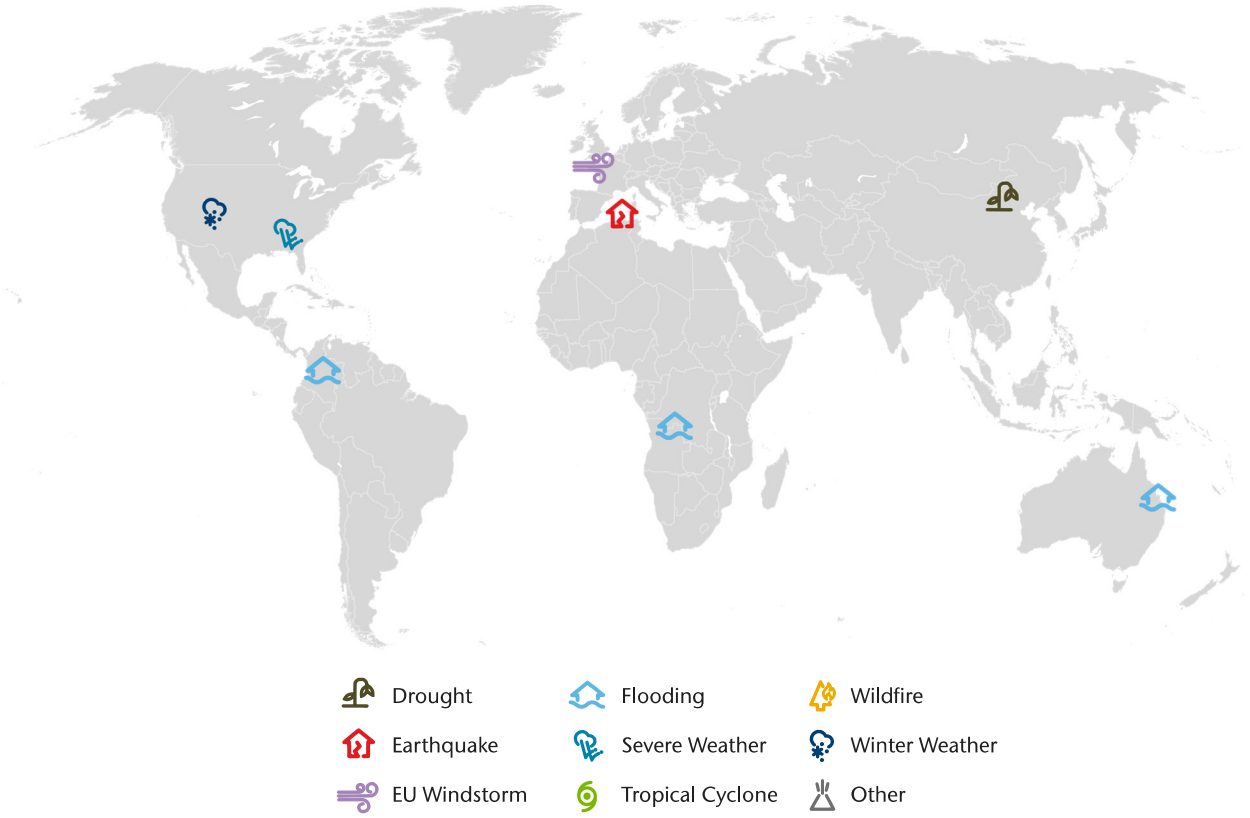
Weekly Cat Report

March 19, 2021

This Week's Natural Disaster Events



Event	Impacted Areas	Fatalities	Damaged Structures and/or Filed Claims	Preliminary Economic Loss (USD)*	Page
Winter Weather	United States	0	Thousands	Millions	3
Severe Weather	United States	0	Thousands	100+ million	3
Windstorms Klaus & Luis	Western & Central Europe	0	10s of thousands	100s of millions	13
Flooding	Colombia	15+	Hundreds	Unknown	15
Severe Weather	Mongolia, China	10+	Unknown	Unknown	15
Flooding	Australia	0	Thousands	Millions	15
Earthquake	Algeria	0	Unknown	Unknown	15
Flooding	DRC & Angola	8	Unknown	Unknown	15

**Please note that these estimates are preliminary and subject to change. In some instances, initial estimates may be significantly adjusted as losses develop over time. This data is provided as an initial view of the potential financial impact from a recently completed or ongoing event based on early available assessments.*

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

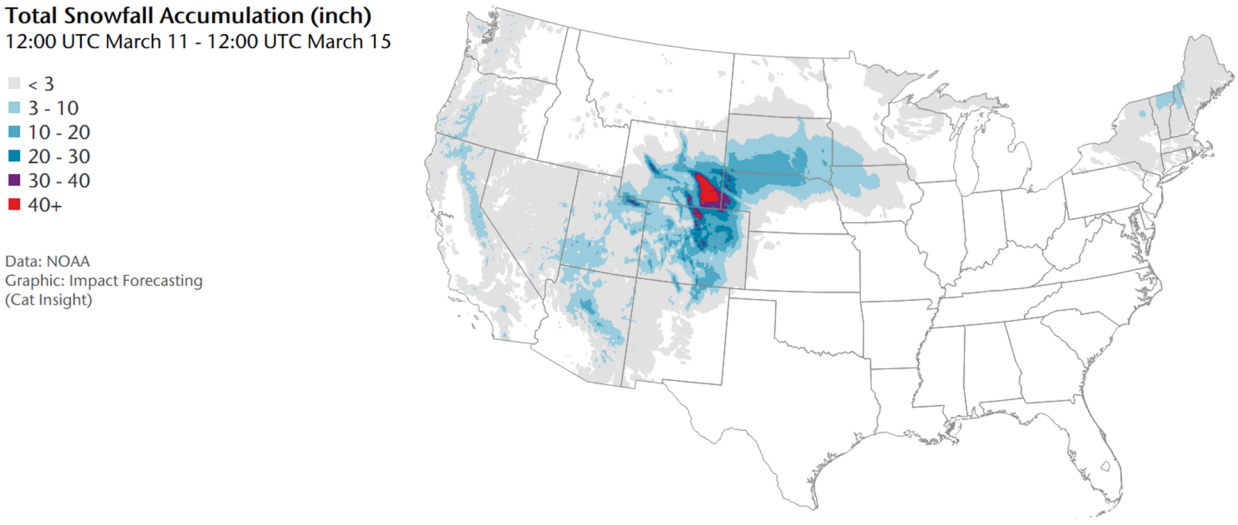
Record snow precedes major severe weather outbreak

Two highly impactful storm systems intensified across the central United States between March 12-18. A potent upper level low interacting with a nearly stationary frontal boundary generated a record breaking winter storm across portions of Wyoming, Colorado, Nebraska, and South Dakota between March 12-15, while severe weather swept across the Southern Plains. Large hail and damaging tornadoes were observed in the Texas Panhandle on March 12-13. By March 16, a vigorous low-pressure system emerged across the Plains, generating a significant multi-day severe weather outbreak in the Southern Plains, Lower Mississippi Valley, and Southeast between Mach 16-18. On March 17, severe storms and supercells spawned multiple strong and long track tornadoes across portions of Louisiana, Alabama, and Mississippi. The storms resulted in notable damage to structures, power lines, and trees.

Meteorological Recap

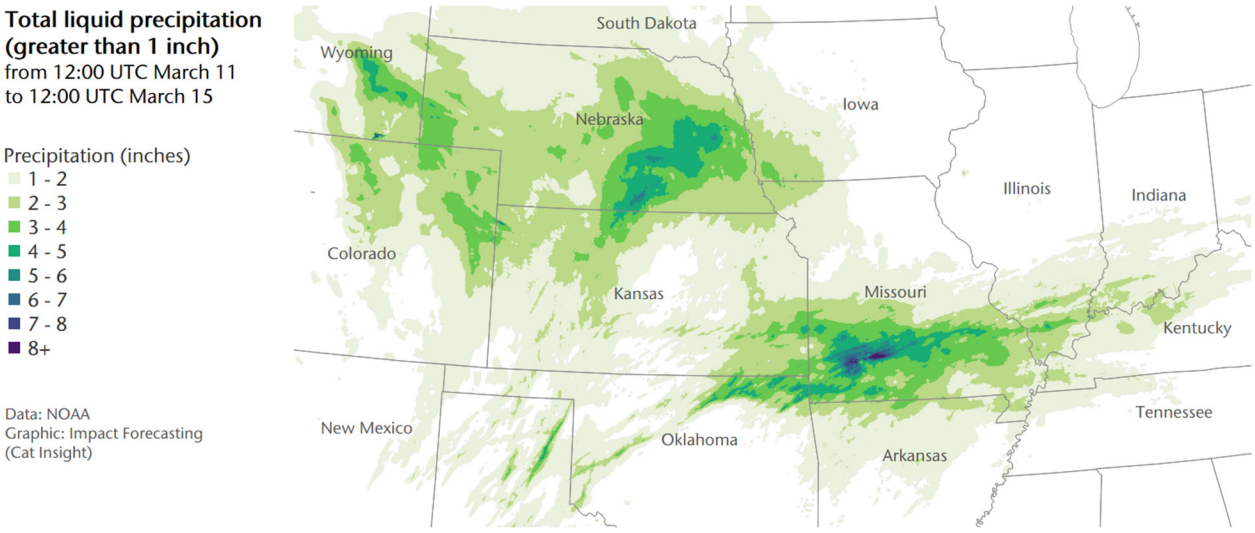
March 12-15

An intensifying, cold upper-level low pressure system generated multiple hazards across southwestern and central portions of the U.S. between March 12-15 as it interacted with a frontal boundary draped across the Central Plains. Impacts included a long duration and significant winter weather event in regions of Colorado, Wyoming, Nebraska, and South Dakota, flooding and flash flooding in the Plains and Middle Mississippi Valley, and a multi-day severe weather outbreak in the southern Plains – particularly in sparsely populated regions of northwestern Texas, including the Texas Panhandle.



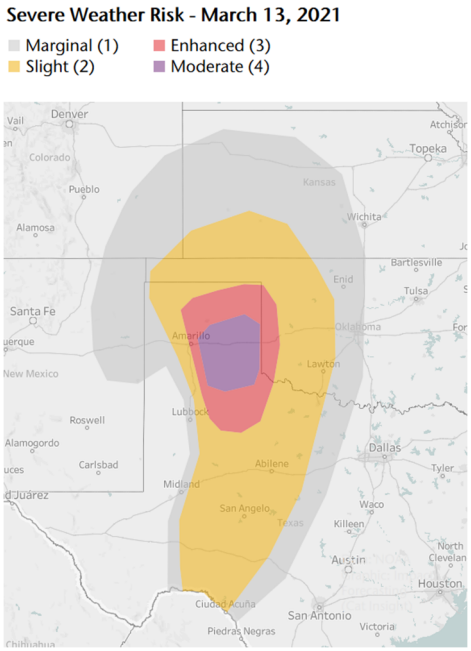
Severe Weather and Heavy Rainfall

A quasi-stationary frontal boundary extending across the Plains and Middle Mississippi Valley served as the focal region for an extended period of heavy rainfall and locally severe storms, peaking between March 12-14. A broad region of southwesterly flow downstream from the cut-off low allowed moisture from the Gulf of Mexico to pool along the frontal boundary. These conditions, combined with favorable upper level dynamics resulted in prolonged periods of developing and training heavy rainfall and convective activity adjacent to and north of the frontal boundary. By March 13, heavy rainfall resulted in flash flood and flood watches and warnings spanning from Oklahoma into Illinois.



