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Actuarial Weather Extremes January 2021

February 2021

Actuarial Weather Extremes: January 2021

January Weather Station Records, Dangerous Snowfall Accumulation, Persistent Severe Drought Conditions

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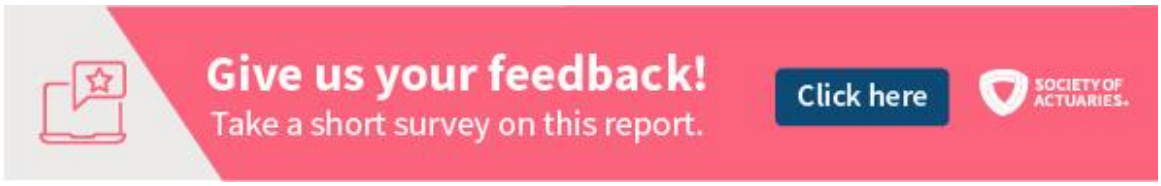

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Overview

This report examines individual station records in the U.S. and Canada for four weather metrics from the Global Historical Climatology Network (GHCN): Precipitation (PRCP), Snow (SNOW), Daily Maximum Temperature (TMAX), and Daily Minimum Temperature (TMIN). Extreme snow in the California / Nevada border area in late January produced nearly 70 inches of snow at one station, and reports from nearby areas indicated over 100 inches in a four-day period. Additionally, the report focuses on drought conditions which persist and compared to January 2020 are extreme.

PRCP, SNOW, TMAX, TMIN January Station Records: Several GHCN weather stations recorded record readings and amounts for January in 2021. The records in many cases are greater than 150% of the previous record amount (for PRCP and SNOW) and shown by excess temperature amount (for TMAX and TMIN). See Figures 1-4.

Heavy Snowfall in California / Nevada Border Area: One GHCN Station near Truckee California, recorded 70 inches of snow during the period January 26-29. As reported by KTLA News California, the National Weather Service indicated that Mammoth Mountain, CA recorded 94 inches of snow at the base and 107 inches of snow at the summit in 72 hours leading up to January 29, 2021. [1] The storm included an "atmospheric river" that dumped heavy moisture on California for three days. Atmospheric rivers are long concentrated streams of moist air that come onshore from the ocean. [2]

Persisting Drought Conditions in Western U.S. Over 60% of the U.S. was in Severe Drought condition or worse in late January 2021 versus less than 2.5% of the U.S. in the same conditions in late January 2020. [3] In some cases, the drought extremes are in areas noted above which were set upon by the atmospheric river systems. These areas are seeing extreme conditions at both ends with respect to moisture.

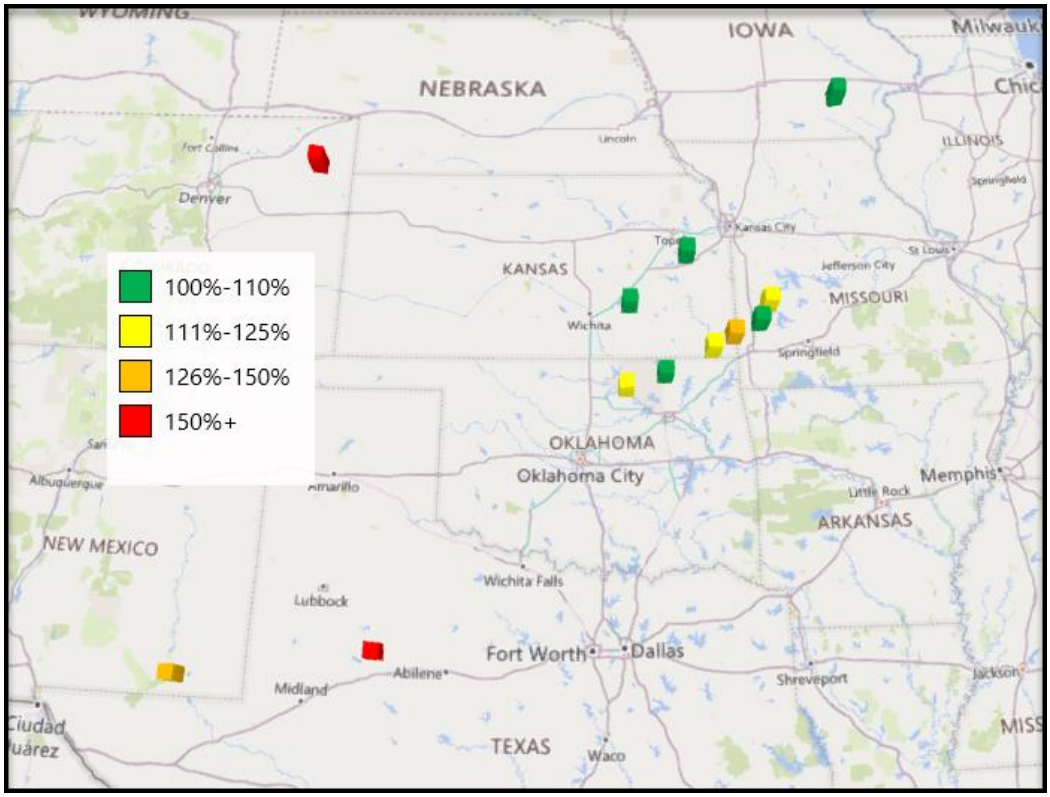
[1] KTLA News. January 29, 2021. Mammoth receives about 9 feet of snow as 'superstorm' wallops Sierra | KTLA
[2] Inside Climate News. February 2, 2021. A Surge From an Atmospheric River Drove California's Latest Climate Extremes - Inside Climate News
[3] Compare Two Weeks | United States Drought Monitor (unl.edu)

