



Climate change affects both typical and extreme weather.

Averages

Temperature
IncreasePrecipitation
Change

Extremes

Extreme Rainfall
& StormsExtreme Heat
& Cold

Wildfire



Drought



All

This can have multiple impacts on utilities. Climate change can ...

...make it harder to meet community needs for water.

There may be reduced water supply, caused by:

Change from snow to rain, streamflow timing



Increased evaporation & transpiration by plants



Decreased surface water



Decreased infiltration & recharge to ground water



Dry, hydrophobic soils with increased run-off, less capture

**There may be decreased water quality, caused by:**

Biological/microbial growth, e.g., HABs



Heavy runoff and high winds causing erosion, contamination *



Smoke & contamination *



Loss of vegetation, heavy runoff causing erosion, contamination *



Less dilution, higher concentrations of contaminants

**There may be increased demands for water, used for:**

Human consumption



Gardens, trees, other plants



Cooling



* Chemical, mineral, organic, and particulate contamination, depending on source.

...affect utility infrastructure.

Extreme weather can lead to:

Damage to physical infrastructure (wells, pipes, treatment, storage, etc.)



Dry soils, pipe breaks

**Infrastructure may be inadequate for:**

Stormwater or combined storm-water/wastewater overflow



Firefighting

**It can affect infrastructure operations tied to:**

Reservoir levels



Wastewater evaporation



Water and wastewater treatment chemistry



Electrical power



Telecommunications service & transportation access



...affect utility administration and operations.

There may be inadequate funding for operations and improvements, associated with:

Population decline, fewer ratepayers



Population increase, causing greater infrastructure needs



Financing linked to to climate vulnerability, such as bond ratings

**Staff and board member availability may decrease due to:**

Population decline



Risks to worker safety & health



Extreme events limiting availability



Climate Change Projections



Climate science uses models to project temperature and precipitation, considering them in relation to a historical period (1981-2005) and in the future at mid-century (2035-2065) and the end of the century (2070-2099). The conditions are averaged over the entire time period being considered.

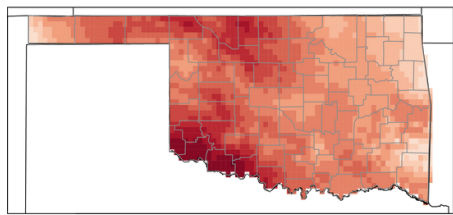


Climate science considers more than one possibility for future climate, based on scenarios developed by scientists and adopted by an international organization, the Intergovernmental Panel on Climate Change. The scenarios incorporate different levels of emissions of greenhouse gases, known as "representative concentration pathways" or RCPs. The levels of emissions are dependent on policy decisions and other factors. RCP 4.5 is considered a "moderate" climate change scenario and RCP 8.5 is considered a "high" climate change scenario.



Climate science uses global climate models to project changes at global scales and downscaling to project changes at local scales. The South Central Climate Adaptation Science Center has used methods known as statistical downscaling on projections from three global climate models from the Intergovernmental Panel on Climate Change in its fifth phase of the Coupled Model Intercomparison Project (CMIP5) to produce regional and local scale projections for the south central United States. **Source:** Dixon K.W., A.M. Wootten, M.J. Nath, J. Lanzante, D.J. Adams-Smith, C.E. Whitlock, C.F. Gaitán, R.A. McPherson, 2020: South Central Climate Projections Evaluation Project (C-PrEP), South Central Climate Adaptation Science Center, Norman, Oklahoma, USA. DOI: <https://doi.org/10.21429/12gk-dh47>

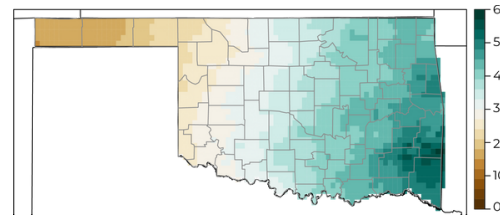
Historical and Projected Future Temperatures and Precipitation Across Oklahoma



Map 1: Number of Days Over 95°F, Average from 1981-2005

Historical Temperature Data

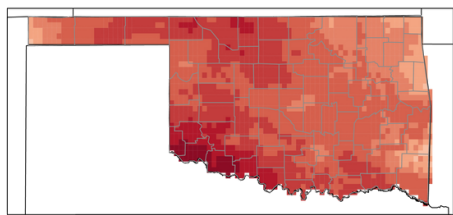
Over the historical period in Oklahoma, the total number of days in a year **over 95°F** has ranged from **10 to 60 days**, and the total number of days in a year **over 100°F** has ranged from **less than 1 to 26 days**, both depending on location.



Map 1: Total Annual Precipitation, Average from 1981-2005

Historical Precipitation Data

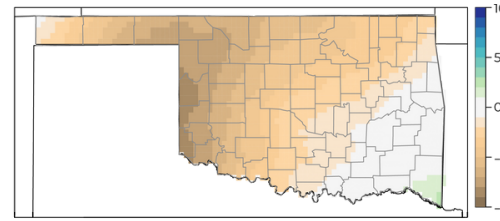
Over the historical period in Oklahoma, the **total precipitation** over a year has ranged from **15 inches to 58 inches**, and the **maximum precipitation in one day** has ranged from **1 inches to 3 inches**, both depending on location.



Map 2: Number of Days Over 95°F, Moderate Climate Scenario, Average from 2035-2065

Moderate Climate Change Scenario

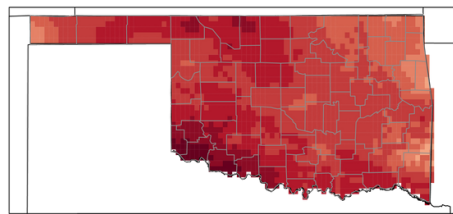
The number of days **over 95°F** will increase to 36 to 94 days (**an additional 24 to 40 days**), and the number of days **over 100°F** will increase to 10 to 57 days (**an additional 9 to 33 days**) at mid-century in Oklahoma, depending on location.



Map 2: Percentage Change in Total Annual Precipitation, Moderate Climate Scenario, Average from 2035-2065

Moderate Climate Change Scenario

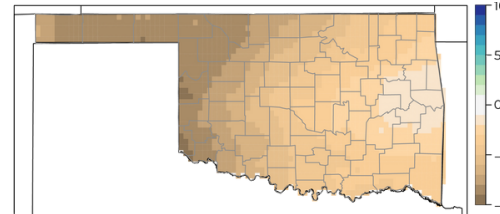
Precipitation change is projected to range from -2 inches to +1 inch over a year, or a **percentage change of -9% to +3%** (still at 15 to 58 inches), and the **maximum precipitation in a day** is projected to change by less than 1 inch in either direction, with a **percentage change of -9% to +9%**, at mid-century in Oklahoma, depending on location.



Map 3: Number of Days Over 95°F, High Climate Scenario, Average from 2035-2065

High Climate Change Scenario

The number of days **over 95°F** will increase to 47 to 104 days (**an additional 36 to 52 days**), and the number of days **over 100°F** will increase to 17 to 67 days (**an additional 16 to 43 days**) at mid-century in Oklahoma, depending on location.



Map 3: Percentage Change in Total Annual Precipitation, High Climate Scenario, Average from 2035-2065

High Climate Change Scenario

Precipitation change is projected to range from -3 inches to +1 inch over a year, or a **percentage change of -9% to +1%** (to 14 to 57 inches), and the **maximum precipitation in a day** is projected to change by less than 1 inch in either direction, with a **percentage change of -2% to +16%**, at mid-century in Oklahoma, depending on location.

*Note that the scale changes from historical to projected data.

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