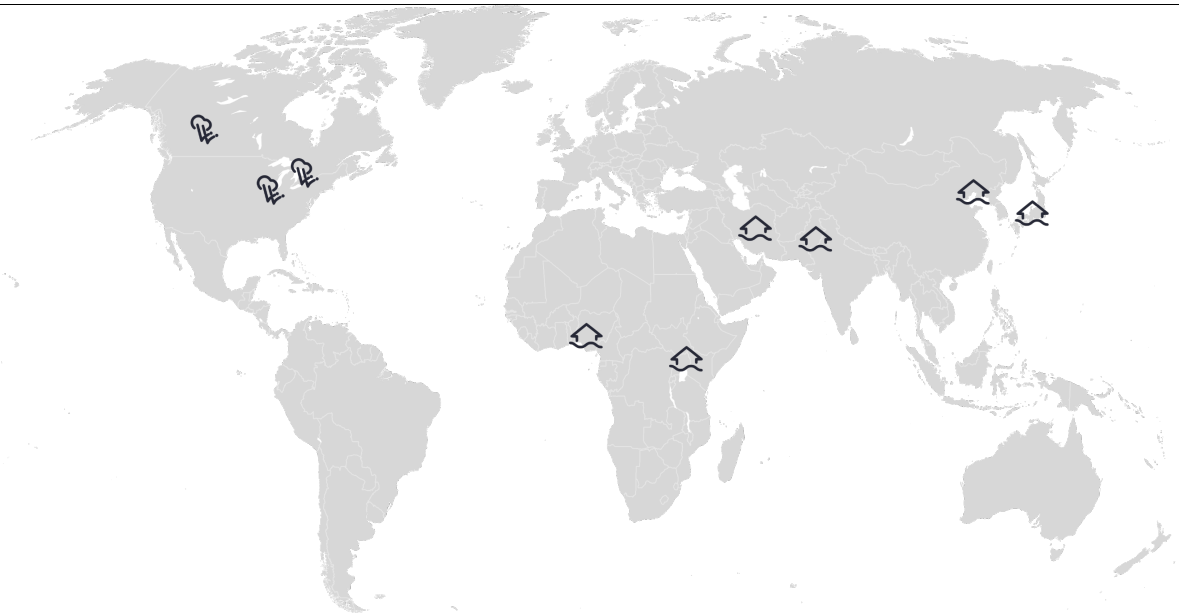


# **Weekly Cat Report**

August 05, 2022



## Executive Summary



| Event          | Affected Region(s) | Fatalities | Economic Loss (\$) | Page |
|----------------|--------------------|------------|--------------------|------|
| Flooding       | United States      | 37+        | 1.0+ billion       | 3    |
| Flooding       | Pakistan, Iran     | 623+       | 100s of millions   | 5    |
| Flooding       | China              | 0          | 10s of millions    | 7    |
| Flooding       | Uganda             | 24+        | Unknown            | 7    |
| Severe Weather | United States      | 0          | Millions           | 7    |
| Severe Weather | Canada             | 0          | Millions           | 7    |
| Flooding       | Nigeria            | 7+         | Unknown            | 8    |
| Flooding       | Japan              | 0          | Millions           | 8    |

Please note that any financial loss estimate is preliminary and subject to change. These estimates are provided as an initial view of the potential financial impact from a recently completed or ongoing event based on early available assessments. Significant adjustments may inevitably occur. All losses in US dollars (\$) unless noted otherwise.

Along with this report, we continue to welcome users to access current and historical natural catastrophe data and event analysis on Impact Forecasting's Catastrophe Insight website: <http://catastropheinsight.aon.com>

## United States: Flooding (Update)

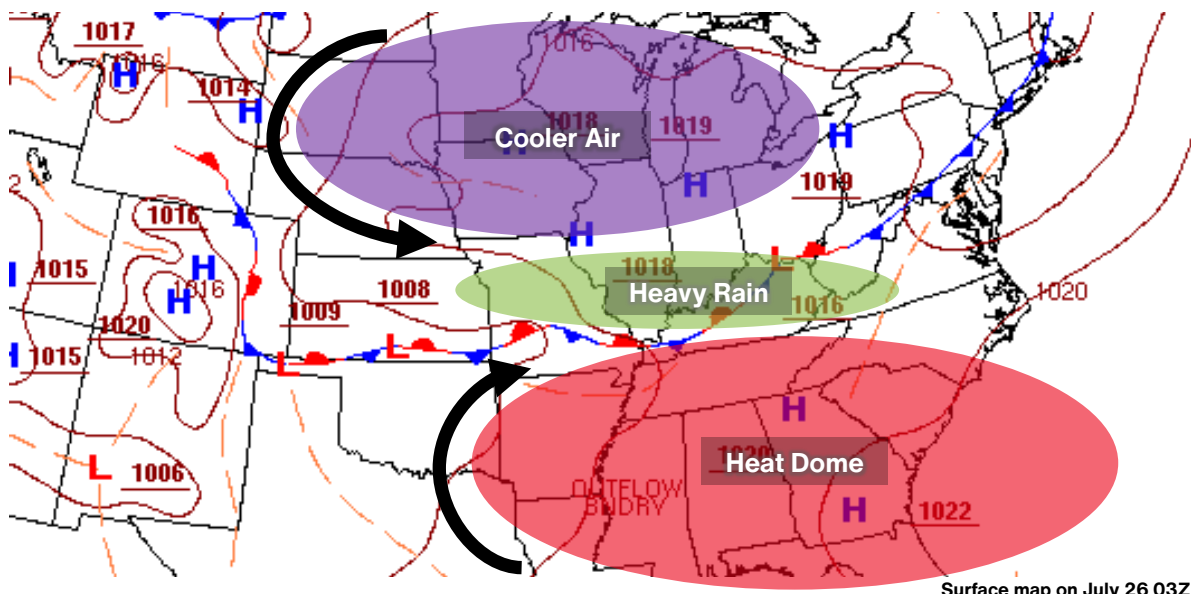
### Overview

Relief and recovery efforts continued in parts of the United States following multiple instances of historic rainfall and subsequent flooding from July 25-28. Parts of the St. Louis, Missouri metropolitan region and Eastern Kentucky were hardest-hit. At least 37 fatalities were recorded in Kentucky alone. The regional National Weather Service offices noted that rainfall rates exceeded the 0.1% probability of occurrence in given locations (1-in-1,000+ return period). The total economic cost of the floods in Missouri and Kentucky was expected to exceed USD1.0 billion.

### Meteorological Recap

The atmospheric set-up which spawned the separate incidents of exceptional rainfall in the St. Louis, Missouri metro region (July 26) and Eastern Kentucky (July 28). The pattern was enhanced by a ridge of high pressure in the Atlantic Ocean – known as the Bermuda High – which helped push a dome of extremely hot air and moisture across the Southeast into the Mid-Mississippi and Lower Ohio Valleys. This air moistened the vertical column of the atmosphere near a stalled surface frontal boundary that stretched from Kansas to Appalachia. With cooler air located to the north of the stalled boundary, this led to more destabilization and wetness that left very moist atmospheric conditions that were favorable for persistent rounds of heavy rains to fall over the same areas for several consecutive hours. This set-up persisted on both July 26 and July 28. At the peak, hourly rainfall rates reached and topped 1 to 3 in (25 to 76 mm) per hour.

