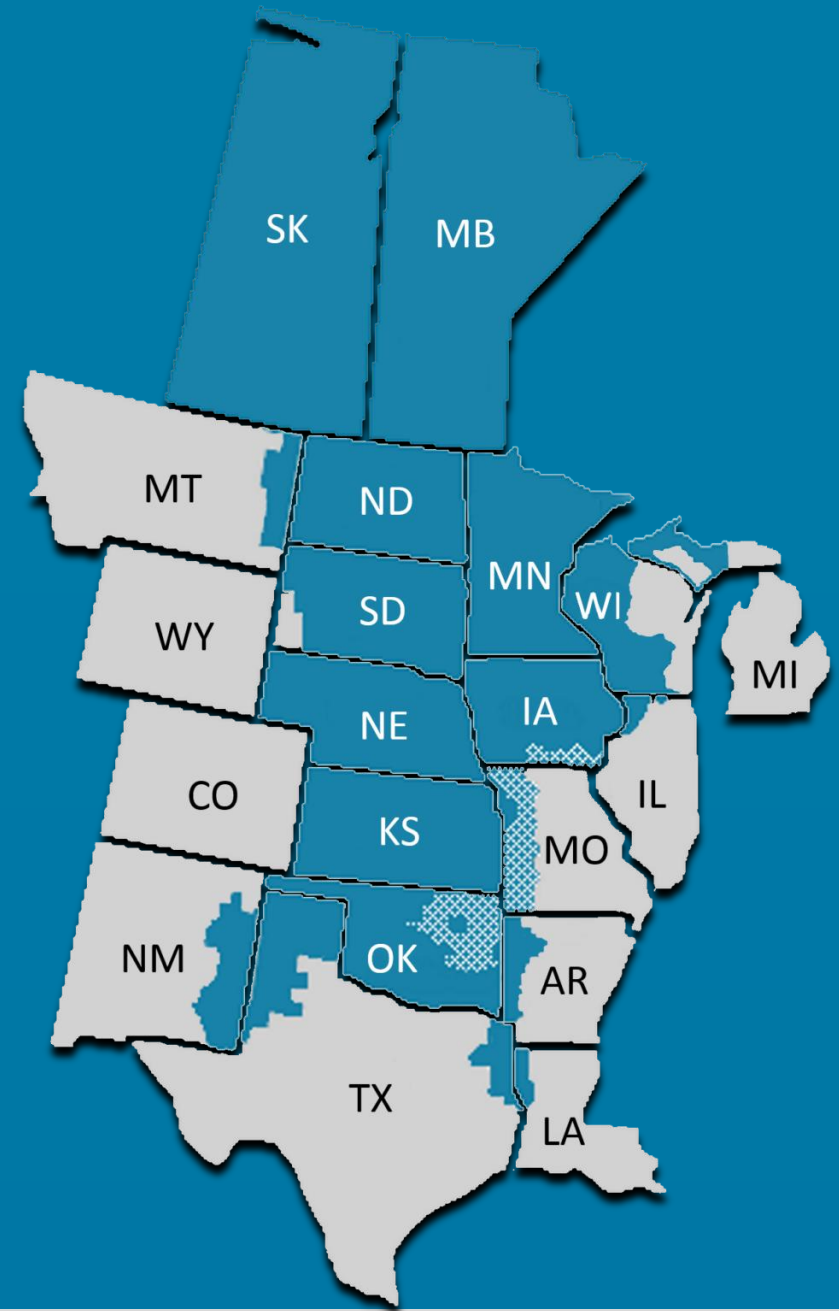




MIDWEST
RELIABILITY
ORGANIZATION

2026 MRO Reliability, Security and CMEP Summit

Grid Reliability is a Team Sport





MIDWEST
RELIABILITY
ORGANIZATION

Steen Fjalstad

Director of Outreach and Security



 CONNECTION

 CURIOSITY

 COMMITMENT

 COMPETENCY

Hotel Safety & Emergency Procedures

Hilton Omaha Safety & Emergency Information

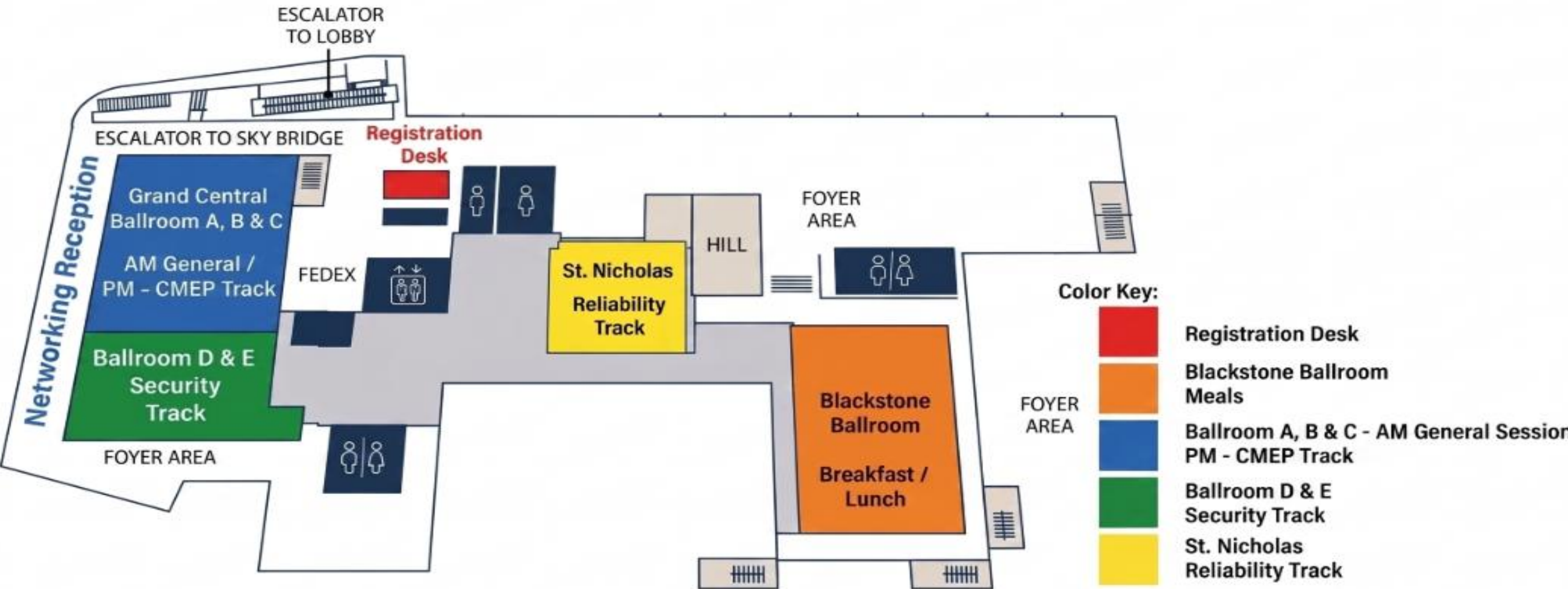
- Conference App, Website, and at the Registration Desk
- Emergency contacts, medical, weather, evacuation, and hotel information

In the case of an emergency, call 911 first,

In the case of an Emergency the hotel will make announcement with further directions



Map of Hotel - Also Available in the Event Application



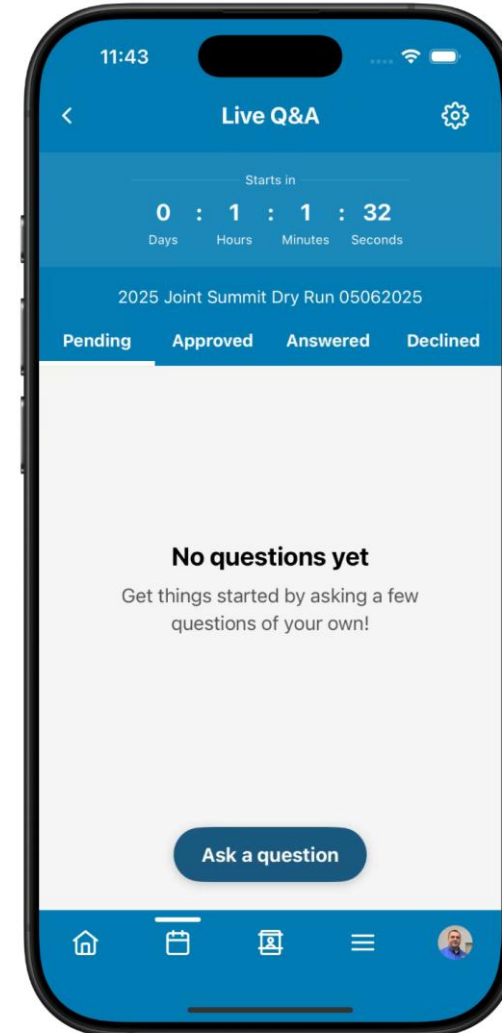
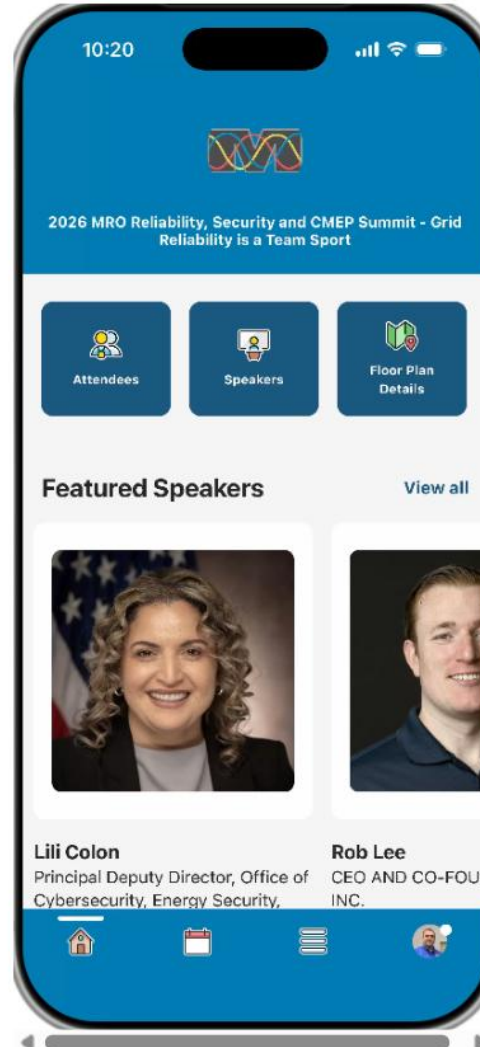
Event Application – Key Functions

Engaging During Sessions

Participants are encouraged to actively engage during sessions!

You may:

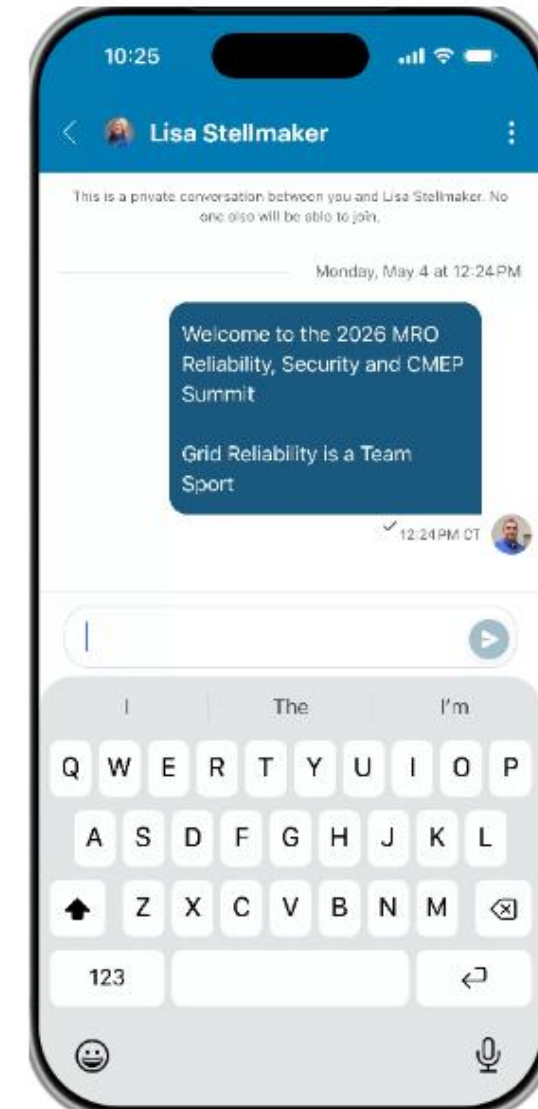
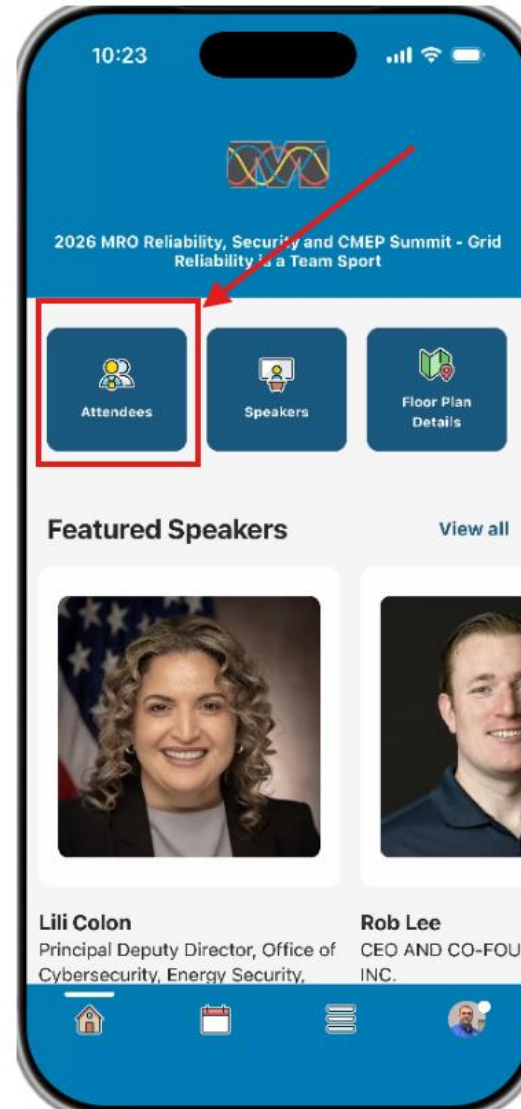
- In-person attendees may raise their hand to ask a question during live discussions.
- All attendees—both in-person and virtual—can submit questions through the Q&A feature in the Attendee Hub at any time.



Event Application – Key Functions

Why use the event App - (Cvent)?

- **Personalized Agenda – Access your sessions and schedule at a glance**
- **Live Q&A & Polling – Engage directly with speakers in real time**
- **Speaker & Session Info – View bios, session details, and slides**
- **Networking Tools – Connect with fellow attendees**
- **Seamless Experience – Whether you're in the room or virtual, stay connected and informed**



MRO Upcoming Events

- **MRO Case Files: A NERC CIP-015 Investigation Webinar:**
 - June 22, 2026, 1:00 PM - 2:00 PM CT
- **2026 Regional Summer Assessment Webinar:**
 - June 25, 2026, 1:00 PM - 2:00 PM CT
- **Understanding NERC's Large Load Action Plan Webinar**
 - June 29, 2026 (registration available soon)
- **Enforcement Fundamentals: Navigating the NERC Enforcement Process Workshop:**
 - An in-person workshop; that will focus on best practices for submitting information to ensure the most efficient processing of non-compliances.
 - July 28 - 29, 2026 (registration available soon)



Please take a moment to complete the survey

Your feedback helps shape the future of the MRO Summit!

 **Find survey signs located throughout the event space**

 **Scan the QR code, or click the link if you're attending online**

- ✓ Influence next year's content
- ✓ Ensure your voice is heard
- ✓ Quick and anonymous

<https://www.surveymonkey.com/r/2026MROSummit>



Annual HERO Award

Nominate
Someone Today!



SAVE THE DATE

2027 MRO Grid Summit

May 25 to 26, 2027

**Radisson Blu Mall of America
Bloomington, Minnesota**



Disclaimer:

Please be aware that vendors and suppliers may attend, and their views are their own and do not necessarily reflect the positions of MRO. We request that vendors and suppliers refrain from promoting or marketing their products during the event.



Disclaimer:

Midwest Reliability Organization (MRO) is committed to providing outreach, training, and non-binding guidance to industry stakeholders on important industry topics. Subject Matter Experts (SMEs) from MRO's organizational groups and the industry may develop materials, including presentations, provided as a part of the event. The views expressed in the materials are those of the SMEs and do not necessarily express the opinions and views of MRO.





**MIDWEST
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MIDWEST
RELIABILITY
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Richard Burt

Senior Vice President and Chief Operating Officer



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 COMMITMENT

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RELIABILITY IS A TEAM SPORT

TOGETHER, WE POWER A RELIABLE AND SECURE FUTURE

NO SINGLE ENTITY CAN
MAINTAIN THE GRID IN ISOLATION.

WE ALL HAVE A ROLE.
WE ALL WIN TOGETHER.



OUR 4 ZONES OF DEFENSE



ENERGY

Leverage data, tools, and approaches to address existing and emerging grid risks.



SECURITY

Strengthening cyber and physical security of critical infrastructure.



ENGAGEMENT

Expanding stakeholder and policymaker engagement.



AGILITY & SUSTAINABILITY

Adapting to changing conditions and ensure long-term resilience.



ONE TEAM. ONE GRID. ONE MISSION. | RELIABLE. SECURE. TOGETHER.



MIDWEST
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ORGANIZATION

Javier Fernandez

President and Chief Executive Officer of OPPD



Omaha Public Power District



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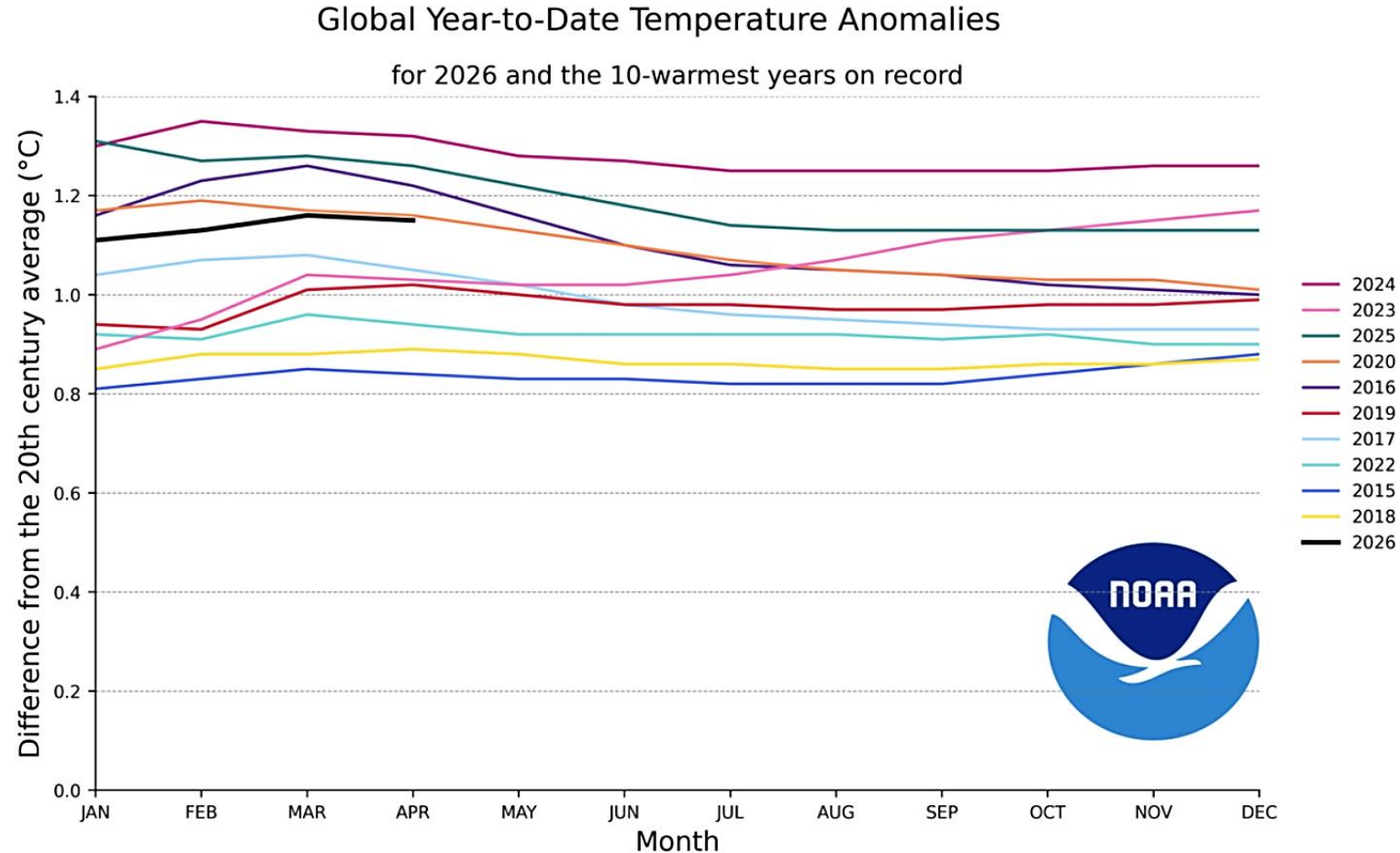


DRAGOS 

Rob M. Lee
CEO & Co-Founder,
Dragos

Amplifying Barometric Swings Yield Extreme Weather: Impacts to the Energy Sector Sites, Staff, Security, and Supply Chain

*“The 10 warmest years in the 143-year record have all occurred **since 2015**. The 2024 January–December 2024 global surface temperature ranked warmest in the 175-year record at 1.29°C (2.32°F) above the 20th century average” (NOAA).*



Chief Meteorologist Ms. Sunny Wescott
Critical Infrastructure and Emergency Response Operations

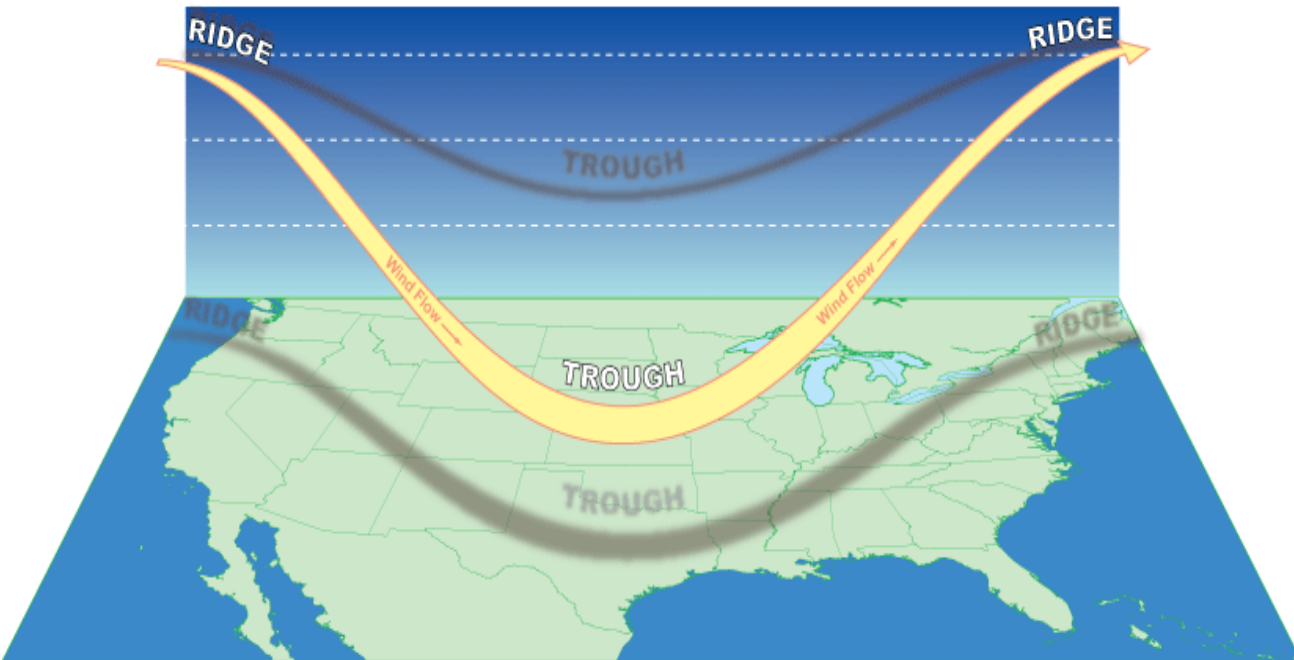
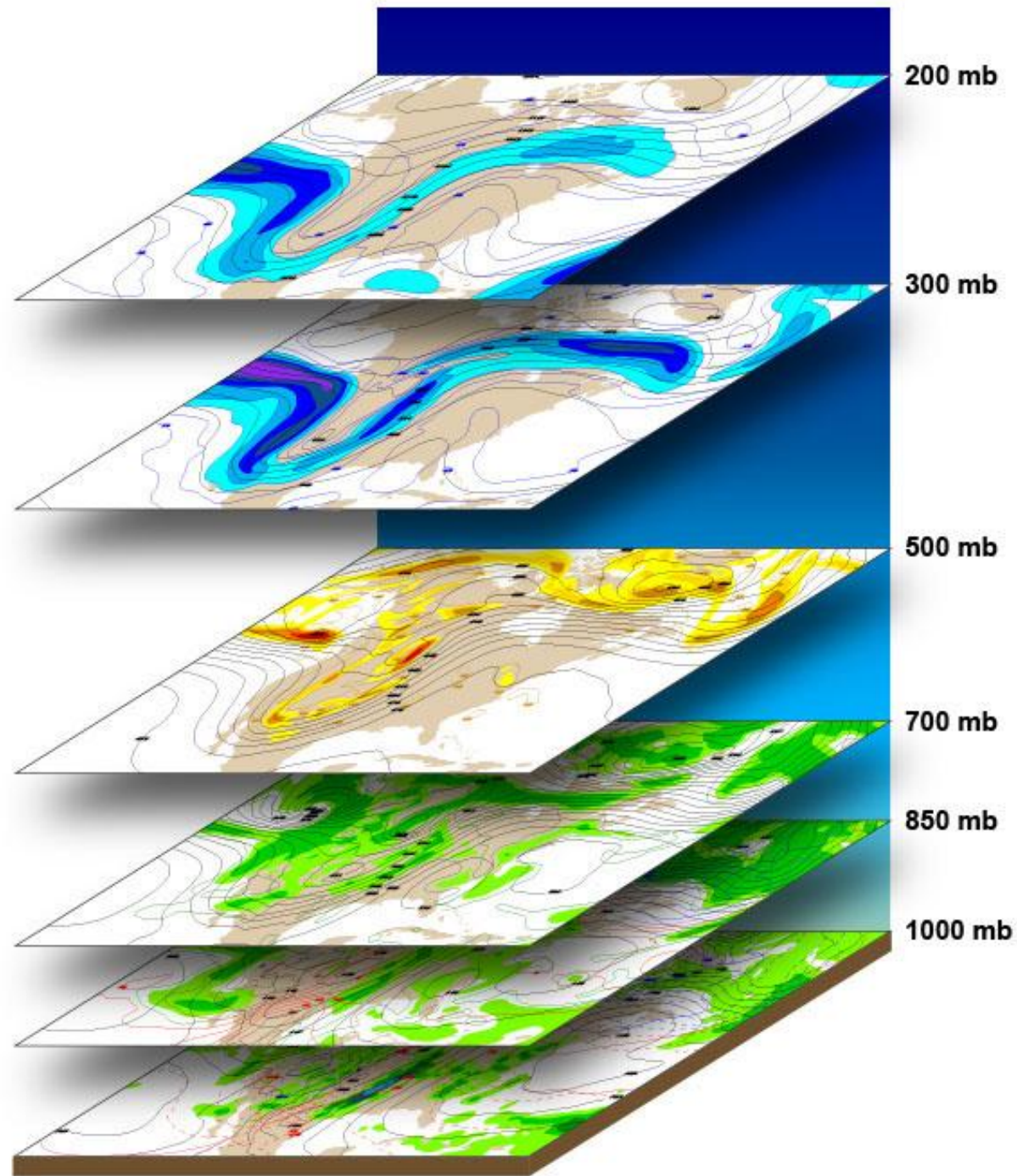
Atmospheric Pressure - Millibar 101

Upper-level air charts show the atmosphere in three dimensions.

