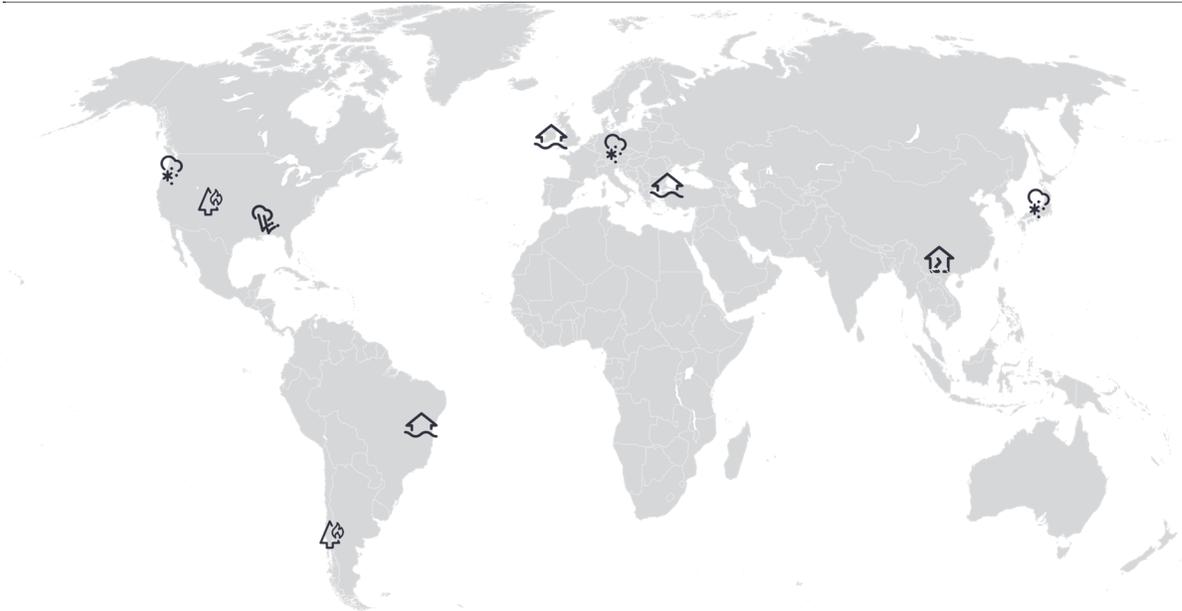


# **Weekly Cat Report**

December 31, 2021



## Executive Summary



Event	Affected Region(s)	Fatalities	Economic Loss (USD)	Page
<b>Flooding</b>	Brazil	24+	500+ million	3
<b>Winter Weather</b>	Germany	2	Negligible	5
<b>Wildfire</b>	Chile	0	Unknown	5
<b>Winter Weather</b>	Japan	2	Millions	5
<b>Earthquake</b>	China, Laos	0	71+ million	5
<b>Winter Weather</b>	United States	2	Millions	5
<b>Flooding</b>	Ireland	0	Millions	6
<b>Severe Weather</b>	United States	0	Millions	6
<b>Flooding</b>	Turkey	0	Millions	6
<b>Wildfire</b>	United States	0	Unknown	6

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.

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>

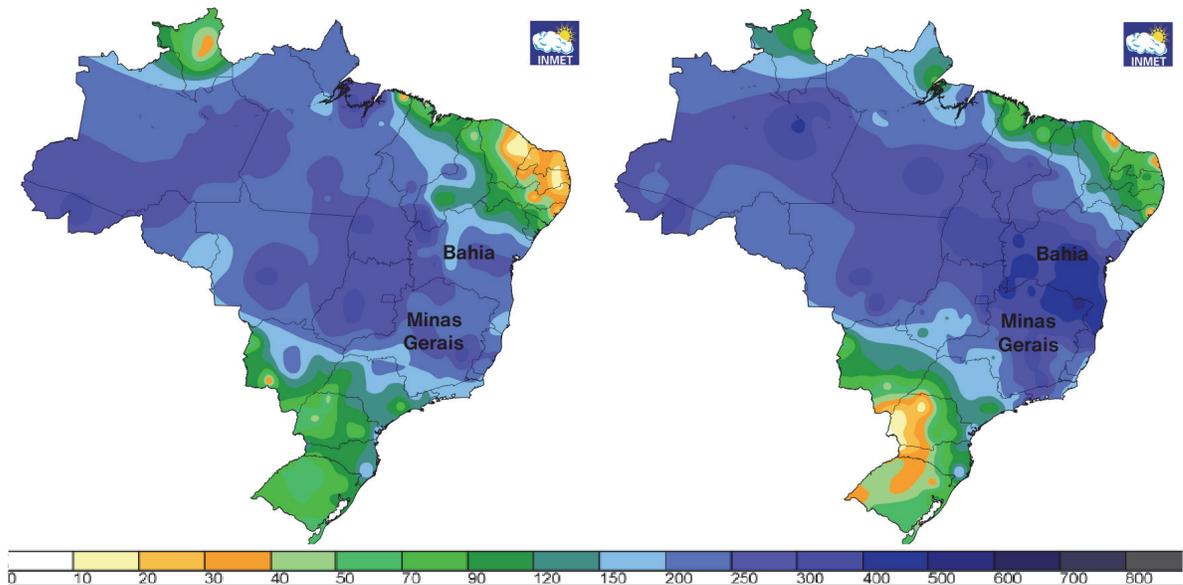
## Flooding: Brazil

### Overview

Periods of tremendous moisture and thunderstorms broadly associated with peaking La Niña conditions impacted large portions of central and northern Brazil since mid-November. The most catastrophic damage was incurred in the State of Bahia where no fewer than 24 fatalities and hundreds of injuries were reported. At least 630,000 people were affected by the flooding. Extensive damages to homes, businesses, infrastructure, and agriculture were observed. Total economic losses reached into the hundreds of millions (USD).