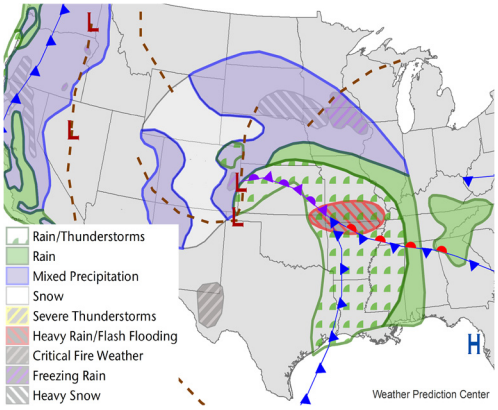
In the Southern Plains, the Storm Prediction Center (SPC) issued a Slight Risk (level 2 out of 5) for severe storms in a region anchored across northwest Texas and southwest Oklahoma on March 12. Storm development was enhanced by a moderately unstable atmosphere characterized by dewpoints approaching 60°F (16°C) and steep mid-level lapse rates (changes in temperature with height). Isolated thunderstorms were initiated in eastern New Mexico and northwestern Texas by the late evening hours. A particularly impactful long track supercell trailed north and east of Lubbock (Texas). The storms generated localized reports of severe hail, strong winds, and a possible tornado.

A second day of concentrated damaging severe weather in Texas occurred on March 13. The SPC indicated a Moderate Risk (level 4 out of 5) for severe storms in the east-central and southeastern Texas Panhandle. A broader region extending from southwestern Kansas into southwestern Texas fell within a Slight Risk (level 2 out of 5) or greater. The focus for severe weather was in the warm sector of a surface cyclone, and eastward of a developing dryline (a boundary which separates dry air form moist air). The environment east of the dryline was characterized by ample moisture and diurnal heating, steep mid-level lapse rates, and a favorable shear profile conducive for severe thunderstorm and supercell development. Throughout the late afternoon and early evening hours multiple supercells with strong rotation tracked across the Texas Panhandle, while the greatest impacts occurred roughly between Amarillo and Lubbock. Particularly Dangerous Situation (PDS) tornado warnings were issued for portions of Randall, Armstrong, and Carson Counties. As of this writing, 27 reports of tornadoes were compiled in Texas on March 13 – in some instances multiple reports can encompass a single tornado.



Winter Weather

The cold upper level low initially churning across southern California lifted into Colorado between March 12-14, where it interacted with the quasi-stationary frontal boundary across the Plains. This pattern generated a highly impactful and long duration winter weather event in regions of the Central Rockies and High Plains which peaked between March 13-14. The progression of the low was slowed by a blocking ridge to its the northeast in tandem with a strong ridge over the Gulf of Mexico. A conveyor belt of warm, moist air was advected northeastward from the Gulf of Mexico and forced upward by increasingly higher terrain near the Front Range of the Rocky Mountains where it encountered substantially colder air. This process, known as upslope flow, significantly enhanced the amount and rate of snowfall accumulation in portions of Colorado, Wyoming, Nebraska, and South Dakota.



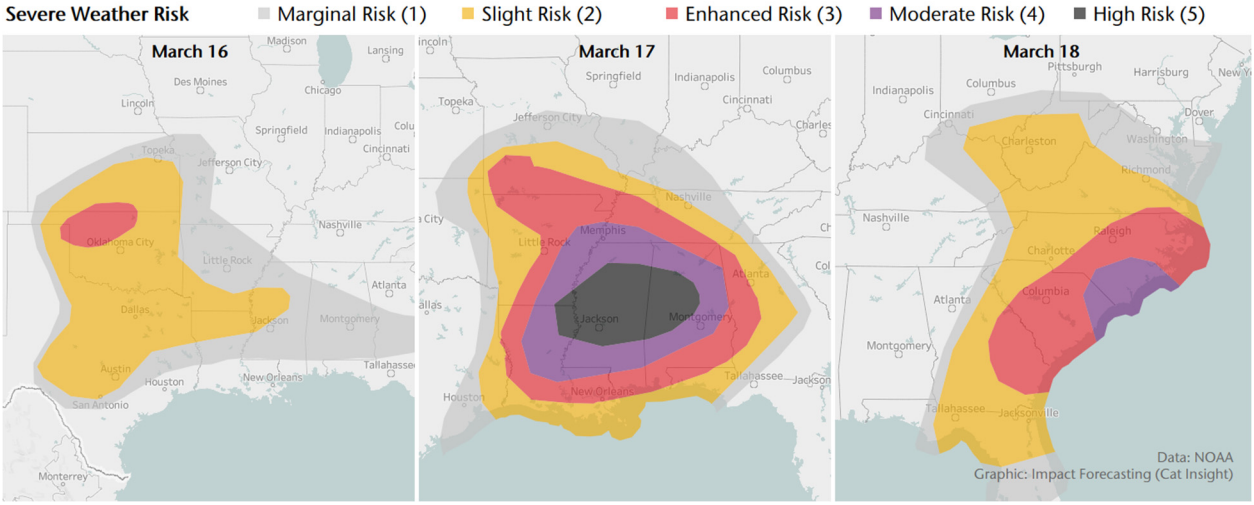
U.S Surface Weather Map from March 14
Data: Weather Prediction Center

Strong winds and blowing snow prompted the NWS to issue Blizzard Warnings across expanses of the Central Rockies and High Plains by March 14. During the height of the event, the NWS forecast office in Cheyenne (Wyoming) warned of historic and crippling winter storm impacts across southeast Wyoming and western Nebraska. In Cheyenne, a two-day snowfall accumulation of 30.8 inches (78 centimeters) was measured between March 13-14, this was 1.1 inches (2.8 centimeters) short of reaching the record. However, Cheyenne did set a one-day snowfall record, with 22.7 inches (57.7 centimeters) measured on March 14. To the south, Denver International Airport (Colorado) reported a snowfall total of 27.1 inches (69 centimeters) between March 13-14, ranking as the 2nd largest two-day snowfall total, and the 4th biggest snowstorm in Denver's recorded history. Records for the airport extend back through 1881. By March 15, the low began to wind down while progressing northeastward, bringing additional winter weather impacts to portions of the Northern Plains and Midwest.

The storm arrived as both Colorado and Wyoming (along with much of the Southwest) were experiencing ongoing severe and long-term drought conditions. Data from the United States Drought Monitor (USDM) released on March 11 indicated that 87 percent of Wyoming was experiencing drought conditions (level 2 out of 5), of which 20 percent was classified as extreme drought (level 4 out of 5). In Colorado, 99 percent of the state was affected by drought conditions, of which 57 percent was classified as extreme (level 4 out of 5) or exceptional (level 5 out of 5). The substantial and slowly melting snowpack produced by the event was beneficial to the regions hydrological outlook in the short term.

March 16-18

A vigorous and compact mid-level rotation which trekked southeastward across the Four Corners region on March 16 became the catalyst for a strengthening surface low pressure system as it emerged over the Plains. This environment generated a high impact multi-day severe weather outbreak between March 16-18 which evolved eastward across the Southern Plains, Lower Mississippi Valley, and Southeast. The severe threat was greatest in the warm sector, where southerly winds advected ample low-level moisture from the Gulf of Mexico northward around the eastern side of the low-pressure system. At the upper levels, an advantageously positioned and fast-moving jet-stream enhanced upward motion and aided in generating favorable wind shear profiles necessary for the development of severe storms and supercells.



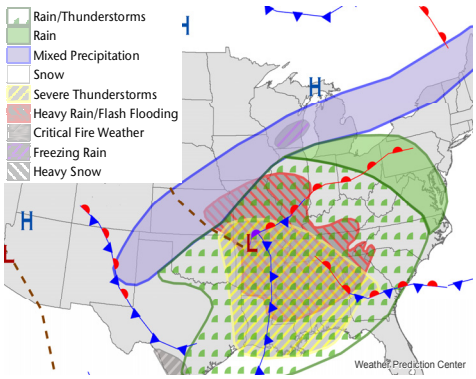
March 16

On March 16, the Storm Prediction Center (SPC) highlighted a region in northwest and north-central Oklahoma for an Enhanced Risk (level 3 out of 5) for severe weather, surrounded by a broader region of Slight Risk (level 2 out of 5) across portions of the Southern Plains and Lower Mississippi Valley. Favorable conditions for severe storm development increased in the late evening and overnight hours in response to the approaching surface cyclone. Southerly winds aided in increased low-level moisture, with dewpoints in Oklahoma reaching into the 60's (°F).

Severe storm clusters and supercells initiated across the Texas Panhandle and expanded into Oklahoma during the evening and overnight hours in the region south of the surface warm front and east of a dryline (a boundary which separates dry air from moist air). Further storm development occurred in central Texas, ahead of the dryline and cold front. The predominant hazards with these events were strong straight-line winds and severe hail. As cold air wrapped around the backside of the low-pressure system, precipitation quickly changed from rain to snow across portions of the Oklahoma and Texas Panhandles. The snow, coupled with strong winds prompted the NWS is issue Blizzard Warnings across the region.

March 17

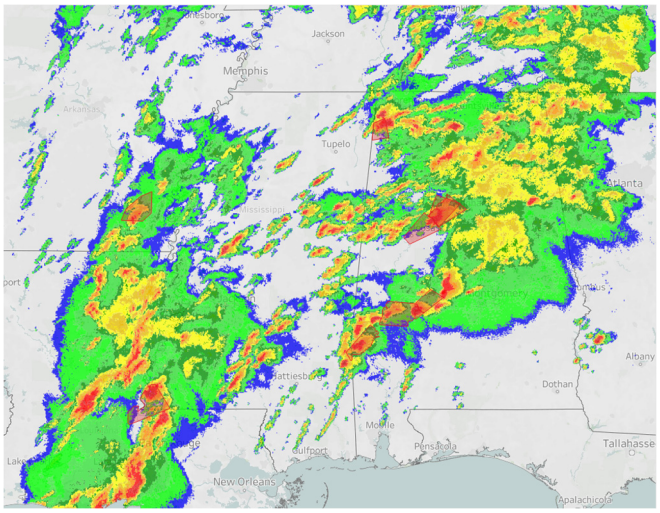
On March 17, the surface cyclone and associated intense short-wave trough progressed eastward toward the Lower Mississippi Valley. Strengthening moisture transport aided by southerly flow enhanced a large warm sector capable of generating successive rounds of severe storms and supercells. The SPC indicated a broad region with a significant threat for widespread severe weather and tornadoes across the Lower Mississippi Valley and Deep South. This included a High Risk (level 5 out of 5) of severe weather for northeast Louisiana, southeast Arkansas, and central Mississippi and Alabama. This was the first High Risk issued by the SPC in March since 2012. This region included a rare hatched 45 percent tornado risk across eastern Mississippi and western Alabama. This represented the probability that a strong tornado would pass within 25 miles of any point in the region of interest.