GHCN PRCP, SNOW, TMAX, TMIN Station Records for January

Figures 1-4 show Global Historical Climatology Network (GHCN) January Monthly Station Records set in January 2021 for the years 1960-2021. Temperatures in the Canadian Atlantic Provinces exhibited record warmth for January. Precipitation records were concentrated in the Central U.S. and Snow records were prevalent in the Southwest U.S. and near to a very large snow system in Norther California which is featured in Figure 5.

Figure 1

PRECIPITATION RECORDS IN JANUARY 2021 (% OF PREVIOUS RECORD)



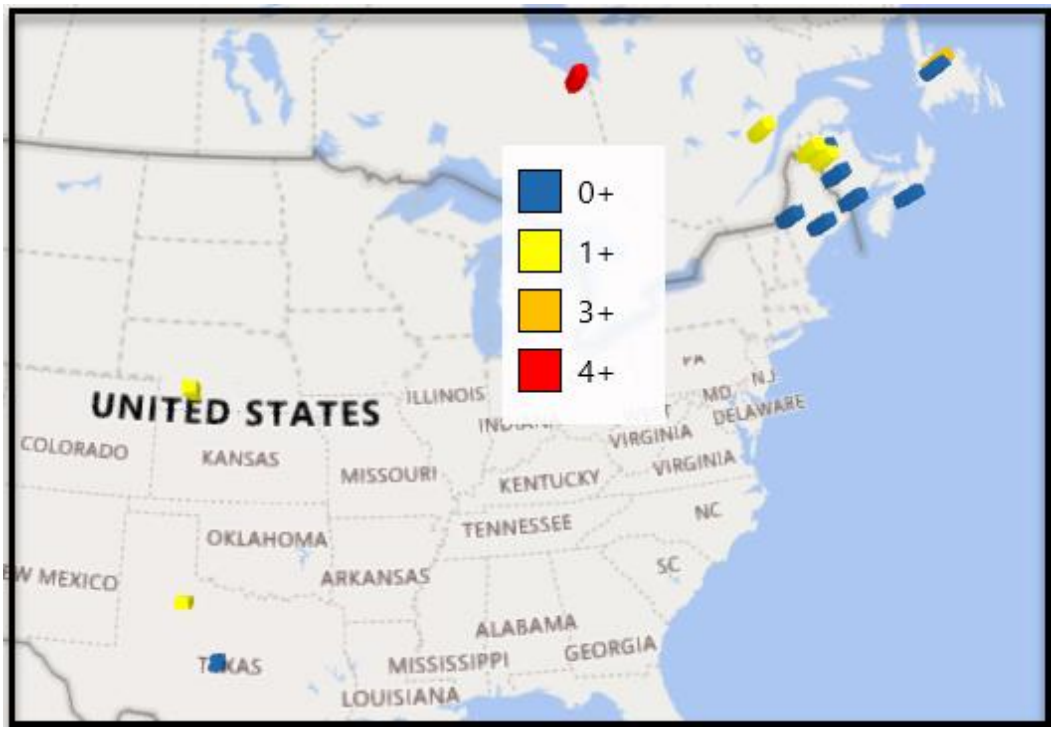
Source: GHCN station data (Accessed February 4, 2021). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

