



WECC

Reliability in the West Discussion Series

May 1, 2024

Travis English Interim Manager, Communications

Antitrust Policy

- All WECC meetings are conducted in accordance with the WECC Antitrust Policy and the NERC Antitrust Compliance Guidelines
- All participants must comply with the policy and guidelines
- This meeting is public—confidential or proprietary information should not be discussed in open session



Antitrust Policy

- This webinar is being recorded and will be posted publicly
- By participating, you give your consent for your name, voice, image, and likeness to be included in that recording
- WECC strives to ensure the information presented today is accurate and reflects the views of WECC
- However, all interpretations and positions are subject to change
- If you have any questions, please contact WECC's legal counsel



Summer Outlook

May 1, 2024

Sunny Westcott Lead Meteorologist Cyber & Infrastructure Security Agency



WECC

CISA ISD Meteorological Engagement Effort

CISA Extreme Weather Outreach Seasonal Outlook Updates

"The 10 warmest years in the 143-year record have all occurred since 2010" (NOAA, 2023).



Chief Meteorologist Ms. Sunny Wescott Cybersecurity and Infrastructure Security Agency (CISA) Department of Homeland Security (DHS) Assistant Chief of Staff Office (ACOS) 202-701-4470 | Sunny.Wescott@cisa.dhs.gov



NCEI Anomalous Weather – March '24

The February global surface temperature was 2.52°F above the 20thcentury average of 53.8°F, making it the warmest February on record.

Persistent heat brought record-breaking temperatures to portions of the U.S. during March:

- San Juan broke several daily temperature records and tied 1981 for its second-warmest March on record.
- For January-March, the average CONUS temperature was 39.4°F, (4.2°F above average) ranking fifth warmest on record for this period.
- The January-March precipitation total for the contiguous U.S. was 8.15 inches, 1.19 inches above average (10th wettest in 130 years).
- Approximately 46 million people were impacted by record heat during the month of February.
- It was the warmest winter season on record for the contiguous U.S. by • over 0.8°F. A total of 506 counties each had their warmest February.

A new billion-dollar weather and climate disaster after a southern tornado outbreak and East Coast storm occurred in January and another new one was confirmed this month for the severe weather March 13-15.

A March blizzard yielded gusts of up to 190 mph and over 10 feet of snow.





U.S. Selected Significant Climate Anomalies and Events March 2024

Snow depth across Anchorage remained above two feet by the end of Mar-the second-highest depth ever recorded this late in Mar.

On Apr 2, about 18% of the contiguous U.S. was in drought, down about 3.6% from the end of Feb. Drought conditions expanded or intensified in portions of the Plains and in parts of the Northwest, the central MS Valley, the northern Great Lakes and HI this month. Drought contracted or was reduced in intensity across much of the MS Valley, PR and the West, and in parts of the Plains, Great Lakes and Carolinas.



A powerful storm system brought considerable snowfall to Denver and the CO Rocky Mountains on Mar 13-15. Over a foot of new snow was measured in parts of the city, making it the most significant snowstorm the area has experienced in the past three years.

A blizzard in early Mar blasted parts of Sierra Nevada with gusts of up to 190 mph and more than 10 feet of snow, shattering the "snow drought" and significantly boosting vital snowpack levels.

 ∇

V

On Mar 12–15, a severe weather outbreak brought heavy rain, hail and tornadoes (including two EF-3s) to parts of the Midwest. This is the largest severe outbreak of 2024 as of Mar 31 in the US, with over 400 severe weather reports

> Snow drought occurred in the Southeast as Asheville, Greensboro and Charlotte, NC, had their longest streaks with no measurable snowfall through Mar. The last measurable snows in those cities were recorded on Mar 13, Jan 17 and Jan 30, 2022, respectively.

Wildfires in the TX Panhandle, including the Smokehouse Creek wildfire, scorched more than one million acres during Feb-Mar, destroying hundreds of structures and claiming the lives of more than 7,000 cattle.

The average U.S. temperature for Mar was 45.1°F, which is 3.6°F above average, ranking 17th warmest in the 130-year record. The U.S. precipitation average for Mar was 2.85 in, 0.34 in. above average, ranking in the wettest third of the record.