U.S Surface Weather Map from March 17
Data: Weather Prediction Center

In the morning hours, convection associated with the dry line was ongoing across portions of eastern Texas. Furthermore, storms were continuing across regions near the surface warm front, centered in northeast Arkansas, northern Mississippi, and southwest Tennessee. This elevated convection produced locally heavy rainfall and flash flooding as the storms continued to push northward with the advance of the frontal boundary, which further expanded the warm sector to the south. Instability was enhanced in the warm sector as the day progressed due to extremely favorable wind shear profiles (change of wind speed and/or direction with height), a developing low-level jet, warming surface temperatures, dewpoints approaching and exceeding the mid to upper 60's (°F), and sufficient Convective Available Potential Energy or CAPE, which is related to the updraft strength in a thunderstorm.

At 11:35 AM CDT (16:45 UTC) on March 17, the SPC issued a Particularly Dangerous Situation (PDS) Tornado Watch for portions of western and central Alabama and central to eastern Mississippi. The watch warned of; numerous tornadoes with a few intense tornadoes likely, in addition to anticipated localized significant straight-line wind gusts reaching 80 mph (128 kph) and isolated large hail up to 3.0 inches (7.6 centimeters) in diameter. Shortly after the watch was initiated, numerous discrete cells and supercell thunderstorms ignited across the area of concern. A second PDS Tornado Watch was issued at 11:55 AM (17:55 UTC) west of the first watch. The second PDS watch area encompassed southeast Arkansas, northern Louisiana, and northern and western Mississippi. The watch was issued as multiple strong and long track tornadoes were possible in an increasingly unstable environment.



Radar Reflectivity and Tornado Warnings (March 17, 21:00 UTC)
Data: MRMS/NOAA; Graphic: Impact Forecasting (Cat Insight)

By the afternoon hours, tornado warnings and tornado sightings occurred throughout Mississippi and Alabama, coupled with multiple instances of flash flooding. Several PDS tornado warnings were issued in Alabama, of which portions of Tuscaloosa, Choctaw, and Clarke Counties were included. Many localities experienced multiple rounds of severe weather between the afternoon and evening hours of March 17. In Alabama, four separate tornado warned storms tracked over or near the town of Selma (Dallas County). As of this writing, there were 120 instances of severe weather reported on March 17, of which 27 were for tornadoes. These numbers are anticipated to change in the coming days, as storm surveys and damage assessments are completed. On March 18, the NWS forecast office in Birmingham began surveying storm damage, and noted tornadoes potentially tracked across 12 counties in central Alabama. The NWS issued no less than 100 tornado warnings between March 16 and the morning of March 18 – a majority of which occurred on March 17.

Once the initial round of severe storms moved out of Mississippi, a strengthening low-level jet, and period of clearing allowed surface temperature to climb into the 80's (°F) with dewpoints remaining in the 60's (°F). This created a moderately unstable environment in which another round of severe storms and supercells would strengthen as the surface trough and frontal boundary approached northeastern Louisiana and central Mississippi. In the evening and overnight hours, a pre-frontal convective line, proceeded to move through the region generating a final push of severe weather and heavy rainfall. Closer to the surface cyclone, a cluster of severe storms generated large hail and a reported tornado in southern Missouri.

March 18

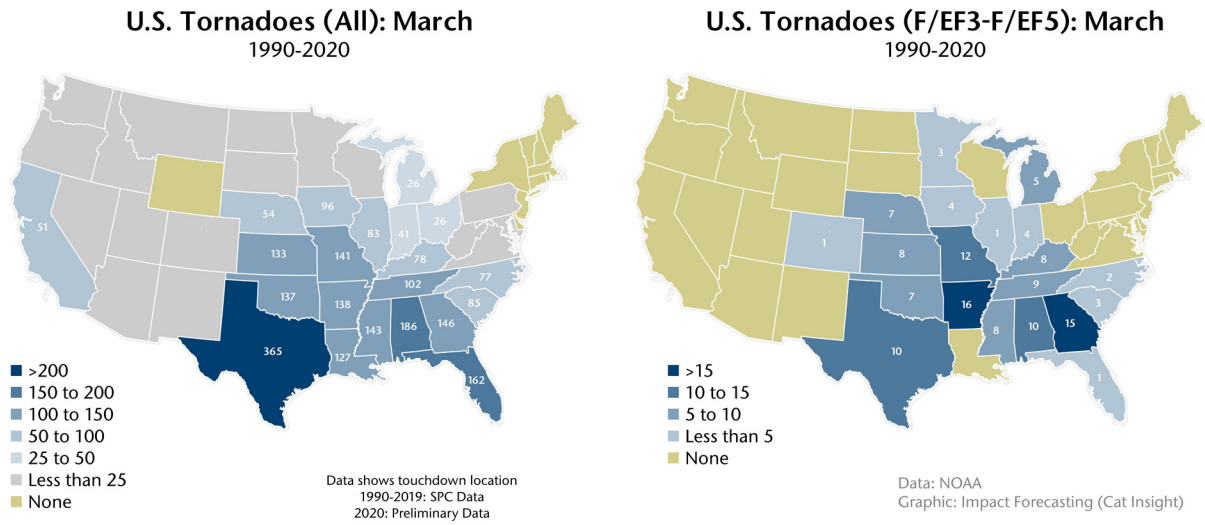
The main severe weather threat continued to evolve eastward by March 18, as a regional outbreak of storms targeted the Southeast and Appalachians with support from the upper level low, and dynamic mid-level jet-stream. The surface low proceeded to occlude over the Ohio River Valley, while a strong cold frontal boundary trekked eastward over the Southeastern U.S.

A convective line of storms, which previously impacted the Deep South overnight, continued to bring locally heavy rainfall across the region throughout the morning hours. Localities across southern Georgia and the Florida Panhandle were most affected. A warm front associated with the low-pressure system shifted northward throughout the day, allowing moisture to push inland in advance of approaching storms. The surge of moisture, combined with sufficient daytime heating and mid-level lapse rates (the change in temperature with height) allowed for further limited invigoration and development of severe weather throughout the day. The SPC initially issued a Moderate Risk (level 4 out of 5) for severe storms in a small region of northeastern South Carolina and southern North Carolina, which was downgraded by the early afternoon. A broad region of Slight Risk (level 2 out of 5) or higher extended northward from northern Florida to central Virginia, and westward toward the surface low in regions of the Appalachians and Ohio River Valley.

Miscellaneous

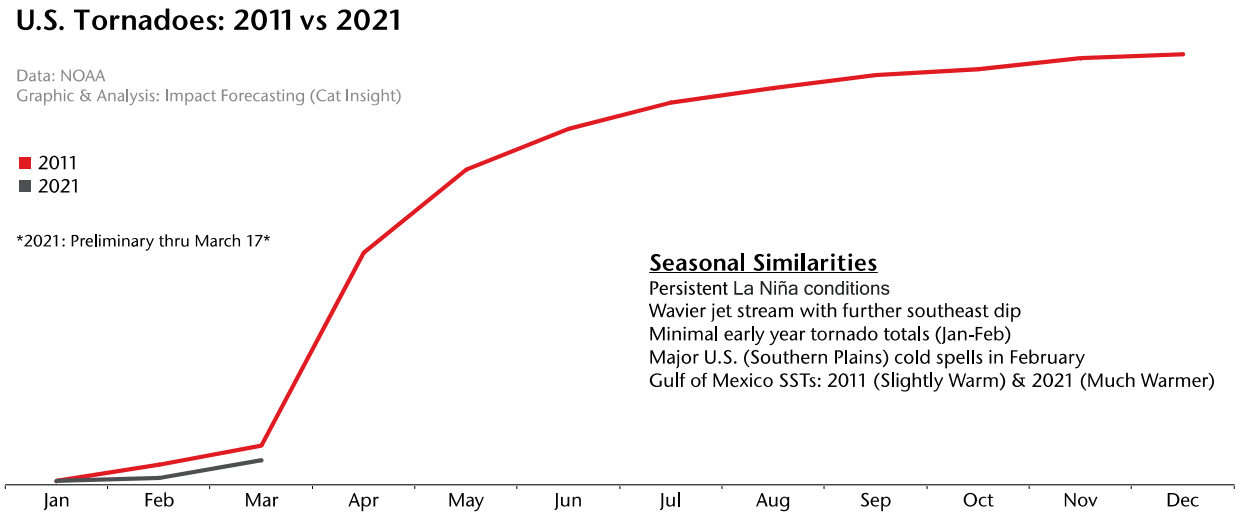
March Tornadoes

March is often a very active month for tornadic activity in the United States. The graphic(s) below highlight historical tornado frequency in the U.S. since 1990 – the start of the “Doppler Era”.

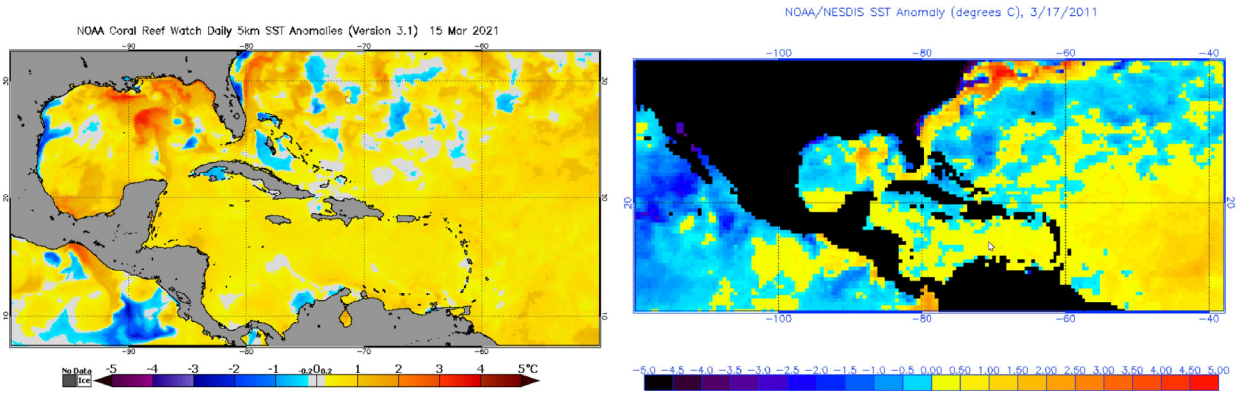


2011 vs 2021

There are also notable comparisons to be made regarding the start of 2021 versus what was experienced in 2011. While it remains highly uncertain (and unlikely) that 2021 will rival the ferocity and frequency of the tornado season of 2011, it is worth noting that La Niña conditions remain present and that often drives higher tornado counts into the U.S. Southeast. Similarly to 2011, 2021 has also featured a major February cold snap into the U.S. Southern Plains. The Gulf of Mexico is significantly warmer in 2021 than it was at this time in 2011, which may be key in fueling spring season thunderstorm events.



The below graphic shows current sea surface temperature anomalies in the Gulf of Mexico and Caribbean Sea on March 15, 2021 and March 17, 2011. The water temperatures are substantially warmer than normal at present, and much warmer than previously seen in at this timeframe in 2011. It is worth noting that by April 2011, the Gulf of Mexico would significantly warm and serve as a primary source of fuel for the atmosphere that drove the series of historic tornado outbreaks.