- Wind flowing from a ridge toward a trough is decreasing in height above the surface. Conversely, wind flowing from a trough into a ridge is increasing in height.
- Between the colder, more dense air and the warmer, less dense air is the location of the greatest change (gradient) in heights of any pressure level which causes the flow of winds bringing in major temperature changes.

By tracking these pressure gradients, we observe patterns of higher heights (called ridges) and lower heights (called troughs). These ridges and troughs drive the weather we experience at the surface from storms to heat domes.

- Atmospheric Pressure is measured with an instrument called a barometer, which is why it is also referred to as barometric pressure.



High and Low Pressures: the Carousel of Weather

A **low-pressure system** has lower pressure at its center than the areas around it. Winds blow towards the low, and the air rises in the atmosphere where they meet.

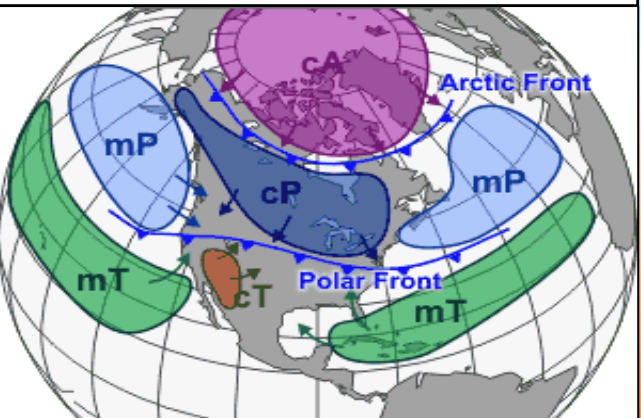
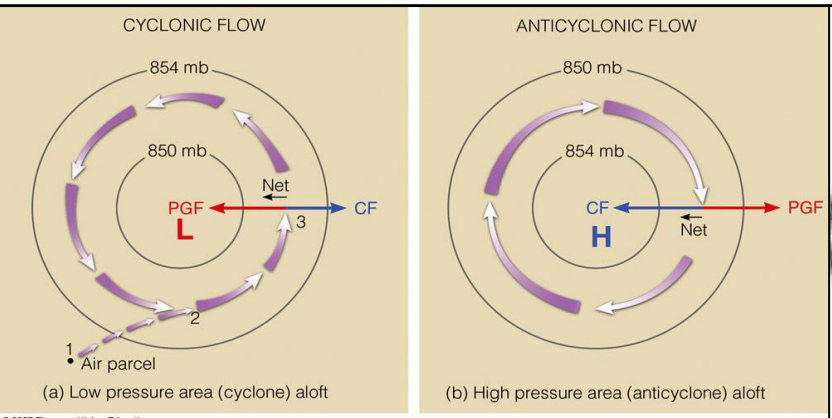
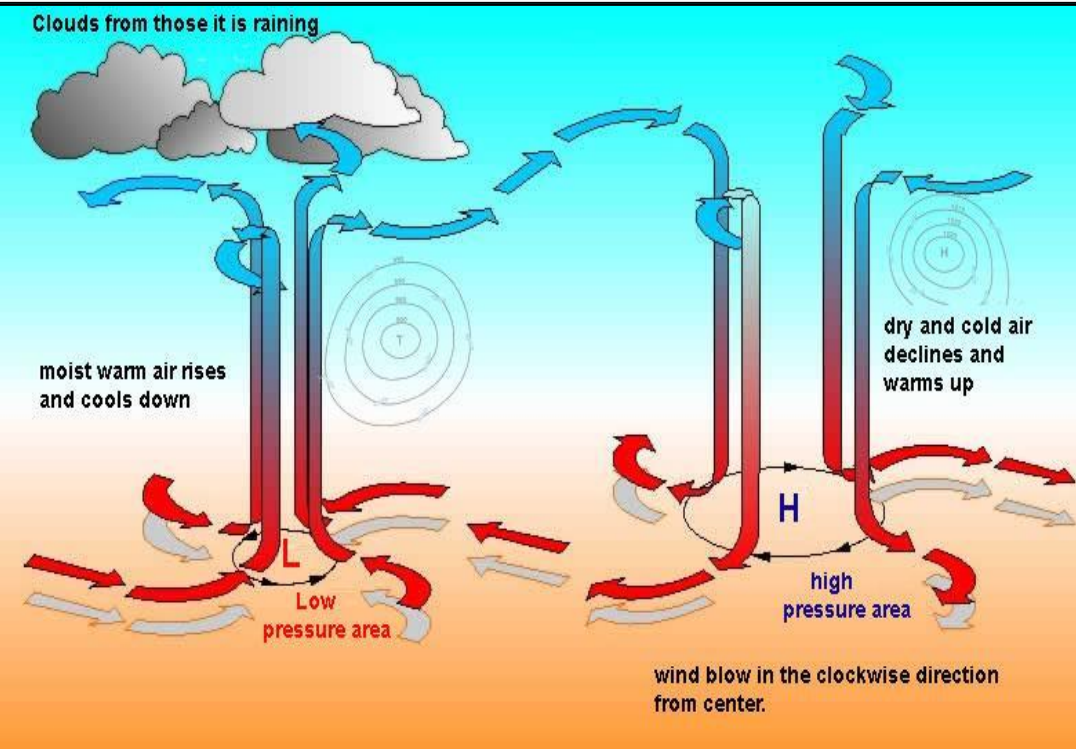
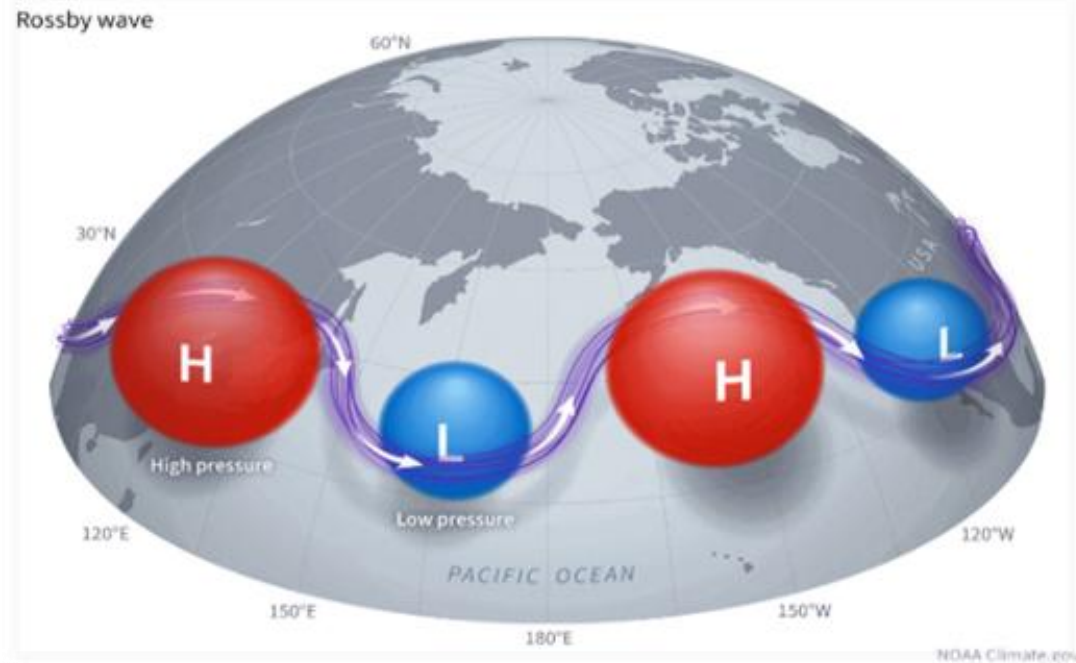
- Because of Earth's spin and the Coriolis effect, winds of a low-pressure system swirl counterclockwise north of the equator.
- As the air rises, the water vapor within it condenses, forming clouds and often precipitation.
- On weather maps, a low-pressure system is labeled with red L.

A **high-pressure system** has higher pressure at its center than the areas around it. Winds blow away from high pressure.

- Swirling in the opposite direction from a low-pressure system, the winds of a high-pressure system rotate clockwise north of the equator (anticyclonic flow).
- Air from higher in the atmosphere sinks down to fill the space left as air is blown outward. On a weather map, you may notice a blue H, denoting the location of a high-pressure system.

Air pressure depends on the temperature of the air and the density of the air molecules. Air masses differ based off their prevailing fields.

The tighter the gradient between the high and the incoming low, the stronger the winds will be as they mix down from the upper levels.



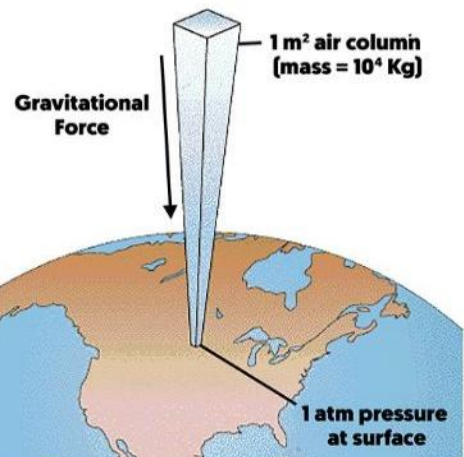
Major Pressure Swings Begin

As low pressures continue to change in depth and intensity, the high-pressure events are left to dominate for longer periods, increase coverage area, and promote significant levels of humidity and water vapor adding to trapped heat.

- The low-pressures drive global cooling winds, bring rainfall and storm events, and are responsible for all notable cloud coverage.
- High-pressures yield clear skies, heat domes, haze, stagnant air, and even the cold air damming periods.

This means a change in either pressure consistency or strength brings immediate consequences for the water cycle.

What is Atmospheric Pressure?

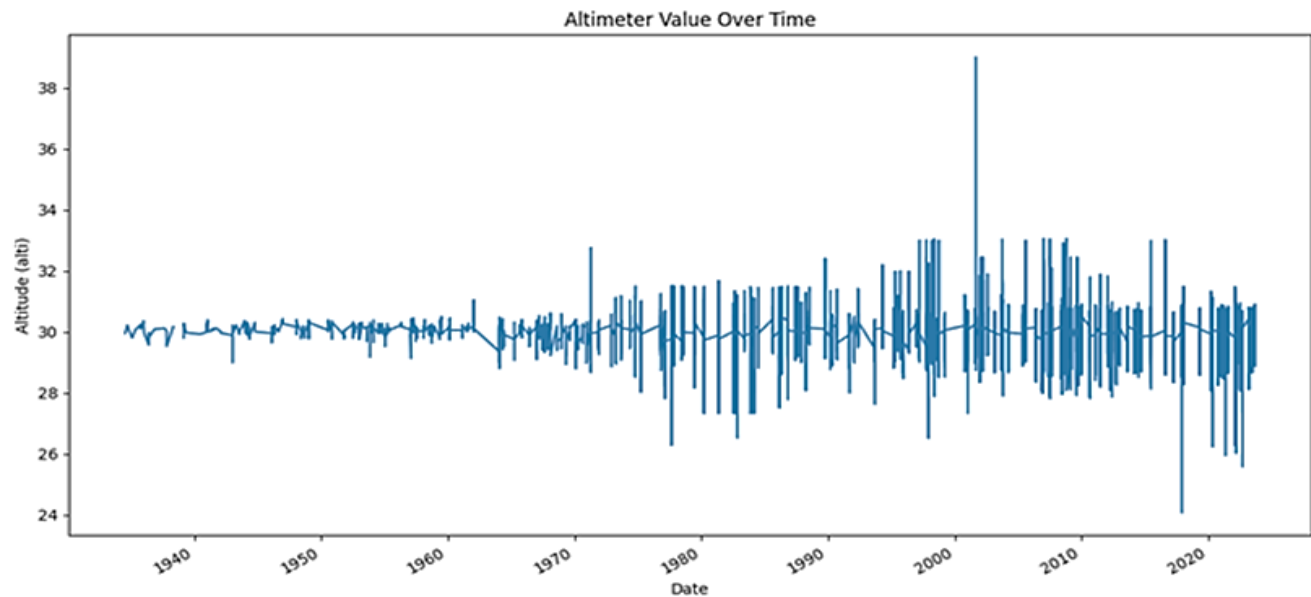


Atmospheric pressure, in physics, refers to the force exerted by the air molecules in Earth's atmosphere on surfaces within it.

It decreases with altitude due to the decreasing density of air. Standard atmospheric pressure at sea level is around 101.3 kilopascals.

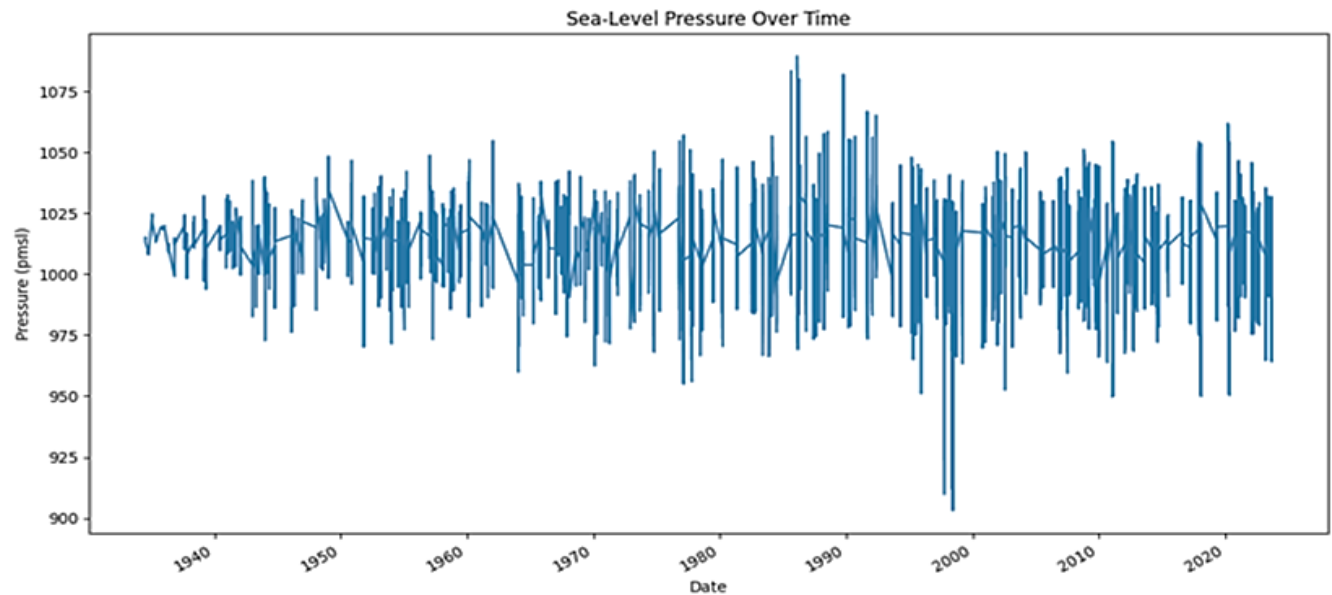
Variations in **atmospheric pressure** influence weather patterns and are measured using instruments like barometers.

Understanding atmospheric pressure is vital in meteorology, aviation, and various scientific applications. It plays a fundamental role in the behavior of gases, weather phenomena, and the dynamics of Earth's atmosphere.



ASOS Raw Data
National Overview

Generated on 2024-11-09 05:48:34.466552



Generated on 2024-11-09 05:48:22.662762

Upper-Level Winds

A recent study, in *Nature*, suggests that **the fastest upper-level jet stream winds will accelerate by about 2% for every degree Celsius (1.8° Fahrenheit) that the world warms.**

- Furthermore, the fastest winds will speed up 2.5 times faster than the average wind.
- A 2019 study found that in the preceding nine years the global **average wind speed increased nearly 6%.**
- Over oceans evidence points more toward increasing average wind speeds in many areas, including widespread increases in extreme oceanic wind gusts in recent analyses.

Extreme regional wind events such as the Santa Ana, Diablo, and Chinook, have increased in general over the last 60 years.

- Shifts in winds carrying major seasonal precipitation like Atmospheric Rivers and Monsoons are forecast to amplify in variations of frequency and timeliness.

Studies over the past 45 years indicate changes to the tropopause, the top of the troposphere, and the width of the tropical belt may be shrinking, changing the overall storm pattern across the globe.

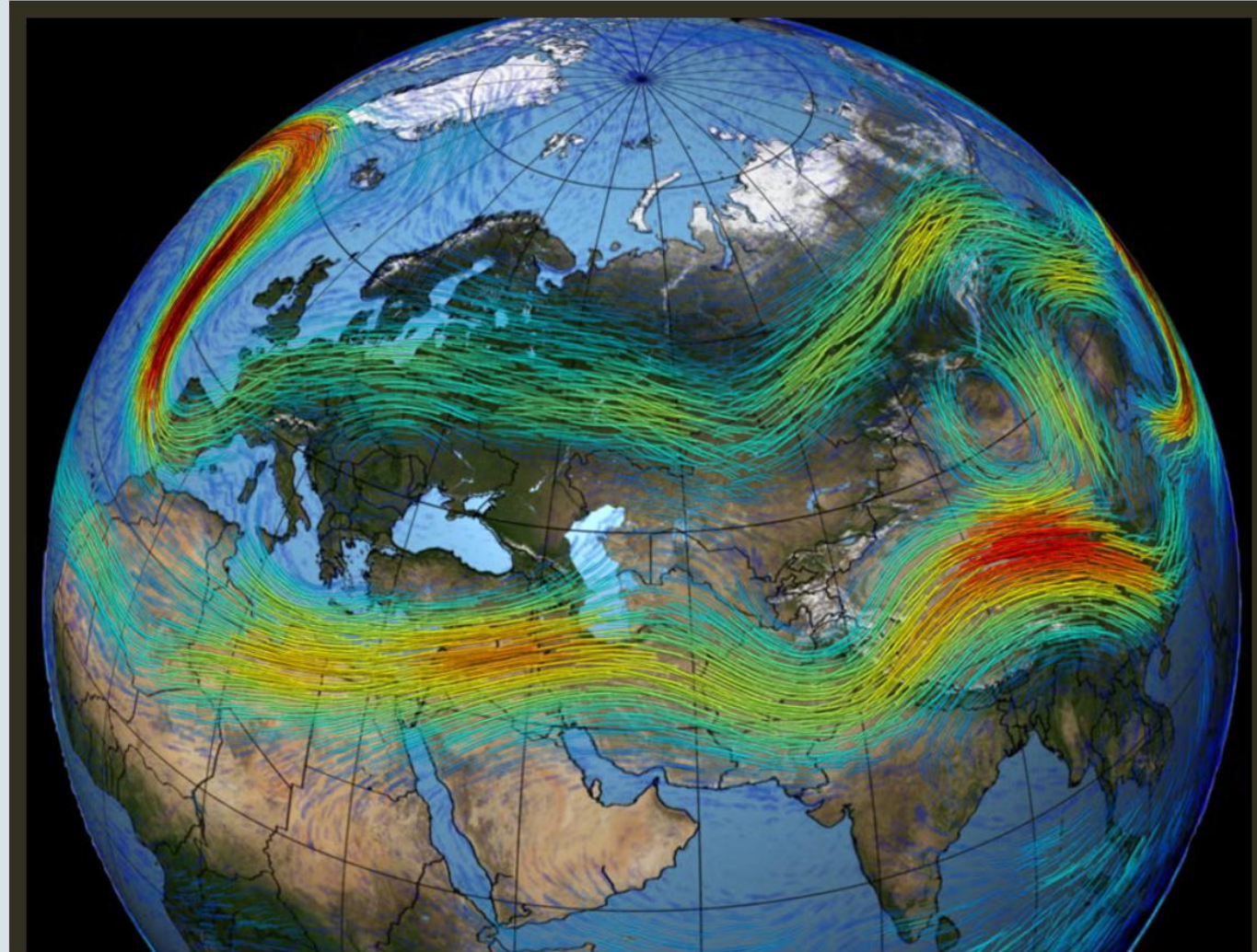
- The troposphere is the bottom layer of Earth's atmosphere and contains most of the atmosphere's mass, clouds and weather phenomena, and is where the global population and wildlife lives.

The tropopause has climbed about 50 to 60 meters per decade in the past 20 years.

JET STREAM WINDS WILL ACCELERATE WITH WARMING CLIMATE

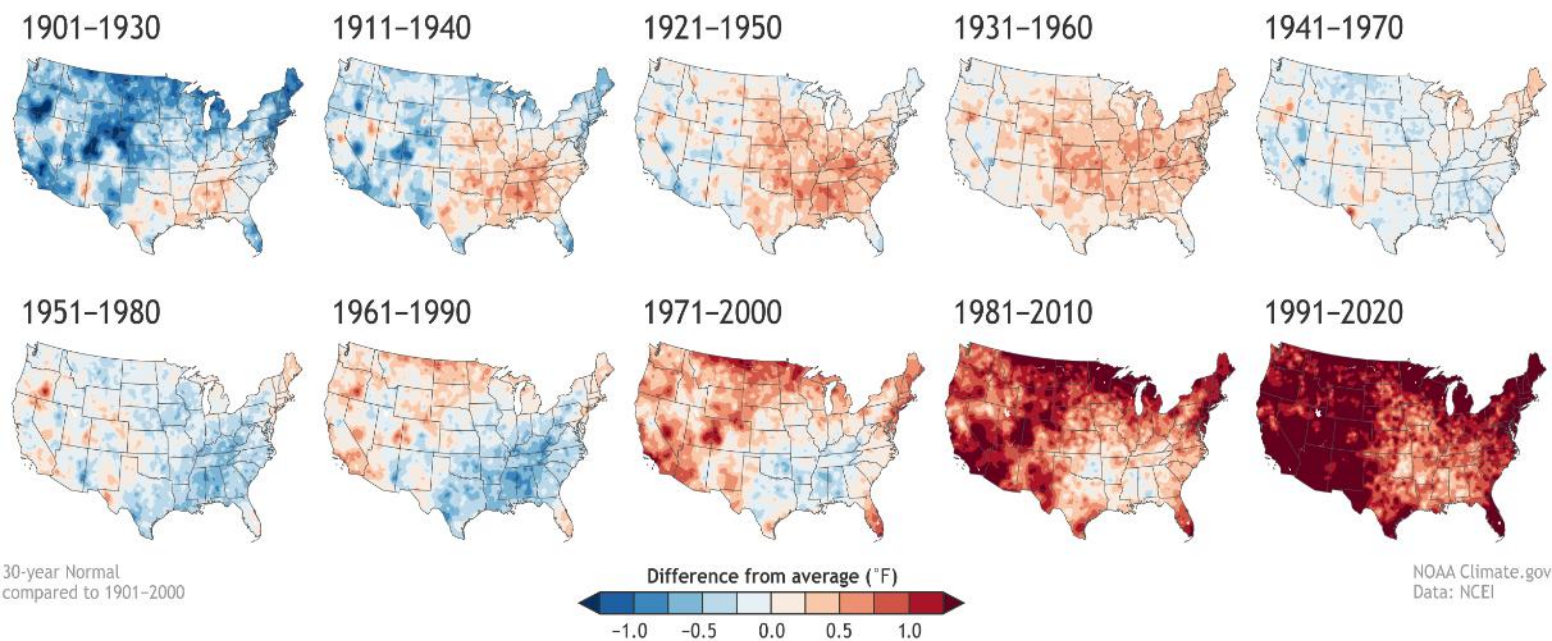
Faster winds likely to cause bumpier flights, more severe weather

DEC 6, 2023 - BY STAFF

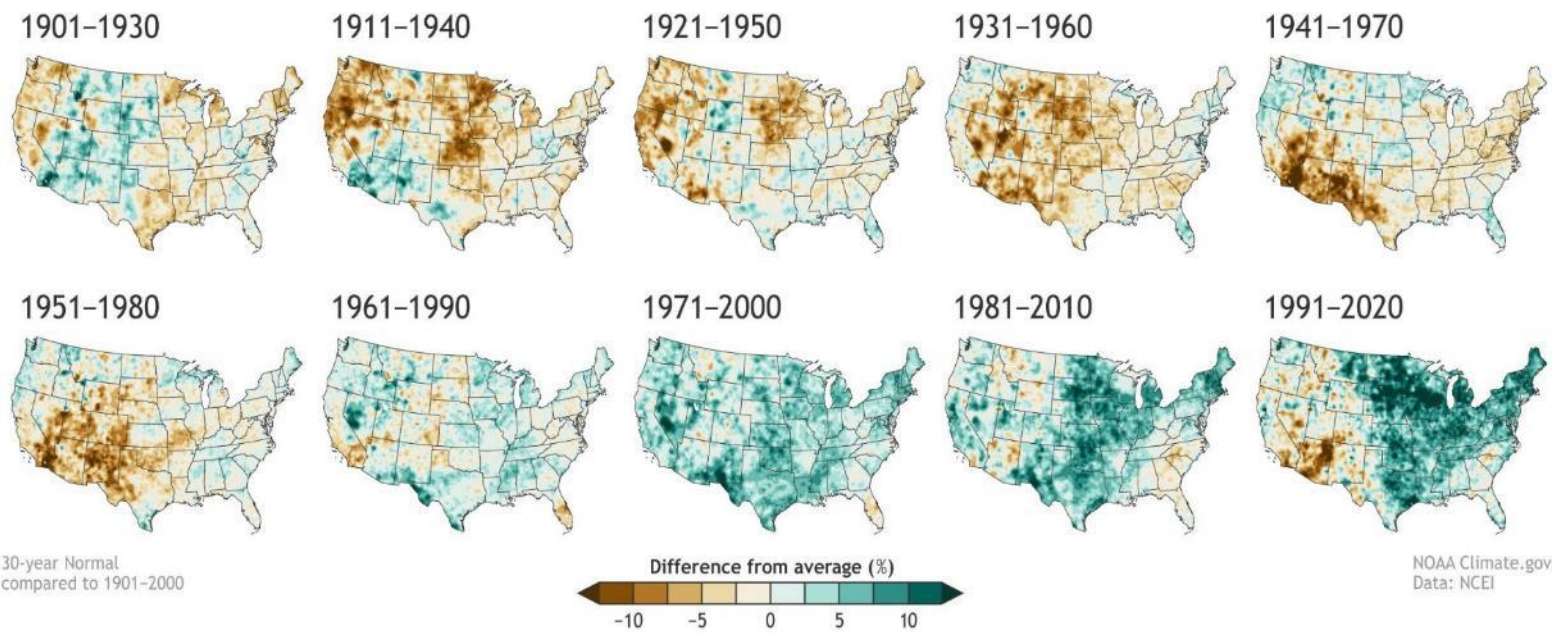


New research shows that the fastest jet stream winds will accelerate with climate change. (Image by NASA/Goddard Space Flight Center Scientific Visualization Studio.)

U.S. ANNUAL TEMPERATURE COMPARED TO 20th-CENTURY AVERAGE



U.S. ANNUAL PRECIPITATION COMPARED TO 20th-CENTURY AVERAGE



By 2050, about 63% of the US may be forced to endure temperatures over 100°F. Areas where triple-digit temperatures are seasonal already, will see baseline temperatures and frequency of high heat events increase.