See the graphic below for a visualization of the set-up.



The “training” of thunderstorms across metro St. Louis and Eastern Kentucky (especially the town of Hazard) resulted in rainfall totals within 6-hour timeseries that equalled a 0.1% probability of occurrence: or a 1-in-1,000 return period. Such a return period means that this volume of rain has a 0.1% chance of occurring in any given year at any given location. This does not mean that it would be another 1,000 years until another such event would be expected again.

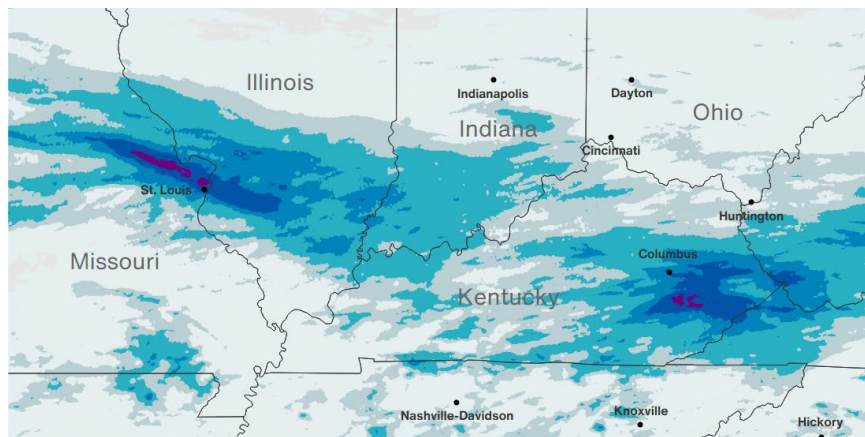
As the influence of climate change becomes more prevalent, it is expected that extreme high-intensity, low temporal precipitation events will be more common. This is due to continued anthropogenic-caused warming in the Earth’s atmosphere and oceans. More warmth and moisture in the atmosphere means it can hold more water and subsequently precipitate that to the surface with greater intensity. Combined with aging infrastructure unable to handle the volume of water, plus changes in land use in some highly vulnerable areas, this brings greater risk of flash flood occurrence.

## Missouri & Kentucky Flash-Flooding Event July 25-28, 2022

72-hour rainfall  
ending 6:00 PM CDT July 28 (in)



Data: NOAA  
Graphic: Aon (Catastrophe Insight)



## Event Details

Damage assessments remained ongoing in Missouri and Kentucky. The damage footprint is considerable after several rivers and creeks rapidly overflowed their banks and inundated thousands of homes, businesses, vehicles, agricultural land, infrastructure, and other property. The death toll in Eastern Kentucky, notably around the town of Hazard, had risen to at least 37 with several others still listed as missing. The damage in Kentucky led to a Major Disaster Declaration on July 29, which makes federal disaster assistance available. Damage in Missouri was still under investigation for a disaster declaration approval.

***For a full recap of event details, please see the July 29, 2022 Weekly Cat Report.***

## Financial Loss

It remained too preliminary to provide a specific economic or insured loss estimate for the July 26-28 flooding across the Mississippi and Ohio Valleys. The scope of damage to property, infrastructure, and agriculture is significant. Direct combined economic losses from Missouri to Kentucky were anticipated to mark a billion-dollar-plus total. Given low National Flood Insurance Program (NFIP) take-up, a sizeable portion of the residential and commercial damage was expected to be uninsured.

## Pakistan and Iran: Flooding & Landslides

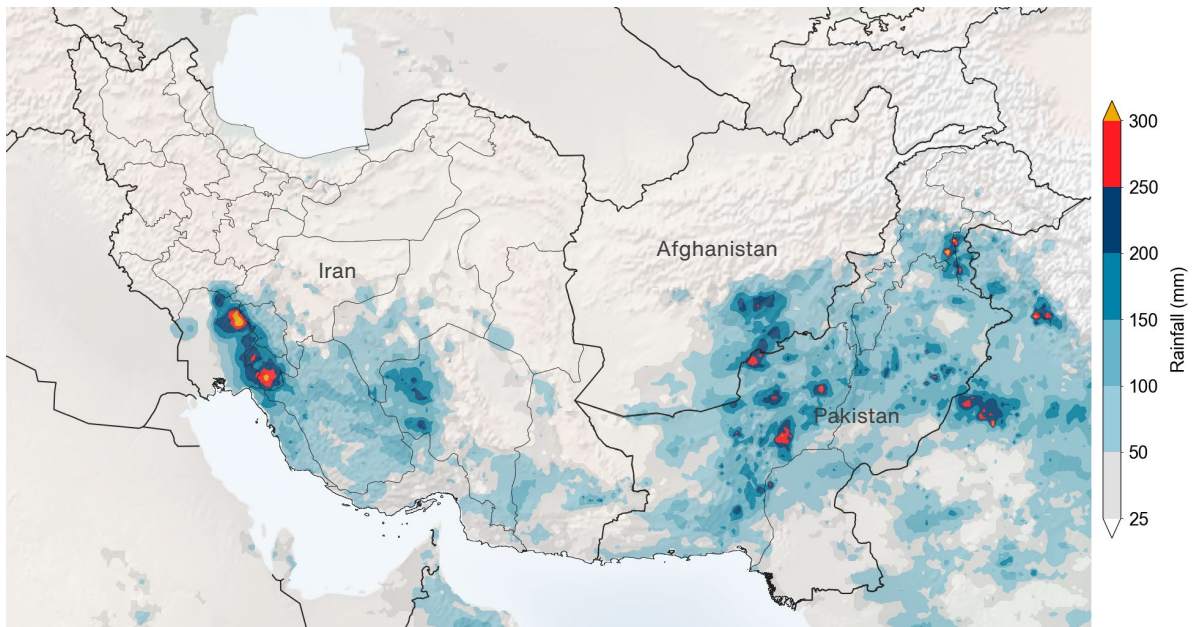
### Overview

Over the past two weeks, a deep monsoon trough with systems of low-pressure in the surrounding affected Pakistan and Iran, leading to widespread riverine flooding in these areas. The summer monsoon death tolls for Pakistan since June 14 exceeded 500 on August 2, and fatalities from the two weeks-long floods in Iran had surpassed 80. More than 60,000 houses were damaged in Pakistan and Iran. The combined economic losses were anticipated into the hundreds of millions (USD), if not higher.

### Meteorological Recap

#### July 25-31

Multiple low-pressure systems were sitting around South Asia and the Middle East early in the week. A cyclonic circulation lying over South Pakistan and adjoining Kutch on July 25 brought heavy rainfall to Karachi and Sindh. The Indian Meteorological Department (IMD) forecast the monsoon trough to shift north in the next couple of days. The Pakistan Meteorological Department (PMD) also expected monsoon currents to penetrate the upper and central parts of the country from July 27. Areas of stationary low could also be observed over Iran and the western Arabian Sea, and flood damages were reported in Iran and Yemen (see previous Weekly Cat Report).