### Meteorological Recap

Extensive flooding impacted portions of Brazil, particularly the states of Bahia, Minas Gerais, Espírito Santo, and Tocantins since mid-November. The extreme rainfall was enhanced by multiple anomalous South Atlantic Convergence Zone (ZCAS) episodes across central and northern Brazil – which consist of a persistent and nearly-stationary band of clouds, heavy rainfall, and thunderstorm activity. These events were strongly influenced by the negative phase of the El Niño-Southern Oscillation (ENSO), which is characterized by cooler than average waters in the tropical Pacific Ocean.



**Accumulated precipitation in November (left) and December (right)**

Source: INMET

According to the National Institute of Meteorology (INMET), a weather station in Bahia, near Lençóis, reported 578 millimeters (22.8 inches) of rainfall between December 1-27. This is well above the December monthly station average of 132.6 millimeters (5.2 inches) and marked the largest December rainfall accumulation since at least 1961. In Minas Gerais, the Pedra Azul station measured the highest accumulated rainfall in any single month since 1961. On December 27, the station also set a daily rainfall record with 134.2 millimeters (5.2 inches).

## Event Details

In **Bahia State**, at least 24 fatalities have been confirmed since the beginning of the month, while another 430 people were treated for injuries. Rising river levels resulted in the failure of at least two dams in the region; the Igua dam along the Verruga river collapsed on December 25, and a failure at a second dam near Jussiape was reported on December 26. Widespread inundation was also observed along the banks of the Cachoeira River. State officials reported nearly 630,000 people have been affected by the floods and 91,000 people were displaced. In total, 131 state municipalities were impacted, of which at least 132 declared a formal state of emergency.



**Flooding in Itajuípe, Bahia State**

Source: State of Bahia Government

Preliminary damage assessments from the country's disaster information system suggest that total economic losses in the state might approach BRL1.0 billion (USD175 million). However, multiple state officials tentatively estimated the rebuild costs of damaged properties at BRL2.0 billion (USD351 million).

Extensive damage to homes, businesses, roadways, and bridges was reported throughout the region, including 40 state highways. Incessant rainfall also affected neighbouring states in recent weeks, particularly northern **Minas Gerais**. In the period of December 7-10, flooding caused additional damage in the state, preliminarily estimated at BRL165 million (USD29 million). More than 2,000 homes were inundated.

Additional flooding was reported from Espírito Santo and Tocantins.

The table below highlights rainfall totals (mm) between December 1-27 as reported by INMET:

Location	Rainfall (mm)	Location	Rainfall (mm)
Pedra Azul, Minas Gerais	612.2	Salinas, Minas Gerais	411.4
Lençóis, Bahia	578.0	Ilhéus, Bahia	410.4
Caravelas, Bahia	493.4	Sao Mateus, Espírito Santo	381.2

## Financial Loss

Preliminary damage assessments from the country's disaster information system and government officials suggest that total economic losses in Bahia alone might approach or exceed BRL2.0 billion (USD351 million). Additional significant losses were expected from other states, particularly Minas Gerais, which will add to the overall damage cost.

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## Natural Catastrophes: In Brief

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### Winter Weather (Germany)

Freezing rain and heavy snowfall caused hundreds of accidents in many parts of Germany on December 23-24. Many roads mostly in Bavaria, south-eastern Germany, were closed - multiple areas reported icy and mirror-smooth streets and roads. As a result, more than 350 car accidents due to freezing rain and black ice were reported. At least 2 deaths and more than 60 injuries were reported.

### Wildfires (Chile)

Several wildfires charred 23,000 hectares (56,800 acres) of land in central and southern Chile this week. The most affected regions were La Araucanía, which alone accumulated an affected total of 14,000 hectares (35,000 acres), as well as the regions of Ñuble, Quillón, O'Higgins, and Los Lagos. The fires started on December 23 and left several homes destroyed. Four people were injured during support work. A total of 44 forest fires have been registered nationwide, of which 19 were still active according to the latest report published by the National Emergency Office and National Forestry Corporation on December 30.

### Winter Weather (Japan)

Snowstorm conditions worsened this week, following last week's winter weather that hit northern and central Japan. More than 100 domestic flights were grounded on December 26. Land traffic was also disrupted, and more than 3,200 households experienced power outages. According to Japan's Fire and Disaster Management Agency (FDMA), there were two fatalities and 30 injuries, mainly in Niigata Prefecture. Economic losses were expected to be in the millions.

### Earthquake (China, Laos)

A shallow, magnitude-5.7 earthquake struck the border between China and Lao PDR on December 24. Powerful tremors could be felt in the densely populated Jiangcheng Hani and Yi Autonomous County, Yunnan province. At least 10 people in China were injured, and more than 6,400 houses sustained varying degrees of damage. Preliminary reports put the damage estimates at CNY450 million (USD71 million). In the Phongsaly, province, Lao PDR, homes in 20 villages were damaged by the earthquake. Authorities reported damages of at least LAK1.4 billion (USD120,000).

### Winter Weather (United States)

A stagnant upper-level pattern featuring an anomalous trough over the West resulted in a series of storm systems and cold weather across the Pacific Northwest and California during the last week of December. The barrage of moisture resulted in feet of snow in higher elevations, while measurable snowfall also impacted major cities such as Seattle and Portland. The snow was followed by record low temperatures. In California, no less than 100,000 customers were without power by the evening of December 27 due to fallen trees and power lines - a majority resided in El Dorado, Nevada, Placer, and Sierra Counties. Deteriorating conditions closed multiple roadways across the region. At least two deaths were reported.

## **Flooding (Ireland)**

Torrential rains on December 25 resulted in notable regional flooding in the Wexford County in south eastern Ireland. Among the worst affected communities was Bridgetown (with a population of ~460). Floodwaters inundated several residential properties and businesses, and additionally washed away several bridges and damaged multiple road sections in the area. Local authorities initially expected economic losses well into the millions (EUR), largely due to damage on infrastructure.

