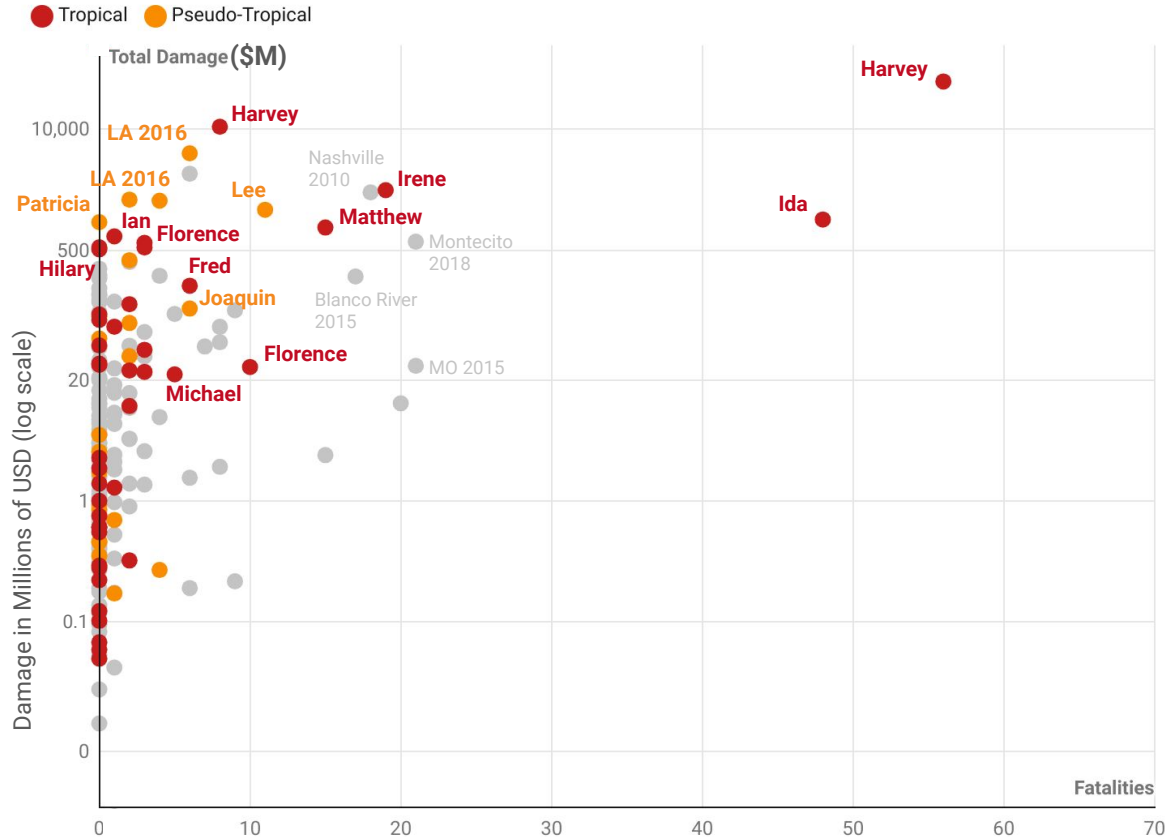
*Compared to 23% for Moderate Risk Days*

**62%** have at least \$1 million in damages

*Compared to 32% for Moderate Risk Days*



# Tropical Cyclone or Remnant High Risk Days



- What is presented here are individual 24-hour periods, so some names may show up more than once (*if events lasted longer than a day*)
- Nearly all of the most damaging High Risk days were **tropical cyclones, their remnants, or tropical disturbances**
- Deadliest High Risk days are more of a mixture of tropical and non-tropical cases
- **Harvey** and **Ida** stand out for their combination of large number of fatalities with extreme damage costs. **Irene** and **Matthew** to a slightly lesser extent.

# Most Damaging and Deadly High Risk Days

## High Risk Days with the Highest Storm Data Damage Costs

Calculated for the 24-hour period beginning 12 UTC on the date listed below. Storm Data damage estimates are just estimates and may differ from other sources.