As average temperatures at the Earth's surface rise, **more evaporation occurs**, which increases overall precipitation. **For every 1.8°F of warming, the atmosphere can hold about 7% more moisture.**

- Warmer air holds more water because the water vapor molecules it contains move faster than those in colder air making them less likely to condense back to liquid.
- Sea surface temperatures have risen by 0.5–0.6°C since the 1950s, and over the oceans this has led to **4% more atmospheric water vapor since the 1970s.**
- As water vapor condenses to form rain it produces heat, brings warm air down and causing friction on impact, heating the surface.

As temperatures increase, short-burst heavy rainfall events will increase. The air is on average warmer and moister than it was prior to 1970, leading to **a 5-10% effect on precipitation and storms causing extreme downpours.**

WMO State of the Climate 2025

Monsoon season flooding had major impacts in parts of South Asia from late May onwards. The most severe impacts occurred in Pakistan, where 1037 flood-related deaths were reported during the season.

142 lightning-related deaths 17 were reported in India in June.

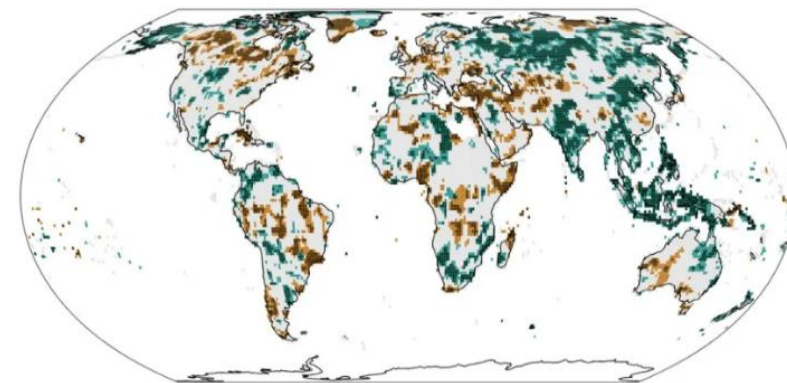
Tropical cyclone season in the South China Sea: Macao reported 14 tropical cyclone impacts during the year, the most in a single year.

Typhoons Bualoi, Ragasa, Matmo and Kalmaegi contributed to the floods, as did a number of other systems. Bach Ma, a mountain site near Hue, received 1739.6 mm of rain in 24 hours on 26-27 October, a national record.

Japan, China and the Republic of Korea all had their hottest summers on record. In Japan, mean summer temperatures were 2.36 °C above the 1991-2020 average, 0.60 °C above the previous record set in 2023 and 2024, and more than 1 °C above any summer prior to 2023.

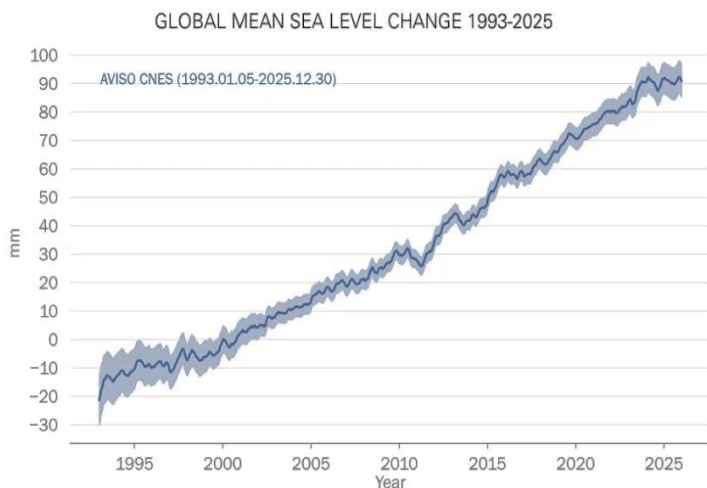
The largest known wildfires in the Republic of Korea occurred in late March, with the eastern part of the country impacted by fires which spread quickly in unseasonably warm and windy conditions following a dry winter.

2025 was an **abnormally wet** year in some regions and an **abnormally dry** year in others

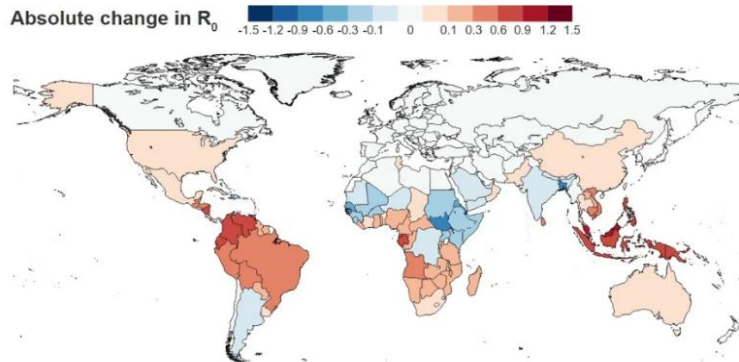


RELATIVE TO PRECIPITATION TOTALS FROM 1991 - 2020

In 2025, global mean sea level remained near record high levels of 2024

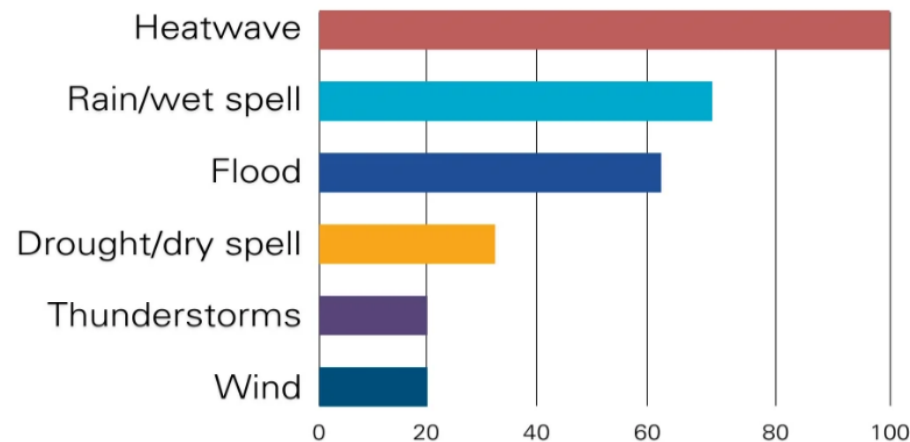


Changes in temperature and rainfall patterns have made climate more suitable for dengue to spread



ABSOLUTE CHANGE IN BASIC REPRODUCTION NUMBER (R_0) FOR DENGUE TRANSMISSION BY *Aedes Aegypti* MOSQUITOES IN 2015-2024 COMPARED TO 1951-1960 BASELINE (data from the 2025 Lancet Countdown report)

Extreme events had widespread impacts in 2025



REPORTED EVENTS BY 89 WMO MEMBERS

New Trend Studies: Weather Hazards Impacts Amplifying

For the third year in a row, Earth's average temperature reached 1.44°C hotter than the climate that sustained development as the 20th century began (1850-1900).

- This report analyzed data from eight different sources; while two ranked 2025 as the second hottest year in the last 176 years, the other six placed it as the third hottest.
- One-third of the world's oceans experienced their top three warmest temperatures historically, dating back to 1958.
- *A new El Niño could push global warming to about 1.7 degrees Celsius in 2027.*

New hail study: a global climatology of very large hail events from 1950 to 2023 combines statistical modelling with atmospheric reanalysis and examine trends in their frequency and related economic impacts showing Northern Argentina emerges as the global hotspot of very large hail events, followed by Uruguay, Paraguay, southern Brazil, the US Great Plains and South Africa.

- Hail-related losses have increased in the USA, Australia and Europe.

Hail is a primary contributor to insurance losses from severe convective storms, with the US accounting for 50–80% of insured SCS losses.

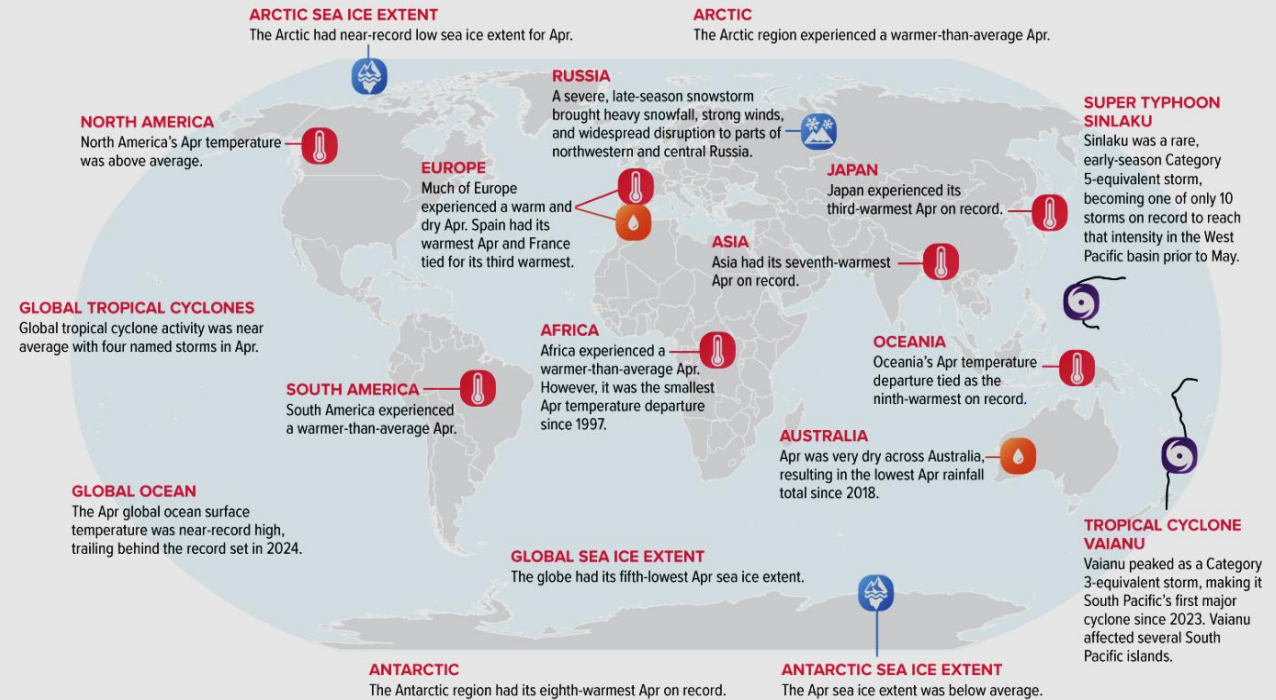
- *These losses are comparable to those caused by landfalling hurricanes.*

Vaisala Xweather reported about 250 million lightning strikes occurred in 2025, **a 20% increase from 2024.**

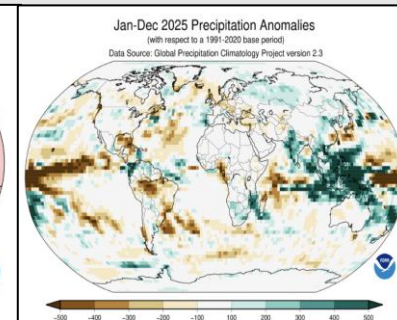
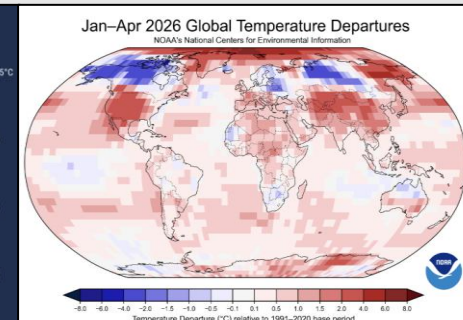
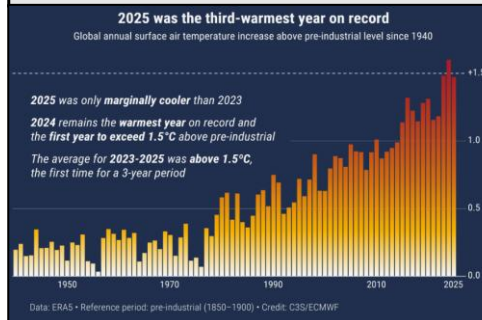
- The most active day in 2025 was April 5, when 157 severe storms, including 21 tornadoes in the Southeast, *produced more than three million lightning events.*

Notable Weather and Climate Events: April 2026

GLOBAL AVERAGE TEMPERATURE
Average global surface temperature was the fourth-warmest Apr on record.



Please note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/>



NOAA NCEI March 2026

At the county level, more than 500 counties—covering over one-quarter of the CONUS and affecting an estimated 79 million people—recorded their warmest March on record.

The average temperature over the contiguous US (CONUS) in March was 50.85°F, 9.35°F above average, ranking as the warmest March in the 132-year record.

- **This marks the first time any month's average temperature has exceeded 9°F above its 20th-century baseline.**
- It also concludes the warmest 12-month period on record for the CONUS
- Based on the spatial extent of record-warm March conditions across the CONUS, 2026 ranks second only to 2012 in area experiencing its warmest March on record.

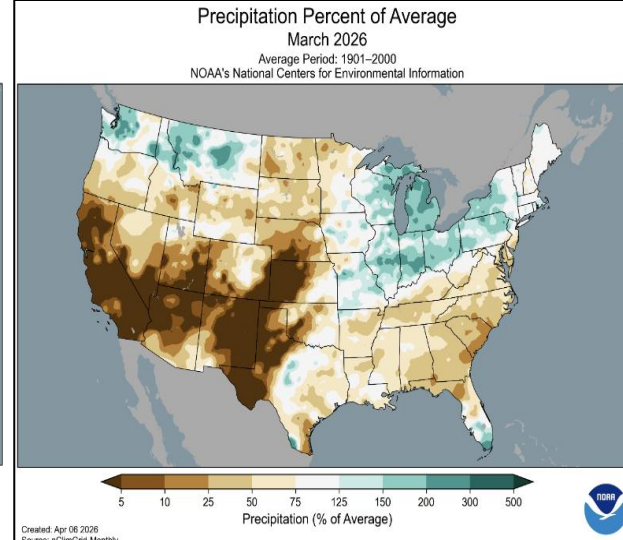
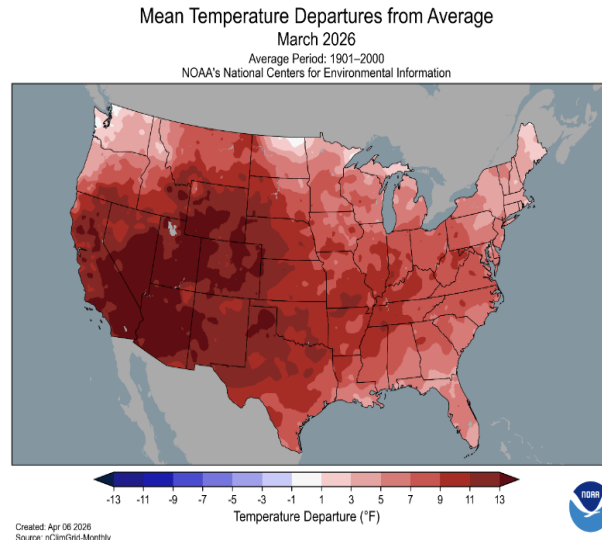
Based on NOAA climate region average temperatures, three of the nine regions—the West, Southwest and South—had their warmest March on record at more than 10°F above average, while the Northwest, Northern Rockies and Plains, Ohio Valley and Southeast each recorded one of their six warmest Marches.

Ten states set their warmest March records: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oklahoma, Texas, Utah and Wyoming.

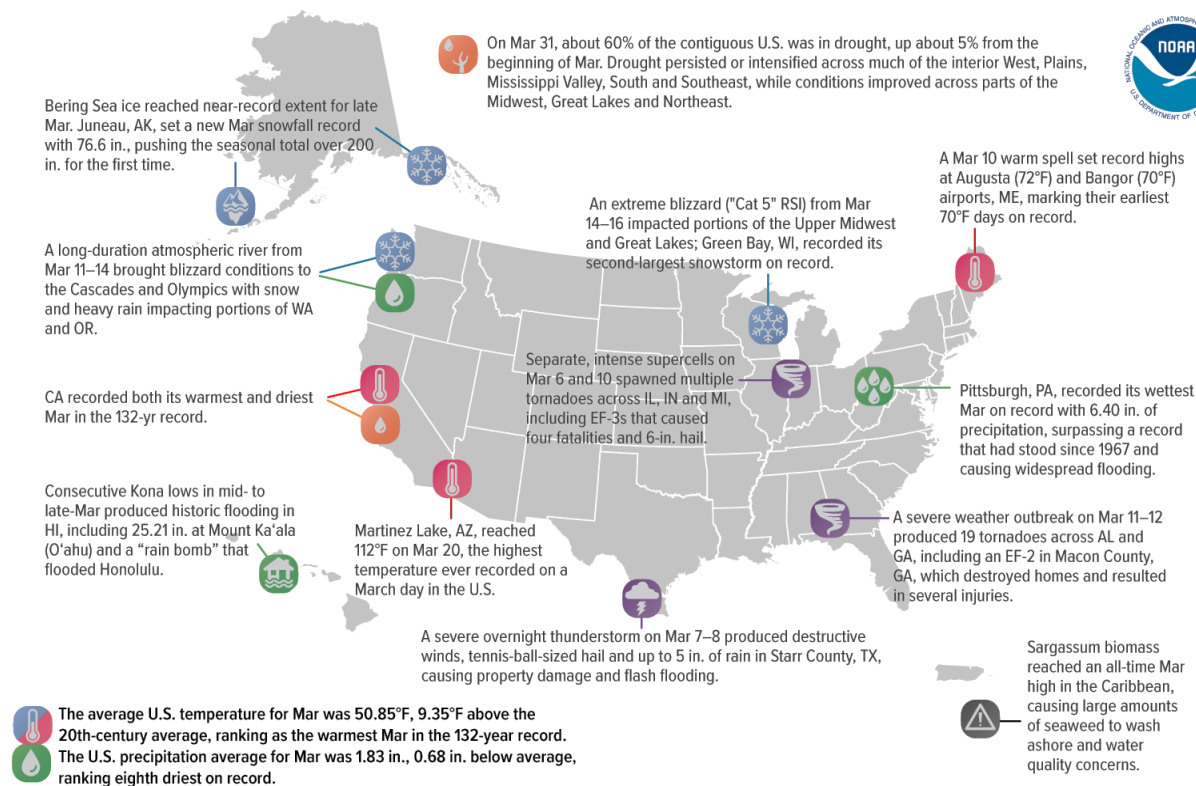
- In each of these states, the March average exceeded its April 20th-century average; in California, it was even 0.7°F above its May average.

Wyoming: As of early April, Fontenelle Reservoir was at 49% of its full storage capacity, according to the Bureau of Reclamation — despite March inflows roughly 99% of average.

The original CO River flows were allocated from 17.5 million feet, while current conditions have resulted in about 12-13 million acre-feet available.



Notable Weather and Climate Events: March 2026



Please Note: Material provided in this map was compiled from NOAA's State of the Climate Reports. For more information please visit: <https://www.ncei.noaa.gov/access/monitoring/monthly-report/>

Warming Fall – Threats to Energy and Ecology

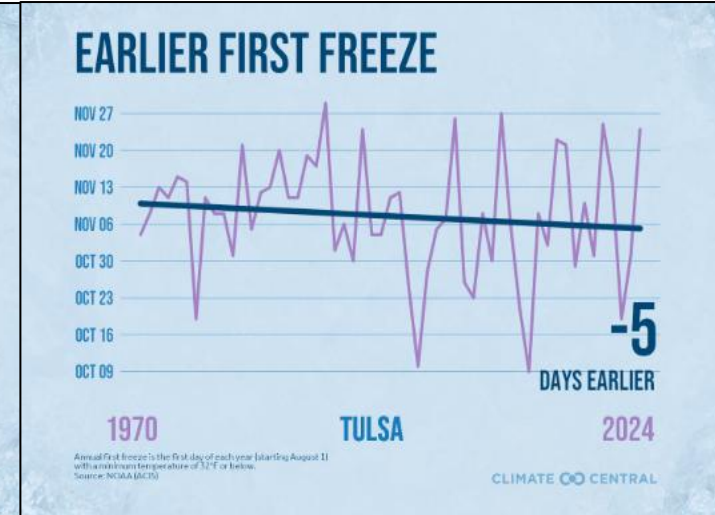
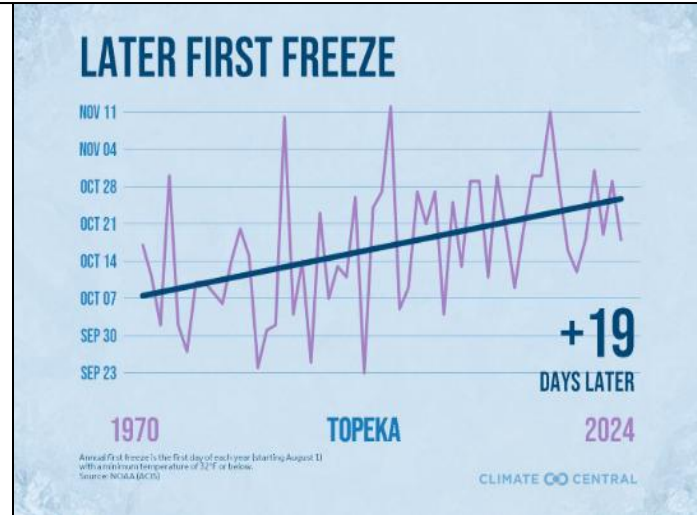
September 1st is the start of meteorological fall. The season has warmed in every county across the contiguous U.S. since 1970 and is warming fastest in the Southwest.

Fall has warmed in 237 US cities by 2.8°F on average from 1970 to 2024.

- Unusually warm fall days now happen more often in 238 cities, or 98% of the 243 cities analyzed.
- 103 (42%) of those locations have warmed by 3°F or more since 1970.

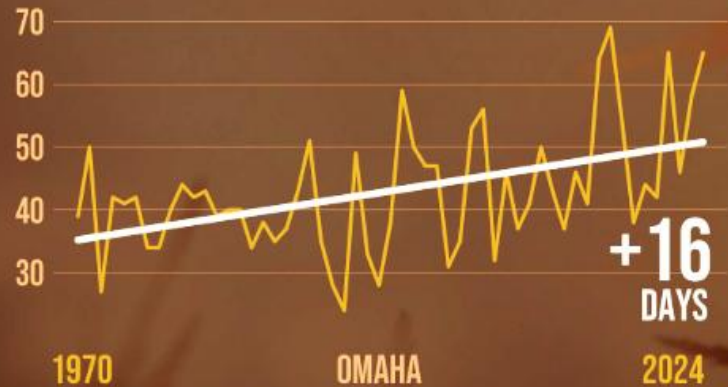
A warmer fall season means that the risky heat, high cooling demand, wildfires, and allergies of summer linger later into the year affecting health, ecosystems, and the economy.

- Top five fall warming locations: Reno, NV (7.7°F); El Paso, TX (6.5°F); Las Vegas, NV (6.2°F); Tyler, TX (5.8°F); and Tucson, AZ (5.8°F).
- Almost half of the cities analyzed (119, or 49%) now experience at least two more weeks' worth of above-normal fall days than in 1970. Over the last 10 years, back-to-school cooling demand increased by about 34%



The first freeze now arrives later in 88% (179) of cities analyzed: 12 days later, on average, than in the early 1970s. A later freeze can worsen allergies, change migration, lengthen pest seasons, and reduce summer fruit yields and lead to more heat-driven drought and water stress. Ice cover on the Great Lakes has been consistently reducing, declining by ~25% from 1973 to 2023.

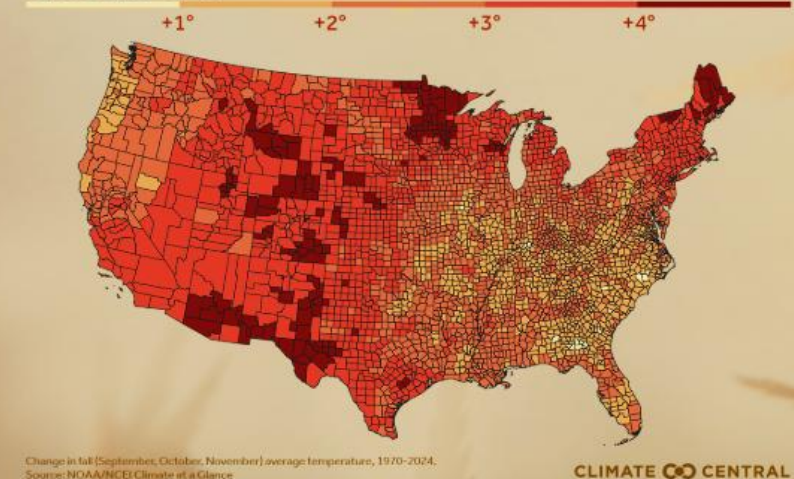
MORE WARM FALL DAYS DAYS ABOVE NORMAL



FALL WARMING AVERAGE TEMPERATURE



FALL WARMING SINCE 1970 (°F)



Changing Spring Conditions

The spring season has warmed in 234 (97%) of the 241 U.S. cities analyzed — by 2.4°F on average.

- Unusually warm spring days now happen more often. Four out of every five cities now experience at least one more week of warmer-than-normal spring days than in the 1970s.
- Spring has warmed the most across the southern tier of the country, particularly in the Southwest.
- Spring warming can prolong seasonal allergies, worsen wildfire risk, and limit snow-fed water supplies.

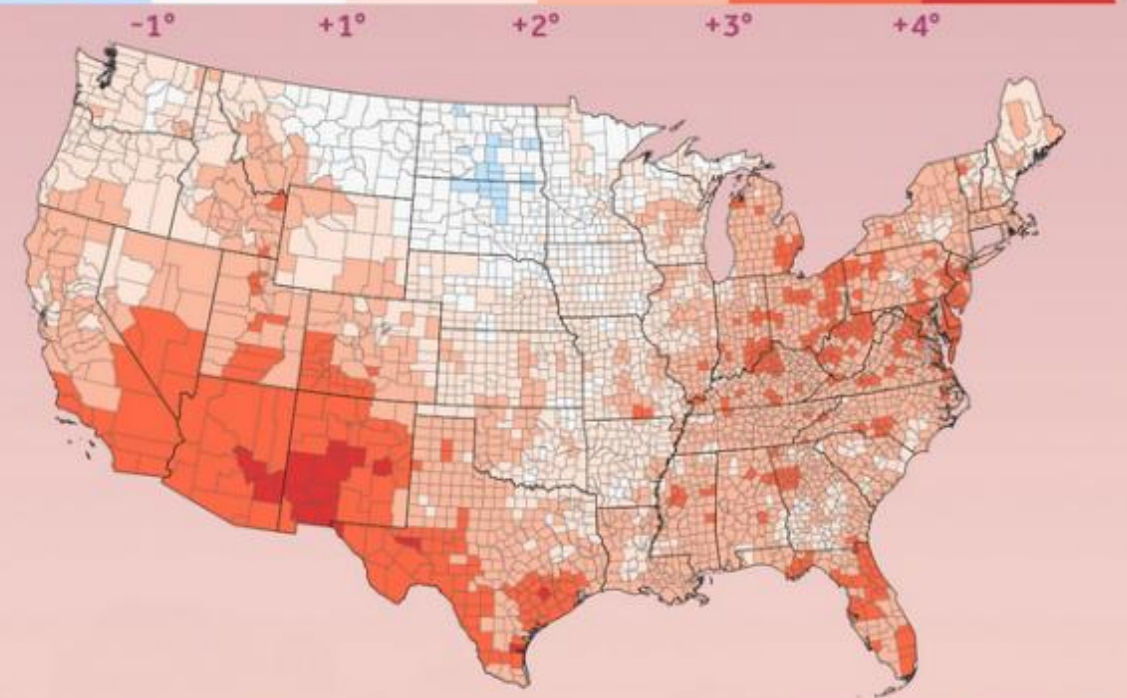
Spring warmed the most, on average, in locations across the southern tier of the country: Southwest (3.4°F), South (2.7°F), Southeast (2.5°F), and Ohio Valley (2.5°F).