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

Moist southerly flow and increasing instability resulted in a favourable environment for severe weather across parts of the southern United States on December 29-30. The Storm Prediction Center (SPC) highlighted a region in Arkansas, Mississippi, Tennessee, Alabama, and Georgia for an Enhanced Risk (level 3 out of 5) for severe weather on December 29. In the afternoon and evening hours, a long-lived line of storms with embedded rotation produced reports of large hail, strong winds, and isolated tornadoes. A likely tornado which struck the Town of Winfield in Alabama resulted in extensive damage to property, businesses, vegetation, and power lines. On December 30, a stalled frontal boundary led to multiple Flash Flood Warnings and additional severe weather in central Alabama and Georgia. Total economic losses were expected to reach well into the millions.

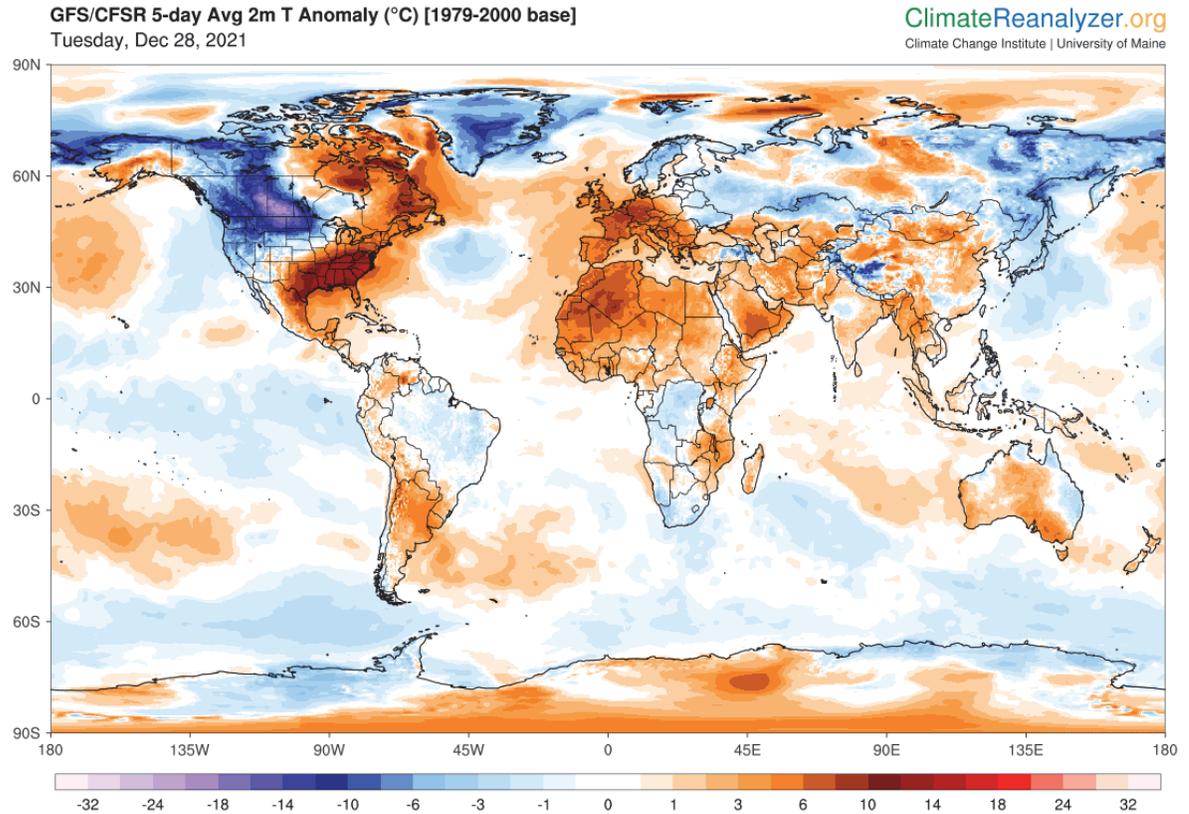
## **Flooding (Turkey)**

Heavy rains caused flooding in the provinces of Erdine and Kirklareli in north western Turkey on December 29. Floodwaters from Ergene river inundated several homes, dozens of people from flooded homes have been evacuated, however no deaths and injuries have been reported. Around 70 sheep and goats are thought to have perished. Affected areas have seen torrential rains, with more than 150 millimetres (5.9 inches) of rain in a 24-hour period.

