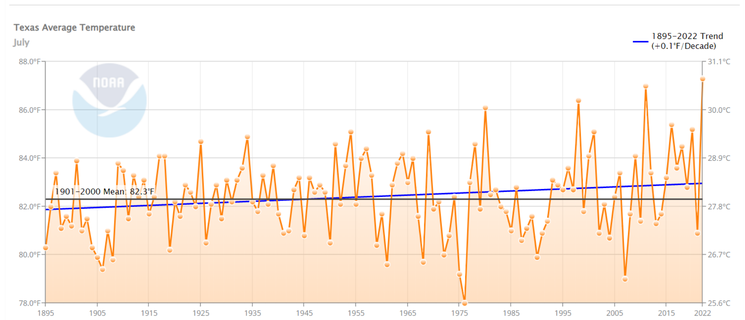
What Do We Know Today about Climate Change Effects?

Temperature Trends

The annual average temperature in Texas has risen almost 1.5 ˚F since the beginning of the 20th century.[1]

The time series graph below shows the average daily (24-hour) July temperature in Texas. July of 2022 was the hottest on record, with an average daily (24-hour) temperature of 87.3 ˚F.



Source: Climate at a Glance | National Centers for Environmental Information (NCEI) (noaa.gov)

Temperature Projections

Under some scenarios, annual average temperatures in Texas are anticipated to increase 3–5 ˚F by mid-century.

Mean Temperature, Annual

Annual Mean Temperature 1971–2000

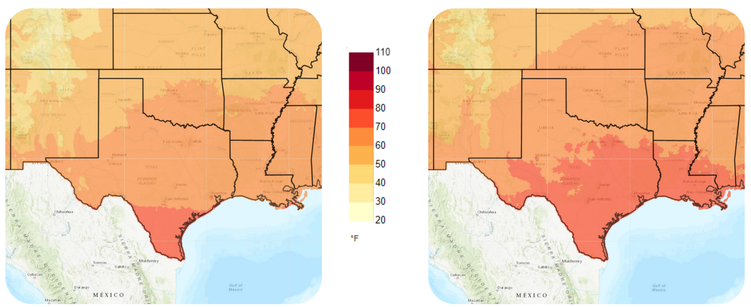
Historical simulation, 1971–2000 mean

Multi-model mean derived from 20 downscaled CMIP5 models

Projected Annual Mean Temperature 2040–2069 (RCP* = 8.5)

Higher Emissions (RCP 8.5), 2040–2069 mean

Multi-model mean derived from 20 downscaled CMIP5 models



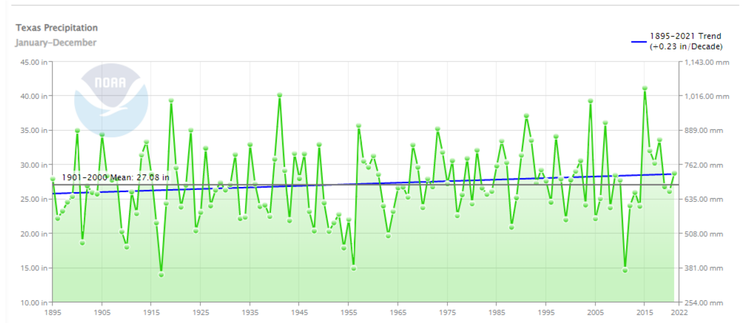
Source: Climate Mapper Tool | U.S. Climate Resilience Toolkit

[1] Runkle, J., K.E. Kunkel, J. Nielson-Gammon, R. Frankson, S.M. Champion, B.C. Stewart, L. Romolo, and W. Sweet, 2022: Texas State Climate Summary 2022. NOAA Technical Report NESDIS 150-TX. NOAA/NESDIS, Silver Spring, MD, 5 pp. Available: https://statesummaries.ncics.org/chapter/tx/

* RCP = Representative Concentration Pathway. RCP is a greenhouse gas concentration (not emissions) trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC). Four pathways were used for climate modeling and research for the IPCC Fifth Assessment Report in 2014. RCP 8.5 is the worst-case scenario with the highest greenhouse gas concentration trajectory, referring to the concentration of greenhouse gases in 2100.