Weekly satellite rainfall estimate for Pakistan and Iran (July 25 - July 31)

Source: NASA / GPM

## Event Details



**Pakistan Navy helicopters in relief operations in Balochistan, landslides in Tehran province**

Source: Pakistan Navy / Iranian Red Crescent Society

In **Pakistan**, weather emergencies were declared in Karachi and Hyderabad on July 25 as heavier-than-usual rains lashed the cities. At least 30 villages in Sindh province were submerged after floodwaters from Balochistan entered the province. Flights and train operations were disrupted. Major bridges collapsed and portions of the Quetta-Karachi highway were swept away. No fewer than 2,500 km (1,500 mi) of roads were damaged. Till July 24, monsoonal rains had claimed 310 lives and injured 295 others. At least another 200 and 300 people were killed or injured between July 25-August 4. Flood victims especially in Balochistan were struggling to access food and water. A helicopter on relief mission crashed on August 2, killing all six onboard. The summer season had led to more than 9,500 destroyed and 37,000 damaged houses. The seasonal fatality count was 543 with another 627 people injured.

In **Iran**, flash flooding first hit Fars Province and left 22 tourists dead on July 22. Another round of flooding, especially between July 28-29, affected the provinces of Tehran and Mazandaran, northern Iran. According to the Iranian Red Crescent Society, additional 59 people lost their lives, and 30 persons remain missing, taking the total death tolls to above 80. Flash flooding and debris up to 4 meters (13.1 ft) damaged no fewer than 20,000 houses and dozens of vehicles. The ancient city of Yazd in Mazandaran, a UNESCO heritage site, incurred notable damages. Local authorities put initial estimated agricultural losses at \$200 million. In 2019, heavy rain in southern Iran killed at least 76 people and caused economic damages exceeding into the billions (USD). However, the high fatalities this time were mainly due to mudslides in vulnerable areas in the northern region.

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## Natural Catastrophes: In Brief

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### **Flooding (China)**

The Raoyang River in Liaoning recorded its highest water level after heavy rain battered the province on July 28-30. Beizhen city received the most rainfall at 226 mm (8.9 in). At least 30 reservoirs were above their flood limits. No fewer than 35 roads were cut off, and 44,000 ha (109,000 acres) of crops were affected. Direct economic losses from the flood exceeded ¥417 million (\$62 million).

### **Flooding (Uganda)**

Torrential rain caused Nabuyonga and Namatala rivers to overflow their banks in eastern Uganda, particularly in Districts of Mbale, Kapchorwa and Sironko, since July 30. As of this writing, widespread flooding and landslides left at least 24 people dead and four people injured, according to authorities. Notable property damages to buildings, vehicles, crops, and local infrastructure were incurred throughout the affected area. Total damage assessments remain ongoing.

### **Severe Weather (United States)**

Rounds of severe thunderstorm activity swept across central and eastern portions of the United States from August 2-4. An upper-level disturbance and subsequent surface frontal boundary tracked southward out of the Canadian Prairies into the Upper Midwest before later tracking through the Great Lakes, Ohio Valley, and the Mid-Atlantic. The atmosphere was fueled by above average summer temperatures engulfing much of the country clashing with cooler air behind the front. Clusters of thunderstorms marked by damaging straight-line winds topping 80 mph (130 kph) were cited from the Dakotas to New York. Hundreds of storm reports were received into the Storm Prediction Center with most damage due to downed trees onto properties and vehicles. Total economic and insured losses were estimated into the millions (USD).

### **Severe Weather (Canada)**

Multiple rounds of severe weather affected multiple regions of Canada from August 1-4. Initially, record-breaking storms were cited in Alberta, where a 4.84-inch (12.3-centimeter) hailstone was found near the town of Innisfail. The stone weighed 292.71 grams (0.64 pounds) which set a new Canadian record for heaviest hailstone; breaking the previous record of 290 grams (0.63 pounds) set on July 31, 1973 in Saskatchewan. Dozens of vehicles were caught in the hailstorm near Innisfail and Red Deer that caused extensive damage. Elsewhere, severe thunderstorms on August 2 and 3 led to tree and property damage in parts of Manitoba and Ontario.

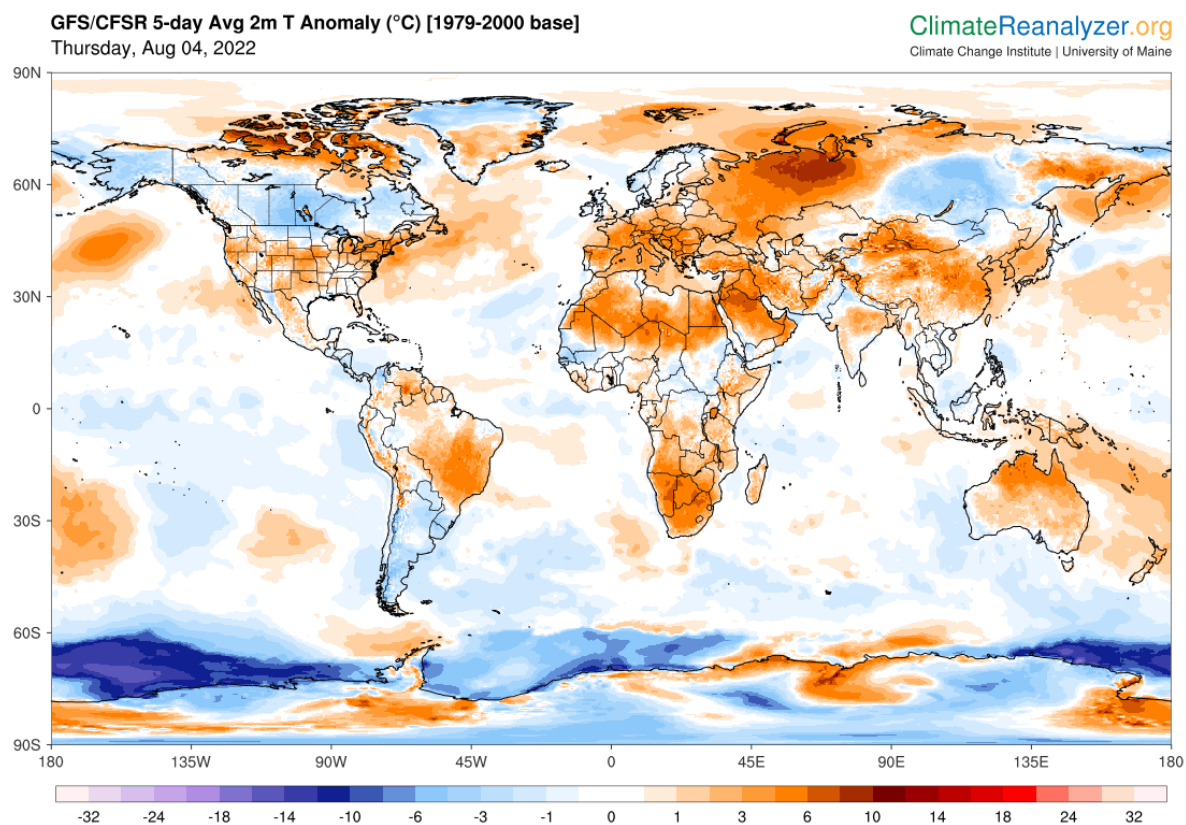
## **Flooding (Nigeria)**

Torrential rains on August 1-2 led to widespread flooding in Nigeria's Jigawa state, killing at least seven people and injuring several others. Local officials cited the heaviest flood damaged in the Local Government Areas (LGAs) of Kiri Kasamma, Dutse, Hadejia, Kafin Hausa, Guri, Auyo, and Jahun. Hundreds of homes were reported damaged or destroyed and vast areas of agricultural land was inundated.