## **Wildfires (United States)**

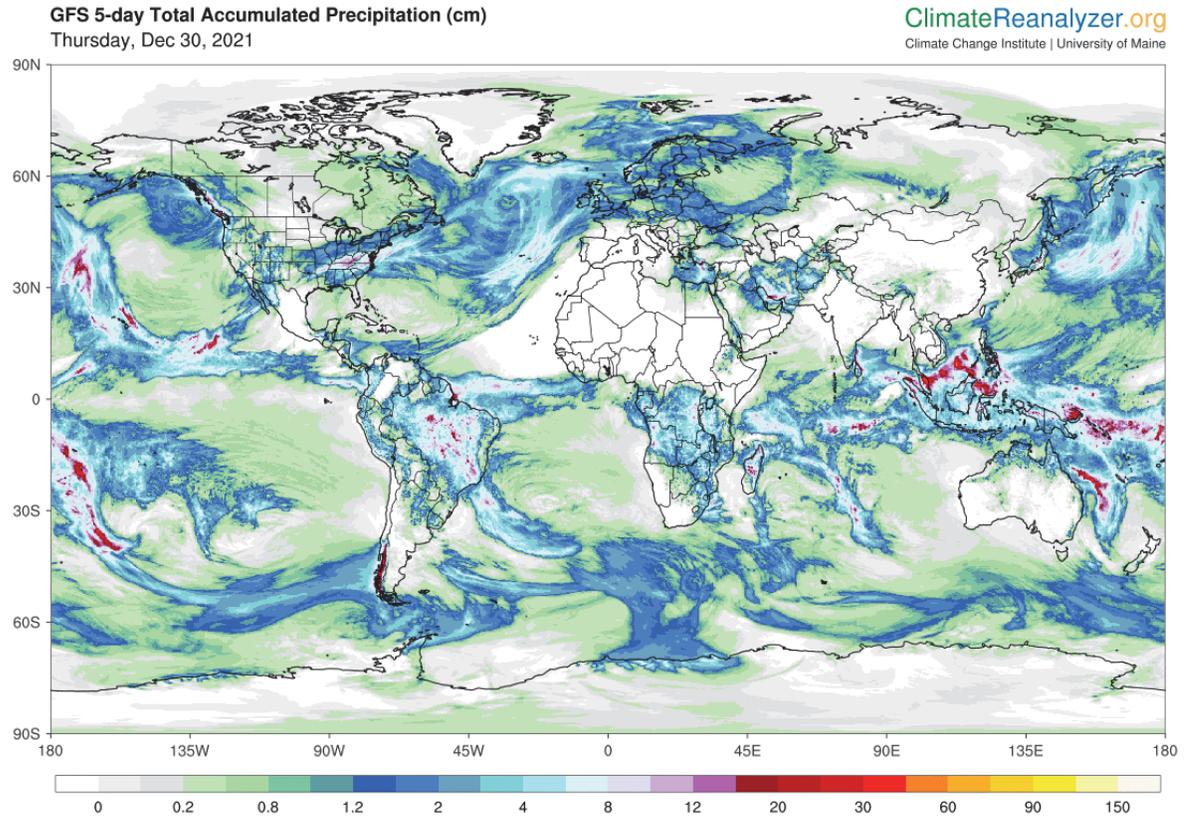
Strong downslope winds and an exceptionally dry air mass resulted in a period of dangerous fire weather conditions in parts of northern Colorado on December 30 – particularly in the wildland-urban interface in southern Boulder County. In the foothill communities, wind gusts approached and exceeded 80 to 90 mph (130 to 145 kph) in the afternoon hours. A maximum gust of 110 mph (177 kph) was measured in northern Jefferson County. Damaged power lines and transformers sparked multiple grass fires in the region. In Boulder County, evacuation orders were issued for the City of Superior and Louisville due to the rapidly growing Marshall Fire. Preliminary reports indicated potentially significant damage to several homes and other structures in Superior and Louisville. A second large grass fire, known as the Middle Fork Fire, was threatening structures near the North Foothills Highway and Middle Fork Road.

## Global Temperature Anomaly Forecast



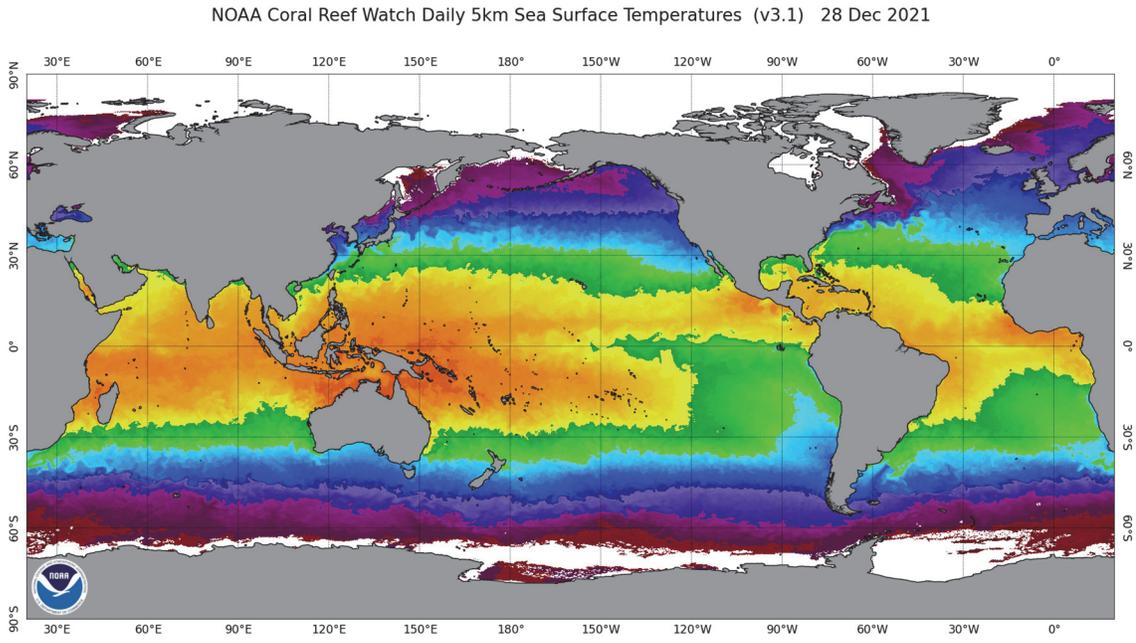
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

## Global Precipitation Anomaly Forecast

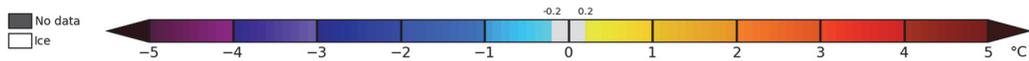
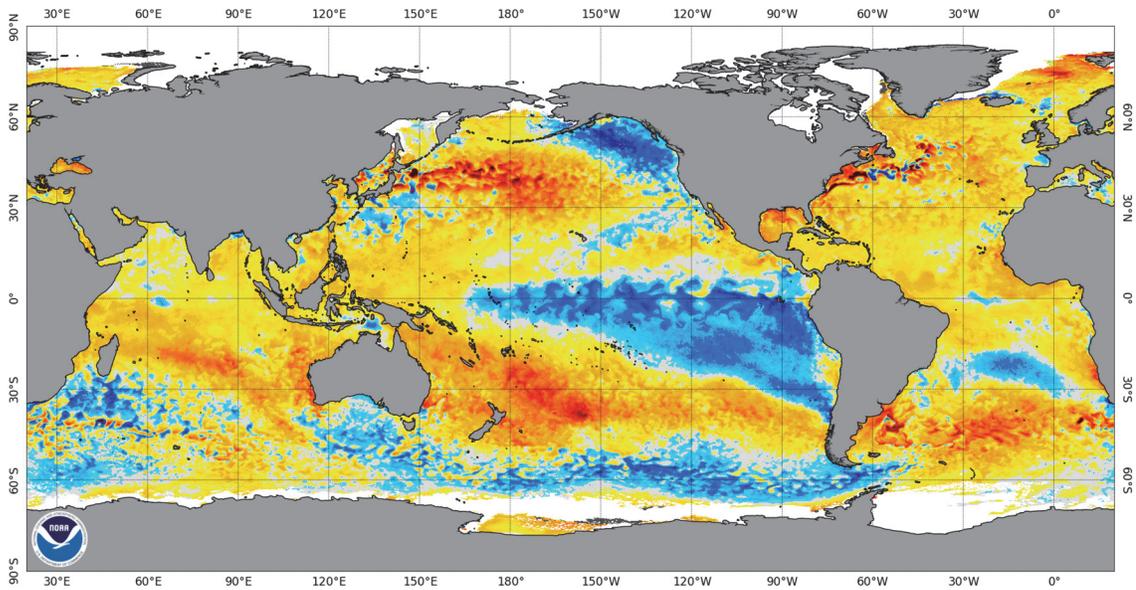