Event Details

March 12-15

In **Colorado**, blowing snow aided in closing all runways at Denver International Airport by March 14, where no less than 2,300 flights were canceled or delayed between March 13-14. Peña Boulevard, which leads to the airport, quickly became impassable with multiple vehicles stranded on the roadway. In Aurora, east of Denver, the Police Department responded to numerous calls regarding motorist in need of assistance, including 25-30 stranded vehicles on the E-470 toll road. The heavy and wet snow generated by this storm was able to easily stick to surfaces like power lines and trees. Multiple instances of tree damage were reported, especially in Larimer County and the Fort Collins area. No less than 40,000 customers across Colorado were affected by power outages by March 14.

Near whiteout conditions in Wyoming on March 14
Source; Wyoming Highway Patrol

In **Wyoming**, the Department of Transportation reported snow drifts approaching 5 feet (1.5 meters) along roadways in both Laramie and Cheyenne. Numerous roads and interstates across southern Wyoming were closed or impassable, including portions of Interstate-80. The entire length of Interstate-25 spanning from Buffalo southward to the Colorado border was shutdown. Rocky Mountain Power reported thousands of storm related power outages across the state.

In **Nebraska**, heavy snowfall closed numerous roadways across the panhandle, including portions of Interstate-80 west of North Platte.

In **Texas,** hailstones approaching 2.5 inches (6.4 centimeters were observed in Hale County on March 12. On March 13, baseball sized hailstones approaching 2.75 inches (7.0 centimeters) were reported in Carson County. On the same day, multiple supercells generated several large and highly visible tornadoes across the Texas Panhandle, including twin tornadoes from a single supercell which occurred south of Canyon (Randall County). This supercell originally spawned an EF-2 tornado in Randall County, near the town of Happy. The tornado produced maximum estimated wind speeds of 115 mph (185 kph) with a path length of 17.2 miles (27.7 kilometers). The tornado significantly damaged several homes and electrical transmission lines before collapsing a cell phone tower. A brief secondary EF-1 tornado was noted during this time and was quickly absorbed by the larger circulation. The parent supercell generated an additional EF-1 tornado near Palo Duro Canyon, which coincided with the original tornado for a brief period. This twister had a path length of 18.3 miles (29.5 kilometers) which spanned into Armstrong County. The tornado resulted in damaged campgrounds in Palo Duro Canyon State Park which included several cabins and travel trailers, in addition to notable tree damage. A second EF-2 tornado was confirmed in Donely County, which resulted in minor damage to Clarendon College and surrounding homes, in addition to notable damage to structures near Greenbelt Reservoir. As of this writing, at least 13 tornadoes were confirmed in Texas on March 13: EF-0 (4), EF-1 (2), EF-2 (2) – five additional had yet to be given a rating.

Tornado damage in Randall County, Texas
Source: NWS Amarillo (storm survey)

March 16-18

March 16

Hailstones approaching and exceeding 2.0 inches (5.1 centimeters) were reported in **Mississippi** (Copian County), **Oklahoma** (Kiowa County), and **Texas** (Brown County). In Texas, severe straight-line winds reaching 80 mph (128 kph) downed power lines and toppled multiple train cars in Hemphill County. A brief EF-1 tornado in Mississippi (Copiah County), uprooted and snapped multiple trees, and downed power lines near Beauregard.

March 17

By the evening hours on March 17, at least 65,000 customers were experiencing power outages across Texas, Louisiana, Mississippi, and Alabama, of which 27,000 were in Louisiana. Notable damage from severe weather, including impacts from flooding rainfall, large hail, strong straight-line winds, and destructive tornadoes affected a broad region of the Lower Mississippi Valley and Deep South, particularly Mississippi and Alabama. The Governor of Alabama issued a State of Emergency for all 67 Alabama counties in anticipation of the impacts from severe weather.

In **Alabama**, **Clarke County** emergency management officials reported at least five homes were significantly damaged or destroyed by a tornado resulting in two injuries.

In **Hale** and **Tuscaloosa Counties**, no less than 20 to 30 homes and business were damaged near Moundville by a large EF-1 tornado, with maximum wind speeds approaching 110 mph (177 kph). Notable damage occurred in the Waterbury sub-division. Tuscaloosa County emergency management officials reported structural and roofing damage to houses which displaced several residents.

In **Jefferson County**, tornado damage was reported in the Birmingham suburb of Mount Olive and included downed power lines.

Boat wrapped around a tree in Dallas County, Alabama
Source: Central Alabama Electric Co-op (@CAEC_COOP)

In **Autauga County**, multiple trees were toppled or uprooted and damage to structures from a likely tornado was noted. In bordering **Chilton County**, significant tornado damage to structures and vehicles were reported. Preliminary storm survey results indicated an EF-2 tornado, with maximum wind speeds approaching 130 mph (210 kph), touched down south of Pools Crossroads.

In **Pickens County**, baseball size hailstones, approaching 2.75 inches (7.0 centimeters), were observed. Flash flooding led to several emergency calls regarding water rescues throughout the state, including ones which occurred in **Morgan** and **Houston** Counties. Localities in northeast Alabama reported 24-hour rainfall totals approaching and exceeding 6 inches (150 millimeters). In **Sumter County**, strong winds resulted in no less than 20 to 30 downed trees along with minor structural damage near Hghway-17.

In **Mississippi**, several structures and outbuildings were damaged by a reported tornado in Wayne County.

In **Missouri**, damage from a reported tornado in Stone County downed power lines and trees, while impacting at least one structure. In McDonald and Barry Counties, hailstone approaching 2.0 inches (5.1 centimeters) were observed, with noted damage to vehicles. Significant wind damage to several outbuildings was reported in Barry County.

At the time of this writing, severe weather potential was ongoing in the Southeast, and preliminary damage assessments were underway. If necessary, updated event details will be provided in next week's Weekly Cat Report.

Financial Loss

With the severe weather outbreak still ongoing as of this writing, it remained too preliminary to provide a specific economic or insured loss estimate at this time. However, it does appear that while the March 17/18 outbreak was widespread and impactful, it was not as catastrophic as initially feared. Most of the impacts from severe weather occurred in sparsely populated yet highly vulnerable regions of the Southern Plains and Deep South. The winter weather impacts were likely to be negligible.

Twin storms affect Western & Central Europe

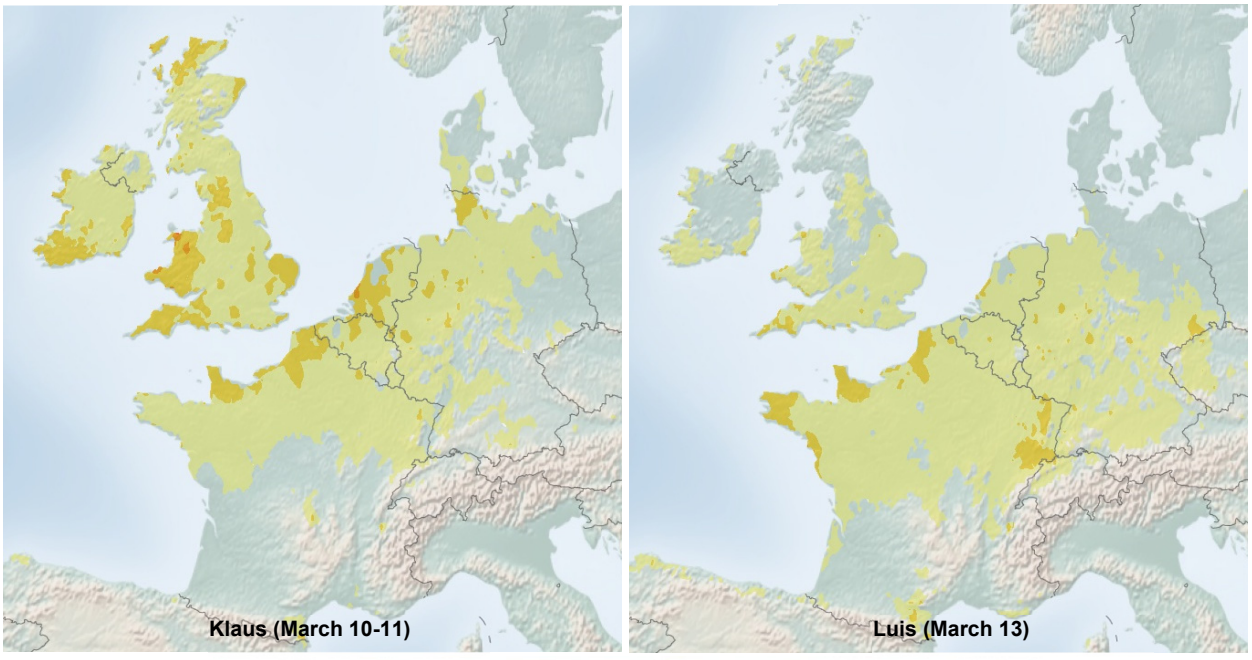
An active cyclonic pattern in Europe resulted in two moderate windstorms, which affected western and central sections of the continent in a quick succession on March 10-13. Windstorms Klaus and Luis brought strong winds and resulted in property and vehicle damage in multiple countries. Local insurers were facing a several tens of thousands of claims worth minimally tens of millions EUR, likely higher.

Meteorological Recap

The period since March 10 was characterized by an active westerly cyclonic pattern in Europe in a positive NAO (North Atlantic Oscillation) phase, which brought locally strong winds and inclement weather to western and central sections of the continent. Quick succession of relatively deep low-pressure areas began with Klaus (names by the FU Berlin) on March 10, when it affected much of Great Britain and Ireland, and later northern France, Benelux and parts of Germany, as its central pressure fell to about 965 millibars and its center moved over the Norwegian Sea, creating a sharp pressure gradient in the North Sea area and the adjacent region.

After a short break on Friday, another low-pressure system (named Luis), which originated south of Greenland and moved quickly eastward in a strong westerly flow, followed a similar path, yet did not reach the intensity of its predecessor and mainly affected northern France, Benelux and Germany with moderate gusts, also brining showers and snow.

Wind footprints of storms Klaus and Luis



Data: Met Office
Graphic: Aon, Catastrophe Insight

Event Details

Neither Klaus nor Luis were officially named by either Met Eiréann or Met Office, despite triggering an orange (medium) warnings for Cork and Kerry counties of **Ireland**. Cork eventually observed a gust of 93 kph (58 mph). Gusts in the **United Kingdom** peaked on exposed coastal stations, namely Capel Curig with 86 mph (138 kph), yet further inland, winds were less severe and eventual damage was relatively minor.

In **Belgium**, the highest gust of 108 kph (67 mph) was measured in Starboek near Antwerp. Effects of the storm resulted in hundreds of emergency interventions across the country, yet there were no fatalities and the amount of damage was described as relatively minor. The situation was similar in the **Netherlands**, with a number of uprooted trees, minor to moderate roof damage and damage on vehicles. Shortly after the storm the local insurance association estimated a potential impact on country's market at EUR30 million (USD36 million).