- **Most locations (80%, or 194) now experience at least seven additional warmer-than-normal spring days than they did in the early 1970s.**

Warmer, shorter winters mean an [earlier spring thaw and later fall freeze](#).

SPRING WARMING

SINCE 1970 (°F)



Change in spring (March, April, May) average temperature, 1970-2024
Source: NOAA Climate at a Glance

CLIMATE CENTRAL

MORE WARM SPRING DAYS

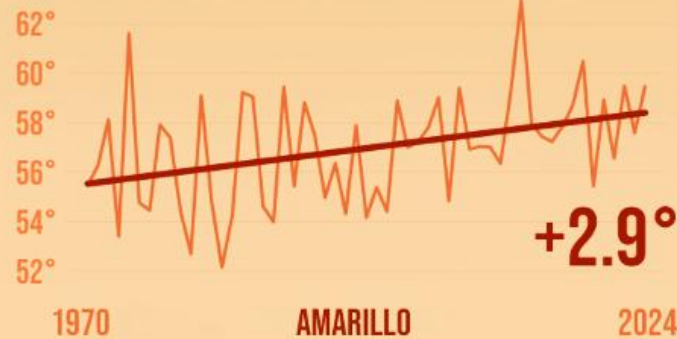
DAYS ABOVE NORMAL



Average spring days (March, April, May) above 1991-2020 climate norms
Source: NOAA (ACIS)

SPRING WARMING

AVERAGE TEMPERATURE



Average spring (March, April, May) temperatures in °F
Source: NOAA (ACIS)

CLIMATE CENTRAL

Warmer spring temperatures result in earlier thaws, heavier spring rainfall, longer growing seasons, double blooms, river system changes, marine and wildlife shifts, and changes to energy needs.

LONGER GROWING SEASON

Change in freeze-free season length from 1970-2023



Freeze-free season - number of days between the onset and end of continuous 32°F
Source: FCD ACT199

CLIMATE CENTRAL

Climate Central's Warming Seasons Graphics

Winters have warmed by 4°F on average across 235 US cities since 1970. Warmer, shorter winters have lingering effects on health, water supplies, and agriculture throughout the year.

Summers are heating up in 234 of major US cities by an average of 2.6°F since 1970.

Analysis also shows persisting warmer-than-normal summer nights since 1970 in 246 major US cities.

MORE HOT SUMMER DAYS DAYS ABOVE NORMAL

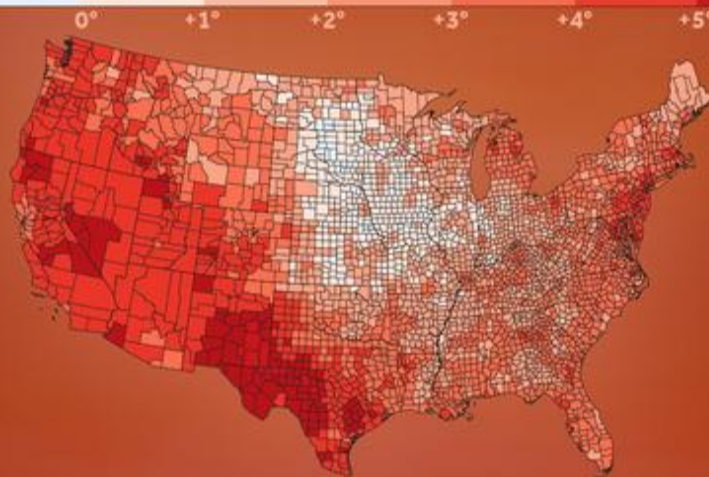


SUMMER WARMING AVERAGE TEMPERATURE



SUMMER WARMING

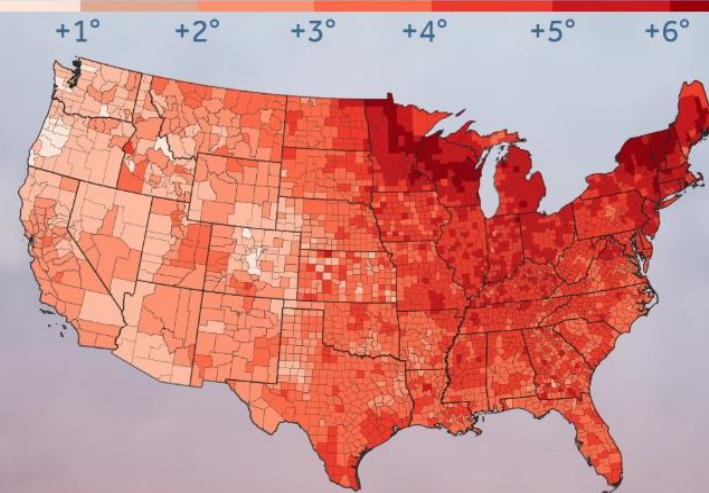
SINCE 1970 (°F)



CLIMATE CENTRAL

WINTER WARMING

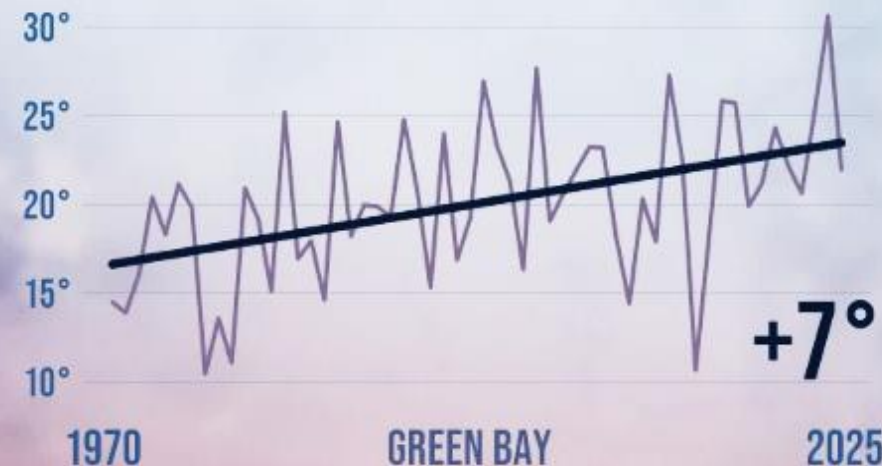
SINCE 1970 (°F)



CLIMATE CENTRAL

WINTER WARMING

AVERAGE TEMPERATURE



CLIMATE CENTRAL

MORE WARM WINTER DAYS

DAYS ABOVE NORMAL

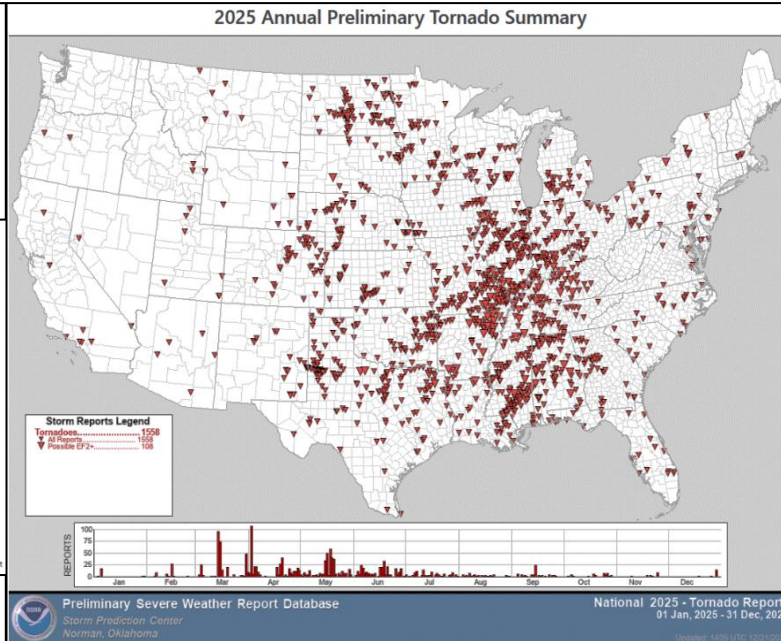
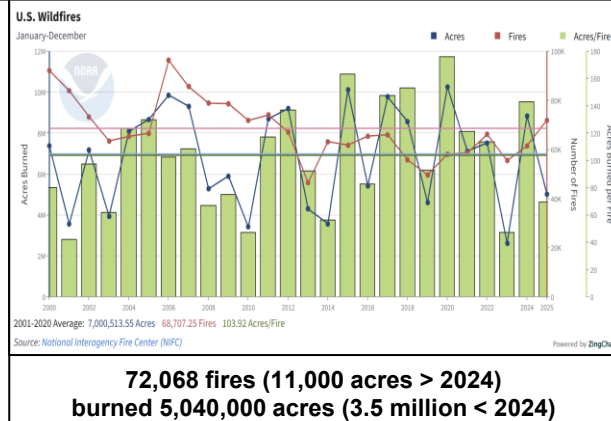
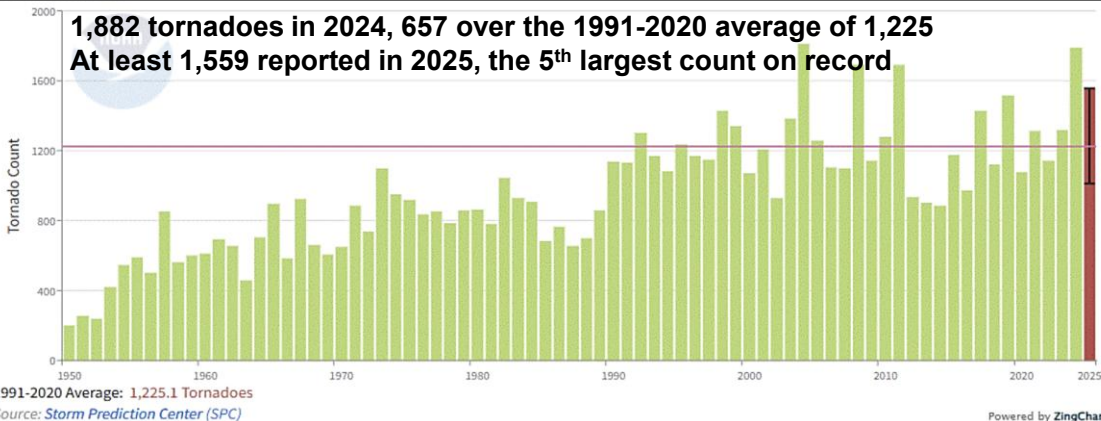


CLIMATE CENTRAL

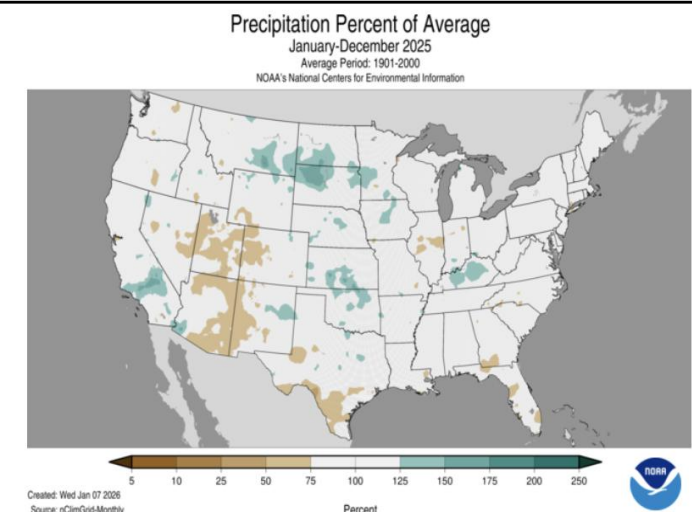
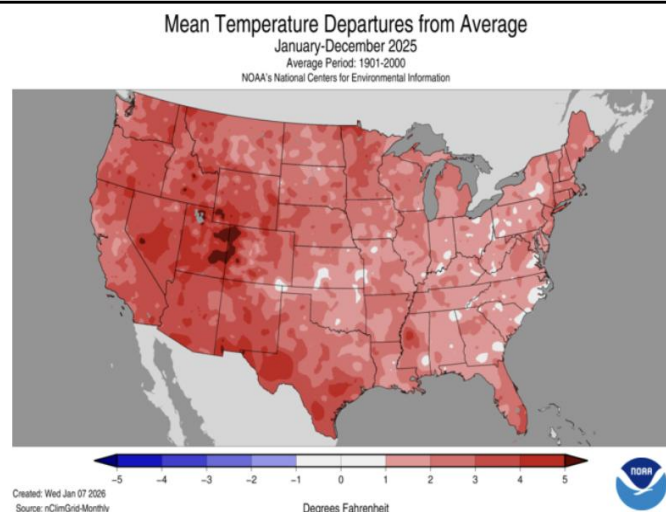
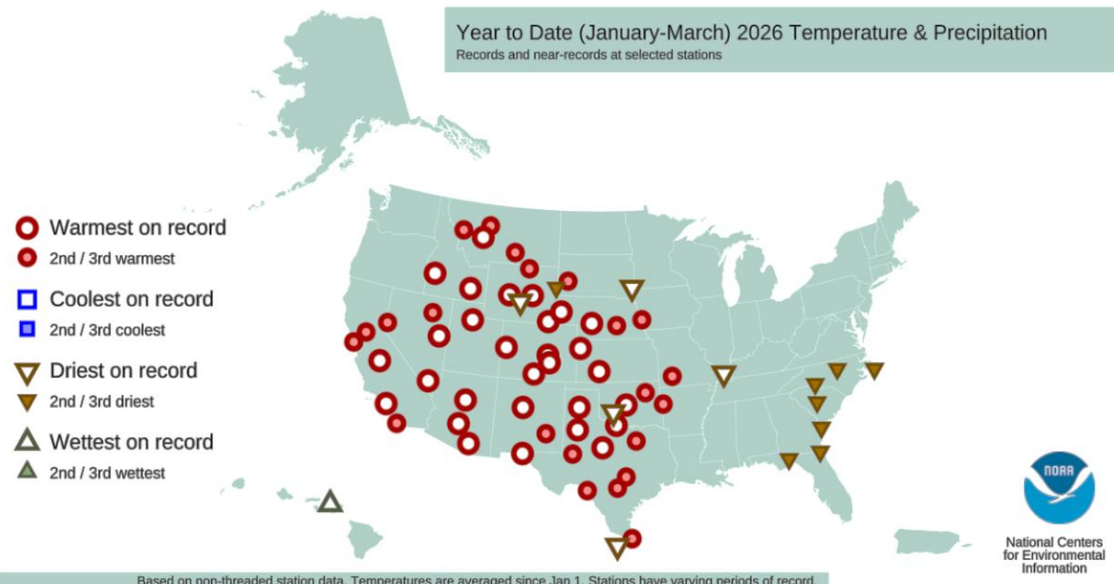
National Temperature Swings Yield Extremes

The average annual temperature for the contiguous U.S. (CONUS) in 2025 was 54.64°F, 2.63°F above the 20th-century average, ranking as the fourth-warmest year in the 131-year record.

The Rockies and Westward region, stretching from the West Coast through the Rocky Mountains, recorded its warmest annual temperature on record.



Following a November that saw five states set monthly records, nine states-Arizona, California, Colorado, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming-recorded their warmest December on record, in stark contrast to Alaska, which endured its coldest December since 1980.



Concrete: In high heat environments over 80°F, concrete should not be poured, or it will not set effectively. This can increase setting time from 2-3 days up to 7 days in hot weather.

- Thermal cracking is found particularly in thick slabs, or mass concrete, where the temperature differential between different areas of the concrete is too high. (Examples: airport aprons, bridge headsticks, and highways where repaving needs have been increasing).

Epoxy: Most heat-resistant epoxies need to be cured at temperatures at or beyond the temperature it will need to endure. If temperatures exceed these maximum service temperatures, the material could start to distort. At a temperature of 135°F or higher, epoxy may begin to exhibit heat damage.

- Epoxy faces the same concerns of needing a few days to cure but in persistent high heat/humidity levels it could take up to two weeks.
 - If Epoxy cures in too high of a temperature it can become too solid, resulting in less give during temperature swings and may crack.

Metals: Extreme heat causes various metals to expand in addition to impacting the structure, electrical resistance, and magnetism. When metal heats, the bonds begin to break.

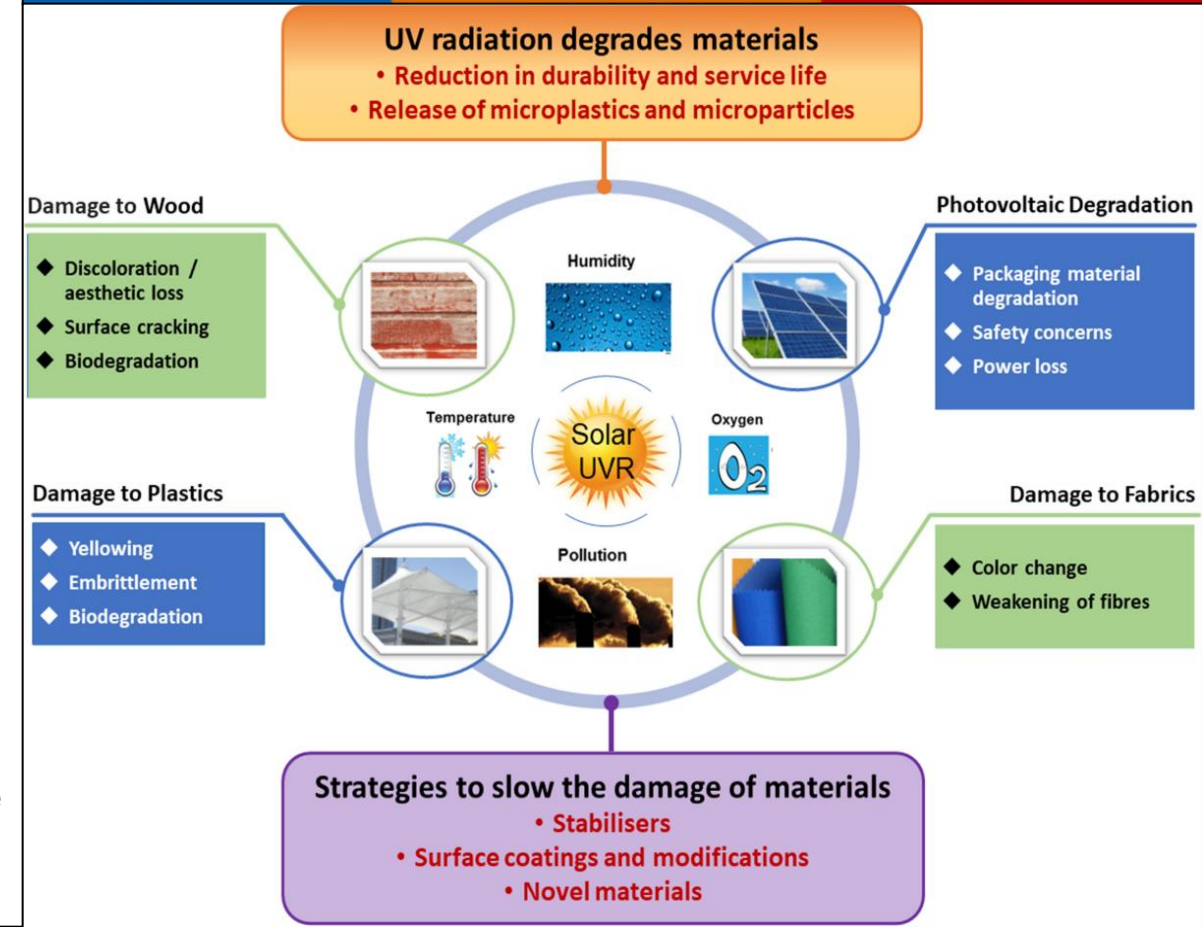
- Bridges in New York, Sacramento, and London have faced thermal expansion or cracking— 95°F in New York, 103°F in Sacramento, and 65°F in London.

Powerlines: Extreme heat can sag powerlines causing transmission lines to lose up to 5.8% of their capacity to carry electricity. Wind turbines can be 25% less efficient in high temperatures.

- The combined effects of extreme heat cost the US over \$162 billion in 2024 – equivalent to nearly 1% of the U.S. GDP.

Despite 2025's below-average total area burned, fires burned more intensely, leading to a 10% increase in emissions compared to the 20-year average. Smoke can pose a serious hazard near power lines because it is conductive and can cause electricity to arc.

AIR TEMP	CONCRETE	ASPHALT
85°	105°	130°
91°	125°	140°
97°	145°	150°



Severe Weather on the Rise

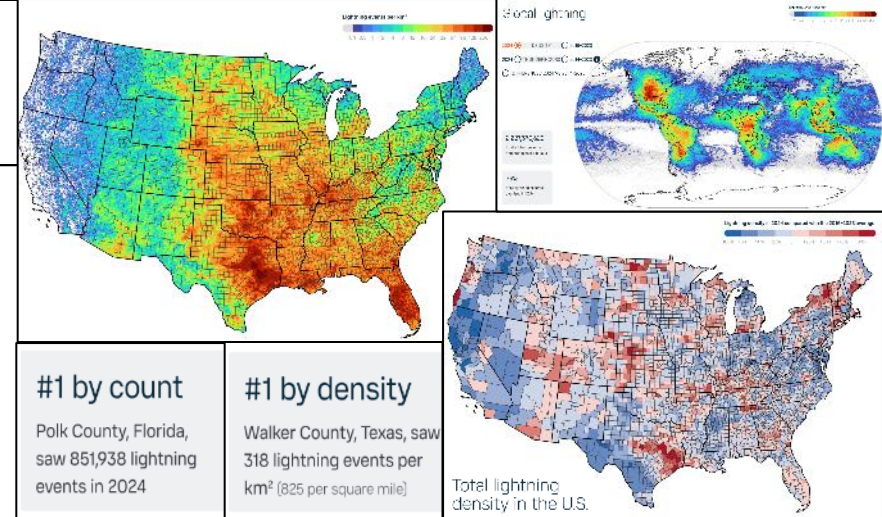
Hail events throughout the US are forecasted to intensify regarding size of the hailstones as warmer seasons across multiple regions can enable stronger updrafts for supercell storms responsible for large hail especially across less hardened areas.

- Insured U.S. hail losses average \$8 billion - \$14 billion per year, or \$80-140 billion per decade.

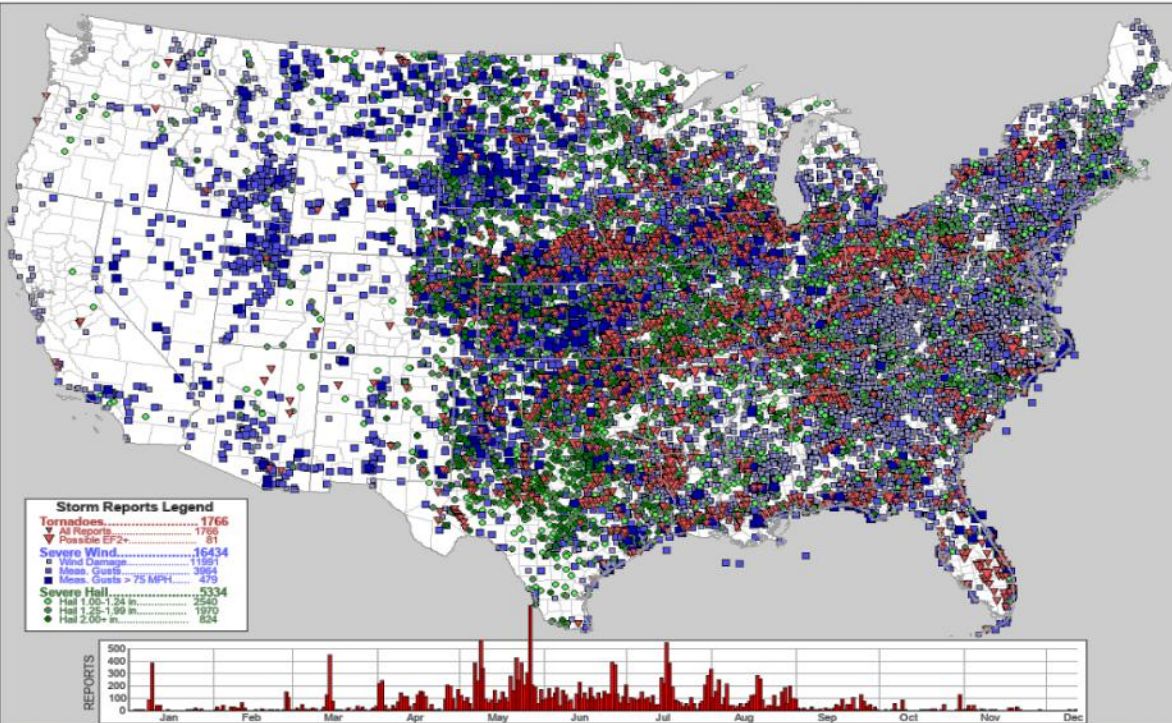
A new [study](#) published by the National Center for Atmospheric Research finds there has been “a fivefold increase in the area affected by straight-line winds since the early 1980s” in the central U.S. Straight-line winds are often produced by thunderstorms and can impacts like that of a tornado. **These winds have increased at a rate of 13% per degree of warming.**

Tornado activity from 2008-2021 in comparison with 1991-2010 indicates the seasonal frequency has remained the same but the location and intensity of tornadic supercells has expanded from “Tornado Alley” to “Dixie Alley” producing larger, longer supercells. Dixie Alley includes Eastern TX, AR, LA, TN, KY, MS, AL, GA, South MO, Southeast OK, and the FL panhandle.

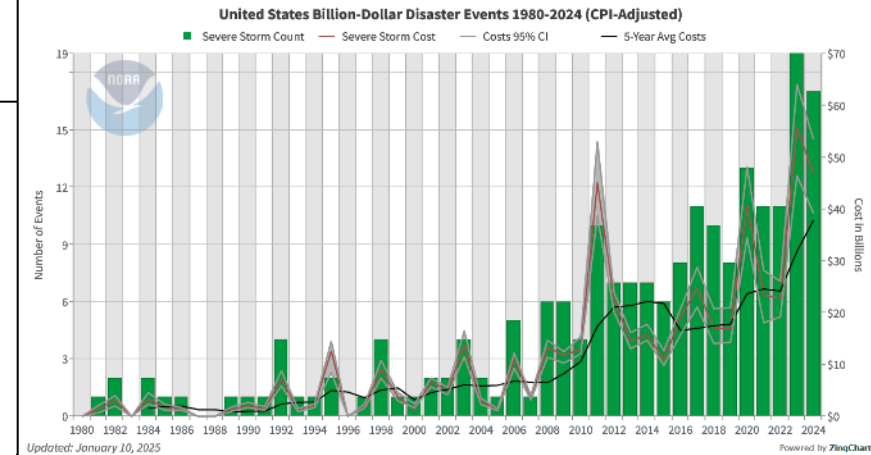
A recent study predicts a nationwide 6.6% increase in supercells and a 25.8% expansion in the area and time supercells remain over land by the year 2100. This may result in areas which do not often see tornadic activity reporting increases.