Precipitation Trends

Precipitation is widely variable across Texas, with a slight increasing trend since the beginning of the 20th century. Since modern record-keeping, there have been significant droughts in the late 1910s, the early 1950s, and the early 2010s; the driest calendar years were 1917, 1956, and 2011. The driest consecutive 5-year period was 1952–1956, and the wettest was 2015–2019.[1]

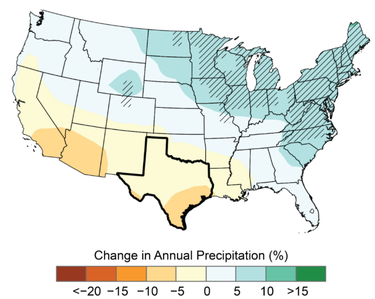


Source: Climate at a Glance | National Centers for Environmental Information (NCEI) (noaa.gov)

Precipitation Projections

Projected precipitation changes are highly variable spatially across the United States. Texas is part of a large area in the southwestern and central United States with projected decreases in annual precipitation. However, most models do not indicate that these changes are statistically significant, so the precipitation changes projected to occur in the Edwards Aquifer region are uncertain.

Projected Change in Annual Precipitation



Drought

Severe droughts have occurred in Texas at least once a century since the 1500s. The recurrence of severe prolonged drought in South Central Texas appears to be normal, not an exception.[2]

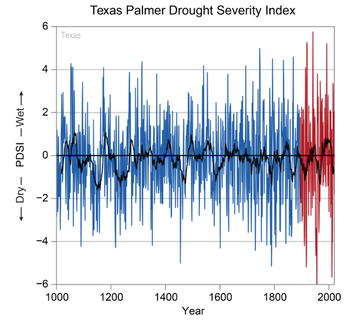
As the atmosphere warms, its capacity to hold water vapor increases by about 7% for every 1.8 ˚F of warming, meaning more evaporation and soil moisture loss in areas that are already dry, and more intense droughts.

Likely to decrease:

- Soil moisture

Likely to increase:

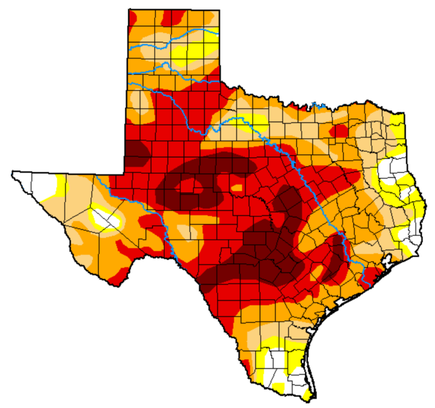
- Frequency and intensity of droughts



Time series of the Palmer Drought Severity Index for Texas from the year 1000 to 2020. Values for 1895–2020 (red) are based on measured temperature and precipitation. Values prior to 1895 (blue) are estimated from indirect measures such as tree rings. The variances between the two segments may not be homogeneous because of these data and methodological differences. The fluctuating black line is a running 20-year average. Periods of drought are common in Texas; the most severe droughts since 1895 were those in 1956 and 2011. Prior to 1895, droughts of the 1956 and 2011 severity occurred occasionally.[1]

Ongoing Drought Conditions

U.S. Drought Monitor, Texas



August 23, 2022

(Released Thursday, Aug. 25, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5.21	94.79	87.18	71.11	43.13	12.42
Last Week 08-16-2022	2.79	97.21	93.40	85.05	61.91	26.49
3 Months Ago 05-24-2022	12.92	87.08	79.11	66.94	46.05	22.08
Start of Calendar Year 01-04-2022	7.58	92.42	79.83	54.25	16.69	0.00
Start of Water Year 09-28-2021	45.57	54.43	7.26	0.27	0.00	0.00
One Year Ago 08-24-2021	94.51	5.49	1.10	0.00	0.00	0.00

Intensity:

None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Deborah Bathke
National Drought Mitigation Center

droughtmonitor.unl.edu

[2] Cleaveland MK, Votteler TH, Stahle DK, Casteel RC, Banner JL. 2011. Extended chronology of drought in South Central, Southeastern, and West Texas. Texas Water Journal. 2(1):54-96. Available from: https://doi.org/10.21423/twj.v2i1.2049.