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

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



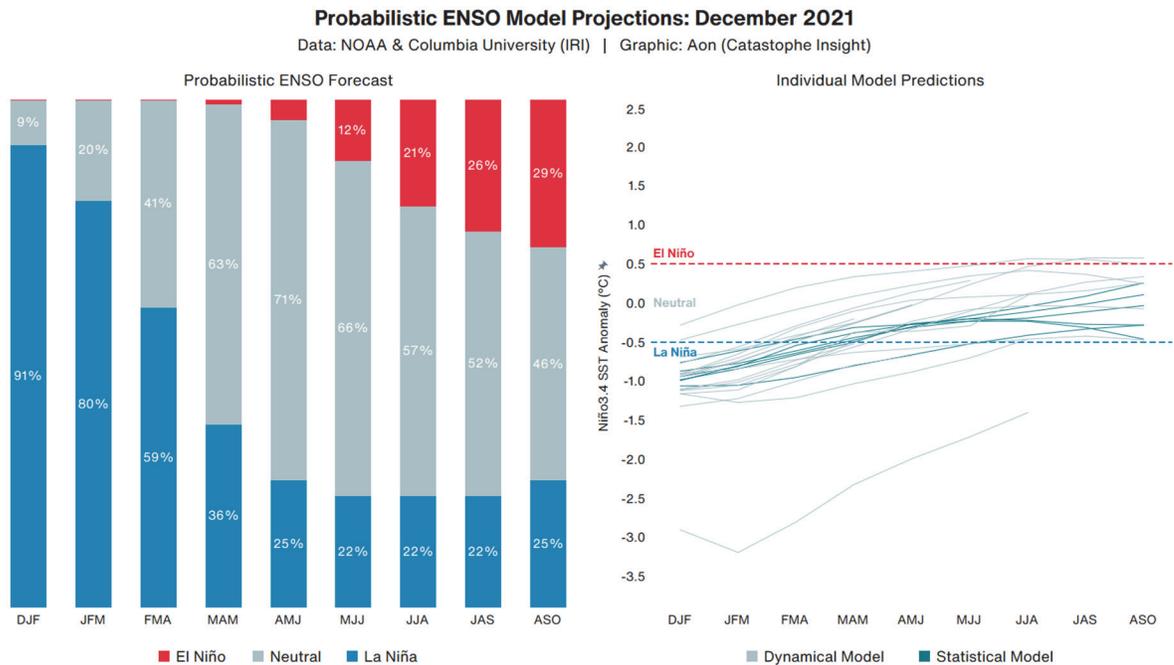
NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1) 28 Dec 2021



## El Niño-Southern Oscillation (ENSO)

### Overview

La Niña conditions have returned in the Central and Eastern Pacific Ocean, and NOAA has issued a “La Niña Advisory”. NOAA cites a 95 percent chance of La Niña conditions persisting through the Northern Hemisphere winter months, and a 60 percent chance of lasting through the spring (April to June). The agency also anticipates the possibility of a moderate strength La Niña at its peak before transitioning back to ENSO-neutral conditions by the Northern Hemisphere Spring of 2022.



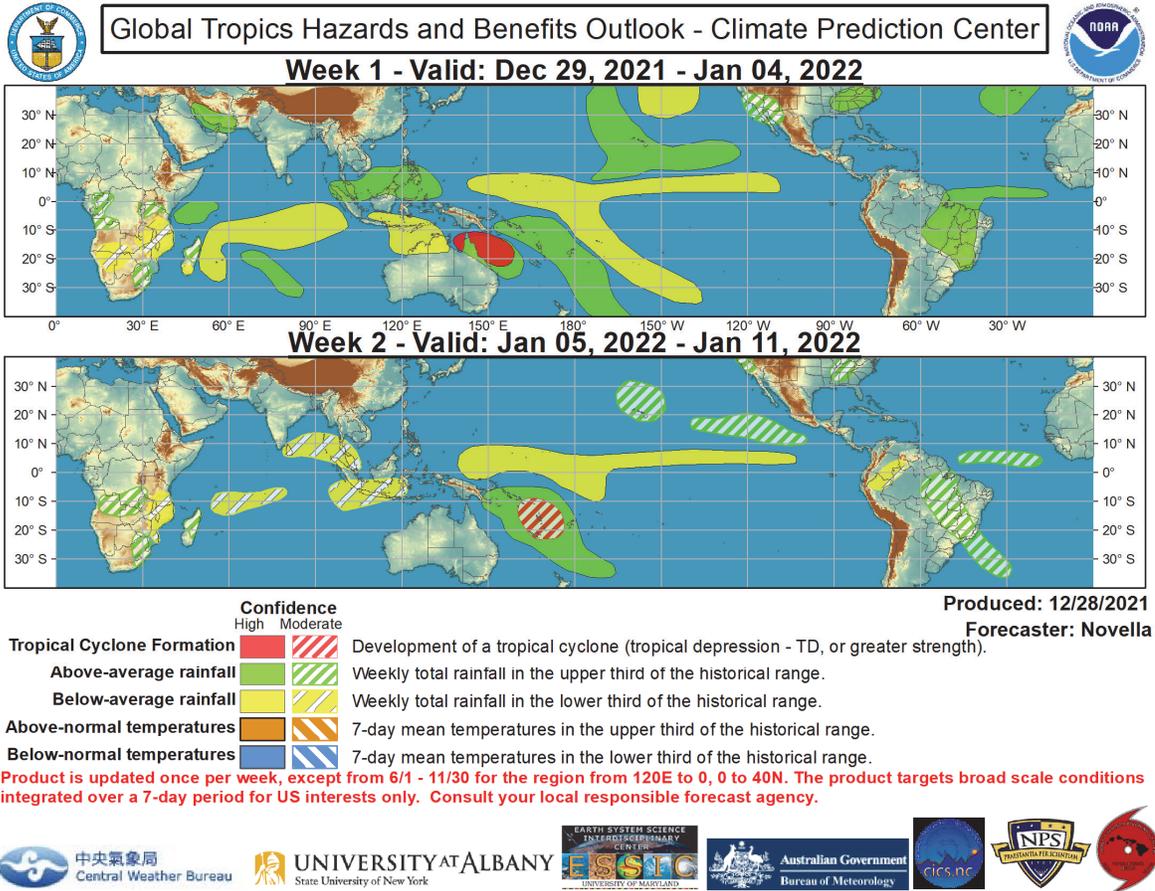
**El Niño:** Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