2024 Annual Preliminary Report Summary

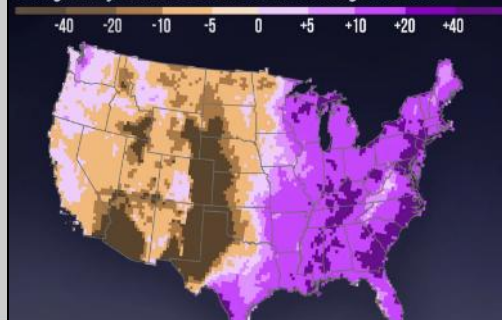


March 2025 produced a new record for tornadic activity in the US while April yielded 2x the average tornado count. Hail reaching DVD size (4-5 inches) aka grapefruit size, was reported in multiple states at increasing rates with last year producing melon size (+6 inches). May 2025 is in the top 10 for most tornadic activity on record and June produced over 215 tornadoes, placing the first 6 months of 2025 +1,200 tornadoes.



ANNUAL THUNDERSTORM POTENTIAL

Change in days with CAPE at or above 1000 J/kg since 1979



HAIL CLAIMS REPORT 2018-2020



The Role of Heat in Storm Growth

Severe thunderstorms are defined as having sustained winds above 93 kilometers (58 miles) per hour or unusually large hail, and there are two key factors that fuel their formation: convective available potential energy (CAPE) and strong wind shear.

- Research by Climate Central has shown an increase of 10 to 15 high-CAPE-value days annually between 1979 and 2021 across much of the eastern US.
- Cities such as Atlanta and New York City could see a doubling of the number of days that severe thunderstorms could occur.

Lightning: *Each 1 degree Celsius of warming could spur a 12% increase in lightning frequency, boosting the flash rate to about four times per second by 2090*, up from nearly three times per second in 2011. Many sites across the US reportedly do not invest in lightning protection systems.

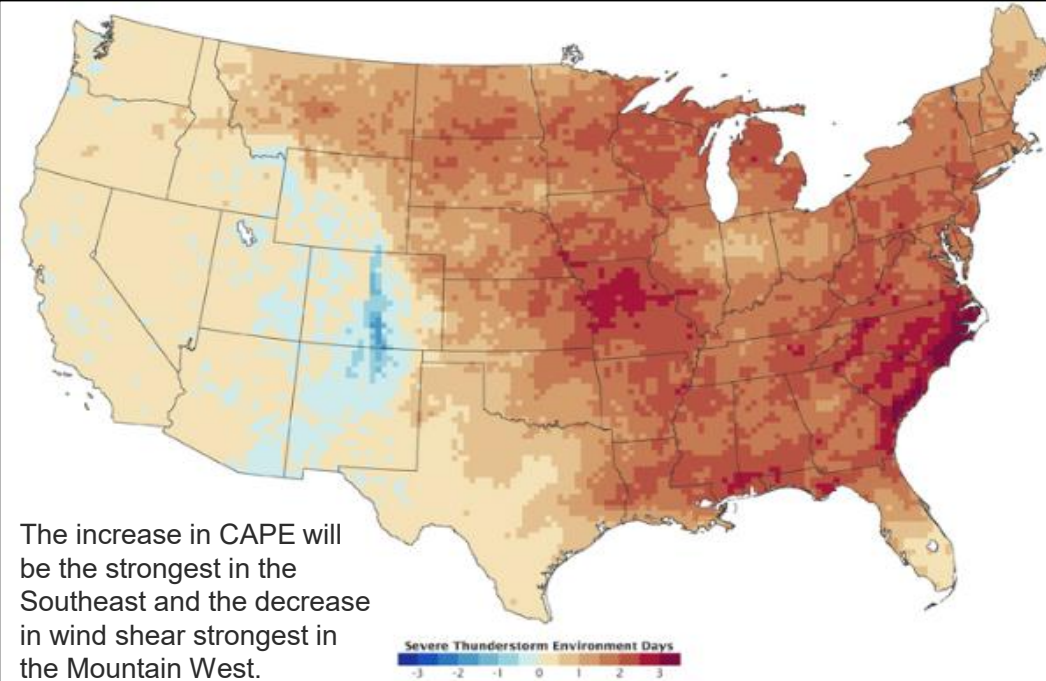
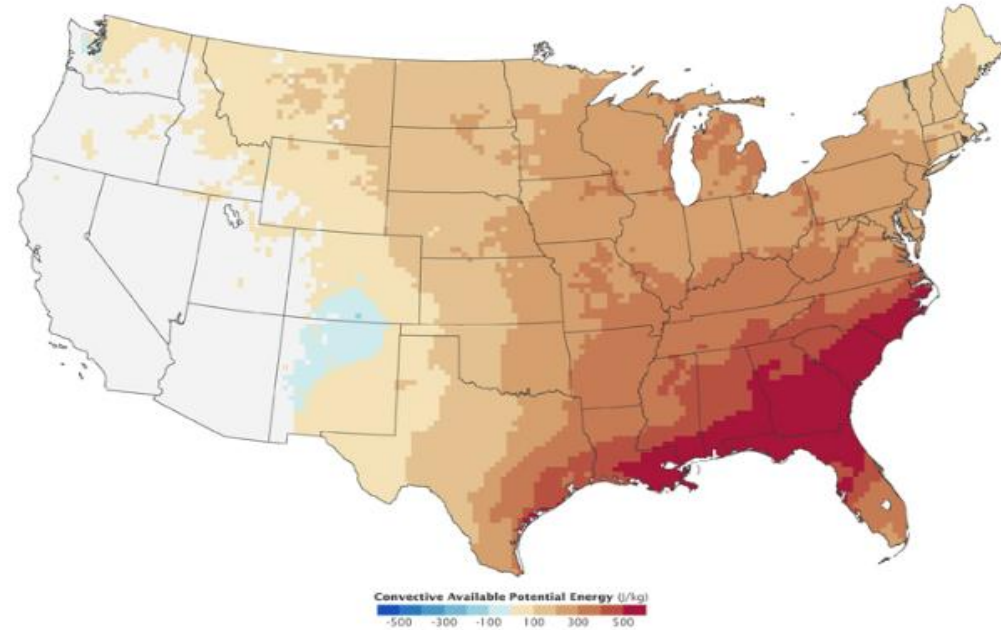
- Flashes that touch down amid minimal or no rainfall, known as dry lightning, are especially effective fire starters.
- Currently about 20 million lightning bolts touch down each year within the US.
- Hotter days may boost updraft within thunderstorms, causing lightning flashes to increase in frequency to about 4 strikes per second globally — about a 40% increase from 2011.
- *The rate of all cloud-to-ground strikes increasing to ~8 flashes per second (+28%).*

Hail: increasing temperatures and humidity could fuel larger hail and could mean smaller pellets are more likely to melt before hitting the ground.

- *Damage from severe thunderstorms has been inching up by about 7% annually for 30 years.*
- Worldwide, thunderstorm losses were almost 90% higher than the previous five-year average of \$32 billion and over double the previous 10-year average of \$27 billion.

Severe thunderstorms and climate change

Models compare the summer climate from 1962–1989 to future climate projections for CAPE indices in 2072–2099.



The increase in CAPE will be the strongest in the Southeast and the decrease in wind shear strongest in the Mountain West.

Hail Records Continue to Rise

2010: A hailstone was discovered in South Dakota measuring 8.0 inches in diameter, 18.625 inches in circumference, and weighing 1.94 pounds.

2016/2022/2024 Colorado reported 2-feet of hail requiring plow trucks to move and triggering flooding as the ice melted quickly at the surface.

2023-2025: Multiple states reported melon-size hail (+6-inch diameter).

2025: Texas's new record hailstone reported at 7.25-inch diameter.

Pollution can influence hail formation and potentially lead to larger hailstones.

Pollutants provide cloud condensation nuclei, affecting the size and number of stones.

Hail severity will increase in most regions of the world while Australia and Europe are expected to experience more hailstorms.

Insured U.S. hail losses now average \$8 billion to \$14 billion per year, or \$80-140 billion per decade (as of 2022).

This outpaces the total of \$14.1 billion in insured US property loss from tornadoes over the decade from 2010 to 2020.



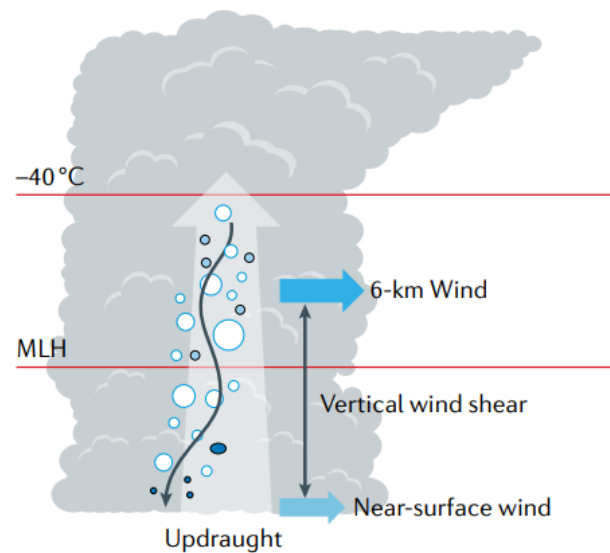
TEXAS Record MONSTER Hailstone!

Documented 7.25" hailstone 3 miles WNW of Vigo Park, Texas at 7:37pm Sunday set a new state record (pending) shattering the previous record of 6.4" in Hondo, TX in 2021.

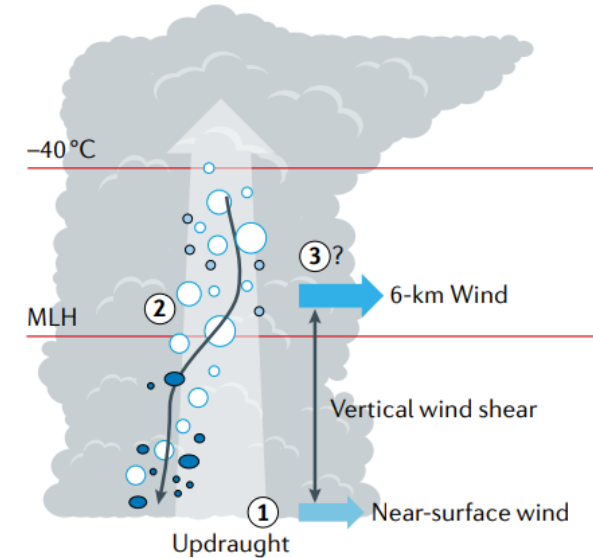
Permission: Val and Amy Castor 7:25 PM · Jun 4, 2024



a Current climate



b Future climate



○ Hailstones ● Supercooled liquid water ● Rain

Fig. 1 | Hail-relevant atmospheric phenomena in current and future climates. The expected changes in hail-relevant atmospheric phenomena between the current (panel a) and future (panel b) climates. The numbers in panel b correspond to the following changes: (1) increased low-level moisture leads to increased convective instability and updraught strength; (2) an increase in the melting level height (MLH) leads to enhanced melting of hailstones and a shift in the distribution of hailstone sizes towards larger hailstones; and (3) changes in vertical wind shear may affect storm structure and hailstone trajectories, but are generally overshadowed by instability changes.

Lightning Trends Increasing Wildfire Risk

The Northwest can expect a widespread increase in days with cloud-to-ground lightning in the years to come, along with heightened wildfire risk, according to projections made with a unique machine-learning approach developed at Washington State University.

- A study [published](#) in the journal *Earth's Future* offers detailed projections of [lightning](#) across the Western U.S. for the mid-21st century. **The largest change in lightning is expected in parts of Idaho, Washington and Oregon, with four to 12 more days of lightning per year in some parts of the Rocky Mountains.**

Researchers also matched those lightning projections with future [wildfire](#) risk to calculate the changes in daily risk of lightning-caused fires. The trend is clear; a heightened risk of lightning-caused wildfires across 98% of Western lands susceptible to fire.

- **Lightning already accounts for more than two-thirds of the acreage burned in wildfires across the West**

In the current project, the team used data from three key meteorological variables conducive to lightning from the summers of 1995–2022 to train the network in each grid box to make mid-century projections.

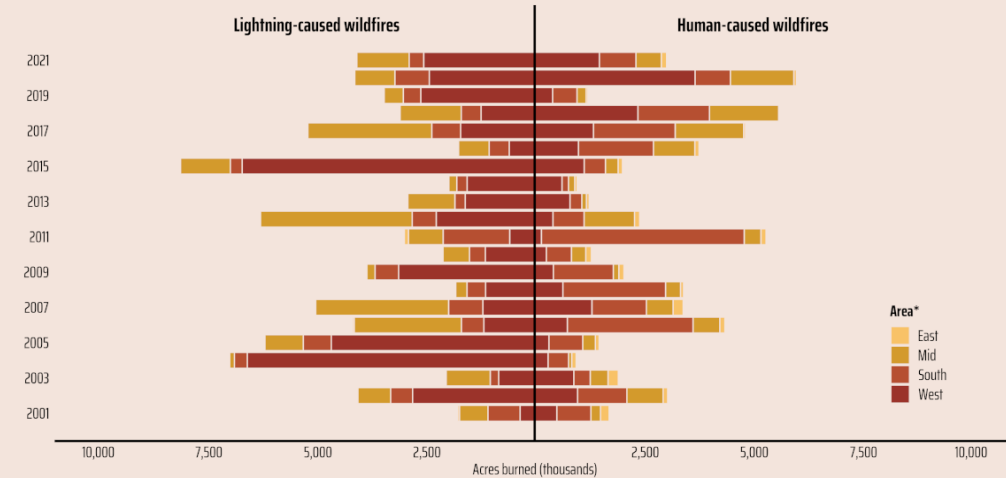
An increase in lightning days does not result in a 1-to-1 increase in fire risk, however, because fire risk depends on other variables, such as temperature, rainfall or wind and vegetation dryness.

- **Across the Rockies the number of days with a high likelihood of lightning-caused fires is expected to grow by three or more days by the mid-21st century, though the overall increase in lightning days is larger.**
- Parts of Utah and Arizona showed a reduction in lightning days—but an increase in days of potential lightning-caused fires, due to higher wildfire risk in general.

A recent study reported a 141% increase in **positive** cloud-to-ground lightning during the Indian summer monsoon from 2014 to 2023.

Wildfire Causes in the U.S. Between 2001 – 2021

Each year, millions of acres of the U.S. landscape burn in wildfires. Lightning strikes account for the majority of wildfires, but humans caused fires are far from few. Wildfire suppression is costly. According to The National Interagency Fire Center (NIFC), the average firefighting suppression cost over the last five year period is estimated at \$2,862,884,200.



What Causes Wildfires?

A spark, in the presence of fuel and oxygen, can cause a fire, which can further spread depending on various weather conditions.



Fire Weather

Nationwide, the number of existing properties facing at least a 1% risk will almost quadruple, to 2.5 million by 2050; not accounting for subdivisions to be built in the intervening years.

Over 7 million American homes currently have a "major" risk of wildfire damage, increasing to 13 million over the next 30 years, according to a national wildfire assessment by the First Street Foundation in May 2022.

A study from the University of Colorado states wildfires have become larger, more frequent, and more widespread since 2000.

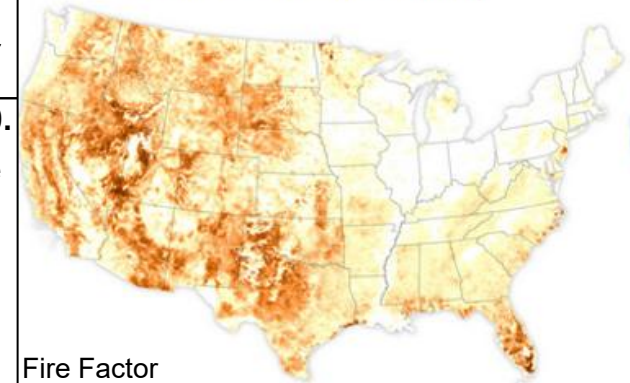
- A new study from the University of Montana highlights burn scar impacts to tree regrowth across various regions, indicating new tree seedlings are unable to survive in hotter climates where parent trees remain. The study indicated that if large areas of the forested parts of the Rocky Mountains burned, only 50% would recover.

Satellite imagery and state/federal fire history records from 28,000 fires in 1984-2018 showed more fires occurred in the past 13 years than the previous 20 years. **On the West and East coasts, fire frequency doubled. In the Great Plains, fire frequency quadrupled.**

Burned vegetation and charred soil form a water repellent layer which blocks water absorption along with compacted soil from months to years of drought which also inhibits water absorption regionally.

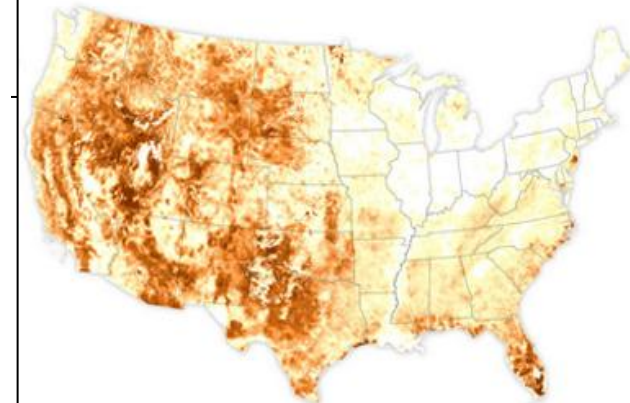
- These major soil changes cause short rainfall events to be less beneficial for long term recovery.

The estimated likelihood of wildfire **today**.

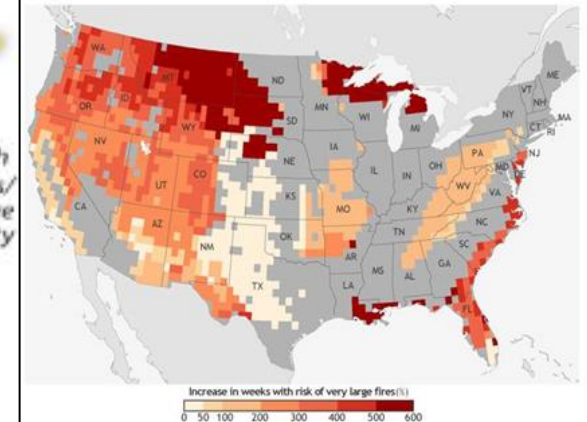


Fire Factor

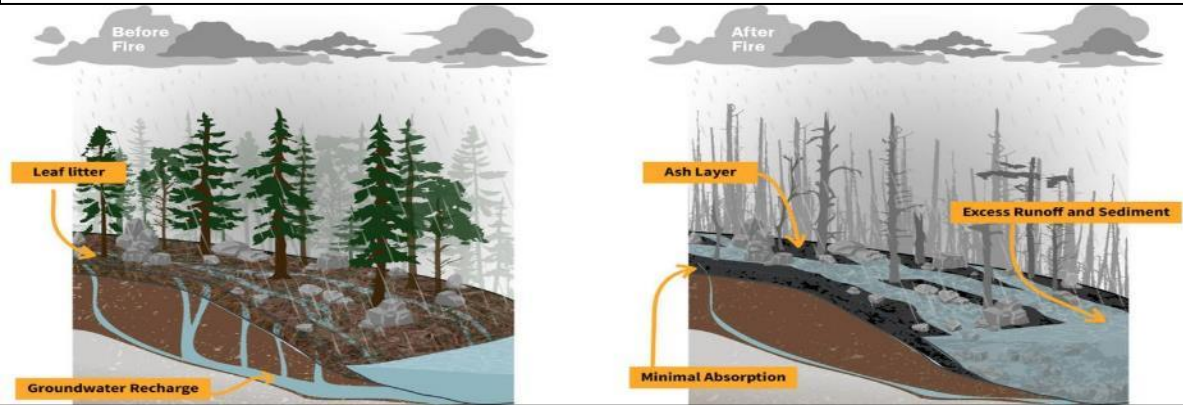
And in 30 years, with warming.



The map below shows the projected increase in the number of "very large fire weeks"—periods where conditions will be conducive to very large fires—by mid-century (2041-2070) compared to the recent past (1971-2000). The projections are based on scenarios where carbon dioxide emissions continue to increase.

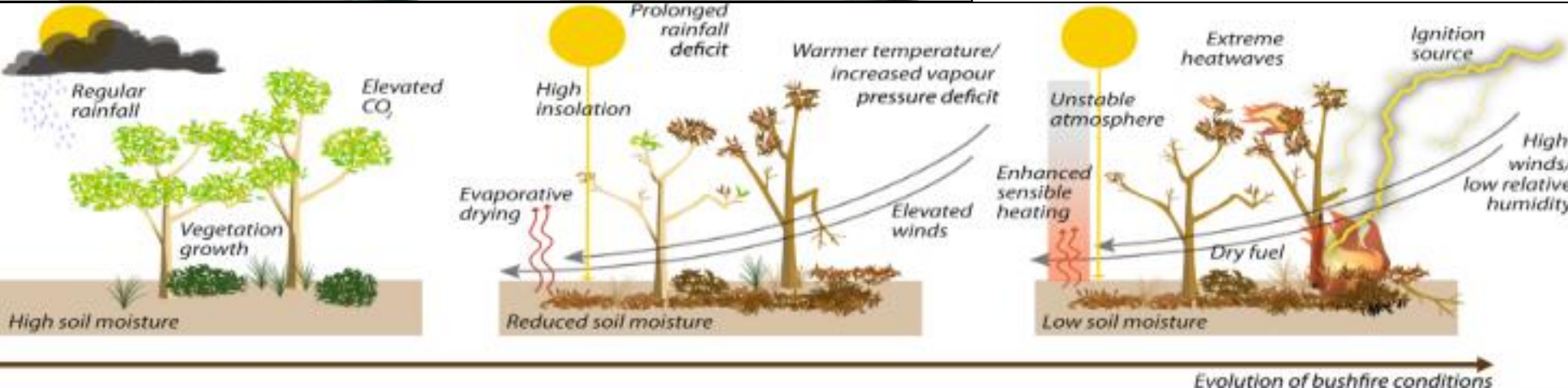


Source: NOAA Climate.gov map, based on data from Barbera et al, 2015.



Disasters related to weather, climate, or water hazards happen five times more often now than they did in the 1970s. Droughts that may have occurred only once every decade or so now happen 70% more often.

- The IPCC states heavy rainfall that used to occur once every 10 years now occur 30% more often.
- 61% of western wildfires have occurred since 2000 with a steady increase in the number of wildfires the last 60 years.



Evolution of bushfire conditions

Energy Sector Losses – Ex Wx

Between 2000 and 2023, 80% of reported major outages in the U.S. were due to weather-related events. Severe hailstorms can damage renewables like wind turbines and solar power.

- The average annual number of weather-related power outages increased by roughly 78% during 2011-2021, compared to 2000-2010.

The US experienced about two times more weather-related outages during the 10 years 2014-2023 versus the first 10 years analyzed of the 2000's (2000-2009).

- Future impacts: A two-week outage could cause a hit to the gross domestic product of the greater Chicago metropolitan area as high as \$17.1 billion.

Solar panels and turbines exposed to icing, freezes, or hail may see significant output loss, damage, or exponential deterioration rates.

- Wind turbines also face significant costs from lightning at +\$100 million a year and accounts for about 60% of the blade losses.

A new survey from the USC Center for Risk and Economic Analysis of Threats and Emergencies on power outages increasing nationally showed that 71% of large enterprises had some backup capacity, compared to only 22% of small businesses and 12% of residential customers.

- Researchers estimate that doubling the number of customers with generation capacity could reduce losses to gross domestic product by up to 14%.

Power outages cost the American economy between \$20 billion and \$55 billion annually from storm-related disruptions alone.

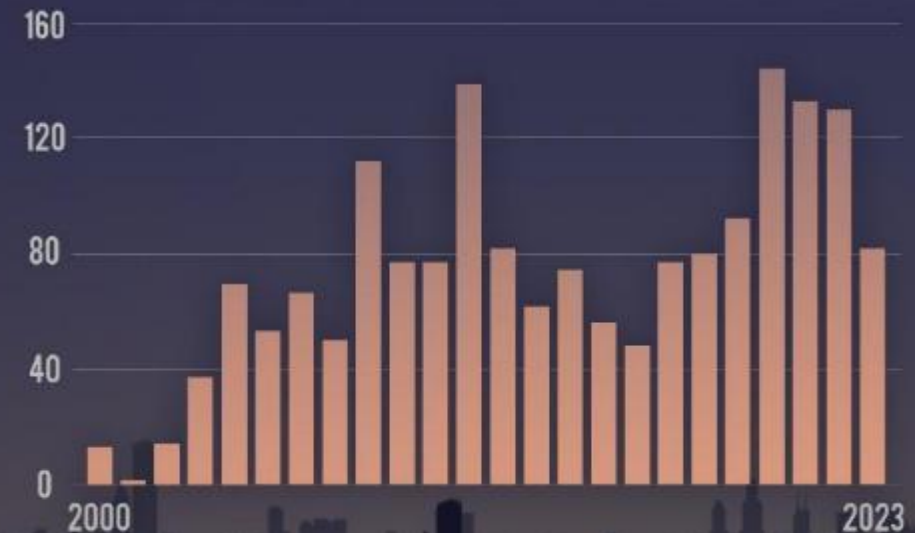
- The cost of a US data center outage has grown to \$8,851 per minute.

MAJOR U.S. POWER OUTAGES WEATHER-RELATED, 2000-2023



Number of outages affecting more than 50k customers or service of 500 megawatts
Source: US Dept of Energy from OC-417

WEATHER-RELATED MAJOR U.S. POWER OUTAGES



Annual number of weather-related major power outages
Number of outages affecting more than 50k customers or service of 500 megawatts
Source: US Department of Energy from OC-417

The Southeast (360), South (352), Northeast (350), and Ohio Valley (301) experienced the most weather-related outages from 2000 to 2023.

Inches Per Hour and Peak Wind Risks Rise

With 2°C (3.6°F) of global warming, the majority (85% or 2,645) of 3,111 total U.S. counties are likely to experience a 10% or higher increase in precipitation falling on the heaviest 1% of days.

A 2024 study by Climate Central found that 126 of 144 US cities they examined saw an increase in hourly rainfall intensity from 1970 to 2022.

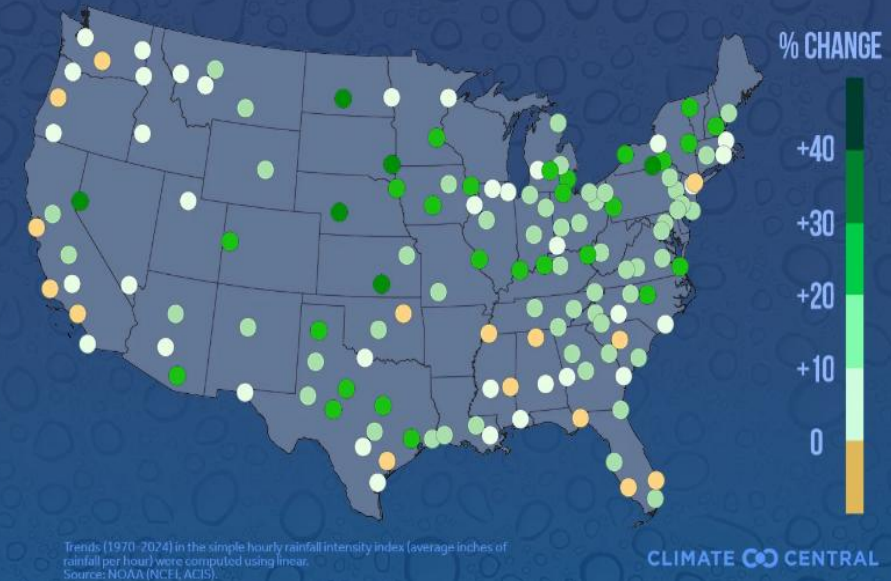
- Rainfall hours became 15% wetter on average across the 126 cities studied with an 88% increase in hourly rainfall rates.
 - The highest known 1-minute total is also held by the US in Unionville, Maryland at 1.23 inches in 1956.
 - The highest known one-hour rainfall total in the US is 12 inches in Holt, Missouri, on June 22, 1947. This rainfall occurred in just 42 minutes.
 - The record 6-hour rainfall was in Smethport, PA at 34.5 inches. A record 42 inches were reported in 24 hours in Alvin, Texas in 1979.