Figure 2

DAILY HIGH TEMPERATURE RECORDS IN JANUARY 2021 (EXCESS DEGREES F OVER PREVIOUS RECORD)

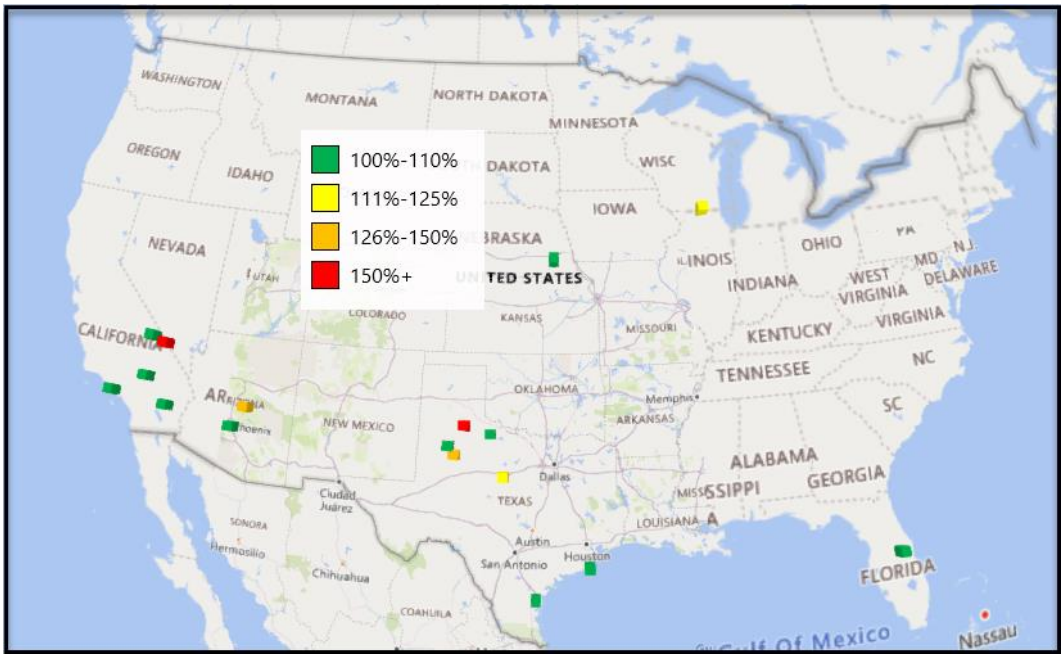
Source: GHCN station data (Accessed February 4, 2021). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

Figure 3
RECORD HIGH DAILY LOW TEMPERATURES IN JANUARY 2021 (EXCESS DEGREES F OVER PREVIOUS RECORD)



Source: GHCN station data (Accessed February 4, 2021). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

Figure 4
SNOW RECORDS IN JANUARY 2021 (% OF PREVIOUS RECORD)