## **Flooding (Japan)**

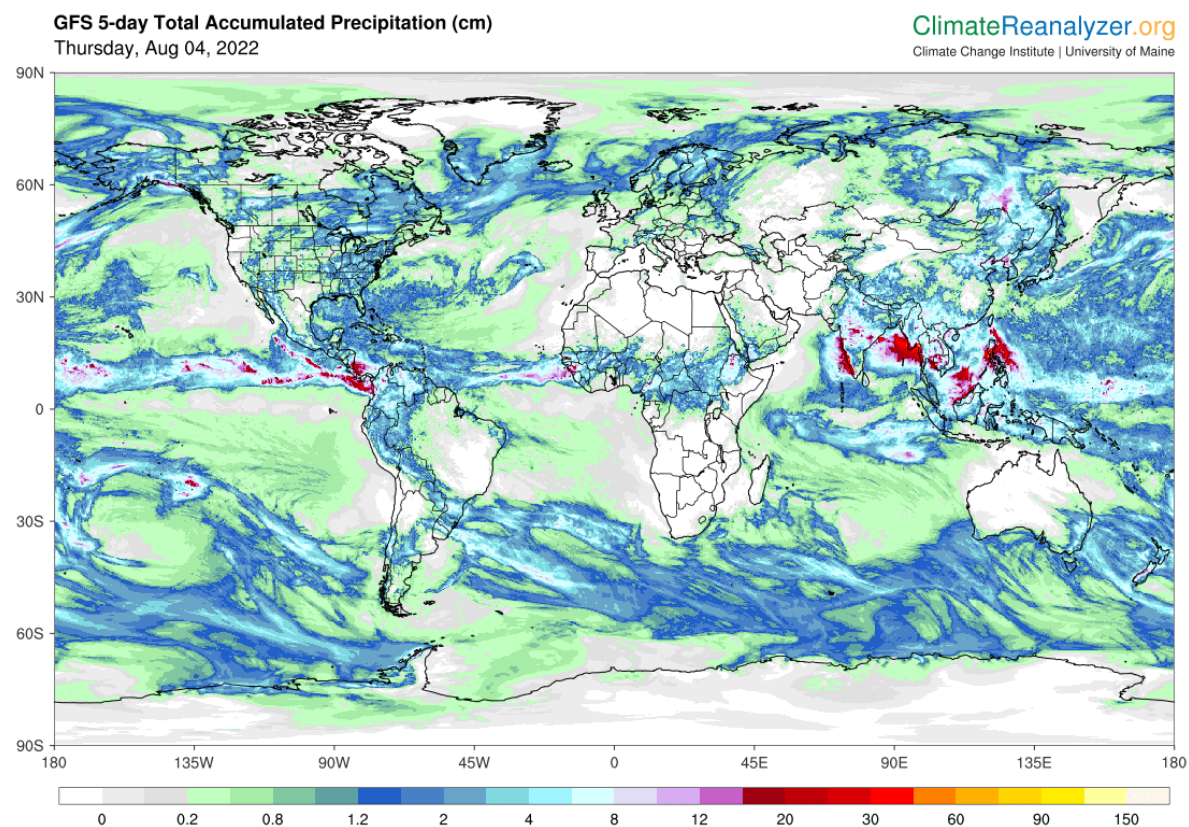
Excessive rainfall from a system arriving from the Sea of Japan brought significant flooding to multiple Japanese prefectures on August 3-4. Some areas recorded more than 400 millimeters (15.75 inches) of rainfall in a 24-hour period, setting several local 24-hour rainfall records. No fatalities were immediately reported, though multiple residents were thought to be missing. Japan's Fire and Disaster Management Agency (FDMA) cited that nearly 367,000 people were asked to evacuate their homes in the Tohoku and Hokuriku regions as rivers overflowed their banks and several landslides occurred. Among the hardest-hit areas came in Yamagata Prefecture after the Mogami River burst its banks and inundated homes, businesses, and vehicles along the river coastline. Similar flooding from swollen rivers and creeks were cited in nearby Niigata and Ishikawa prefectures, where the Kakehashi River overflowed. The FDMA also issued evacuation orders in parts of Iomori, Iwate, Fukushima, and Ishikawa prefectures. Beyond property damage, heavy rains led to flooding that collapsed a bridge used by the East Japan Railway's Banetsu West Line in Fukushima's Kitakata region. Total economic and insured losses were anticipated to reach well into the millions (USD). As the situation continues to evolve, further details will be made available in next week's Weekly Cat Report if necessary.