A new study finds the strongest nor'easters have intensified over the last 80 years, with a 6% increase in peak wind speeds resulting in a nearly 20% increase in destruction potential.

- [Previous studies](#) published have predicted an increase in the intensity of extratropical storms close to the northeastern US due to warming during the cool season.
 - The strongest wind gust recorded in the US was 231 mph at Mt. Washington in 1934

HIGHER RAINFALL INTENSITY

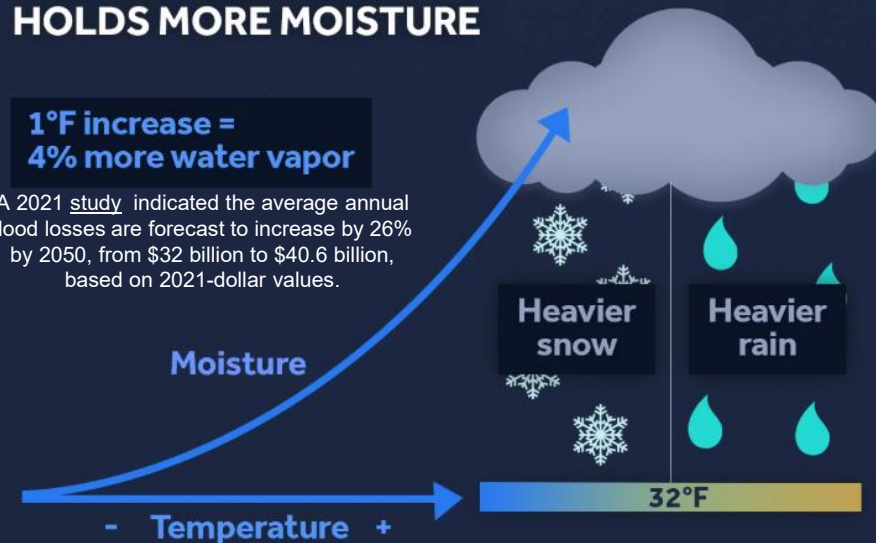
Change in hourly rainfall rate, 1970-2024



WARMER AIR HOLDS MORE MOISTURE

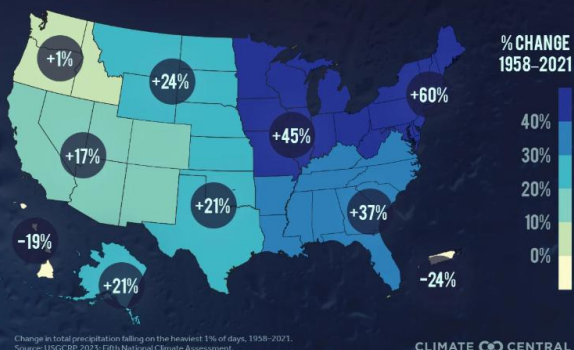
1°F increase = 4% more water vapor

A 2021 [study](#) indicated the average annual flood losses are forecast to increase by 26% by 2050, from \$32 billion to \$40.6 billion, based on 2021-dollar values.



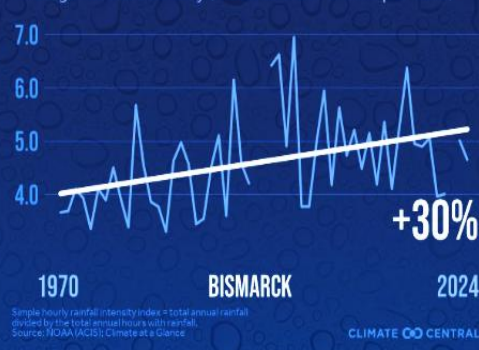
HEAVIER DOWNPOURS

Change in precipitation on heaviest 1% of days



HIGHER RAINFALL INTENSITY

Average rainfall intensity (hundredths of inches per hour)



HOW DOES CLIMATE CHANGE AFFECT CYCLONES?

STRONGER WINDS

The intensity of tropical cyclones is expected to increase, leading to a higher proportion of severe tropical cyclones (and a decreased frequency overall). Cyclones may also intensify faster.

MORE RAINFALL

Warmer ocean temperatures and a warmer atmosphere mean that the rainfall associated with tropical cyclones will likely increase. Flooding is often the most destructive aspect of tropical cyclones.

INCREASED COASTAL EROSION & FLOODING

Rising sea levels mean that the storm surges that accompany tropical cyclones are even more damaging.

LENGTHENED SEASON, INCREASED RANGE

Climate change is likely to extend the cyclone season, and extend the range of cyclones southwards, where housing is not built to withstand cyclones.

Increases in 1 Hour / 6 Hour / 24 Hour Rainfall Totals

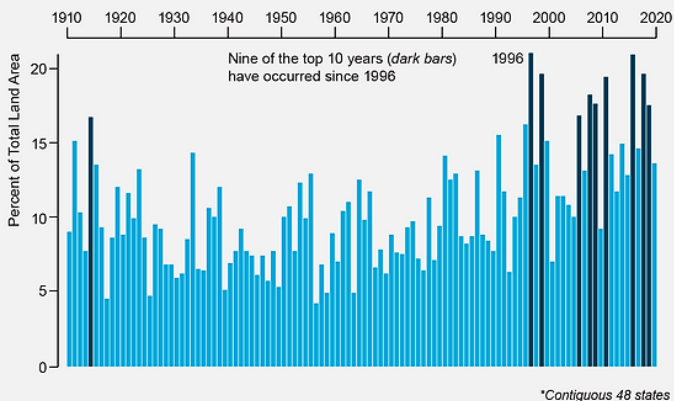
Increases in atmospheric water vapor also amplify the global water cycle. They contribute to making wet regions wetter and dry regions drier. The more water vapor that air contains, the more energy it holds. This energy fuels intense storms, particularly over land. This results in more extreme weather events ([NASA](#)).

- More evaporation from the land also dries soils out. When water from intense storms falls on hard, dry ground, it runs off into rivers and streams instead of dampening soils. This increases the risk of drought and floods.

Heavier Rains

Extreme rains and snows are happening more frequently, as warmer air and oceans generate more vapor in the atmosphere. An "extreme" storm delivers more precipitation in one event than 90 percent of a year's storms do. In recent decades these events have multiplied across many urban and rural areas and will increasingly become the norm.

Percent of U.S. Land Area* Where Extreme One-Day Rains or Snows Have Supplied Much More of the Annual Precipitation Than Average

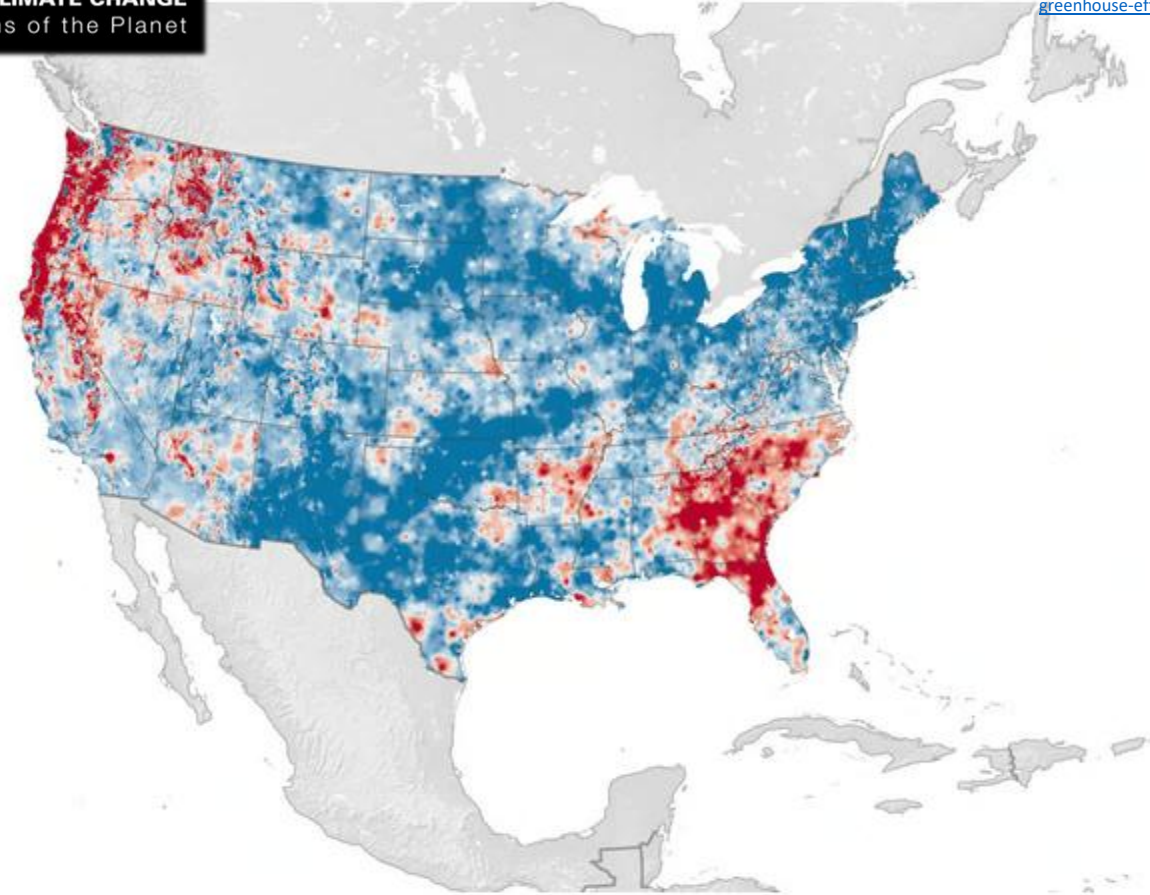


- The average change in hourly rainfall intensity across all 150 stations from 1970 to 2021 was +13%.
- 63% (95/150) of stations had an increase in hourly rainfall intensity of +10% or more ([Climate Central](#)).
- 90% of the 150 locations analyzed now experience more average rainfall per hour than in 1970.
- A 2021 [report found](#) that one-fourth of critical infrastructure is at risk of failure by flooding.
- Nine of the top 10 years for extreme one-day precipitation events have occurred since 1996 ([EPA](#)).

The water-vapor feedback is weakest where vapor is most abundant. In humid areas, the infrared energy absorbed by water vapor is already near its physical limit, so adding some extra moisture has minimal effect. In dry places, however, such as polar regions and deserts, the amount of infrared energy absorbed is well below its potential maximum, so any added vapor will trap more heat and increase temperatures in the lower atmosphere.



<https://climate.nasa.gov/ask-nasa-climate/3143/steamy-relationships-how-atmospheric-water-vapor-amplifies-earths-greenhouse-effect/>



Scientists from the U.S. Geological Survey (USGS) showed that there has been an increase in the flow between the various stages of the water cycle over most the U.S. in the past seven decades. The rates of ocean evaporation, terrestrial evapotranspiration, and precipitation have been increasing. In other words, water has been moving more quickly and intensely through the various stages.

This map shows where the water cycle has been intensifying or weakening across the continental U.S. from 1945-1974 to 1985-2014. Areas in blue show where the water cycle has been speeding up—moving through the various stages faster or with more volume. Red areas have seen declines in precipitation and evapotranspiration and experienced less intense or slower cycles. Larger intensity values indicate more water was cycling in that region, primarily due to increased precipitation. Credit: NASA Earth Observatory image by Lauren Dauphin, using data from Huntington, Thomas, et al. (2018).

BLUF: Extreme Weather Trends for Stormwater

Extreme rain can cause flooding in low-lying areas that have poor drainage and insufficient stormwater infrastructure systems.

This can cause flooding throughout the city, even for inland neighborhoods. Rain-driven flooding can occur suddenly and intensely, but flood conditions may subside more quickly compared to coastal surge flooding.

Extreme rainfall events will increase in number and severity in the future because of the change in baseline temperatures.

By the end of the century, cities could experience as much as 30% more annual rainfall than today, and 1.5 times as many days with over an inch of rain.

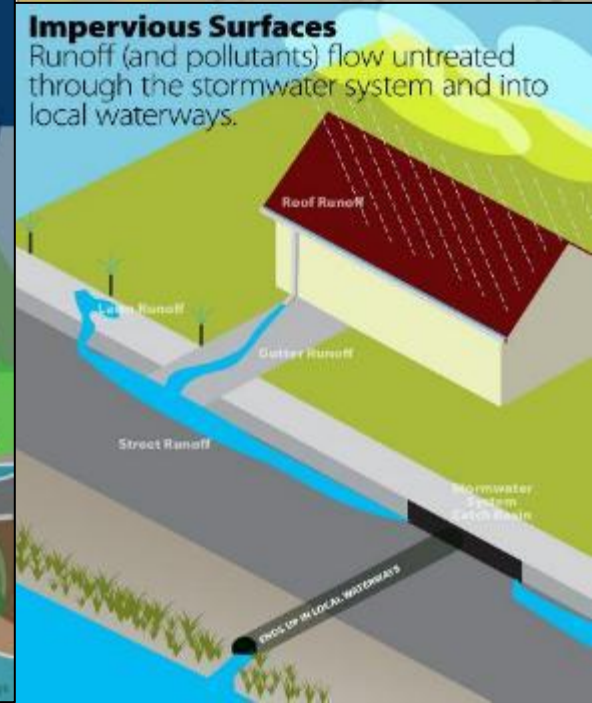
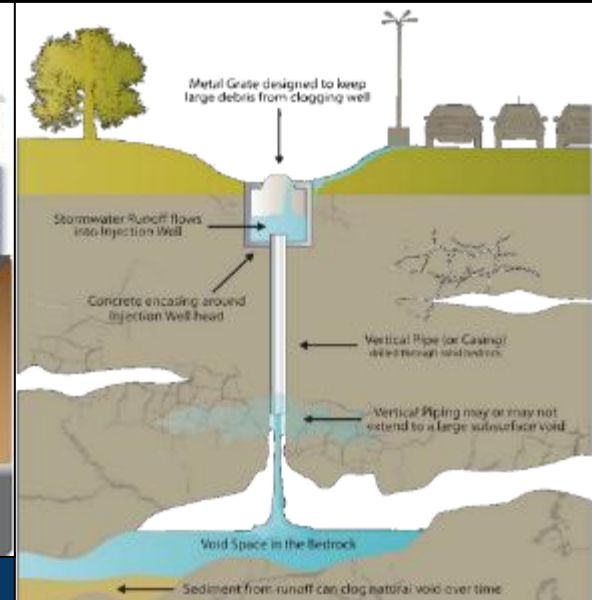
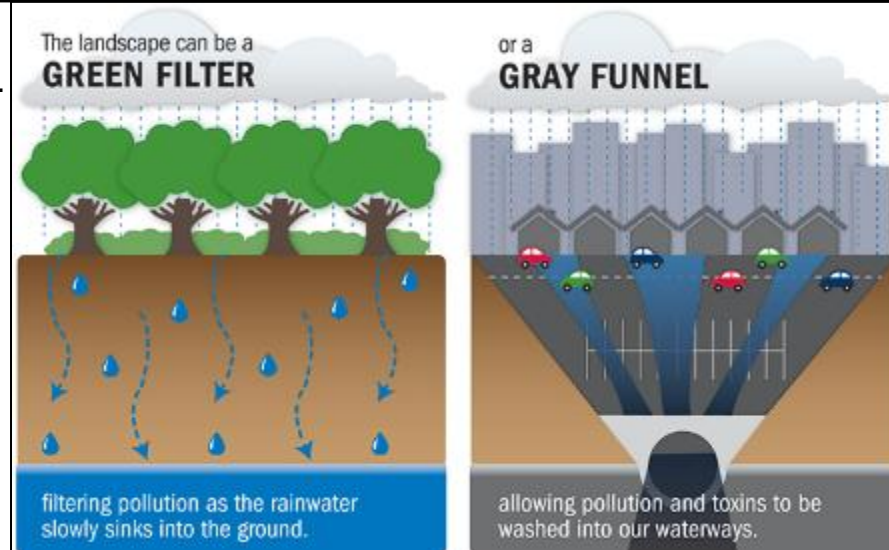
As sea level and groundwater tables rise, stormwater will drain more slowly and contribute to flooding.

- Record rainfall events in 2019 resulted in more than 100 Minnesota communities releasing partially treated wastewater into area rivers and streams.
- Untreated sewage carries pathogens and other contaminants that pose human health and ecological risks.

Extreme temperature swings can degrade the quality of materials in addition to the aging process already underway.

- Canals, reservoirs, earthen dams, roadways, sidewalks, and drainage ditches require water to hold the soils together.

Sinkholes are just one of many forms of ground collapse, or subsidence. Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement.



New Hurricane Studies

2025 was the second year to have produced three or more Category 5 storms, at least in recorded history.

- Storms exceeding 160 knots are appearing more frequently. Between 1982 and 2011, eight such storms were recorded. From 2013 to 2023, that number rose to 10.
- *In total, 18 Category '6' storms have occurred over the past four decades, with more than half forming in just the most recent decade.*
- Hot spots for these exists in the Western Pacific, east of the Philippines and Borneo. Another major hot spot stretches across parts of the North Atlantic near and east of Cuba, Hispaniola, and Florida.
 - The study also found that these hot spots are expanding...

Five tropical cyclones that formed since 2013 would have been deemed Category 6 hurricanes if such a classification existed.

New summaries call for updates to the Saffir Simpson wind scale: Several well-known storms would fall into this proposed Category 6.

- Hurricane Wilma in 2005 remains the most intense hurricane ever measured in the Atlantic with a barometric pressure of 882 mb and winds over 200 mph, breaching the potential Category 6 threshold.
 - Typhoon Haiyan and Typhoon Hagibis both also breached a potential Category 6 threshold with landfalling winds causing catastrophic damages.
- 2015 Hurricane Patricia, in the Pacific Ocean off Mexico's coast, produced winds at of 215 mph (185 knots), **powerful enough to qualify as a Category 7 storm, if such a category existed.**
- 2025 Hurricane Melissa, in the Atlantic Ocean, produced winds at 185 mph with gusts to 252 mph, globally the highest wind oceanic wind gust

Category 6 is the new hurricane normal, scientists warn

Human-caused climate change is making major hurricanes like Melissa much stronger, faster and ultimately more life-threatening

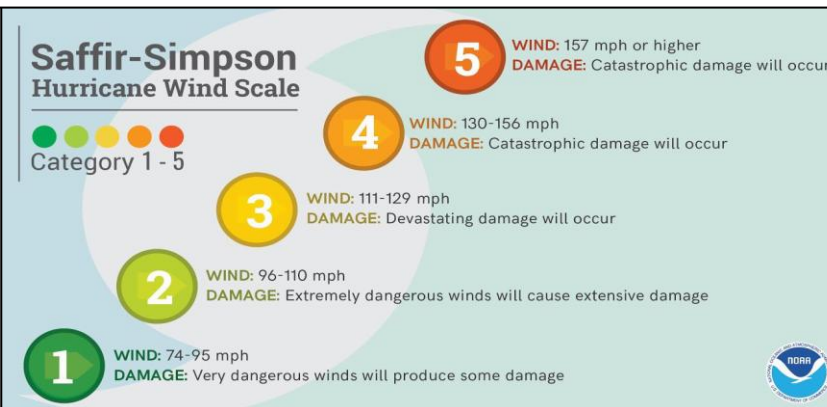
Julia Musto in New York

Monday 03 November 2025 12:12 EST



Melissa was one of the fastest intensifying storms of all time and tied for the most powerful storm for wind speed and pressure in the North Atlantic.

A recent study from Imperial College London found that Melissa was made four times more likely by abnormal warming in recent decades, boosting its wind speed by 11 miles per hour.



SUBTROPICAL CYCLONE

HAS BOTH TROPICAL & NON-TROPICAL CHARACTERISTICS

POST-TROPICAL CYCLONE

WAS ONCE TROPICAL NOW HAS FRONTS & COLD CORE

Non-Hurricane Classifications

Tropical Storm	39-73	--
Tropical Depression	≤ 38	--

In a February 2024 study published in the *Proceedings of the National Academy of Sciences* (PNAS), researchers Michael Wehner and James Kossin proposed adding a hypothetical Category 6 to the scale.

Proposed Category 6 Threshold: Sustained winds of 180 mph or greater. **A cat 7** could be sustained winds over 215 mph gusting to 260 mph

Climate Central: Changing Seasons - Heat

According to new Climate Central analysis, summer heat — and the risks it brings — is lasting longer and stretching into fall.

- Summer is lingering later in 227 (92%) of the 246 major U.S. cities analyzed.
- Across these 227 cities, summer temperatures now extend 10 days later into the fall, on average, than in the early 1970s.
- About one in every five cities now see summer temperatures extend at least two weeks later into the fall than during the early 1970s.
- Lingering summer heat can extend heat-related health risks and seasonal allergies, keep air conditioners running longer, lengthen mosquito seasons, and prolong wildfire seasons and smoke exposure.

Cities in Florida and Texas have experienced the largest extension in summer-like temperatures. Miami, Florida and San Angelo, Texas top the list, with summer temperatures now stretching 46 and 31 days later, respectively.

When summer heat lingers into fall, it can extend the health risks to athletes from [extreme heat](#) or to weather-exposed workers from [humid heat](#).

- Those most at risk for heat-related illness include [children](#) — who now face at [least twice as much extreme heat during childhood](#) than previous generations.

Longer summers also bring [higher demand for indoor cooling](#). Fall cooling degree days, a measure of indoor cooling demand, have [increased dramatically](#) since 1970. [Keeping schools cool](#) during the back-to-school period is a growing challenge, especially for [schools in urban heat islands](#).

- When air conditioners run later into the year, energy costs and heat-trapping emissions both increase.

Hotter falls also mean a longer wildfire season. The annual frequency of hot, dry, windy [fire weather is growing](#)

SEASONS ARE SHIFTING

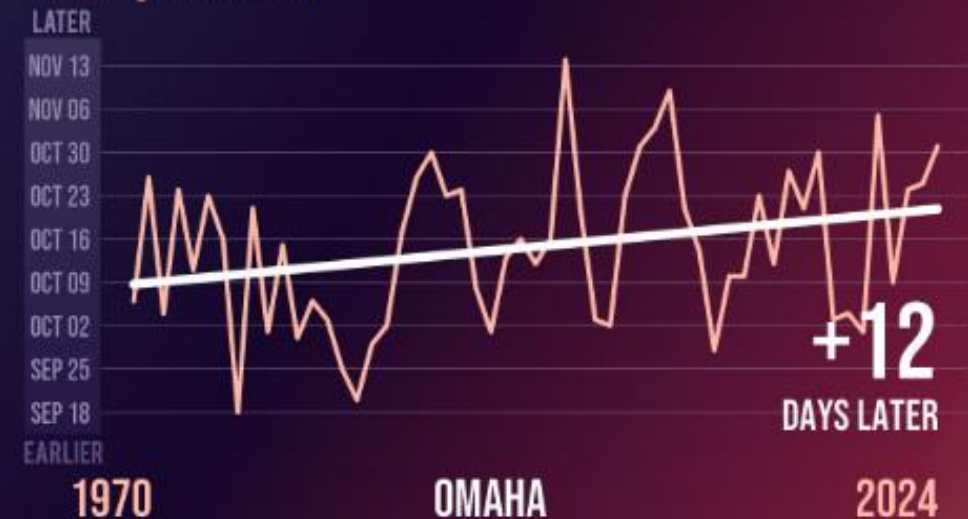


CLIMATE CENTRAL

The US experienced about 60% more heat season power outages during the last 10 years (2014-2023) than during the first 10 years analyzed (2000-2009).

LINGERING SUMMER HEAT

Last day above 80°F



Annual date of the last day with maximum temperature at or above 80°F (1970-2020) (50-year climatology). Source: NOAA (NCEP)

CLIMATE CENTRAL

New Heat + Power Outage Graphics

The U.S. experienced about **60% more heat season power outages** during the last 10 years (2014-2023) than during the first 10 years analyzed (2000-2009).

- The South faces more heat season power outages than any other region — followed closely by the Southeast, Northeast, and Ohio Valley.
 - Texas and Michigan led all other states in total heat season outages.

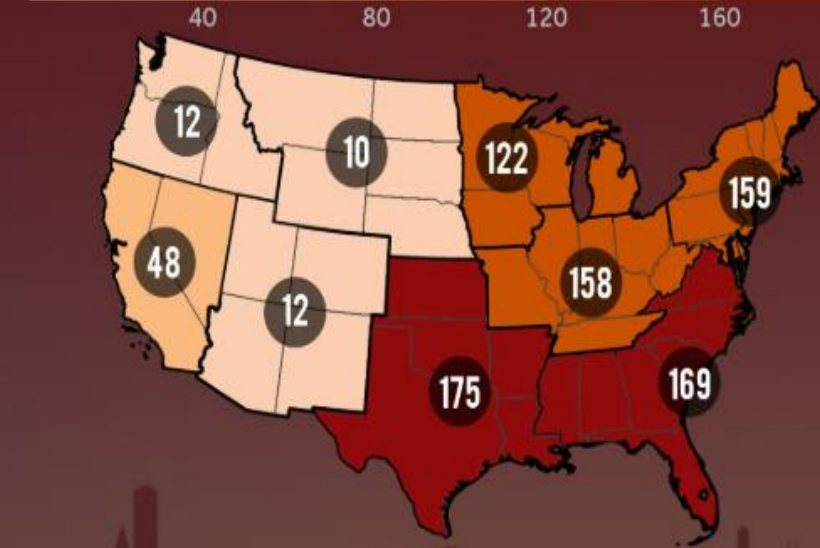
Multi-day heat streaks are dangerous. They worsen air quality and put people at risk from heat-related illness. They can also strain the grid and lead to power outages.

- Persisting heatwaves are becoming more common according to an analysis of the changing frequency of extreme heat streaks in 247 cities across the U.S. from 1970 to 2024.
- The annual number of extreme heat streaks increased in 198 (80%) of the cities analyzed.
- On average, these 198 cities now experience two more extreme heat streaks each year than in the early 1970s.

In Atlanta, Detroit, and Phoenix, between 68% and 100% of the population would face elevated risk of heat exhaustion or heat stroke during a combined blackout and heat wave. Such events could more than double rates of heat-related mortality in all three cities.

HEAT SEASON POWER OUTAGES

Weather-related outages (May - September), 2000-2023



Total weather-related major power outages in each region during May-September, 2000-2023. Major outages affect 50k+ customers or service of 300+ megawatts. Source: US Department of Energy Form OE-417

CLIMATE CENTRAL

Gateway Arch National Park MORE EXTREME HEAT



Average annual frequency of extremely hot days below the 50th percentile compared with data in the recent past (1979-2012) and in 2050 under the "warmest" scenario in the coupled climate model used for this analysis. Source: National Park Service, Climate Change Response Program.