**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

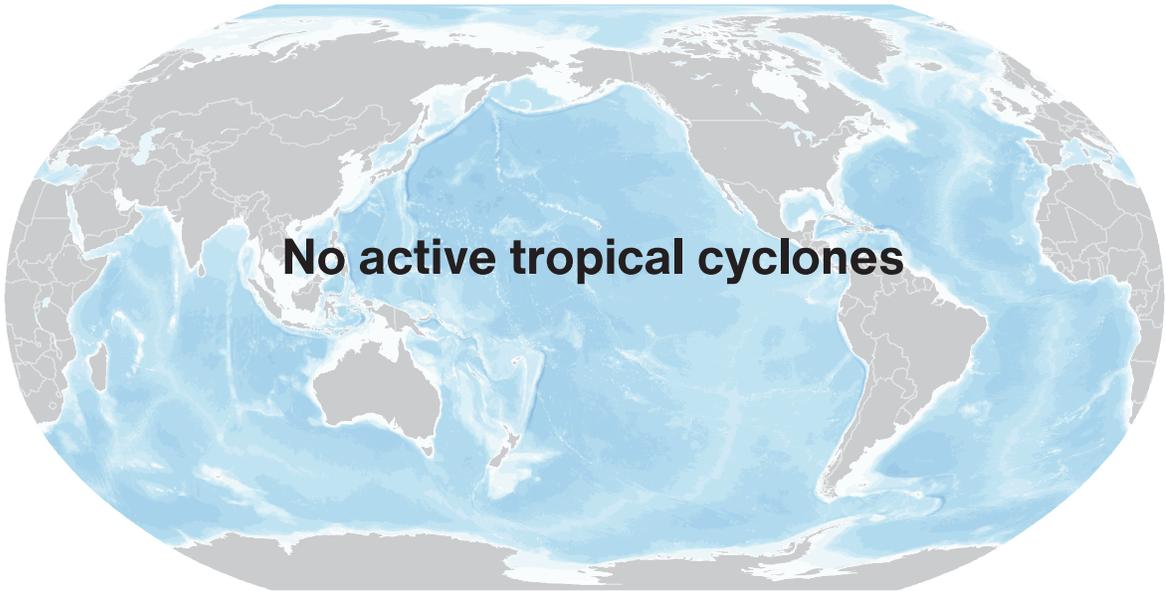


Source: Climate Prediction Center (NOAA)

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## Current Tropical Cyclone Activity

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

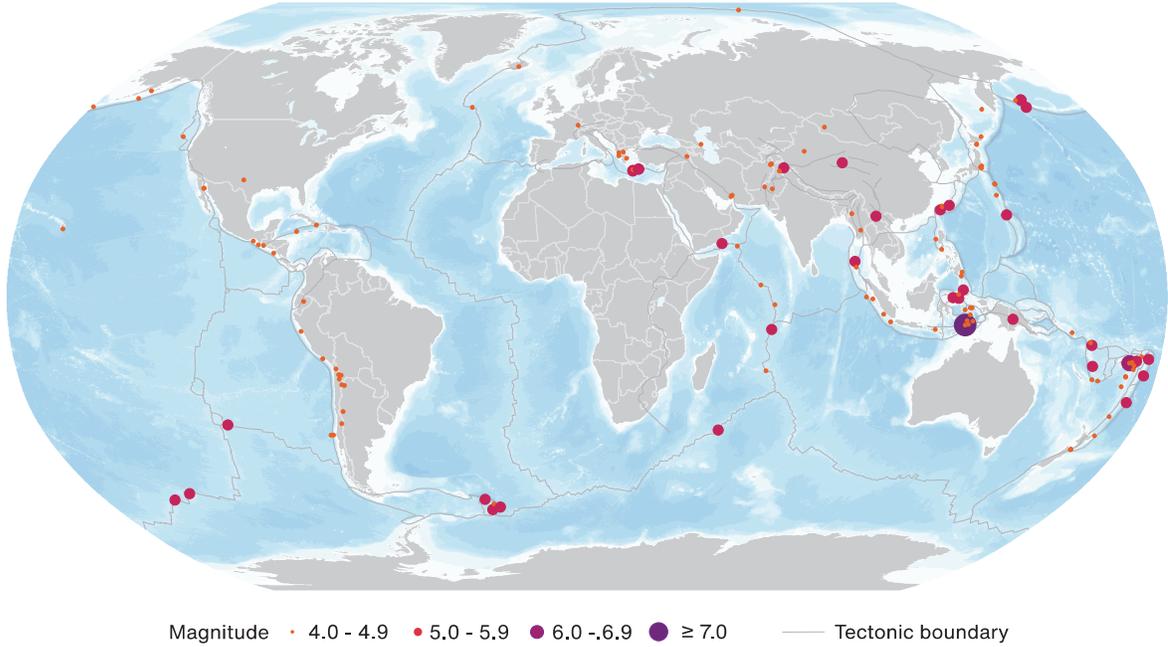
Storm Name	Location	Winds	Location from Nearest Land Area