## Global Temperature Anomaly Forecast



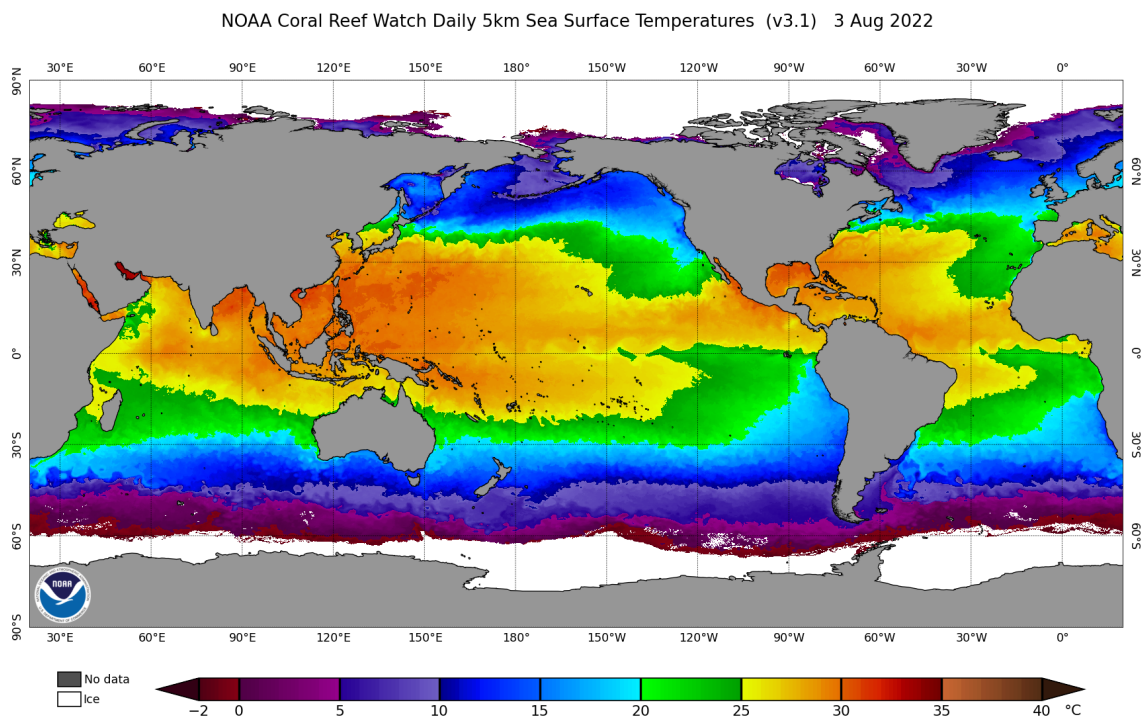
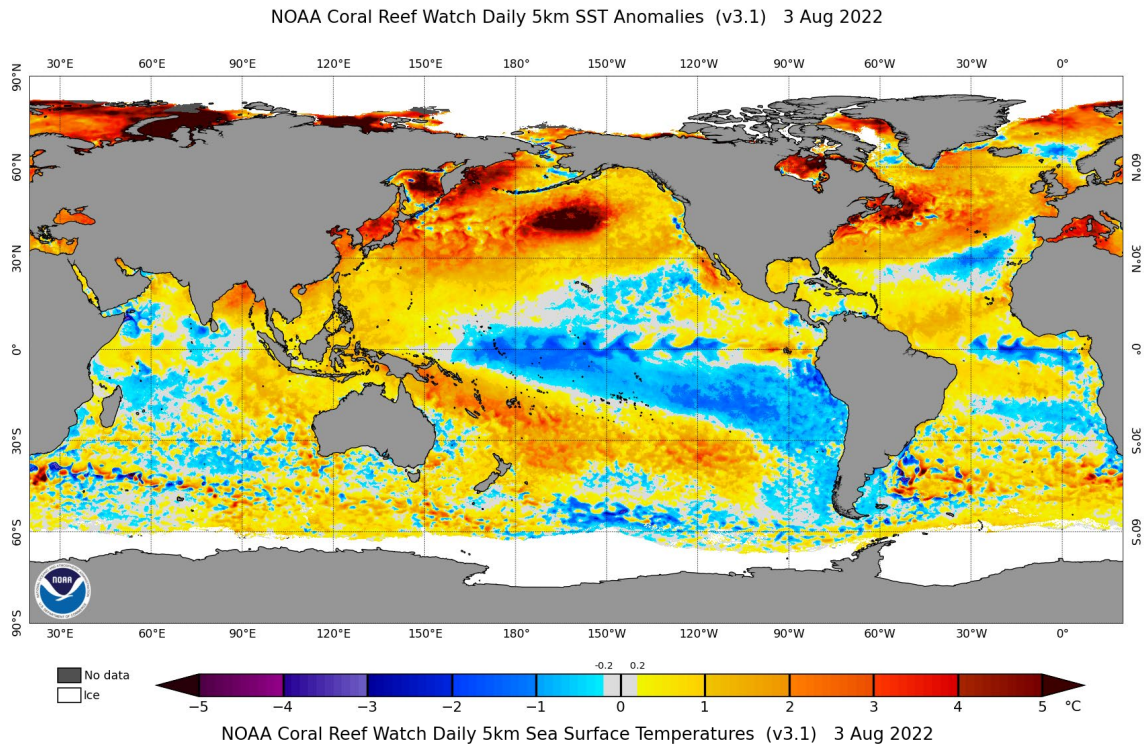
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

## Global Precipitation Anomaly Forecast



Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

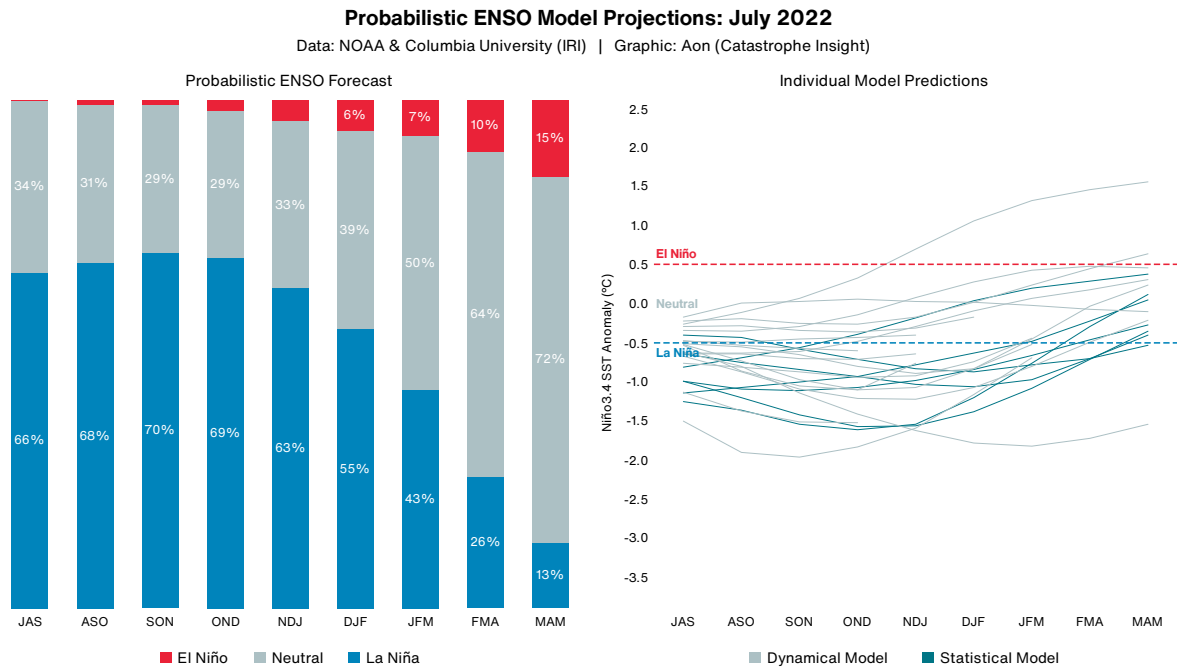
## Weekly Sea Surface Temperature (SST) Maps (°C)



## El Niño-Southern Oscillation (ENSO)

### Overview

La Niña conditions are likely to continue for the next several months. NOAA cites a 60 percent chance of La Niña conditions persisting through the late summer, and a slight increase to a 62 to 66 percent likelihood of continuing into the boreal (northern hemisphere) fall and early winter months.