Germany recorded a moderate market "double" event with notable insured losses; storm Luis generally reached lower intensities, yet affected a more extensive part of the country, including southern and eastern regions, largely unaffected by Klaus. Among the most affected states were Nordrhein-Westfalen, Niedersachsen, Bremen, Schleswig-Holstein, Hamburg, Mecklenburg and Sachsen-Anhalt.

Further impacts, mostly of lower intensity were recorded in France, Switzerland and Central Europe.

Financial Loss

Even though storms Klaus and Luis were not historically significant from a European perspective, they were notable events for local insurance markets in an otherwise extremely quiet windstorm season. Highest impacts were expected to be in Germany, as both storms exercised a large wind field, despite generally low intensities. Insurers in the Netherlands, Belgium, France or the United Kingdom were also faced with thousands of claims and payouts reaching into the tens of millions EUR.

Natural Catastrophes: In Brief

Flooding (Colombia)
Persistent heavy rains have impacted portions of western Colombia since March 11. In the Valle del Cauca Department, a public calamity was declared because of notable damage to roadways, homes, and crops. The city of Santiago de Cali was most impacted. As of this writing, seven weather related deaths were reported across the Department in March. According to Colombia's National Unit for Disaster Risk Management (UNGRD), at least 15 weather related fatalities were confirmed in Colombia along with 289 severe weather events since January 1, of which 146 were landslides, 45 floods, and 32 flash floods.

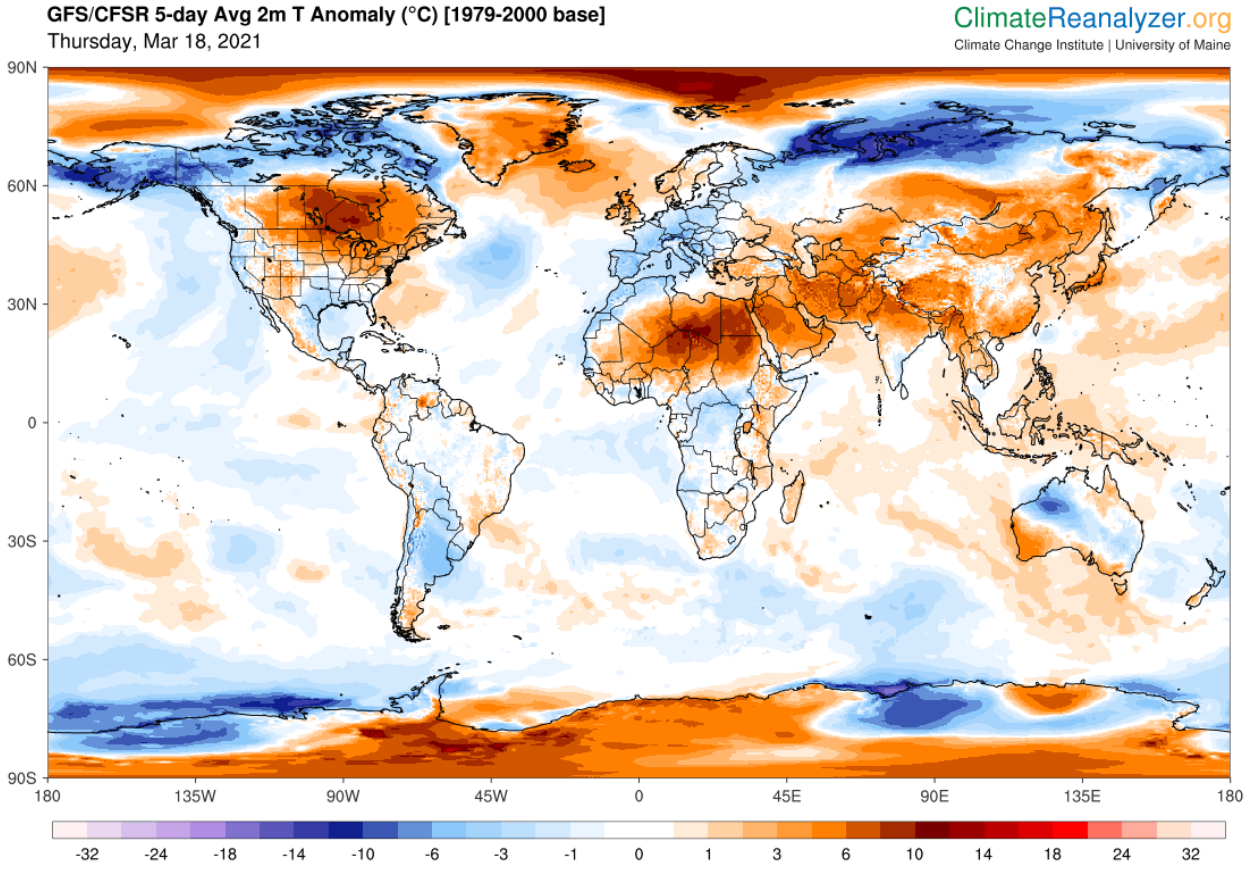
Sandstorm (Mongolia, China)
A rare combination of hot and dry weather conditions and a strong Mongolian Cyclone resulted in severe sand and dust storm conditions which affected wide swaths of Mongolia between March 12-15. According to the Mongolia's National Emergency Management Agency, no less than 10 people were killed while 11 others remained missing. Gale-force winds blowing from Mongolia's Gobi Desert towards the parts of north-western China would later result in a "once-in-a-decade" sandstorm in northern and central parts of China from March 14-16, per the China Meteorological Administration. More than 12 provinces in China, including the national capital region of Beijing, were blanketed in thick yellow sand and dust, causing a major health hazard to the tens of millions of residents in the region. Hundreds of flights remained canceled while schools and offices were closed due to low visibility and storm conditions.

Flooding (Australia)
Multiple slow-moving thunderstorms near the Australian East Coast produced heavy precipitation and flash flooding in the states of New South Wales and Queensland along with the metropolitan city of Sydney between March 13-18. The State Emergency Service of New South Wales received more than 250 calls, mostly related to roof damage, toppled trees, and power outages. According to Australia's Bureau of Meteorology, parts of central Queensland received extremely heavy precipitation, with a weather station in Rockhampton registering more than 550 millimeters (22 inches) of rainfall for one 24-hour stretch ending on March 17 at 03:00 AM. In addition to thousands of homes, businesses, and local infrastructure being damaged, a vast area of agricultural land was left inundated. Total economic and insured losses were anticipated to be well into the millions (USD); if not higher.

Earthquake (Algeria)
A magnitude-6.0 occurred in the Mediterranean Sea, north of Algeria, on March 18 at 00:04 UTC (01:04 local time). The epicenter was located 21 km (13 miles) north-northeast of Bejaia at a depth of roughly 8 kilometers (4 miles). Approximately 1.3 million people were exposed to moderate to strong shaking and more than 12 million to light shaking across the northern parts of Algeria, including Algiers, Setif, Constantine, and Annaba.

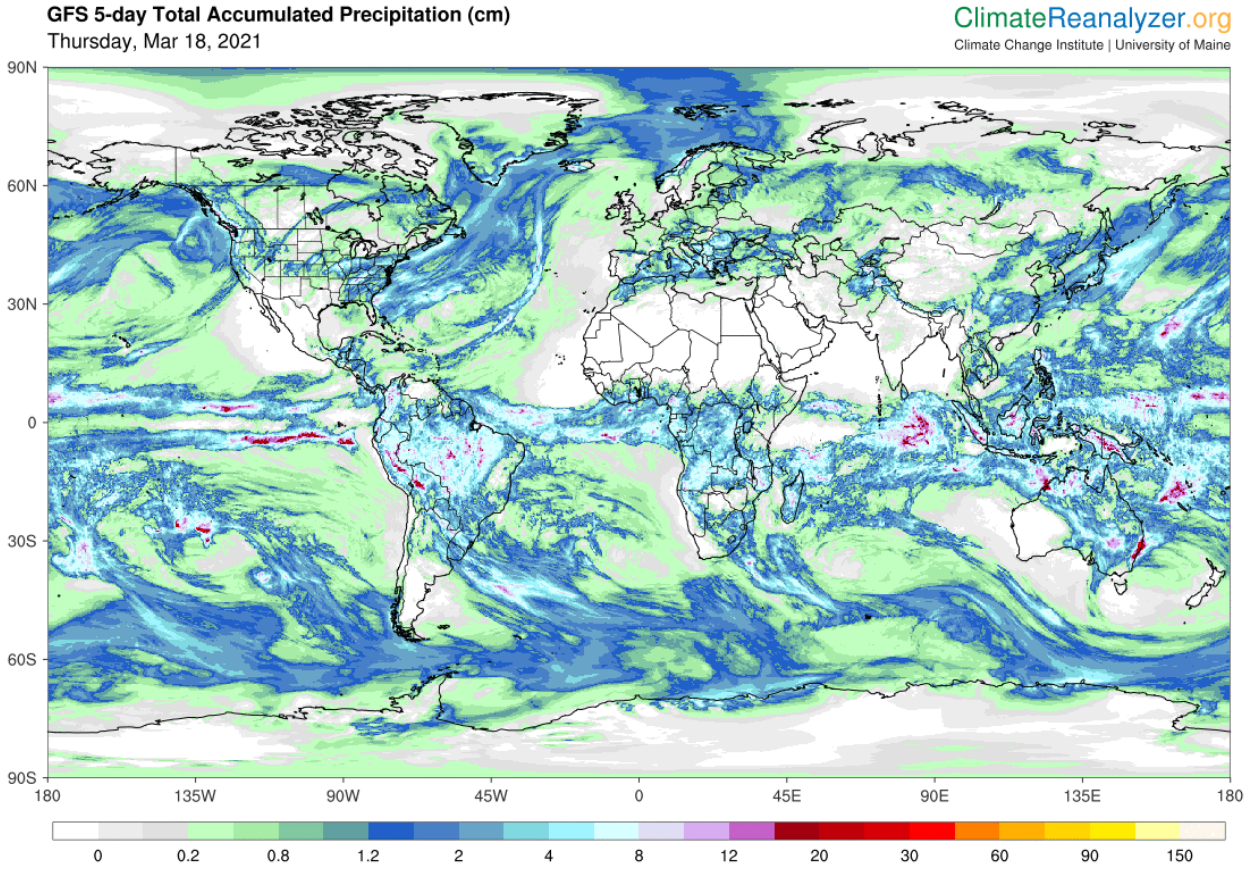
Flooding (DRC & Angola)
Between March 15-16, heavy rainfall triggered severe flash flooding across Kinshasa, the Capital of western Democratic Republic of the Congo (DRC), Brazzaville, and Luanda Province in Angola. According to the local media in DRC, evacuations took place in areas close to the Tsiemé river in Brazzaville after floodwater invaded homes. Extensive flooding resulting in at least four fatalities and material damage. Floodwaters also caused the partial collapse of Ndjili Bridge, which connects N'Djili International Airport and several Districts in the outskirts of Kinshasa. Local media in Angola reported that seven people were killed or missing, and more than 550 homes were damaged in Viana, Cacuaco, Talatona, and Belas.