\* TD: Tropical Depression, TS: Tropical Storm, HU: Hurricane, TY: Typhoon, CY: Cyclone

\*\* 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)

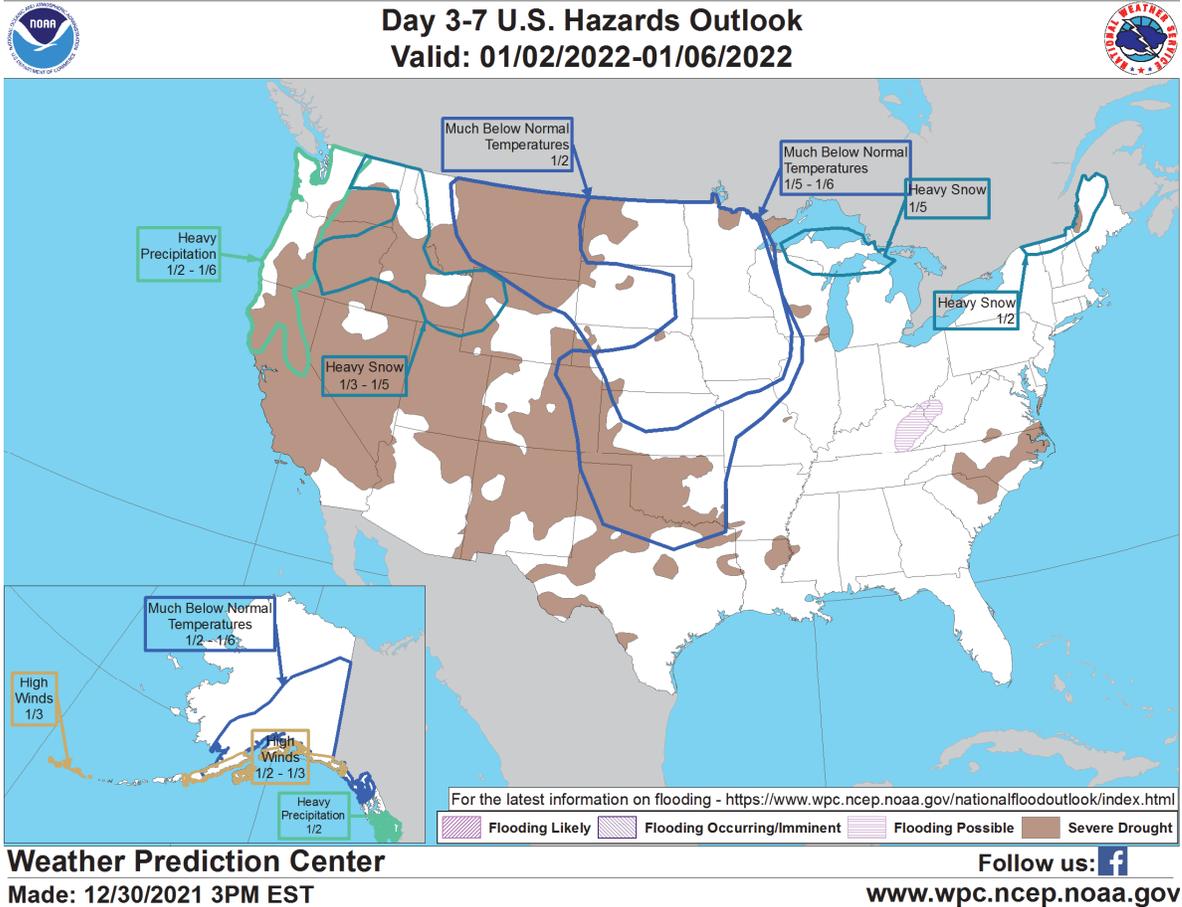
## Global Earthquake Activity ( $\geq M4.0$ ): December 24-30



Date (UTC)	Location	Magnitude	Epicenter
12/26/2021	18.09S, 179.35W	6.1	14 km (9 mi) E of Levuka, Fiji
12/29/2021	7.59S, 127.58E	7.3	12 km (7 mi) NNE of Lospalos, Timor Leste