Rank	Date	Total Damage (\$M)	Description
1	August 26, 2017	32,763	Harvey
2	August 27, 2017	10,665	Harvey
3	August 13, 2016	5,530	No Name Louisiana Low
4	April 30, 2011	3,333	Mid-Mississippi Valley Floods
5	August 28, 2011	2,215	Irene
6	May 1, 2010	2,096	Nashville & Tennessee Floods
7	August 12, 2016	1,751	No Name Louisiana Low
8	August 11, 2016	1,706	No Name Louisiana Low
9	September 7, 2011	1,362	Remnants of Lee
10	September 1, 2021	1,071	Ida in the Northeast
11	October 23, 2015	1,001	Moisture from Patricia in Texas
12	October 8, 2016	877	Matthew
13	September 28, 2022	704	Ian
14	January 9, 2018	617	Montecito, CA Debris Flow
15	September 16, 2018	600	Florence

Matches in both lists highlighted in yellow

## High Risk Days with the Highest Storm Data Fatalities

Calculated for the 24-hour period beginning 12 UTC on the date listed below. This is just a one day total. Multi-day events may have a higher total number of fatalities.

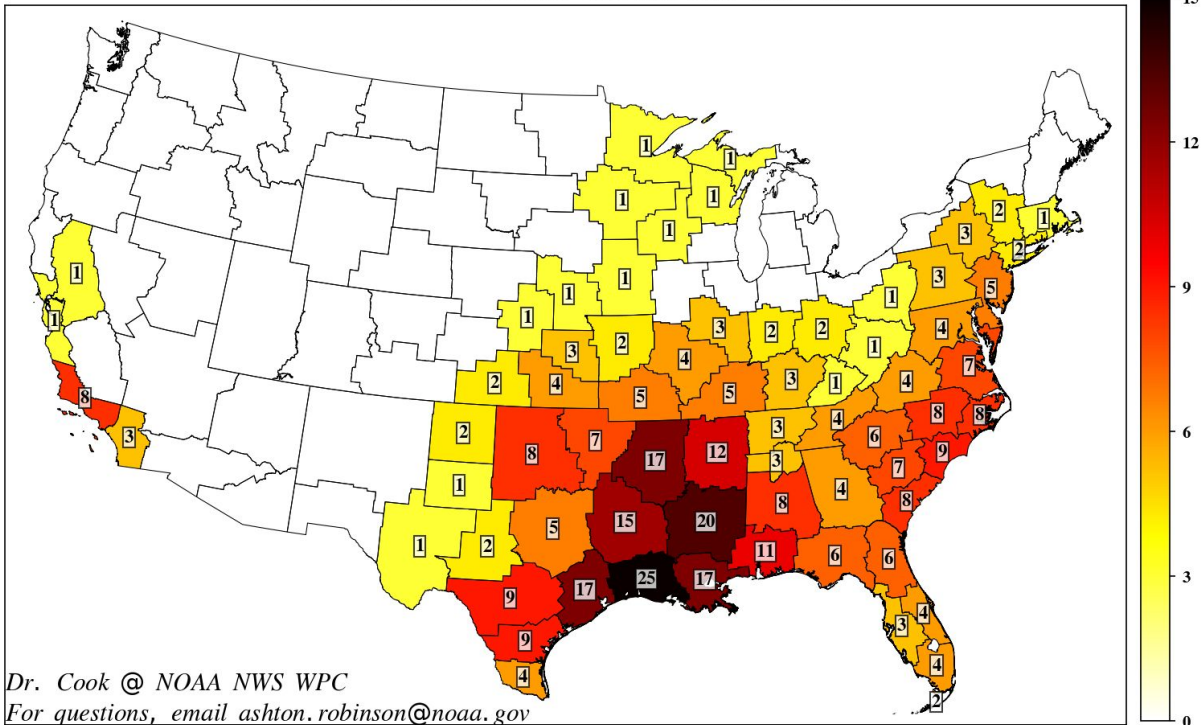
Rank	Date	Fatalities	Description
1	August 26, 2017	56	Harvey
2	September 1, 2021	48	Ida in the Northeast
3	January 9, 2018	21	Montecito, CA Debris Flow
4	December 26, 2015	21	Missouri Floods
5	June 10, 2010	20	Arkansas Campground Flood
6	August 28, 2011	19	Irene
7	May 1, 2010	18	Nashville & Tennessee Floods
8	May 23, 2015	17	Blanco River Floods in TX
9	October 8, 2016	15	Matthew
10	May 31, 2013	15	Oklahoma City Supercell Flood
11	September 7, 2011	11	Remnants of Lee
12	September 15, 2018	10	Florence
13	April 29, 2017	9	Ozarks Floods
14	June 2, 2016	9	Fort Hood, TX Flood