Global Temperature Anomaly Forecast



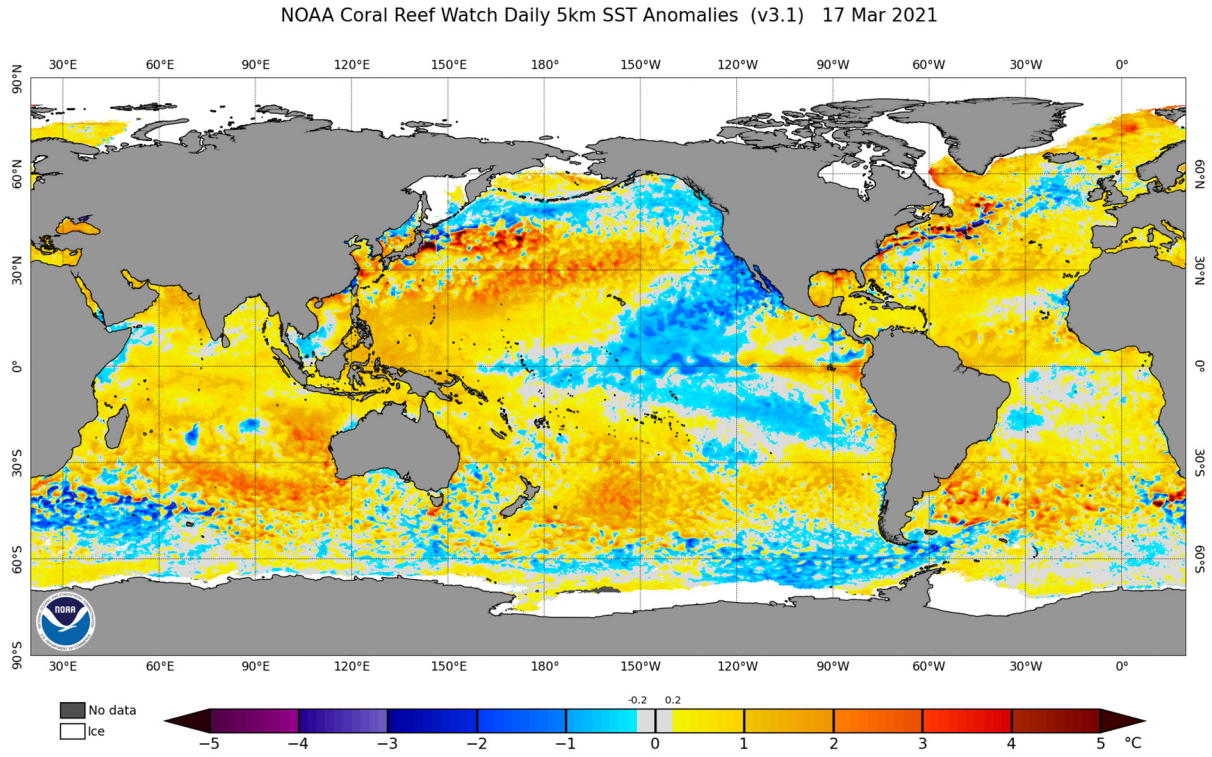
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Global Precipitation Forecast



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

Weekly Sea Surface Temperature (SST) Anomalies (°C)



The SST anomalies are produced by subtracting the long-term mean SST (for that location in that time of year) from the current value. This product with a spatial resolution of 0.5 degree (50 kilometers) is based on NOAA/NESDIS operational daily global 5 kilometer Geo-polar Blended Night-only SST Analysis. The analysis uses satellite data produced by AVHRR radiometer.

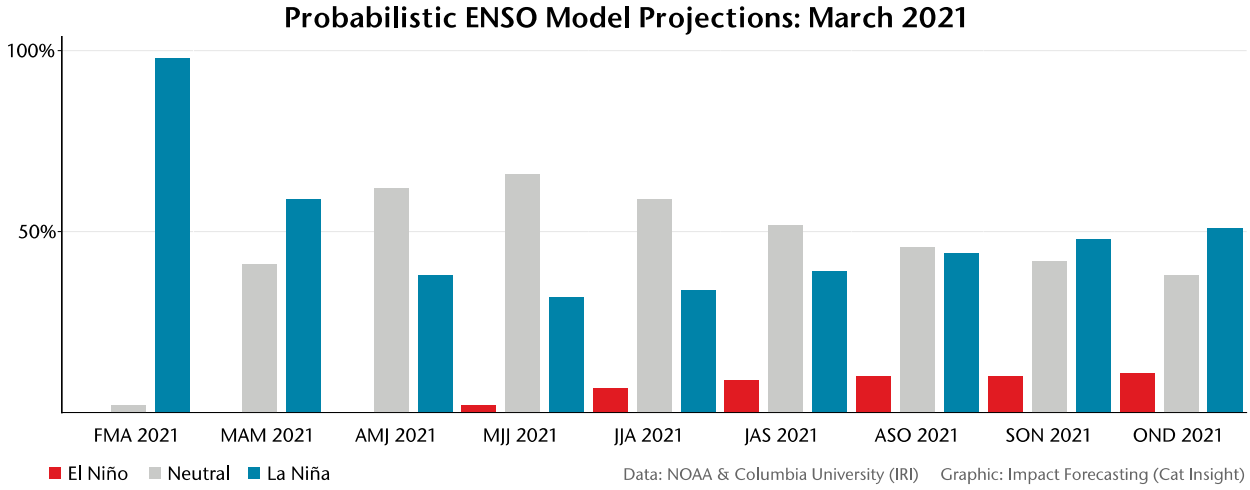
Select Current Global SSTs and Anomalies

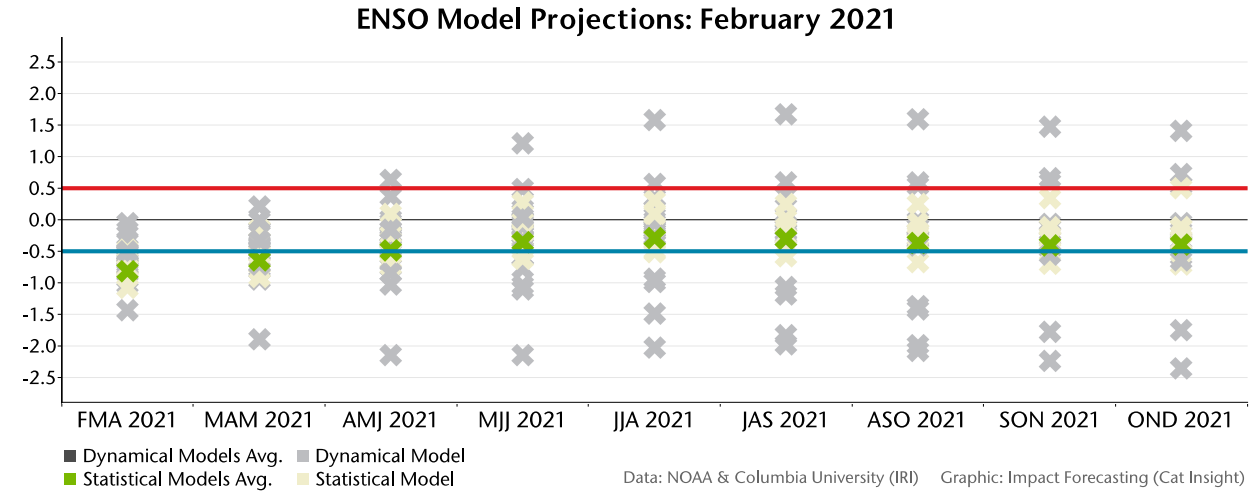
Location of Buoy	Temp (°C)	Departure from Last Year (°C)
Eastern Pacific Ocean (1,020 miles SW of San Salvador, El Salvador)	30.2	+0.2
Niño3.4 region (2°N latitude, 155°W longitude)	25.3	-2.1
Western Pacific Ocean (700 miles NNW of Honiara, Solomon Islands)	26.6	+0.5

Sources: ESRL, NOAA, NEIS, National Data Buoy Center

El Niño-Southern Oscillation (ENSO)

La Niña conditions are currently present, though NOAA has officially issued a **La Niña Advisory**. NOAA notes a 60 percent chance of a transition to ENSO-neutral conditions by the spring months.





El Niño *refers to the above-average sea-surface temperatures (+0.5°C) that periodically develop across the east-central equatorial Pacific. It represents the warm phase of the ENSO cycle.*

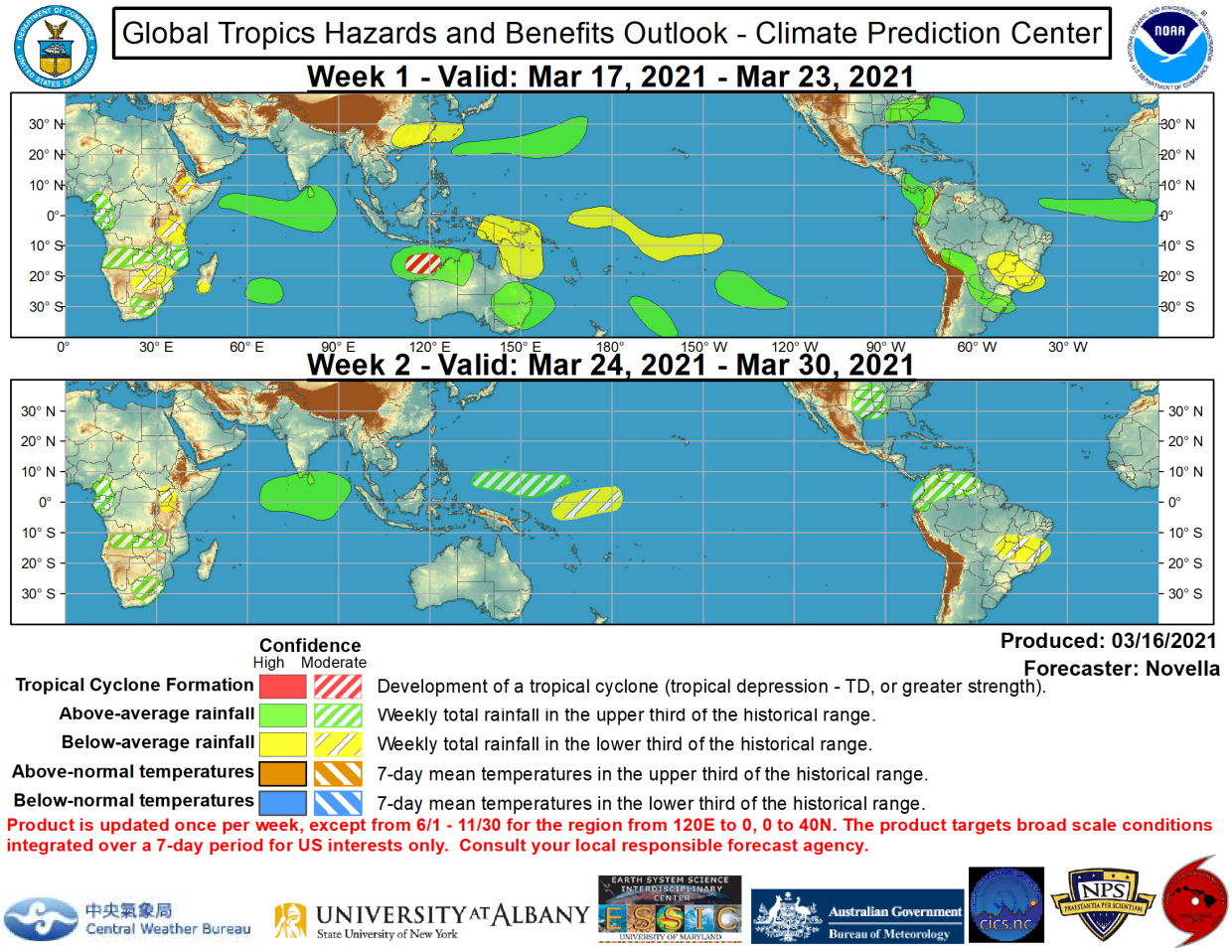
La Niña *refers to the periodic cooling of sea-surface temperatures (-0.5°C) across the east-central equatorial Pacific. It represents the cold phase of the ENSO cycle.*

El Niño and La Niña episodes typically last nine to 12 months, but some prolonged events may last for years. While their frequency can be quite irregular, El Niño and La Niña events occur on average every two to seven years. Typically, El Niño occurs more frequently than La Niña.