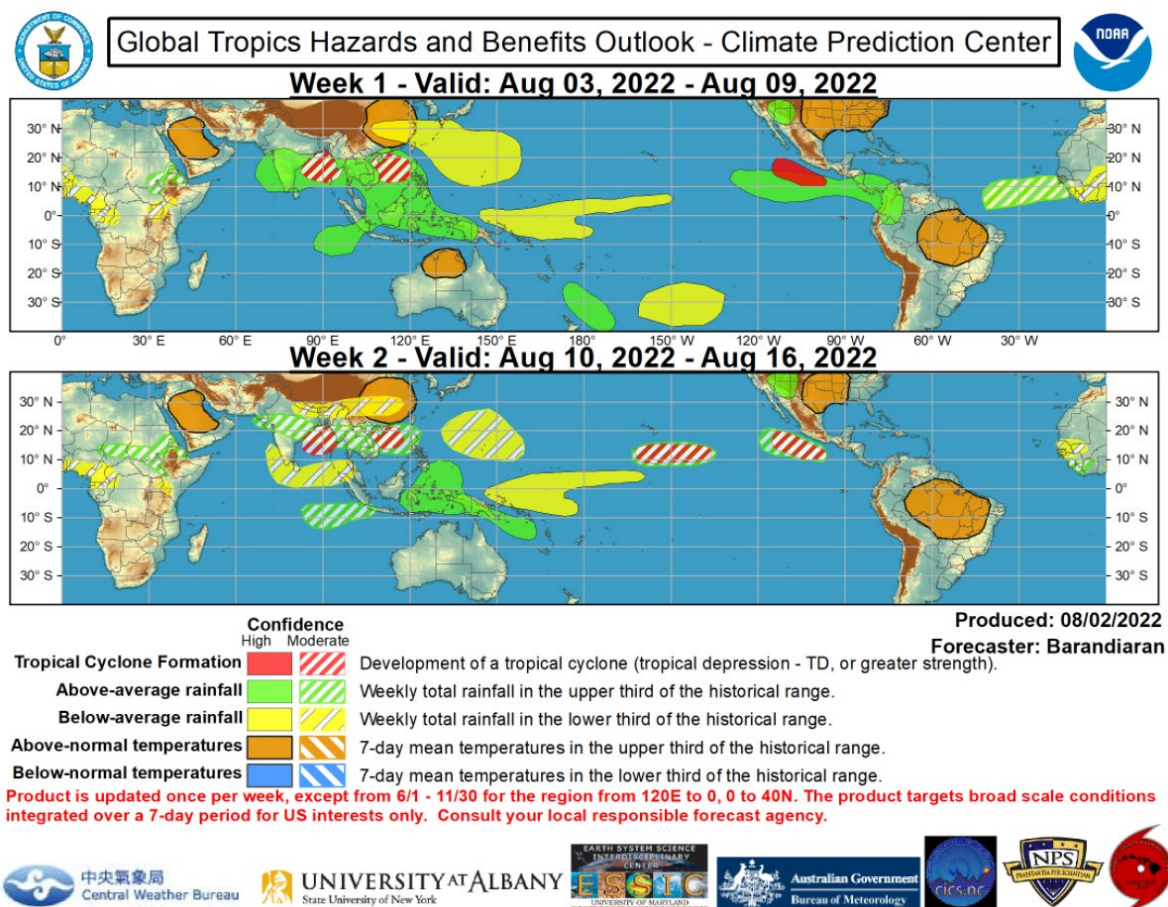
**El Niño:** Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

**La Niña:** Cool phase of an ENSO cycle. Sea surface temperatures of -0.5°C occur across the east-central equatorial Pacific.

**Neutral:** A period when neither El Niño nor La Niña conditions are present.

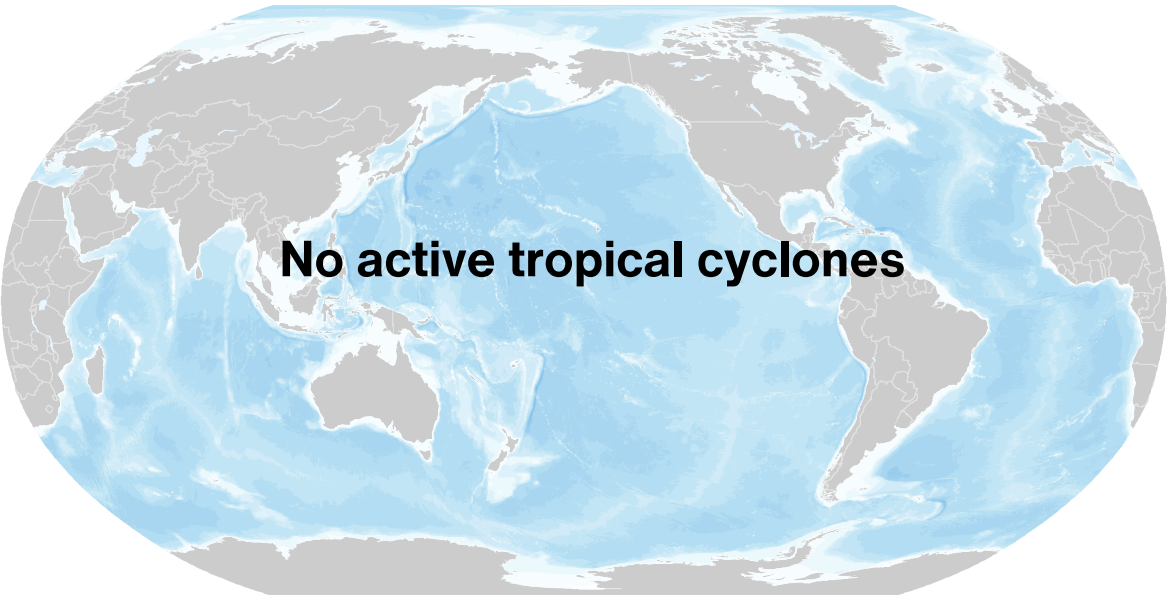
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

## Global Tropics Outlook



Source: Climate Prediction Center (NOAA)

# Current Tropical Cyclone Activity



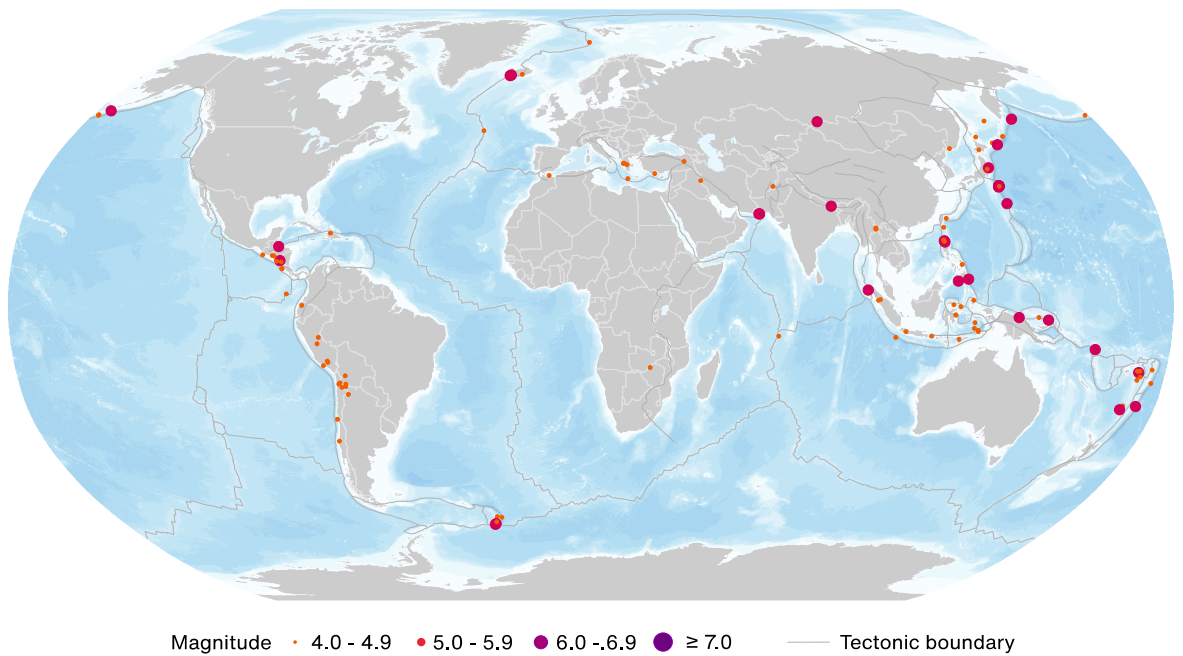
 Tropical Depression  Tropical Storm  Category 1  Category 2  Category 3  Category 4  Category 5

| Storm Name | Location | Winds | Location from Nearest Land Area |
|------------|----------|-------|---------------------------------|
|            |          |       |                                 |