Above-normal temperatures were observed across much of PR during Mar. San Juan broke several daily temperature records and tied 1981 for its secondwarmest Mar on record



Global Unstable Heat in 2024



DAILY SEA SURFACE TEMPERATURE Simate Extrapolar global ocean (60°5-60°N) Change Service Data: ERA5 1979-2024 • Last data: 03 Mar 2024 • Credit: C35/ECMWF 21.2 21.0 20.8 20.4 20.2 20.0 - 2024 2023 19.8 2020 2016 19.6 - 2015 Other years since 1979 19.4 DEC NOV OGRAMME OF opernicus CECMWF HE EUROPEAN UNION

Selected Significant Climate Anomalies and Events: March 2024





Daily sea surface temperature (°C) averaged over the extra-polar global ocean (60°S–60°N) for 2015 (dark blue), 2016 (light blue), 2020 (yellow), 2023 (red), and 2024 (black line). All other years between 1979 and 2022 are shown with grey lines.

Federal Outlooks for Spring and Summer 2024 - NOAA

Temperatures are expected to climb in most regions with the Central US kicking off abnormally high heat indices by the first week of May.

• 2024 already has 99% chance of being among 5 hottest years on record with January, February and March all reporting abnormal heat development in various parts of the country and internationally across both hemispheres.

In the coming weeks temperatures will begin to climb in the Central US and the Great Lakes ranging about 12-15 degrees above average while Northern Canada begins to warm abnormally fast, amplifying concerns of drought, fire weather, and smoke across both countries ahead of Summer.

• Precipitation totals along the southeast are expected to persist from abnormally strong severe weather, in that flash flooding will be a persisting threat.



Drought persistence, deterioration, or development was limited to the southcentral Great Plains, areas near the Mississippi and Ohio Rivers' Confluence, and small scattered areas in the central Gulf Coast region, the northern Great Plains, the southern High Plains, the Pacific Northwest, and Hawaii.

Flash drought conditions are appearing in Oklahoma, and Kansas, with some spillovers in eastern Colorado and western Missouri.

Weeks with little precipitation, warming temperatures, dry soils and low streamflow levels are leading to rapid degradations.

The past two weeks drought has persisted while the evaporative demand is growing across the Great Lakes where temperatures rise next week.

Author:

Rich Tinker



U.S. Seasonal Drought Outlook

Valid for April 18 - July 31, 2024 **Drought Tendency During the Valid Period** Released April 18, 2024 Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. 0 Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4). NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none). **Drought persists** NOAA/NWS/NCEP Climate Prediction Center Drought remains, but improves **Drought removal likely Drought development likely** 0 No drought ÷) O Puerto Rice Alaska https://go.usa.gov/3eZ73

Federal Forecast: Wildfire Threats Developing for Summer 2024

Wildfire threats are already of concern for areas which saw a decreased snowpack this year as well as abnormally higher temperatures than average. Drying winds have continued to increase across the North and Great Lakes. The Front Range will continue to be a major threat ahead of summer heat.

- Currently, three large uncontained wildfires are burning in Kansas, Virginia, and North Carolina. 10,200 fires have burned 1.77 million acres so far.
- A fuels and fire behavior advisory remains in effect for Northwest Texas, western Oklahoma, southwest Kansas, Wisconsin, southeastern Colorado and far eastern New Mexico.



Typeliget petition from densit to submit in fighted from and the out-many-second significant wideout for intention accellance. Typeliget collected has set off penalty for the field form and fully frequently lattice would general.

Renewables at Risk this Summer

Subsidence <u>induced settlement</u> is an identified hazard for <u>natural gas</u> <u>pipelines</u> in Central California and has two components: vertical and horizontal.

• Subsidence is a threat to all built infrastructure on the surface.

The continuous swings in temperatures during winter may cause increased icing on wind turbines resulting in a loss of efficiency, damaged components, or loss of operational capabilities due to weight.

• This year multiple states reported temperatures at or below -20F, when turbines are impacted.

As thunderstorms take on more intense attributes, such as larger/heavier hail and longer lasting tornadic cells

- In Texas this March, a 3,300 acres solar farm capable of producing 350 MW reported significant hail damage from a passing single storm cell.
- Hail in northern states over the past two years has fallen at ranges of 100-150 mph, carrying with it far more impact force than average.

Solar panels can also lose efficiency in extreme heat as well as the removal of trees for the panel farms can result in heightened flood damages.