ENSO-neutral *refers to those periods when neither El Niño nor La Niña conditions are present. These periods often coincide with the transition between El Niño and La Niña events. During ENSO-neutral periods the ocean temperatures, tropical rainfall patterns, and atmospheric winds over the equatorial Pacific Ocean are near the long-term average.*

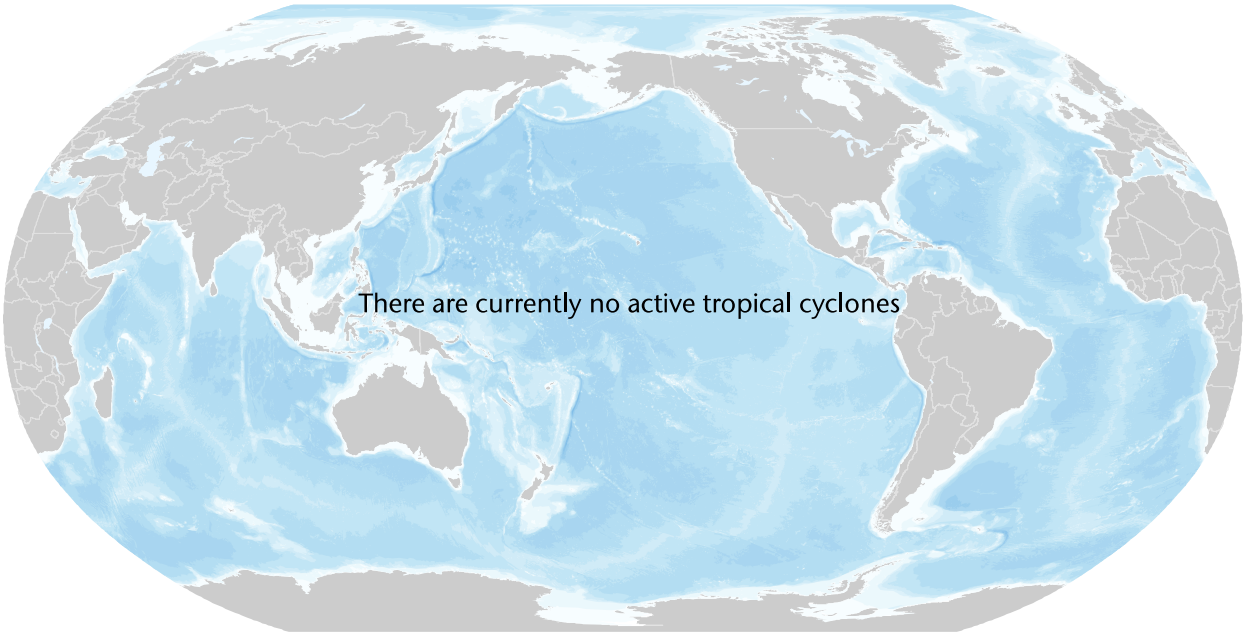
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

Global Tropics Outlook



Source: Climate Prediction Center

Current Tropical Systems



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

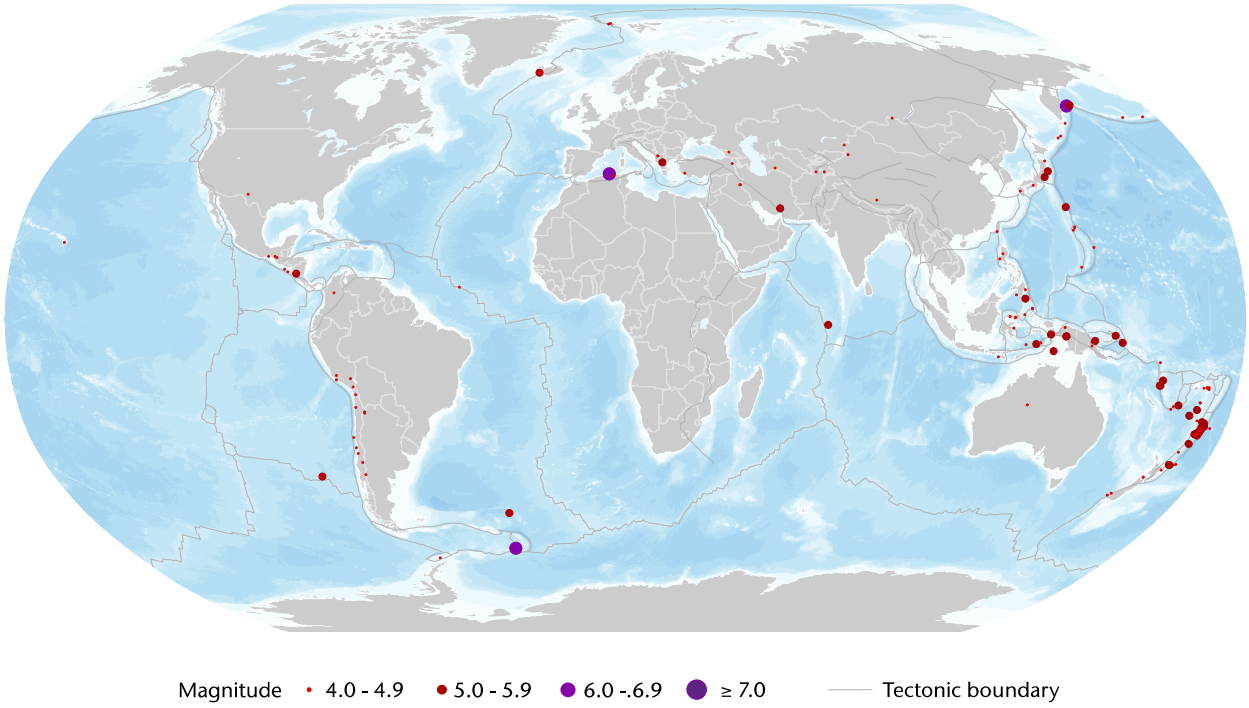
Location and Intensity Information

Name*	Location	Winds	Storm Reference from Land	Motion**

* TD = Tropical Depression, TS = Tropical Storm, HU = Hurricane, TY = Typhoon, STY = Super Typhoon, CY = Cyclone
** N = North, S = South, E = East, W = West, NW = Northwest, NE = Northeast, SE = Southeast, SW = Southwest

Sources: National Hurricane Center, Joint Typhoon Warning Center, Central Pacific Hurricane Center

Global Earthquake Activity (≥M4.0): March 12 – 18

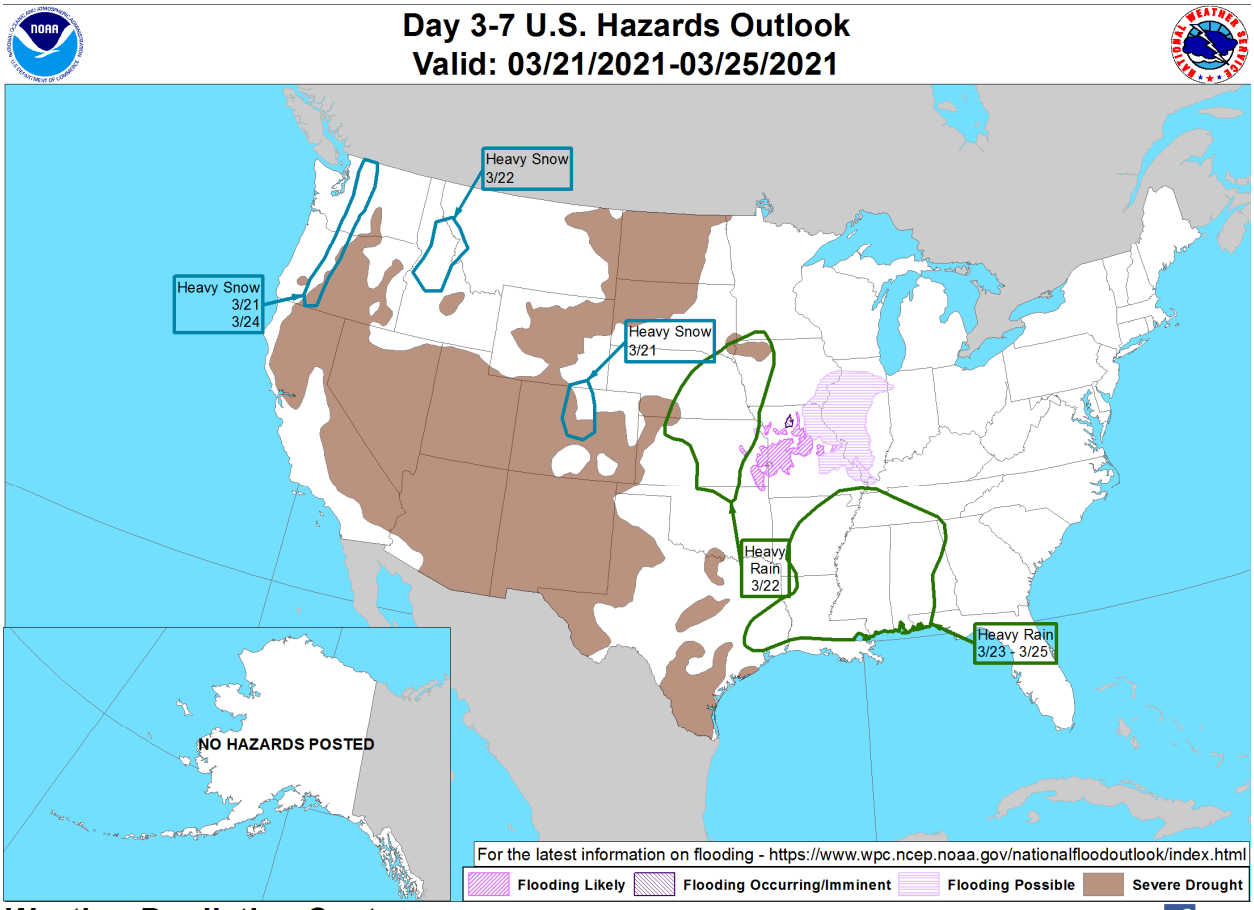


Significant EQ Location and Magnitude (≥M6.0) Information

Date (UTC)	Location	Magnitude	Depth	Epicenter
03/14/2021	59.84°S, 29.50°W	6.0	10 km	South Sandwich Islands region
03/16/2021	54.70°N, 163.21°E	6.6	22 km	17 kilometers (11 miles) SSE of Kamchatsk Staryy, Russia
03/18/2021	36.91°N, 5.20°E	6.0	8 km	20 kilometers (12 miles) NNE of BejaÃ¯a, Algeria