\* TD: Tropical Depression, TS: Tropical Storm, HU: Hurricane, TY: Typhoon, CY: Cyclone; PTC: Potential Tropical Cyclone  
\*\* N: North, S: South, E: East, W: West, NW: Northwest, NE: Northeast, SE: Southeast, SW: Southwest

Source: National Hurricane Center, Joint Typhoon Warning Center, Central Pacific Hurricane Center (NOAA)

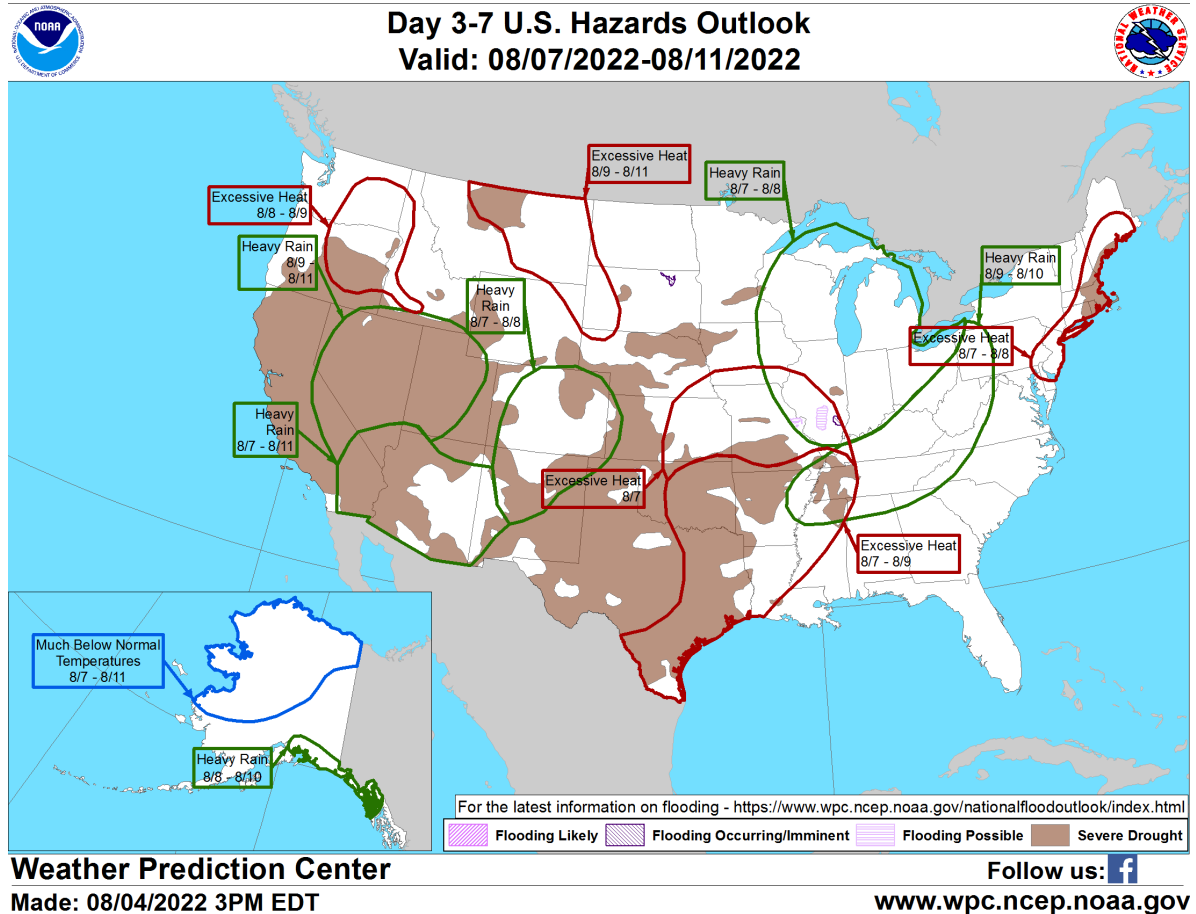
Global Earthquake Activity ( $\geq M4.0$ ): July 29 – August 4



| Date (UTC) | Location | Magnitude | Epicenter |
|------------|----------|-----------|-----------|
|            |          |           |           |

Source: United States Geological Survey

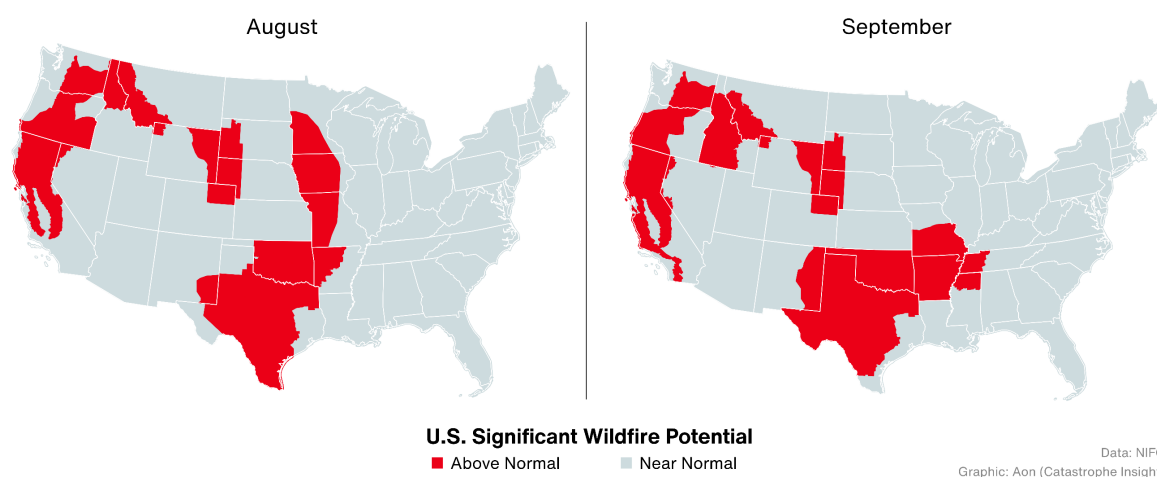
## U.S. Hazard Outlook



- A return of building high pressure will push temperatures to well above average values as well as bringing excess moisture to cause conditions to feel much more uncomfortable. The most prevalent heat will be found from the Plains to the Northeast. Further ridging will cause temperatures to soar in the Pacific Northwest and Big Sky Country.
- A continued active Southwest Monsoon will bring heavy rain and flood risks to the Desert Southwest next week; while moisture riding the previously noted ridge in the Southeast will amplify heavy rain and thunderstorm chances in the Midwest, Ohio & Tennessee Valleys, and the Mid-Atlantic.
- Severe drought conditions persist across a broad section of the western two-thirds of the Lower 48.