Wind speeds are based on a Weibul k value of 2.0

Critical Infrastructure Sectors Risk from Heat

As extreme temperatures continue to swing through the winter, more sites are reporting structural integrity concerns for concrete slabs as building foundations, reservoirs, canals, roadways, runways, and railway platforms.

- Information technology services via datacenters are at operational risk from higher heat concentrations and persisting high heat days through increased cooling needs and decreased water availability. Many datacenter hubs are in higher risk areas over the next decade from heat domes.
- **Communication** infrastructure is at risk as phones can become too hot for use, power outages can impact communication services, and heat induced surface degradation (subsidence or upwelling) can collapse towers. Overheating can cause some phones to drop from 5G to 4G connection.
- **Chemicals** stored in high heat threatened regions can face unhealthy emission levels due to air stagnation, some chemicals flash points are a concern for ambient temperature and can vaporize, and transporting chemicals can become a greater risk for non-cooled containers and combustion.
- Critical manufacturing requires water cooling in operations and dust management which is at risk during heatwaves, some materials and equipment have temperature threshold for use, delays in the supply chain due to heat warping transportation are likely, and power loss can close plants.
- **Dams and waterways** are at clear risk of concrete degradation to the point of cracking, water evaporation causing unhealthy levels of minerals/metals/bacteria in waterways, fish die offs from hotter waters, ecology damages, and reduced hydroelectric output levels.
- Nuclear plants and the agricultural sector require significant water intake and lose operational capabilities on extreme heat days or in heat domes.
- Emergency services + healthcare face higher mortality rates, greater vehicle wear/tear, supply chain delays, heat illness, and personnel strain.

Malleable concrete threat: an electric vehicle is about 300 lbs. heavier than a comparable gas car but up to 1,000 lbs. more for larger vehicles like trucks, placing strain on parking garages, driveways, and roads while wearing down tires about 20% faster and increasing the surface temperature via friction.



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 can reduce 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 like fences and gated vehicle entry points

- Extreme heat and frequent staff rotations may cause gaps in external physical security
- Increased rates of depression during low pressures and aggression during heat waves may lead to workplace violence events
- 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

- 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



High-Pressures and Humans

A heat dome occurs when a persistent region of high-pressure traps heat over a particular area, and it can linger for days to weeks.

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 against women 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.

- <u>A 2019 study from Stanford University found climate change contributed to between</u> <u>3% to 20% of conflicts over the last century with the potential influence set to increase</u> <u>substantially due to warming global temperatures.</u>
- Research from Mexico, which took 16 years' worth of daily crime records from different municipalities found an increase in temperature of 1C correlated with an increase across all types of crime of 1.3%.
- <u>There were about a third more accusations of crime per population on days hotter than</u> <u>32C than on days cooler than 10C.</u>

<u>A study of Los Angeles, CA</u>: On average, overall crime increases by 2.2% and violent crime by 5.7% on days with maximum daily temperatures above 85F (29.4C) compared to days below that threshold. Moreover, heat only affects violent crimes while property crimes are not affected by higher temperatures.

 <u>A laboratory experiment found</u> that participants demonstrated an increase in the joy of destruction when subject to increasing ambient temperatures. 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. (Studies in Conflict & Terrorism)

 Even if the world's countries managed to keep "global temperature rise this century well below 2 degrees Celsius 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



As temperatures rise, so does violent crime

Average violent crime rates vs average temperature, London





Weekly National-International Climate Summary:

Abnormal Weather Events, Climate Headlines, Forecasted Threats, Global Impacts, Wildfires, Tropical Cyclone Updates, and Graphics/Studies.

Bi-Weekly CISA Extreme Weather Working Group:

Regional Data Sharing, Upcoming Product Developments, Climate Education, Sector Impacts, Resiliency Best Practices, and National Coordination-Collaboration.

For Questions Contact:

Ms. Sunny Wescott Chief Meteorologist DHS – CISA – ISD ACOS 202-701-4470 | Sunny.Wescott@cisa.dhs.gov





<Public>

Summer Outlook Panel

- Moderator:
 - Steve Ashbaker—Reliability Initiatives Director, WECC
- Panelists:
 - Tim Beach—Director, Reliability Coordination, RC West/CAISO
 - Hayden Johnson—Lead Functional Coordinator, SPP Western RC
 - Sunny Wescott—Lead Meteorologist, Cyber & Infrastructure Security
 Agency





www.wecc.org