CLIMATE CENTRAL

MORE COMBINED HOT SUMMER DAYS + NIGHTS

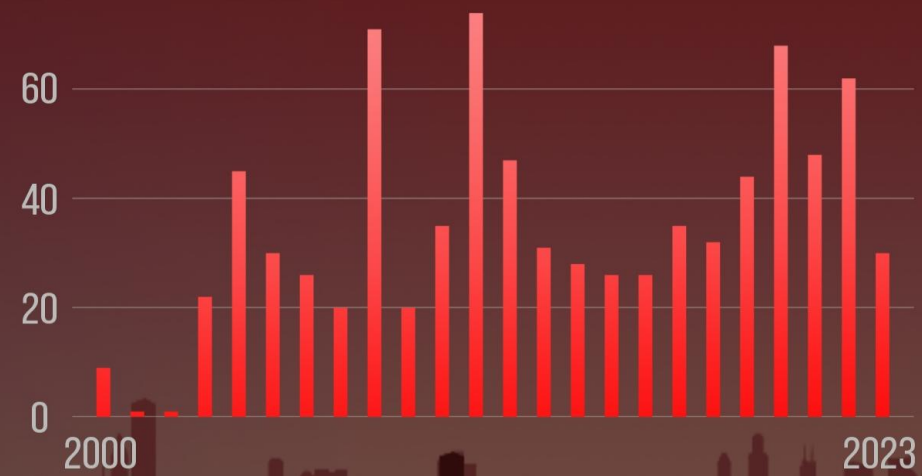


Difference in average annual count of summer days with both maximum and minimum temperatures above the 90th percentile between the last (2014-2023) and first (1970-1979) decades analyzed. Source: NOAA-ACS.org

CLIMATE CENTRAL

HEAT SEASON POWER OUTAGES

Weather-related U.S. outages, May - September



Annual count of weather-related major power outages during May-September. Major outages affect 50k+ customers or service of 300+ megawatts. Source: US Department of Energy Form OE-417

CLIMATE CENTRAL

Transportation Impacts

Extreme heat can degrade the structural integrity of roadways, railways, runways, and pipelines resulting in pivots of resource movement methods.

- When the Mississippi River runs low due to drought events and heat triggered evaporation of the surface waters, the barges must reduce loads and speed causing notable delays in shipments and trucking needs to reduce increasing costs.
 - Heat causing railways to warp can also cause reduced operations by requiring slower movement and reduced loads.

Extreme heat for railways threatens railcars with prolonged exposure to solar radiation when stalled on the tracks and may see material combustion risks or degraded shipping conditions which may impact the supply chain.

- Warped railways under direct heating may increase derailments.
 - Stalled materials in transport can overheat, damaging the products.

These events are occurring globally, resulting in loss of supply for key materials, minerals, metals, increased demand, rising costs, and subsequently delayed delivery.

As temperatures rise, the performance of the aircraft and their engines can deteriorate which can be amplified in major metropolitan areas due to the surrounding ambient temperatures.

- Planes get 1% less lift with every 5.4°F (3°C) of temperature rise.
- Refueling can be delayed due to heat while internal aircraft temperatures can rise rapidly during gate delays or takeoff delays.
- Thermal turbulence occurs due to uneven surface heating by the sun.
- Like railways and barges, the aircraft also cannot take on additional weight during the summer, resulting in higher transportation costs and delays.

Major outdoor events like concerts/festivals, sport games, racing, vacation destinations, amusement parks, and competition-based events cause an upswing in transportation system use and more individuals outside/commuting placed at a higher risk to include waiting on train platforms, bust stops, stalled in traffic, longer plane boarding times, etc.



Physical Security, Site, and Staff Impacts

As severe weather increases the frequency of power outages, causes supply chain delays, amplifies impacts from personnel shortages, damages larger areas causing prolonged restoration times, *negative impacts will increase* for key security personnel and necessary physical security systems.

- Power outages can lead to badging and verification delays, record storing lapse, or loss of site access
- Extreme heat reduces the physical efficiency and mental capability of security staff (lethargy)
- Severe weather can halt drone monitoring operations and obscure video monitoring
- Flooding can result in sensor delays or destruction
- Evacuations being televised may result in exploitation of decreased security presence
- Damages to physical barriers (fences/) gates will likely be an evident security risk
- Extreme heat and frequent staff rotations may cause gaps in external physical security
- High heat periods may cause loss of sleep further reducing the capabilities of staff
- Extreme heat may cause burns or melt certain materials or cause foundations to crack/dimple
- Supply chain or resource hub damages from heat or storms may cause replacement part delays and heightened demand/cost
- Hail can damage or destroy backup generators
- Resource restrictions may result in targeted violence or theft of site resources (e.g. water)
- Theft of backup generators during recovery from storms
- Extreme heat can impede helicopter operations
- Amplified events may reduce emergency response availability (e.g. fire/EMS)
- Battery backups for security systems and control panels may deplete during prolonged outages
- Disaster scams, misinformation, and timed weather/cyber events may increase
- Increased rates of depression during low pressures and aggression during heat waves may lead to workplace violence events
- Theft of larger metal structures such as rural telecom towers or water systems in cages on external apartment or condo buildings have noted a rise in theft
- Attacks on restoration crews are increasing



ExWx and Critical Resource Theft

As extreme weather events continue to rise globally, attacks of opportunity have been on the rise to match the lack of resources following the disaster or during shortages.

Fake Restoration Crews: Roofing companies claiming to be repairing storm damages will gain access to homes and sites, do damage to “inspect” under areas of the roof and demand significant price hikes while threatening to leave the exposed roofing if left unpaid.

- These companies are permitted access to roofs, backyards, areas where generators are often present and even internal systems like HVAC units.

Thieves internationally have begun targeting larger energy systems either for the infrastructure or for the oil pulled to operate the equipment. This means the gangs have sufficient knowledge of systems to safely disconnect or access them during use.

Other theft is also prevalent in China, India, Mexico, and various other countries where rural residents illegally connect to long-distance transmission lines.

Recent similar events in Canada have been on the rise, mimicking events internationally.

- BC Hydro reported 24 maintenance hole theft and mischief cases since January 2024, up from 5 in the previous two years. They warned severed cables can spark fires and trigger outages. Repair costs were about \$1.2 million.
- May 2024: RCMP investigated multiple break-ins and copper wire thefts at substations in the Whitbourne area.
- In 2025 Four men were charged after 33 hydro poles were cut down for copper theft in northern Ontario.
- In 2023, A copper theft in Dartmouth caused an outage affecting about 10,000 residents.
- SaskPower said copper theft cost over \$41,000 in 2020.

In the US: In 2024 Hugo, Oklahoma thieves cut a 488-foot radio broadcast tower for copper.

In 2025 McClain County reported theft of 3,600 feet of copper coax cable from cell towers.

Unveiling the Impact: Transmission Line Collapse Stemming from Tower Parts Theft.

tamperfinder April 24, 2024 Add comment 2 min read

Several asset thefts have been reported in northern India. This type of theft is common in African countries also, where power lines are to be drawn through uninhabited places for a very long distance. The chances of close surveillance of the Distribution company officials are very remote and the perpetrators have enough time to topple a tower or steal a transformer itself. Several accidents have also been reported in such cases.

In Kanpur, police arrested a gang of antisocial elements who stole distribution transformers.



Radio tower copper theft suspect Candice Logan, seen photographed with a car containing what appears to be copper in the trunk. (Facebook/Terry Park)

Extreme Weather and Unrest: Response Risk

AED Equipment: Typically, the temperature range for normal AED operations is 32-122° F, since extreme temperatures can impact normal functions by draining the battery or altering the gel found in pads.

- High temperatures can negatively impact an AED's functionality and lifespan. Extreme heat can cause the internal circuitry to malfunction, potentially leading to device failure during a critical moment.
- Additionally, high temperatures can shorten the lifespan of the AED's battery and affect the gel on the electrode pads.

Emergency Vehicles: extreme heat or high humidity can impact safe temperatures of seatbelt buckles, steering wheels, laptop systems, windshield mounted radar, rifle racks, camera systems, leather accessories, radio console, prisoner cages, in-vehicle fire extinguishers, road flares, etc.

- High temperatures can impact the accuracy and performance of police car radar (speed guns).
- Higher temperatures are linked to increased rates of tire blowouts, diminished battery ranges, radiator cracks, and in smart vehicles may result in touchscreen lifting and loss of access to critical applications due to extremes.
- Over prolonged exposure, fire extinguishers can explode due to excessive heat and pressure buildup.
- Road flares degrade in high temperatures or humidity and should not be left in temperatures >120F for long.

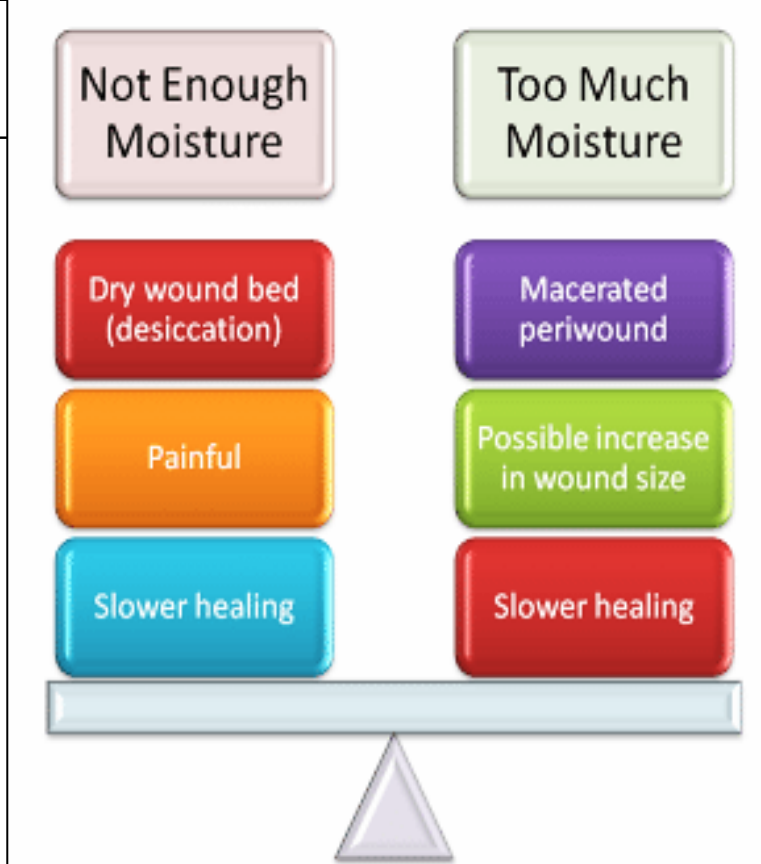
Wounds: High moisture levels can make it harder for these chronic wounds to heal, increasing the risk of infection and complications. Dehydration can worsen ulcers and can reduce the ability to properly judge the level of discomfort.

- Whether you're recovering from a minor scrape, a surgical incision, or a more significant injury, the amount of moisture in the air can determine how quickly and effectively your body repairs itself.
- Too much humidity can increase the risk of infection, while too little can slow the healing process, causing unnecessary pain and discomfort.

Social Impact - Asthma: People may notice their asthma symptoms get worse on humid days when there is a lot of moisture in the air. This is especially true when exercising in humid conditions.

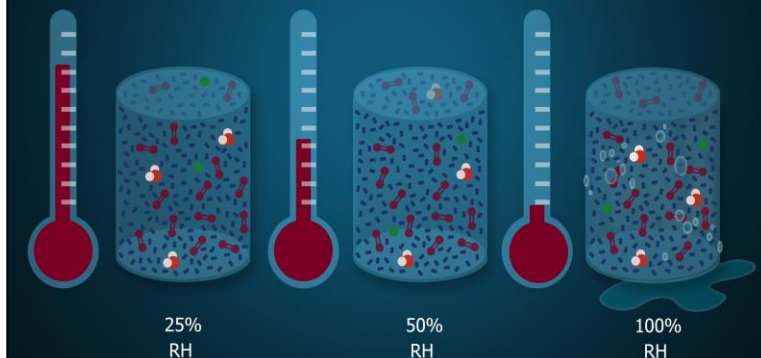
- Humidity can increase the levels of other substances in the air that irritate the bronchial tubes, such as pollen and pollution.
- After experiencing hot, humid air (49°C and 75–80% humidity) for 4 minutes, people with asthma had a 112% increase in airway resistance as opposed to the healthy group that only had a 22% increase in airway resistance.

Social Impact - Thunderstorm Induced Asthma: During the first 20-30 min of a thunderstorm, patients suffering from pollen allergies may inhale a high concentration of the allergenic material that is dispersed into the atmosphere, which in turn can induce asthmatic reactions, often severe.



THE EFFECTS TEMPERATURE HAS ON RELATIVE HUMIDITY

Relative Humidity (RH) refers to the amount of water vapour in the air in relation to how much water vapour the air can hold. Cool air cannot hold as much water vapour as warm air. 25% RH means that the air is holding just 25% of the vapour it is capable of before it is saturated. When the temperature has been reduced to the dew point the RH is 100%, meaning the air is fully saturated and the moisture will begin to condense to liquid phase.



E-Scooters: Bomb Risks

Threats: A growing concern is the availability of materials already assembled being used for destruction during amplifying weather events such as heatwaves.

- Lithium-ion batteries in larger devices like e-bikes and scooters are volatile during major heatwaves as internal cooling systems are often missing and the equipment is recommended to be left in the external hazardous weather conditions.
- Many of these devices have been in operation for nearly a decade in the US and for over two decades in other countries resulting in wear-and-tear from general use and material fails.

From 2019 to 2022, there's been a more than 1,000% increase in injuries from fires that started with an e-bike or e-scooter, and there's been a more than 600% increase in the fires themselves.

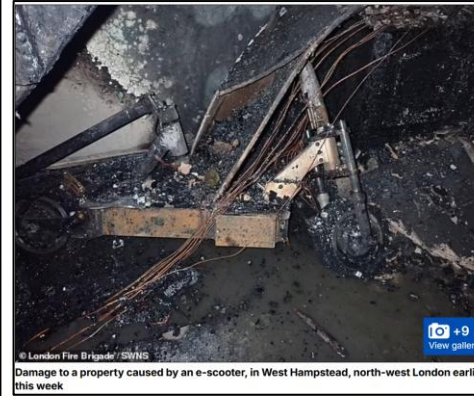
- In December 2022, the federal government's Consumer Product Safety Commission sent a letter to more than 2,000 manufacturers, imploring them to meet safety standards and urging them to review their product line immediately.
- Burn surgeons who treat these often life-changing injuries are calling for hazard labels to increase public awareness, while predicting cases will increase as the number of e-bikes and e-scooters in the UK – currently around 550,000 – continues to rise.
 - The London Fire Brigade, however, has said 143 fires were [caused by e-bikes and 36 by e-scooters in London in 2023](#), causing three deaths and 60 injuries.

Personal Mobility Devices (PMDs) use lithium-ion batteries, which are cheaper to make and more powerful than older types of rechargeable batteries but contain flammable chemicals.

- The other danger from PMD batteries is when the charger terminals are touched – particularly by children. In a fraction of a second, their temperature can rise above 400C, causing burns.

Dockless bikeshare and e-scooter systems expanded coverage, first appearing in the US in 2017 whereas areas like India have had them in use since the early 2000s.

- As of June 30, 2024, there are 60 dockless bikeshare systems and 194 e-scooter systems (not counting systems limited to college / employer sites).
- There is an open-access interactive map showing all the major cities were e-scooters/bikes have been adopted and are in use today.



India's transport ministry has ordered a government investigation into the deadly fires while three manufacturers have recalled over 6,600 scooters over safety fears Credit: India Times

Urgent warning over 'an epidemic' of patients as young as THREE with horrific burns from exploding e-scooters

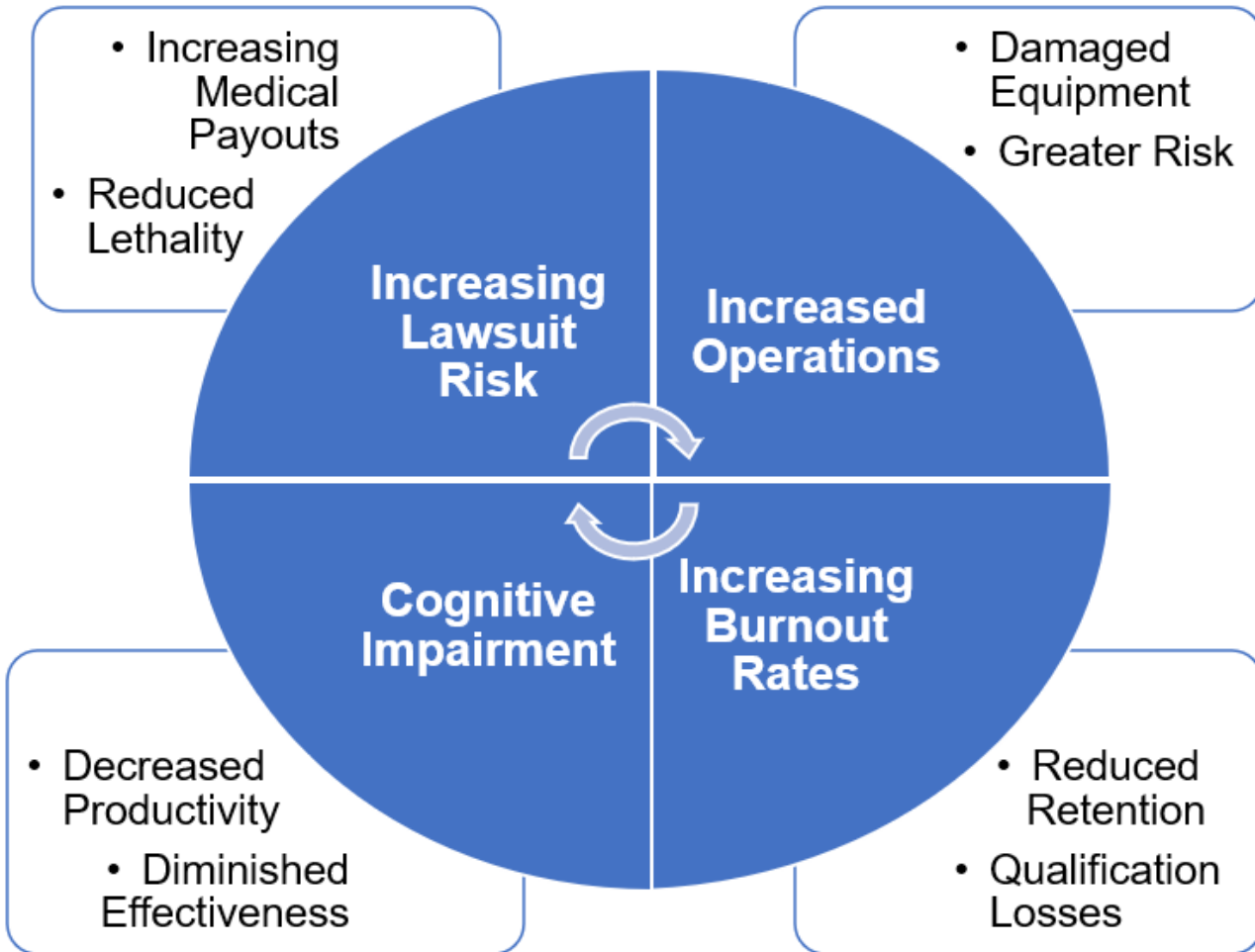
By [ANDY BEAVEN](#)

PUBLISHED: 20:34 EDT, 8 February 2025 | **UPDATED:** 20:57 EDT, 8 February 2025

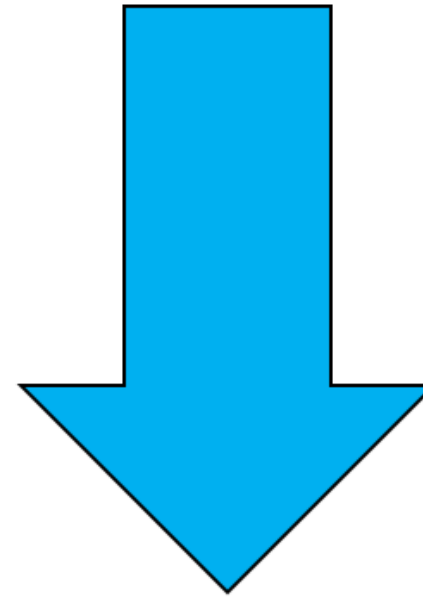


Higher Highs → Lower Lows

Variations outside of the normal for barometric centers present growing operational risks to emergency managers as many struggle to understand the impacts from this invisible threat and are thereby caught off-guard by the symptoms degrading their work performance and destabilizing societal norms.



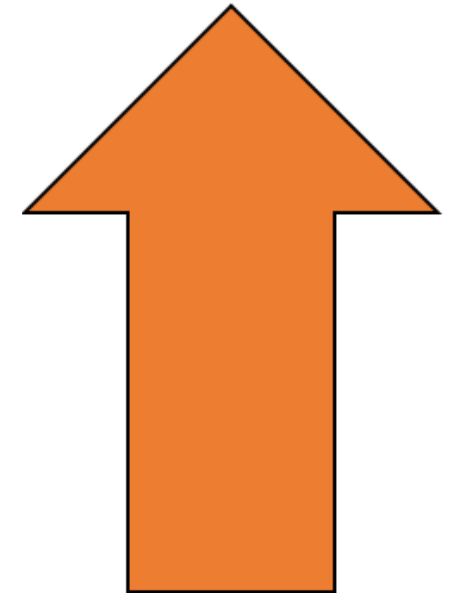
Low Pressure Impacts



- Suicidal Ideation
- Depression
- Lethargy
- Sinus Issues
- Muscular Pain
- Joint Aches
- Barometric Migraines
- Manic Events
- Digestive Issues

High Pressure Impacts

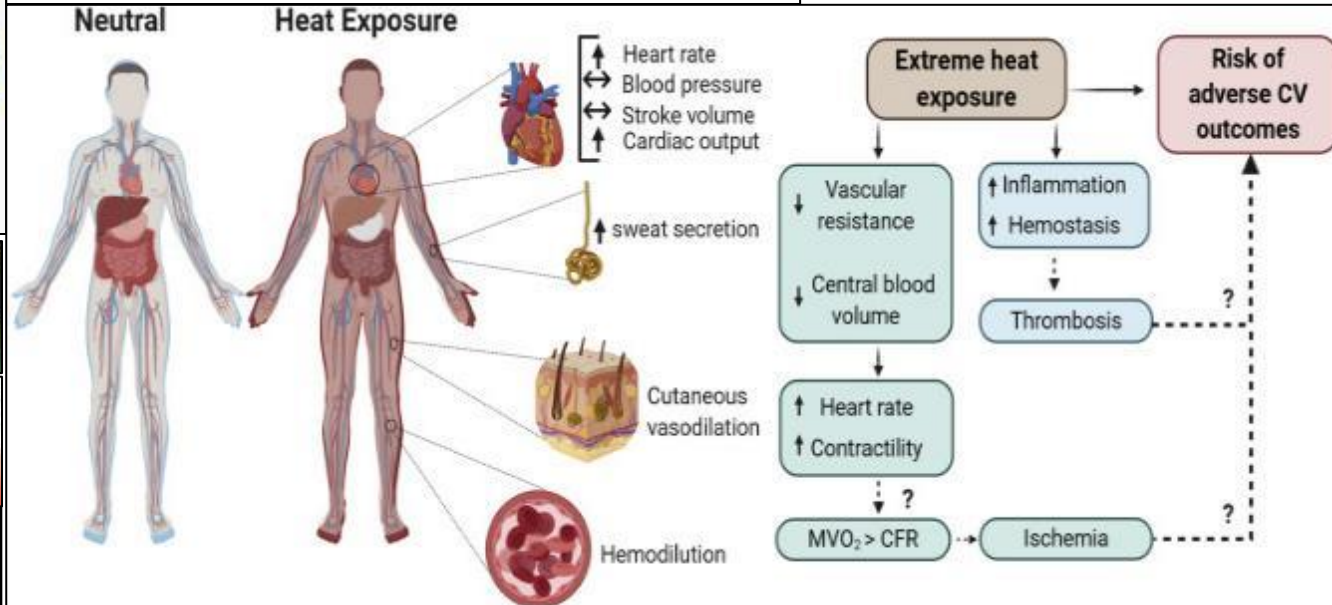
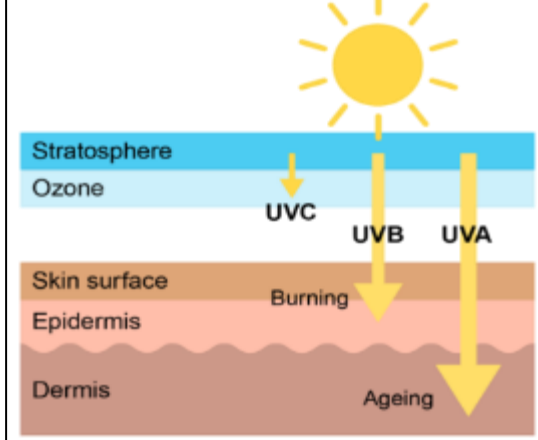
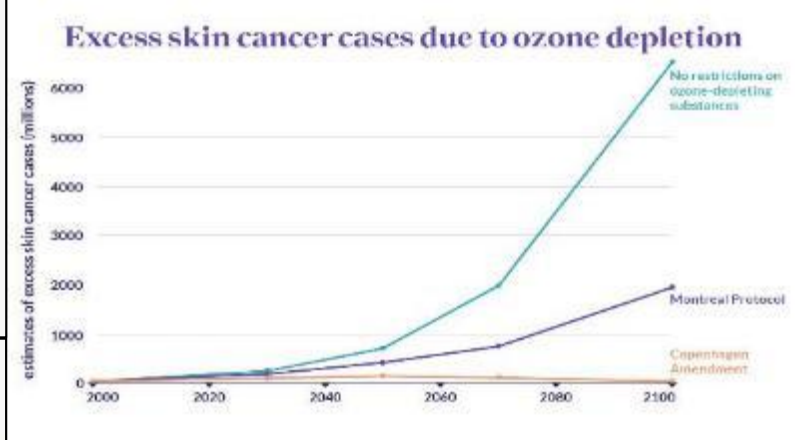
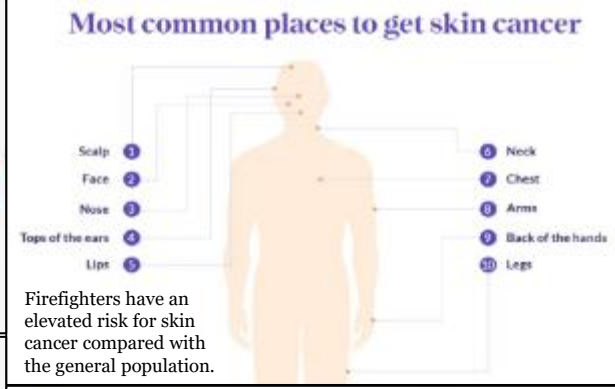
- Aggression
- Property Damage
- Workplace / Domestic Violence
- Membrane Rupture
- Rising Blood Pressure
- Poor Air Quality
- Heatwaves – Heatstroke
- Paranoia
- Poor Sleep



'Too Hot To Op'

First Responders/Operators Risks from Heat

- Higher Rates of Skin Cancer
- Inhalation of Greater Concentrations of Pollution
- Vision Impairment due to Reflectivity
- Overheating – Gear Amplification
- Equipment Degradation
- Dehydration and Mental/Physical Fatigue
- Heat Exhaustion/Stroke
- Sweat Induced Rashes
- Eczema Flareups – Heat
- Higher Heart Attack Risk
- Syncope (fainting)
- Cramps or Swollen Legs (reduced mobility)
- Increased Risk of Kidney Disease
- Extended Muscle Recovery Times
- Blisters from Burns/Heat Exposure
- Brittle Hair/Hair Loss from UV Light Exposure
- Increased Ingrown Nails or Bunions/Hammertoes
- Amplified PTSD Reactions – Heat-Induced Anxiety
- Sleep Disturbance – Persisting Body Temperature
- Development of Secondary Hyperhidrosis



High-Pressures and Humans

Hot weather increases body temperature, which in turn increases heart rate and blood pressure. Increased blood pressure and heart rate can lead to discomfort, which can be attributed to the correlation between high heat and increased anger and violence.