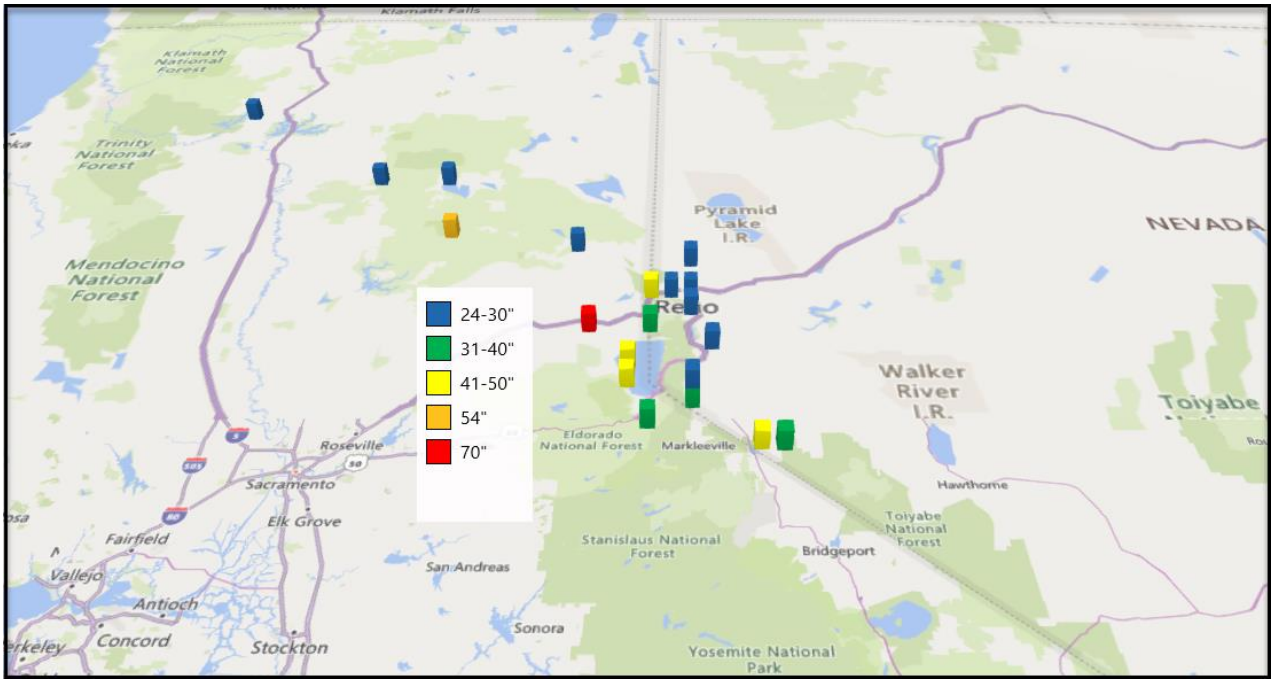
Source: GHCN station data (Accessed February 4, 2021). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

Heavy Snowfall in California / Nevada Border Area

Figure 5 shows the snowfall totals associated with a heavy storm that dropped over 100 inches of snow in some areas of the Sierra Nevada mountain range in a 72-hour period from January 26-29, 2021. Snow Immersion Suffocation (SIS) warnings were issued by nearby ski resorts after the death of a skier who was found upside down and unconscious at the intersection of two ski trails. [4]

Figure 5

STATIONS WITH 24+ INCHES OF SNOWFALL TOTALS OVER THE PERIOD JANUARY 26-29, 2021



Source: GHCN station data (Accessed February 4, 2021). ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz

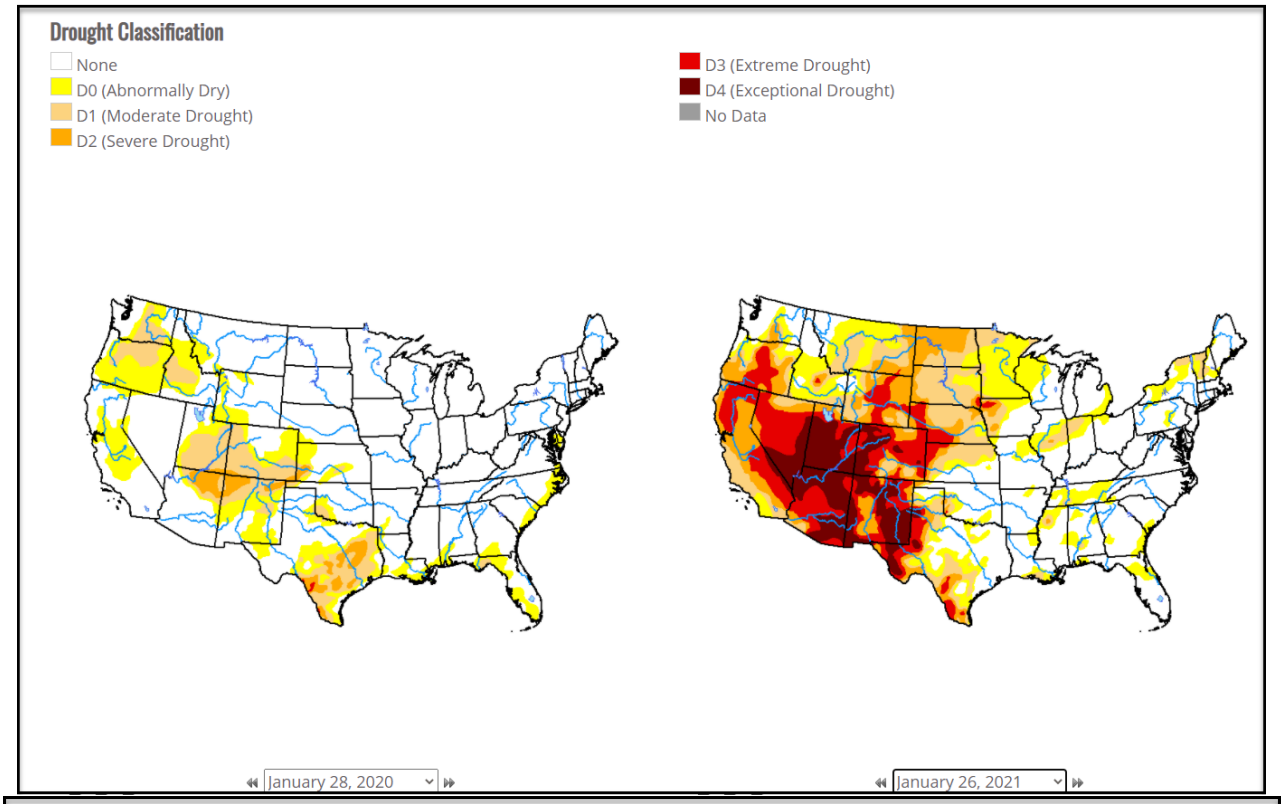
[4] KTLA News. January 29, 2021 Mammoth receives about 9 feet of snow as 'superstorm' wallops Sierra | KTLA

Persisting Drought Conditions in the Western U.S.

Severe drought conditions continue to persist from 2020 in the Western U.S. As compared to late-January 2020, late-January 2021 is in a significantly heavier drought condition, with over 60% of the U.S. in Severe Drought or worse in 2021 versus less than 2.5% of the U.S. in the same conditions a year earlier.

Figure 6

LATE JANUARY CONTINENTAL U.S. DROUGHT CONDITIONS IN 2020 AND 2021



Statistics Comparison

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
2020-01-28	73.32	26.68	11.00	2.39	0.05	0.00	40
2021-01-26	37.69	62.31	46.02	32.51	21.10	8.96	171
Change	-35.63	35.63	35.02	30.12	21.05	8.96	131

Source: United States Drought Monitor, retrieved on 2/16/2021: Compare Two Weeks | United States Drought Monitor (unl.edu)

Rough Assessment of the Losses Caused by the Recent Extreme Weather

Economic and insured losses are often difficult to estimate in the immediate aftermath of an extreme weather event. With the passage of time, the extent of the losses gradually becomes clearer.

Northern California Atmospheric Storm Damage

The Norther California atmospheric storm that led to the heavy snowfalls featured in Figure 6 above, also led to uprooted trees and knocked out power to thousands. [5] The storm included an "atmospheric river" that dumped heavy moisture on California for three days. Atmospheric rivers are long concentrated streams of moist air that come onshore from the ocean. [6]

Data

Snow, precipitation and temperature data used in this report was obtained from the **Global Historical Climatology Network** ("GHCN") weather database, which provides daily weather observations from over 100,000 weather stations worldwide, covering over 180 countries. The database is publicly available through the National Oceanic and Atmospheric Administration (NOAA) via the following FTP site:

ftp://ftp.ncdc.noaa.gov/pub/data/ghcn/daily/ghcnd_all.tar.gz
Filename: ghcnd_all.tar.gz

[5] The Sacramento Bee. January 27, 2021. CA winter storm: See photos, video of damage from heavy rain | The Sacramento Bee (sacbee.com)
[6] Inside Climate News. February 2, 2021. A Surge From an Atmospheric River Drove California's Latest Climate Extremes - Inside Climate News

Acknowledgments

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Feedback

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With roots dating back to 1889, the Society of Actuaries (SOA) is the world's largest actuarial professional organizations with more than 31,000 members. Through research and education, the SOA's mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice and relevant solutions for financial, business and societal challenges. The SOA's vision is for actuaries to be the leading professionals in the measurement and management of risk.

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