# Most Common WFOs Affected by High Risks

NWSFO CWA Number of ERO High Risk Days: 2016 – 2022



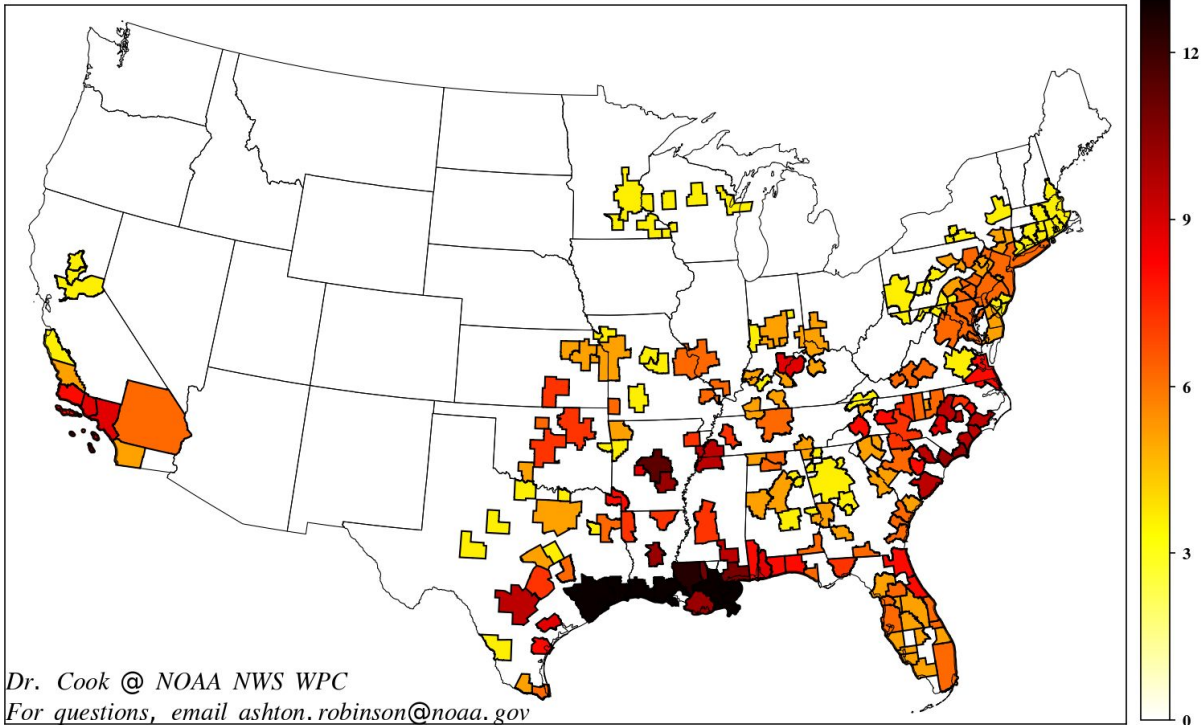
## Top WFOs Affected Since 2016

Rank	WFO	High Risks Count
1	Lake Charles, LA	25
2	Jackson, MS	20
3 (tie)	Little Rock, AR	17
3 (tie)	Houston, TX	17
3 (tie)	New Orleans, LA	17
6	Shreveport, LA	15
7	Memphis, TN	12
8	Mobile, AL	11
9 (tie)	Wilmington, NC	9
9 (tie)	Corpus Christi, TX	9
9 (tie)	Austin/San Antonio, TX	9

Source: Weather Prediction Center • Created with Datawrapper

# Most Common Metro Areas for High Risks

U.S. Metropolitan Statistical Area Number of ERO High Risk Days: 2016–2022



## Top Metro Areas Affected Since 2016

Rank	Metro Statistical Area	High Risks Count
1	Lake Charles, LA	19
2	Beaumont-Port Arthur, TX	18
3	Houston, TX	15
4	New Orleans, LA	14
5	Lafayette, LA	13
6	Baton Rouge, LA	12
7	Little Rock, AR	10
8 (tie)	Gulfport-Biloxi, MS	9
8 (tie)	Hammond, LA	9
10 (tie)	Alexandria, LA	8
10 (tie)	Houma-Thibodaux, LA	8
10 (tie)	Myrtle Beach, SC	8
10 (tie)	Pine Bluff, AR	8

Source: Weather Prediction Center • Created with Datawrapper