Source: Weather Prediction Center (NOAA)

## U.S. Wildfire: Significant Fire Risk Outlook & Activity



### Annual YTD Wildfire Comparison: August 4

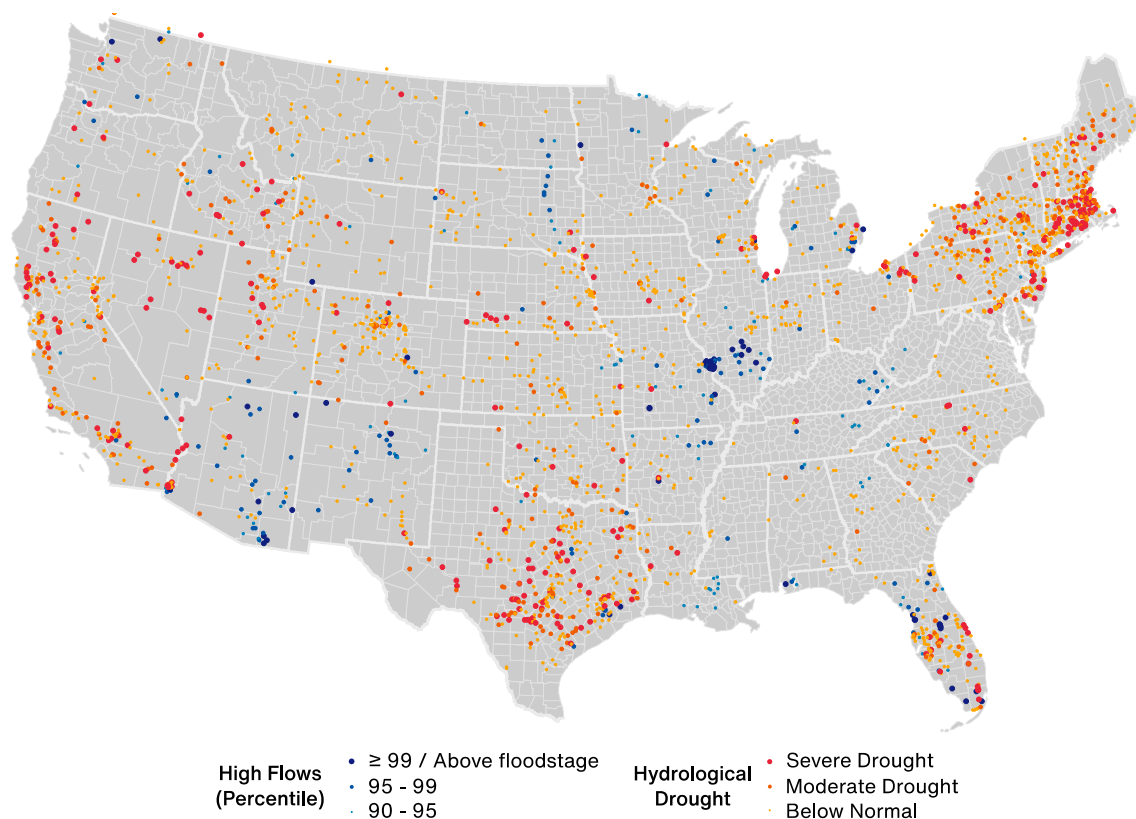
| Year                               | Number of Fires | Acres Burned     | Acres Burned Per Fire |
|------------------------------------|-----------------|------------------|-----------------------|
| 2018                               | 38,692          | 5,078,427        | 131.25                |
| 2019                               | 27,191          | 3,235,456        | 118.99                |
| 2020                               | 32,808          | 2,249,108        | 68.55                 |
| 2021                               | 38,447          | 3,279,393        | 85.30                 |
| 2022                               | 39,910          | 5,802,433        | 145.39                |
| <b>10-Year Average (2012-2021)</b> | <b>34,846</b>   | <b>3,752,006</b> | <b>107.67</b>         |

### Top 5 Most Acres Burned by State: August 4

| State      | Number of Fires | Acres Burned | Acres Burned Per Fire |
|------------|-----------------|--------------|-----------------------|
| Alaska     | 541             | 3,064,335    | 5,664.21              |
| New Mexico | 684             | 861,366      | 1,259.31              |
| Texas      | 5,612           | 558,559      | 99.53                 |
| Oklahoma   | 1,736           | 305,409      | 175.93                |
| Florida    | 2,132           | 140,901      | 66.09                 |

Source: National Interagency Fire Center

## U.S. Current Riverine Flood Risk



A  $\geq 99^{\text{th}}$  percentile indicates that estimated streamflow is greater than the 99<sup>th</sup> percentile for all days of the year. This methodology also applies for the other two categories. A stream in a state of severe drought has 7-day average streamflow of less than or equal to the 5<sup>th</sup> percentile for this day of the year. Moderate drought indicates that estimated 7-day streamflow is between the 6<sup>th</sup> and 9<sup>th</sup> percentile for this day of the year and 'below normal' state is between 10<sup>th</sup> and 24<sup>th</sup> percentile.

### Top 5 Rivers / Creeks: Highest Percentile for Water Height

| Location                                     | Current Stage (ft) | Percentile |
|----------------------------------------------|--------------------|------------|
| Little Wabash River near Clay City, Illinois | 22.50              | 99.07      |
| Clinch River near Tazewell, Tennessee        | 3.83               | 99.04      |
| Bourbeuse River at Union, Missouri           | 6.75               | 99.02      |
| Eleven Point River near Bardley, Missouri    | 5.20               | 99.01      |
| Big Spring near Van Buren, Missouri          | 2.24               | 98.98      |

Source: United States Geological Survey

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## Source Information

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### **United States: Flooding**

U.S. National Weather Service  
U.S. Weather Prediction Center

### **Pakistan and Iran: Flooding**

Pakistan National Disaster Management Authority (NDMA)  
Pakistan Meteorological Department (PMD)  
Iranian Red Crescent Society  
Week-long Iran flooding leaves at least 80 dead and 30 missing, *France24*

### **Natural Catastrophes: In Brief**

Rainstorms affect 222000 people in China's Liaoning, *Xinhua*  
Iranian Red Crescent Society  
Week-long Iran flooding leaves at least 80 dead and 30 missing, *France24*  
Uganda Red Cross Society  
540,000 Japan residents told to evacuate after heavy rain floods homes and roads, *The Japan Times*  
*FloodList.com*

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Aon plc (NYSE:AON) is a leading global professional services firm providing a broad range of risk, retirement and health solutions. Our 50,000 colleagues in 120 countries empower results for clients by using proprietary data and analytics to deliver insights that reduce volatility and improve performance.

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