Source: United States Geological Survey

U.S. Weather Threat Outlook

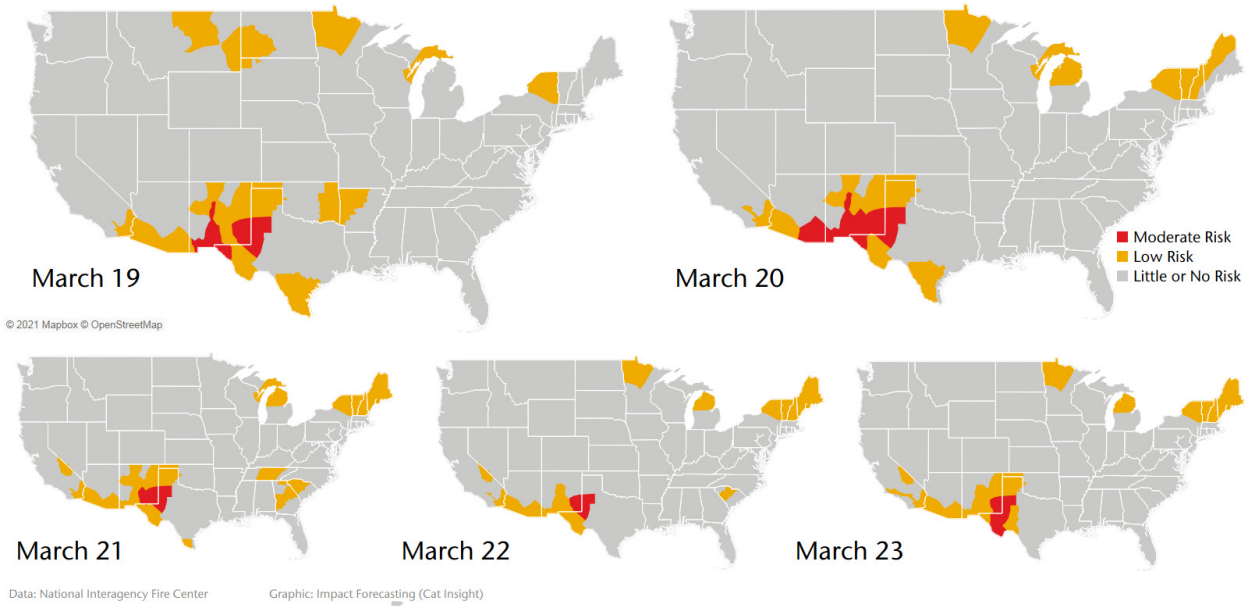


Potential Threats

- Onshore flow and upper level energy are anticipated to generate heavy snow across the Cascades and northern Rockies on March 21-22, with a second round of heavy snow expected across the Cascades by March 24.
- A deepening low-pressure wave and frontal boundary over the central High Plains is expected to bring heavy snowfall to the Central Rockies on March 21.
- Moisture pooling along a frontal boundary will result in heavy rain across the Central Plains on March 22. As the front sinks southeastward and becomes nearly stationary, heavy rain will likely develop in the Lower Mississippi and Tennessee Valley between March 23-25.
- Flooding is possible across regions in the Central Plains and Middle Mississippi Valley.

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

The National Interagency Fire Center has highlighted a limited volume of potential fire risk across much of the country during the next week. The arrival of more seasonal precipitation and temperatures should minimize any significant fire chance for the rest of the winter months, though continued drought conditions in the Desert Southwest will keep a lingering threat.



Annual YTD Wildfire Comparison: March 12*

Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2017	10,608	2,059,102	194.11
2018	8,713	287,630	33.01
2019	2,883	53,747	18.64
2020	4,864	103,407	21.26
2021	5,682	126,986	22.35
10-Year Average (2011-2020)	**6,604**	**295,575**	**44.76**

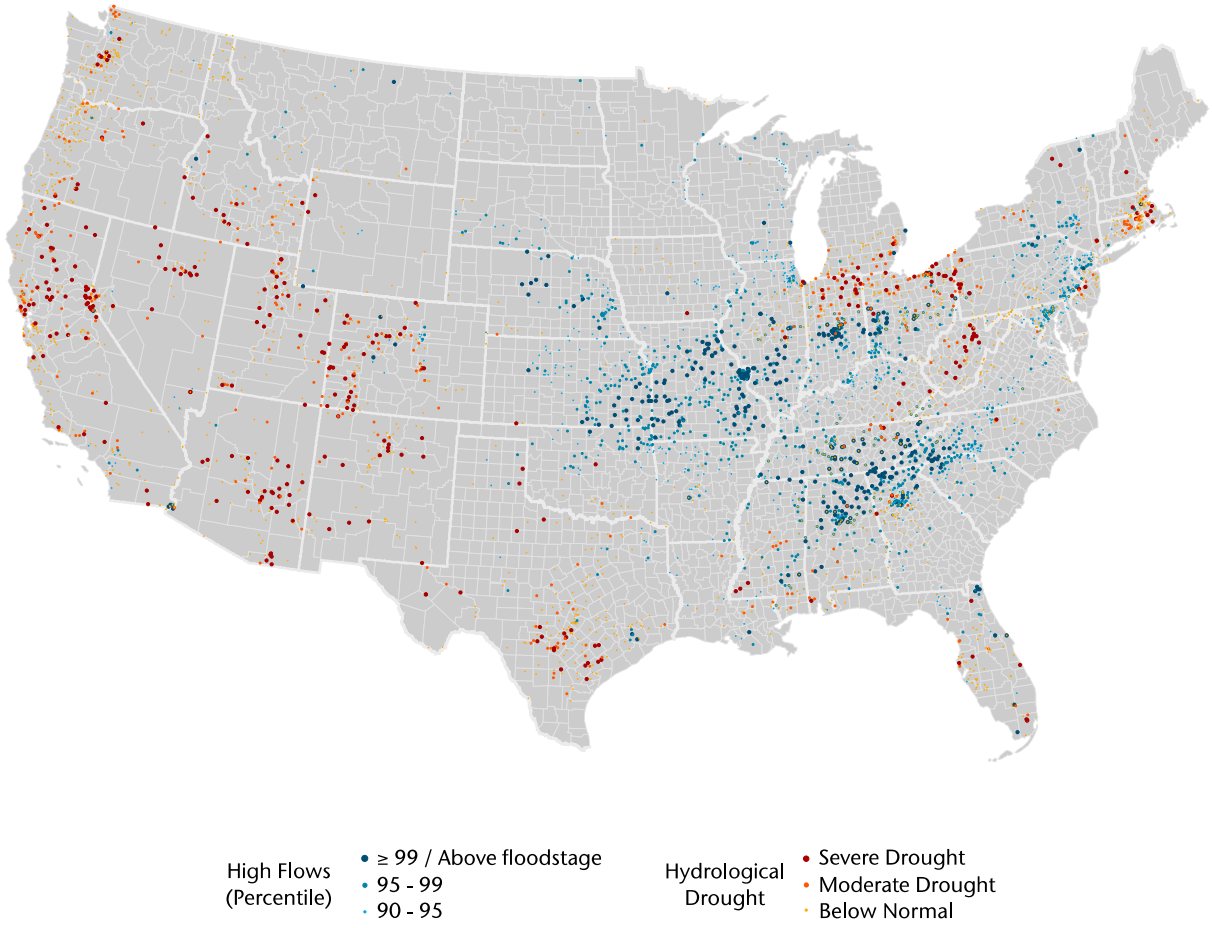
*Most recent available data via NIFC
Source: National Interagency Fire Center

Top 5 Most Acres Burned by State: March 18

State	Number of Fires	Acres Burned	Acres Burned Per Fire
Texas	1,019	32,038	31.44
Oklahoma	397	18,470	46.52
Mississippi	522	16,216	31.07
Florida	533	13,314	24.98
Kansas	18	10,475	581.94

Source: National Interagency Fire Center

Current U.S. Streamflow Status



A ≥99th percentile indicates that estimated streamflow is greater than the 99th percentile for all days of the year. This methodology also applies for the other two categories. A steam in a state of severe drought has 7-day average streamflow of less than or equal to the 5th percentile for this day of the year. Moderate drought indicates that estimated 7-day streamflow is between the 6th and 9th percentile for this day of the year and 'below normal' state is between 10th and 24th percentile.

Top 5 Rivers Currently Nearing or Exceeding Flood Stage

Location	Current Stage (ft)	Flood Percentile
Neosho River near Iola, Kansas	16.94	99.07
Wind River at Riverton, Wyoming	5.94	99.06
North Platte River near Northgate, Colorado	3.62	99.05
Walnut River at Winfield, Kansas	15.38	98.99
Neosho River near Parsons, Kansas	23.29	98.99

Source: United States Geological Survey

Source Information

Record snow precedes major severe weather outbreak

U.S. National Weather Service
U.S. Storm Prediction Center
U.S. Weather Prediction Center
Aurora Police Department
Wyoming Highway Patrol
Colorado and Wyoming see record blizzard, historic snowfall in Denver and Cheyenne, The Washington Post
Winter Storm Xylia Traps Motorists on Colorado Highways, The Weather Channel
March 13 Colorado snowstorm updates: I-25, U.S. 287 closed between Fort Collins and Wyoming, Coloradoan
The storm now battering Wyoming is already a record breaker, Casper Star-Tribune
Dozens Of Homes Damaged Or Destroyed in Deep South Tornado Outbreak, The Weather Channel
Multiple tornadoes reported across Alabama; damage assessment underway, WVTM 13 Birmingham

Twin storms affect Western & Central Europe

Weather: the storm caused damage but the worst is over. Le Soir
'30 million euros in damage from spring storm'. De Telegraaf
Deutscher Wetterdienst
Met Office
Met Eiréann

Natural Catastrophes: In Brief

15 Dead, Thousands Affected After Weeks of Severe Weather, FloodList
146 landslides and 45 floods in Colombia in 2021, El Universal
Emergencies in Valle del Cauca due to heavy rains, El Tiempo
Six dead, dozens missing as Beijing, northern China and Mongolia hit by worst sandstorm in a decade, SCMP
Severe sand and dust storm hits Asia, World Meteorological Agency (WMO)
Emergency flood warning as storms continue for Queensland and NSW, 9 News
Flood warning issued for Sydney and NSW coast as wet weather set to spread, The Guardian
China Meteorological Administration
National Emergency Management Agency, Mongolia
State Emergency Service, New South Wales
Bureau of Meteorology, Australia
M 6.0 - 20 km NNE of Bejaïa, USGS
Algeria: Magnitude-6.0 earthquake strikes in the Mediterranean Sea, GardaWorld
Damaging Flash Floods in Kinshasa and Brazzaville, FloodList
Democratic Republic of the Congo – Floods, ReliefWeb

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