- A recent study in India found that a **1C increase in annual mean temperature was associated with a 4.5% increase in intimate partner violence**. Other studies noted the increase in sexual violence and heightened workplace violence during heat events.

When the barometric pressure is high, more pressure is pushed against our body, limiting tissue expansion, increasing blood pressure with an increased possibility of heart attacks.

- A 10-millibar decrease <1016 millibar and a 10-millibar increase >1016 mbar were associated with a 12% increase and an 11% [increase in myocardial infarction and coronary death events](#).

Studies have focused on temperatures more than the high-pressure centers enabling persisting heat events over regions for longer periods.

- [A 2019 study from Stanford University found weather instability contributed to between 3% to 20% of conflicts over the last century with the potential influence set to increase substantially due to warming temperatures.](#)
- [Research from Mexico took 16 years' worth of daily crime records and found an increase in temperature of 1C correlated with an increase across all types of crime by 1.3%.](#)
- [There were about a third more accusations of crime per population on days hotter than 32C than on days cooler than 10C.](#)

[A study of Los Angeles, CA](#): Overall crime increases by 2.2% and violent crime by 5.7% on days with maximum temperatures above 85F (29.4C).

A 2019 study on terrorist attacks found that not only were terrorist attacks more common on hotter days, but also that the number of fatalities per attack were higher.

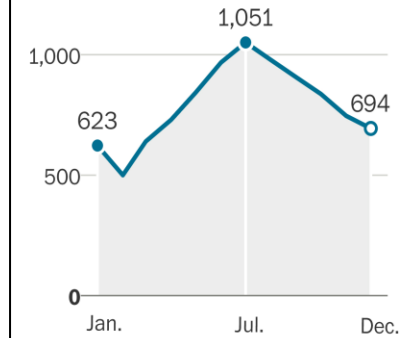
Even if the world's countries managed to keep "global temperature rise this century well below 2C above preindustrial levels," global terrorist attacks would increase by 14% solely due to hotter days.

Total terrorism fatalities would rise by 24% to include the increase in populations being outside more and larger events.

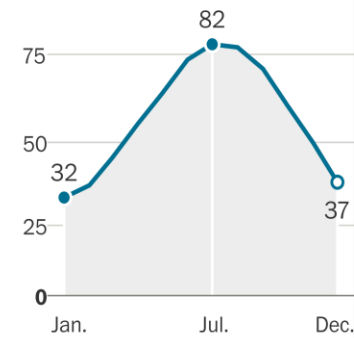
Temperature and violence

Total homicides in Chicago, by month, 2001 – 2018, with average daily high temperature by month

HOMICIDES



AVERAGE HIGH TEMP

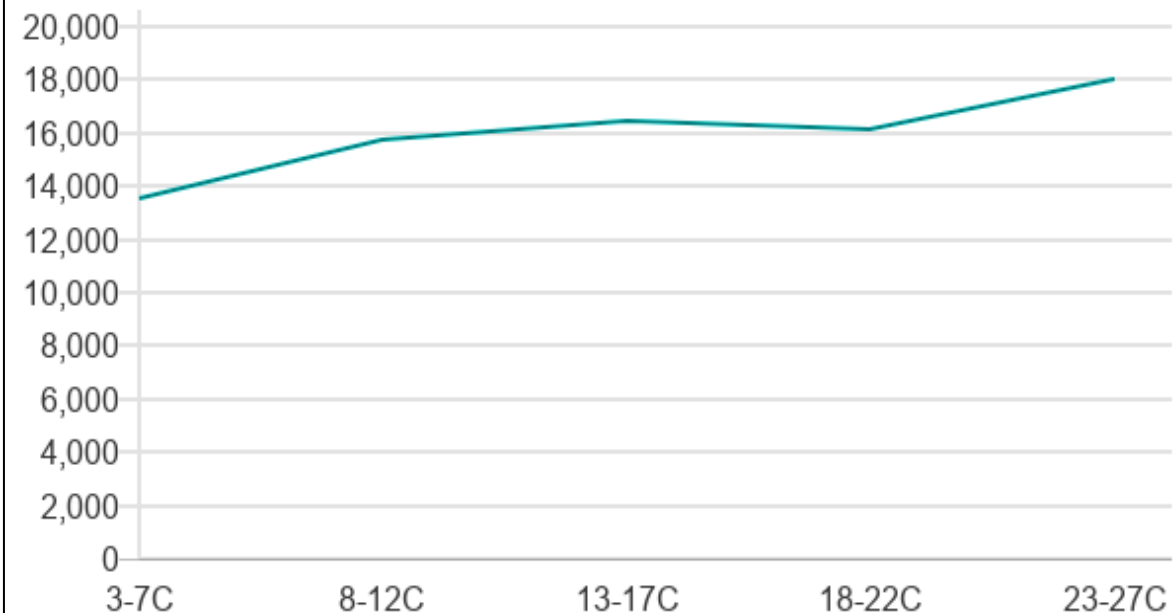


Sources: City of Chicago, NOAA

The Washington Post

As temperatures rise, so does violent crime

Average violent crime rates vs average temperature, London



Source: Metropolitan Police

BBC

According to a 2018 [study](#) published in *Nature Climate Change*, a 1.8°F (1°C) increase in average temperature in the U.S. and Mexico correlates to a 1% increase in suicides. Poor quality sleep may be one of the driving factors.

- Heat also plays a role in perceiving an aggressive tone or transgression when interacting with others. Violence in prisons also increases during extreme heat with days ranging over 27C increasing the probability of violence by 18%.

Twitter sees hate tweets and online aggression [increase](#) during heatwaves, along with phrasing that researchers have linked to [anxiety and depression](#).

Analysis showed that productivity started dropping when average daily maximum temperatures rose above 20°C. The researchers' calculations suggest that [average annual output will decrease by 2.1% if average daily temperatures warm by 1 degree C](#) over current conditions; *annual gross domestic product, or the value of goods and services produced in a single year, would drop by 3%.*

- Impacts to large public venue operations could be experienced in decreased productivity, more aggressive crowds, losses in supply chain, site damages, staff burnout, greater damage to operational capabilities, and delays/cancellations of performances/events.

Portland sees spike in gun violence as heat wave blankets metro area

[A laboratory experiment found](#) that participants demonstrated an increase in the joy of destruction when subject to increasing ambient temperatures.

Published: Jul. 8, 2024 at 1:21 AM EDT



As the temperature rose across Portland, so has violent crime, with six shootings since July 4. According to a local sociology professor, that is a predictable pattern.

According to the Mississippi Department of Public Safety, the violent crime rate in **Mississippi** increased by 2.4% in 2022 from the previous year.

- The most common violent crimes in Mississippi are aggravated assault, robbery and murder.

Research from Lancet Planetary Health states for every 5°C (9°F) increase in the average daily temperature, there was a 4.5% uptick in sex offenses in the following week across several major U.S. cities.

- On days when the temperature gauge exceeded 85°F (29.4°C), overall crime jumped by 2.2%, and violent offenses surged by 5.7%.

With each 5°C rise in temperature, **Chicago's** homicide rates shot up by 9.5%, and **New York City** wasn't far behind with an 8.8% increase.

In 1988, during the periods warmest summer on record, the US reported record-breaking violence (1.56 million cases).

- This is a global phenomena and risk.

Atmospheric Changes and Wildlife

Experts theorize air pressure changes affect a fish's swim bladder, which is used to help a fish maintain neutral buoyancy. The bladder is filled with air and is thereby sensitive to pressure changes that occur when moving between different depths, likely to be affected by changing air pressure.

Recent studies found that temperature indeed drives spatial and temporal changes in fish body size. Around 55% of species were smaller in warmer waters (especially among small-bodied species), while 45% were bigger.

[Dogs](#) are more likely to attack people on days with higher UV levels, according to Harvard Medical School [research](#).

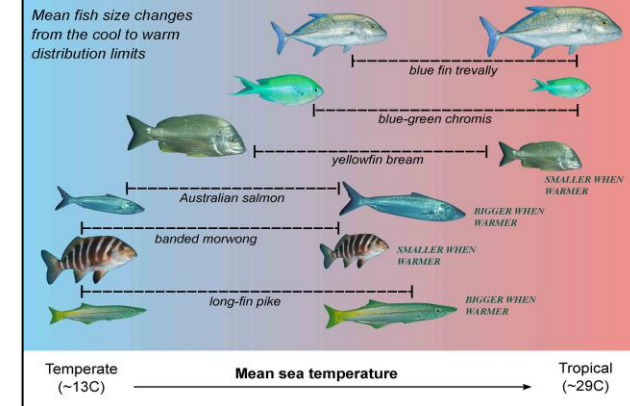
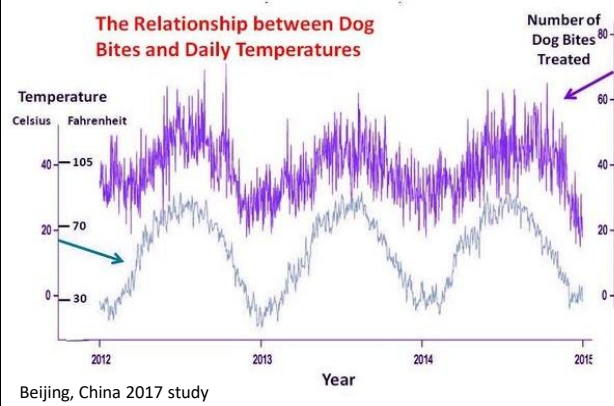
- [Dog bites increased by 11% on days with higher UV levels, 4 percent on hotter days, and 3 percent on days with increased ozone levels.](#)

Previous studies have linked high temperatures and air pollution to increased aggression in humans, [rats](#), monkeys and even ants.

[As a warm weather loving animal, a hotter environment could allow North Carolina's alligators to expand their limited distribution to areas further inland and away from wet, boggy coastal areas.](#)

- [Warmer temperatures could also result in changes to reproductive rates, allowing for earlier sexual maturity and changes in body size for alligators. This could have implications for similar creatures globally.](#)
- Florida has seen a significant rise in alligator attacks, with the [Florida Fish and Wildlife Conservation Commission](#) (FWC) reporting an upward trend in the number of alligator bites and fatalities.
- Almost half of the [453](#) alligator bites reported in Florida between 1948 and 2022, around 47%, occurred in the last 22 years, from (2000-2022).

[An uptick in human-shark interactions has been occurring on the shores of Long Island, New York -- closing beaches as surfers, lifeguards and swimmers suffer bites from sharks in search of food.](#)



While the onset of overall changes in heat can drive migration threats for animals, the amplification of intensity for storms (both continental and tropical) can trigger bursts of movement and subsequent threats to population centers which normally are not exposed to sudden influxes of insects, rodents, or predators.

- Sudden floods from a rare storm in Egypt flushed swarms of scorpions and tarantulas from their underground burrows into people's homes resulting in over 500 locals seeking medical attention due to stings.
- Torrential floods in Tanzania led to more lion attacks after their usual prey migrated away from floodplains.
- Higher air temperatures in Australia triggered more aggressive behavior in eastern brown snakes, leading to more incidents of snake bites.
- Wildfires in Sumatra, Indonesia drove Asian elephants and tigers out of reserves and into human-inhabited areas, leading to at least one death.
- Disruption of food webs in the Americas drove black bears in New Mexico and foxes in Chile into human settlements in search of food.
- Warmer air and ocean temperatures in a severe El Nino led to an increase in shark attacks in South Africa.

In India, unstable weather [reduced](#) vegetation for blue sheep (bharal), forcing them to feed on human crops, drawing snow leopards into town.

Meteorological Intelligence

Power outages can significantly impact physical bank locations by disrupting essential services like ATMs, payment processing, and security systems, potentially leading to temporary closures and hindering customer access to funds

According to a recent study, hackers are leveraging these weather trends to target energy systems when they are at their most critical.

The study, titled “*Operational and economy-wide impact of compound cyber-attacks and extreme weather events on power networks*”, concluded that an attack carried out in the wake of a weather event increased the potential impact 3x more than a standalone cyberattack.

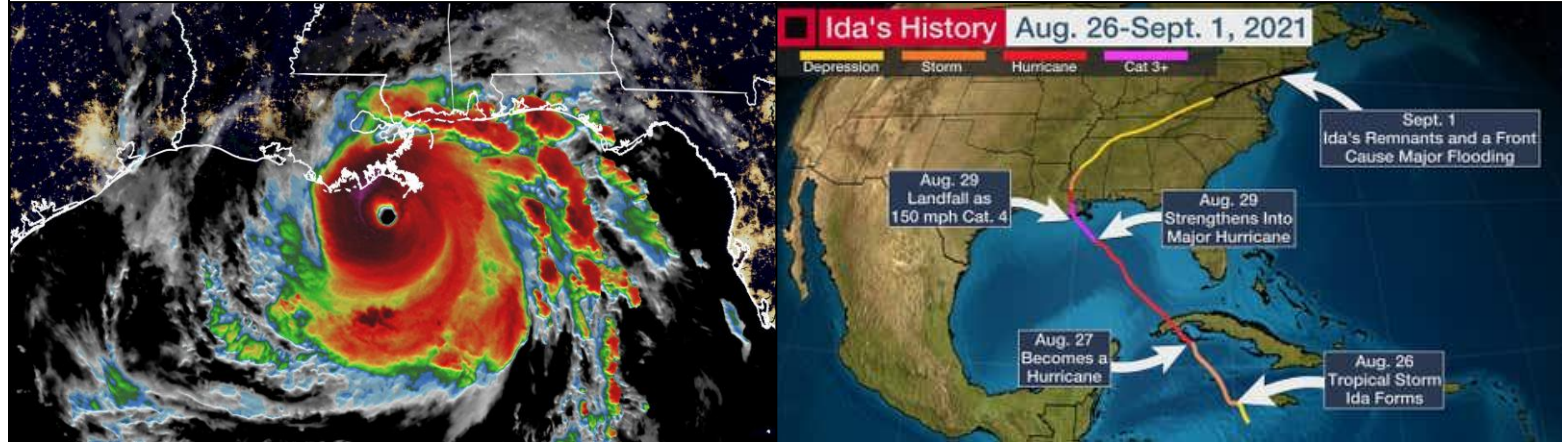
- **Local economies could experience a 37% drop-in economic activity if faced with a compound threat.**
- These events led to a 12% of energy demand going unmet and **a daily GDP reduction up to 3.1%.**

Example Event in Long Island:

- One conclusion listed a 9% increase in demand during a heatwave.
- A lone cyberattack could lead to 4% of demand going unmet.
 - Combined they could yield 12%, or nearly 200,000 customers.

HHS Office of Civil Rights states ransomware attacks on healthcare have surged by 264% over the last five years.

In 2021, [Hurricane Ida](#) in Louisiana left over one million people without power or internet. In the days following the storm, malicious actors launched a “malware attack” on the 24th Judicial District Court, disrupting its database and extending its storm-related closure.



A cyberattack on the grid/energy system components during an extreme weather event can cause ripples:

Restoration gets slower: Crews already face damaged lines, blocked roads, and safety limits. A cyber attack can disrupt outage management, switching, dispatch, and crew coordination at the same time.

Operators lose visibility: If Scada, sensors, or comms are degraded, utilities may not know what failed first, which assets are safe, or where to isolate faults.

Manual operations take longer: Systems can fall back to manual switching and field verification, which is much slower during flood, wind, or heat conditions.

Load stress gets worse: During heatwaves, demand is already high. A cyber event can block demand response, mismanage load shedding, or delay generator dispatch.

Cascading failures become more likely: Weather damage plus bad control signals can overload adjacent assets, spreading outages beyond the original footprint.

Equipment damage can increase: Delayed isolation can let transformers, substations, and feeders operate in unsafe conditions longer.

Public harm rises faster: Hospitals, water systems, telecom, and cooling access are hit longer, raising health and economic losses.

Recovery costs increase: Utilities face both physical repair and digital forensics, system rebuilds, and regulatory scrutiny.

Cybercriminals often intensify phishing and ransomware attacks in the aftermath of natural disasters, targeting affected regions and organizations that are already under stress.

Energy Systems: What Works

Every region faces the meteorological threat differently based off the topology of the area, the development rates, and the general weather pattern the area typically experiences.

Extreme Heat vs Extreme Cold

Addressing extreme heat and cold across transmission lines, power poles, and substations reduces outage risk, equipment failure, and repair costs during increasingly severe weather events.

Strengthening these assets improves grid reliability, protects critical services, and increases national resilience by keeping energy systems stable under stress.

-White reflective paint can help substations in extreme heat by reducing solar heat gain on equipment and enclosures, which may lower overheating risk and improve reliability (calcium carbonate and barium sulfate).

-Microgrids improve resilience in extreme cold and heat by maintaining localized power when the main grid is stressed or disrupted.

-3d-printed flanged bases for transformer poles could speed replacement, reduce custom fabrication delays, and improve resilience after damage or failure with reduced costs in warehousing/producing replacement parts.

-Burying power lines can improve resilience in extreme heat and cold by shielding them from temperature-driven damage, ice, wind, and falling debris.

Dark vs Bright

-White solar panels run at a lower temperature than traditional black solar panels, extending their lifespan and reducing local heat-sinks.

Flood vs Quake

-Pipelines benefit from leak technology and temperature-tolerant materials, insulation, expansion controls, and continuous monitoring for stress and leaks.

Wind vs Storm

-Improve wind turbine resilience to lightning and icing with blade protection, grounding systems, de-icing technology, and condition monitoring.

rank	solution	speed	cost	impact	best use
1	thermal monitoring and heat-trigger thresholds	fast	low	high	find hot spots early
2	infrared inspections and connector upgrades	fast	low	high	wiring, joints, substations
3	reflective coatings and white painting	fast	low	medium	poles, enclosures, roofs
4	shade structures and cool roofs	medium	medium	high	substations, yards, generators
5	ventilation and forced air cooling upgrades	medium	medium	high	substations, generator enclosures
6	equipment spacing and yard layout changes	medium	medium	medium	substations with trapped heat
7	higher temperature conductors and reconductoring	medium	high	high	overloaded transmission corridors
8	dynamic line rating	medium	medium	high	lines with variable thermal limits
9	higher temperature insulation and transformer cooling upgrades	medium	high	high	transformers under sustained heat
10	pole material or geometry redesign	slow	high	medium	repeated heat degradation zones
11	covered conductors and corridor redesign	slow	high	medium	distribution in exposed areas
12	selective undergrounding	slow	very high	high	highest-risk, highest-value circuits

best practice	rationale	example
connect forecast to decisions	Buyers pay for action, not raw alerts	"if heat index exceeds threshold, shift crews and pre-stage cooling assets"
use one shared operating picture	Reduces siloed responses across ops, supply chain, and comms	Single weekly brief with weather, supplier risk, and map view
define decision thresholds early	Speeds action during fast-moving events	Trigger alternate supplier review at 72-hour disruption probability
publish short horizon playbooks	Teams need usable guidance within hours	72-hour hospital storm readiness checklist
show uncertainty clearly	Prevents false precision and builds trust	Use confidence bands, scenario ranges, and threshold language
pair intelligence with experiments	Proves value and improves recommendations	Test inventory buffer changes before peak storm season
capture member feedback fast	Field signals improve forecast relevance	Weekly call to log what worked and what failed
make outputs executive ready	Adoption rises when materials need no translation	One-page brief for leadership with actions, risks, and owners
design for compliance traceability	Buyers need defensible methods and documentation	Versioned assumptions, sources, and action logs
tailor visuals to nontechnical users	Clear maps improve stakeholder understanding	Story map showing facility exposure and likely service impacts

CONTACT

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• Email: Sunny@unlimitedweather.com

IEA Electricity 2026: Analysis and Forecast to 2030

• https://iea.blob.core.windows.net/assets/b73798cb-e452-42b9-9d8a-07542de7a041/Electricity_2026.pdf

HELPFUL STARTS

• NOAA Repository:

<https://www.ncei.noaa.gov/cdo-web/>

• Frontal Boundaries:

<https://aviationweather.gov/gfa/#progchart>

• Infographics:

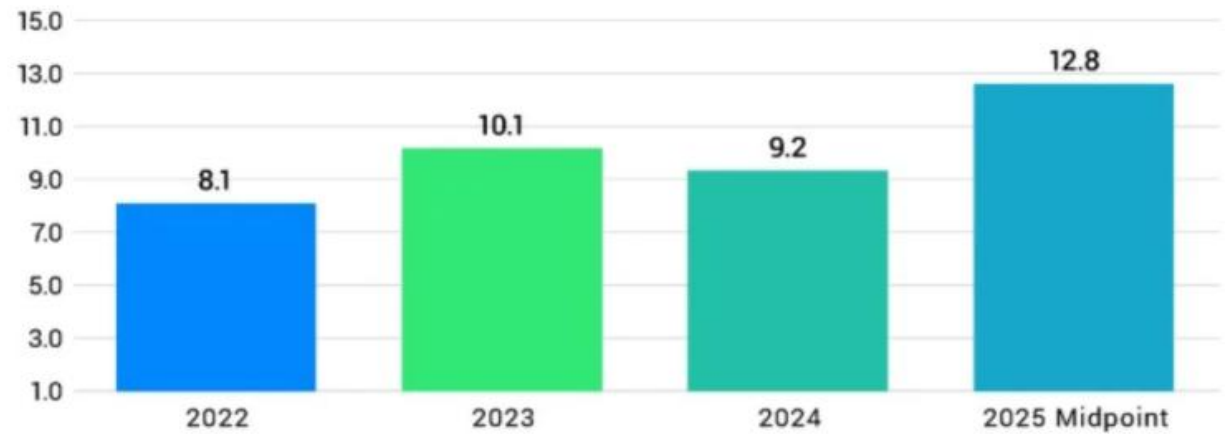
<https://www.climatecentral.org/>

• World Meteorological Organization:

<https://wmo.int/topics/extreme-weather>

Average Length of Longest Outage (Hours)

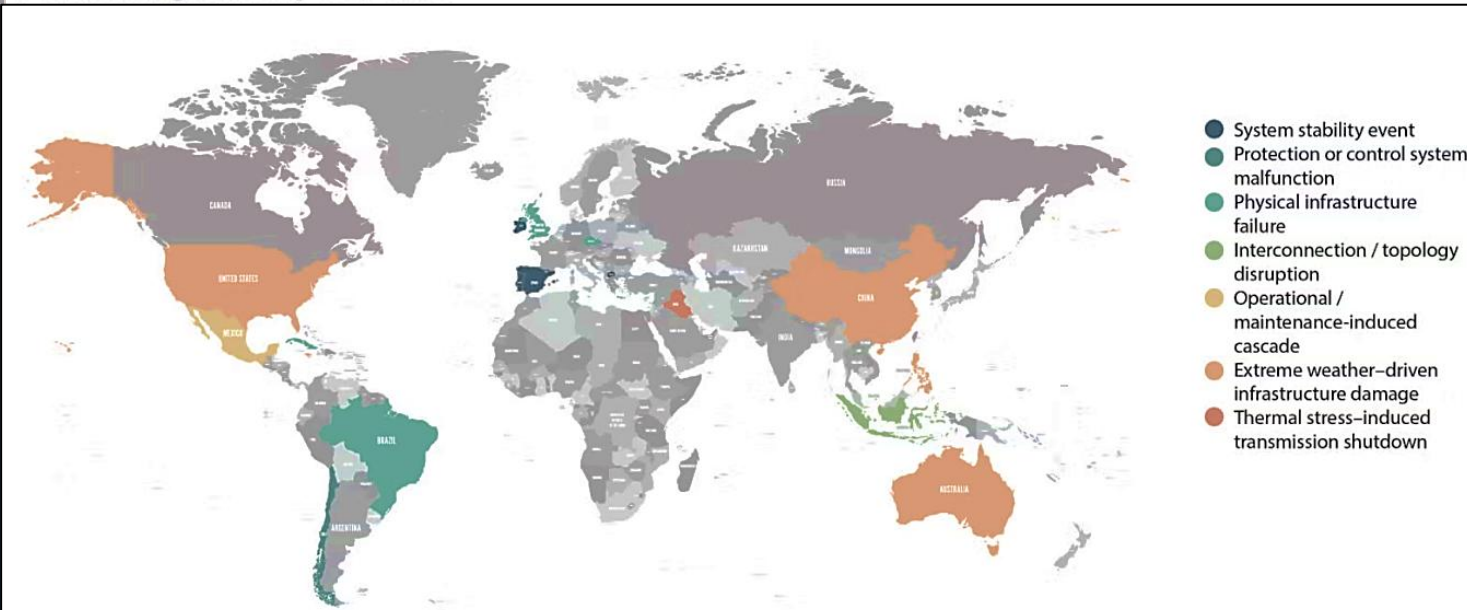
J.D. POWER



Source: J.D. Power 2025 U.S. Electric Utility Residential Customer Satisfaction Study™

JD Power's U.S. Electric Utility Residential Customer Satisfaction Study shows power outages getting longer over time.

Permission granted by JD Power



A breakdown of 15 major blackout events in 2025 by cause and geography. Sources: POWER; IEA, Electricity 2026 (February 2026).

Winning YOUR Super Bowl

- Thoughts on How to Consistently Perform at Your Highest Level for the Good of the “Team!”

Steve Beuerlein

Former Notre Dame and NFL QB



Qualities Vital to BUILDING a Championship Team:

☐ TOUGHNESS

- Mentally and Physically
- Individually and as a Team

☐ GREAT TEAMMATES

- Team Above Self Mentality
- Support One Another
- Hold Each Other Accountable

☐ SOLID LEADERSHIP

- Confidence is Contagious
- Know When to Push or Pull Back
- **TAKE** Accountability



“LOU HOLTZ FACTOR” = 1988 National Championship

3 Most Important Rules To Live By:

- ❖ DO WHAT’S RIGHT – “Never a RIGHT time to do the WRONG thing AND Never a WRONG time to do the RIGHT thing.”

- ❖ DO THE BEST YOU CAN
 - Always Give Great Effort
 - Focus On What YOU Can Control
 - Do YOUR Job

- ❖ SHOW PEOPLE YOU CARE
 - A Word Of Encouragement Goes A Long Way
 - Celebrate Successes Of Others
 - Apologize If You Are “Responsible”



“JIMMY JOHNSON FACTOR” = 3 Super Bowl Wins in 4 years

“MY WAY OR THE HIGHWAY!”

□ GENERAL MENTALITY –

- “If you WANT to be here, you WILL do things the way I want them done.”
- “If you do things the way I want them done, we WILL win.”
- “When we win, good things WILL come for EVERYONE and we WILL have a lot of fun!”

□ RESULT –

- Everyone understood roles and supported one another.
- Everyone BELIEVED good things were coming... and they did!



FORREST GUMP FACTOR = Every Day is Different!

“YOU NEVER KNOW WHAT YOU’RE GONNA GET.”

1. CHALLENGES / ADVERSITY / FAILURES

- Next Challenge is Right Around the Corner
- “Adversity Builds Character”
- Most People = More Failures Than Successes

2. NOT EVERYONE WILL GET CREDIT FOR SUCCESS

- “Unsung Heroes” are Everywhere
- Football = O-Line / Grid = Cybersecurity, Infrastructure, etc.
- **KEYS:** Strong Leadership and Recognition

3. TEAMMATES WILL COME AND GO

- Retirement / New Opportunities / Termination / Health
- “Next Person Up!” Mentality = Super Important!!
- **KEYS:** Mentorship and Patience



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FINAL THOUGHT... “GRID RELIABILITY IS A TEAM SPORT!”

TO WIN A TEAM CHAMPIONSHIP IS THE ULTIMATE!!

- ❖ It requires everyone to:
 - *Do the Right Things*
 - *Do the Best You Can Possibly Do*
 - *Show One Another You Care*

- ❖ My Question for You Today is Very Simple...

How Badly Do You Want to Be a Champion?



Questions