Source: United States Geological Survey

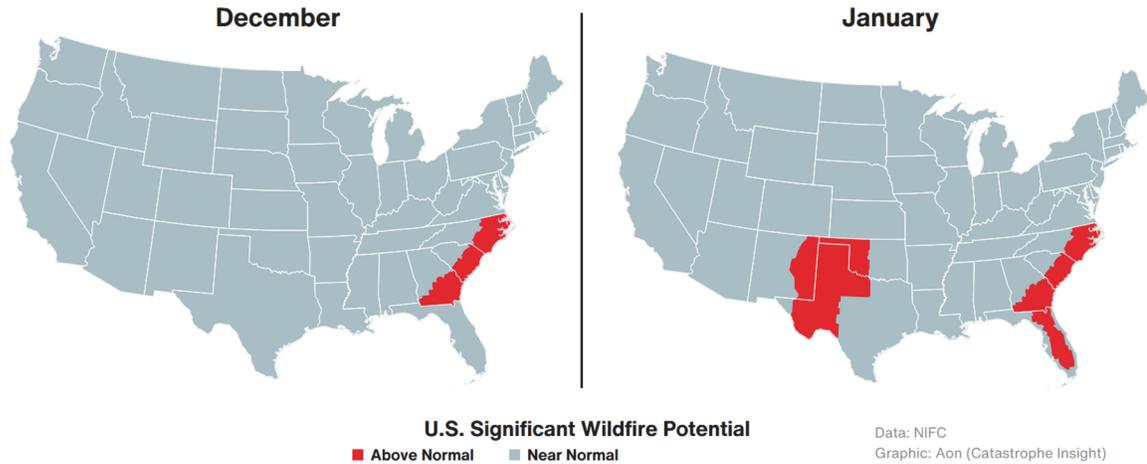
## U.S. Hazard Outlook



- An Arctic air mass will continue to bring much below normal temperatures to parts of the Plains and Upper Mississippi Valley on January 2. A cold high pressure will result in another round of cold air across the Northern Rockies and Plains on January 5.
- A potent storm system is expected bring heavy snow to northern New England on January 2, after producing wintry weather across the Midwest and severe storms in the South on New Year's Day.
- An active pattern in the West will feature heavy precipitation for Northern California and the Pacific Northwest between January 2-6, with heavy snow in the Intermountain West and Northern Rockies.
- Heavy snow is likely across the Upper Great Lakes on January 5.

Source: Weather Prediction Center (NOAA)

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



### Annual YTD Wildfire Comparison: December 24\*

Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2017	65,130	9,563,168	146.83
2018	55,911	8,582,609	153.50
2019	49,574	4,576,991	92.33
2020	57,547	10,357,374	179.98
2021	58,288	7,819,070	134.15
<b>10-Year Average (2011-2020)</b>	<b>60,091</b>	<b>7,410,408</b>	<b>123.32</b>

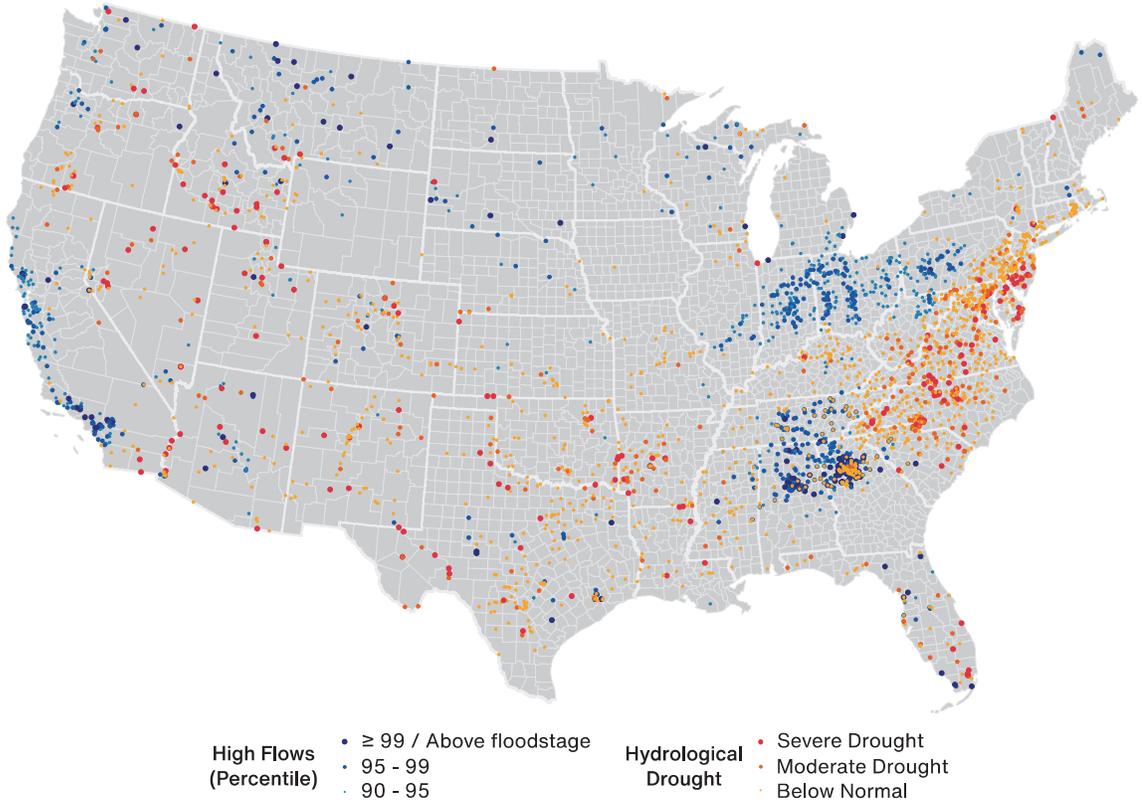
### Top 5 Most Acres Burned by State: December 30

State	Number of Fires	Acres Burned	Acres Burned Per Fire
California	9,263	2,232,607	241.02
Oregon	2,099	822,775	391.98
Montana	2,573	747,678	290.59
Washington	1,862	674,222	362.10
Arizona	1,774	524,429	295.62

\*Most recent NIFC update

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
Missouri River at Fort Benton, Montana	6.92	99.24
Weber River near Oakley, Utah	5.90	99.15
St. Louis River at Scanlon, Minnesota	4.56	99.12
Musselshell River at Harlowton, Montana	8.73	99.10
Wind River at Riverton, Wyoming	5.50	99.06

Source: United States Geological Survey

## Source Information

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### **Brazil: Flooding**

Instituto Nacional de Meteorologia (INMET)

Flood Death Toll Rises in Bahia, Thousands Displaced in Minas Gerais, *Floodlist*

Find out why it has rained so much in Bahia in recent days, *Jornal O Globo*

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

Freezing rain in Germany: 2 dead and several injured, *Catastrophes Naturelles*, *ESWD*

Bushfire burns through 12,000 hectares in Chile, *Reuters*, *Onemi*

Severe Brazil flooding spreads in Bahia and beyond, *The Washington Post*

Calls for humanitarian aid as parts of Wexford devastated by 'worst flooding in living memory' on Christmas Day. *Independent*

PowerOutage.US

U.S. National Weather Service

U.S. Storm Prediction Center

Dozens Rescued From Floods in Erdine and Kirklareli, *Floodlist*

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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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