

Climate change in OKLAHOMA



While climate change is often talked about in the future tense, our climate is already changing in both averages and the number and intensity of extremes. Oklahoma has recently experienced record-breaking heat, increased drought, and a slight increase in extreme weather events. As global temperatures continue to rise, Oklahoma is expected to experience more heat waves, drought, and flooding. The Southern Climate Impacts Planning Program (SCIPP) is a climate hazards research program whose mission is to help Oklahoma residents increase their resiliency and level of preparedness for weather extremes now and in the future.

Climate Change: Observations

Temperature

While “global warming” implies rising temperatures, climate change isn’t quite that simple. Every place experiences climate change differently.

Temperatures throughout the Great Plains have increased by 1.5° Fahrenheit since the 1960s (NCA). These warming trends are especially evident in winter, resulting in fewer frosts per year (NCA), and during summer hot spells, with more nights staying above 68 degrees.



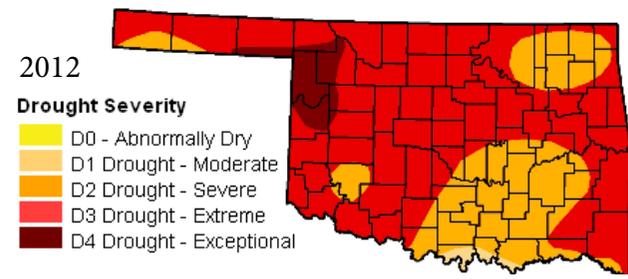
 The rate of annual heat-related illnesses and deaths in the U.S. has tripled in the last 20 years as heat waves have become more common and more intense. Each year, high temperatures kill more people than hurricanes, floods, tornadoes, blizzards, and lightning combined (CDC).

 All of the environmental changes observed in the last 150 years resulted from a 2 degree global temperature rise. Temperatures in the southern Great Plains are projected to increase another 3-9 degrees by 2100 (NCA).

Quick Fact:
Rising temperatures and changes in precipitation patterns as a result of climate change put additional stress on water resources.

Precipitation

In Oklahoma, rainfall has become more unpredictable, swinging back and forth between extreme drought and intense downpours. Climate records show trends of long droughts, some lasting decades, followed by intense flooding. For example, Oklahoma has experienced six multi-year or decade-long drought events since 1920 (Oklahoma Water Resources Board).



 Flooding in Oklahoma occurs most often in the spring and fall. Intense downpours have become more common in Oklahoma, with total annual rainfall on very wet days increasing more per year since 1948 than other states in the southern Great Plains.

While overall precipitation was above normal for Oklahoma from 1980-2010, the state has experienced record drought during the last three years. For the entire month of June in 2011, all of Oklahoma received about 1.1 inches of rainfall, down from its average monthly rainfall of 4 inches (SCIPP).

Water Stress

Every river and stream in Oklahoma is vulnerable to climate change. Water tables have already begun shifting, their depths shrinking due to prolonged drought, rising temperatures, and increased irrigation (Oklahoma Water Resources Board).

Water levels have decreased by more than 150 feet in some parts of the High Plains Aquifer, which provides the majority of the region’s water (NCA).



Water stress is one of Oklahoma’s most widespread climate change-related problems. Increased demand for water as a result of a growing population and warmer temperatures has led to increased irrigation.

Oklahoma’s Water Resources Board, through the Oklahoma Comprehensive Water Plan (OCWP), has evaluated the effects of projected population and climatic changes on the state’s water resources and has made policy recommendations. The strategies proposed in the OCWP, such as water conservation and reuse, have the potential to allow Oklahoma to meet future water demands (National Resources Defense Council).

 Visit the OCWP website at <http://www.owrb.ok.gov/> for more information about Oklahoma’s water management plants.

Overview

The models scientists use to project future climate change are extremely thorough, consider the unique geography and climate of every region, and look forward 25 and 100 years (NOAA).

In Oklahoma, models project prolonged periods of drought, more frequent and intense heat waves, and overall warmer temperatures.

Climate change acts as a threat-multiplier, loading the dice for more intense hurricanes, heat waves, floods, droughts, and extreme weather.

Overall precipitation is expected to decrease 6-10 percent by 2100, with the southwest parts of the state experiencing greater rain loss than the northeast.

Droughts will become more frequent, last longer and be more intense. Rains following droughts will often be quick and heavy, causing flash-flooding and destroying aging and vulnerable infrastructure (NCA).



With more dry periods, higher temperatures and more lightning, large wildfires are expected to become more common (Price 2012, NCA).

In addition to heat waves, cold seasons are expected to be warmer and shorter, leading to fewer frost and freezing days (OCS).

Plant growing seasons will become longer, the types of plants that can survive in Oklahoma will begin to change, and precipitation events will become more intense causing more flooding of agricultural areas (USDA).



Q: What effect will climate change have on tornadoes and other types of severe weather in Oklahoma?

A: Climate models show an increase in weather conditions favorable for severe thunderstorms. However, since severe thunderstorms and tornadoes are relatively rare events at a given location, regional trends in the strength and number of events are unclear (Brooks 2013).

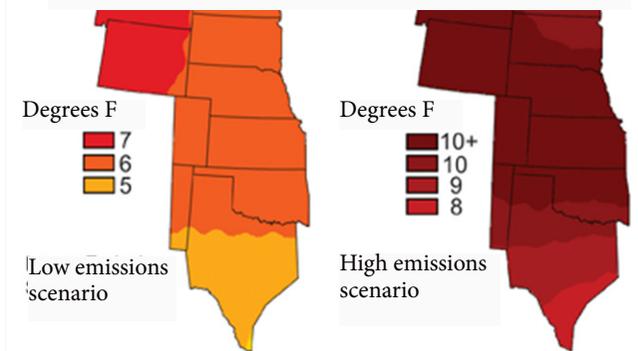
Temperature

Future temperature rise depends partly on the amount of greenhouse gasses added to the atmosphere in coming decades. Global temperatures are expected to increase another 3-12 degrees Fahrenheit by 2100 (IPCC).

Temperatures in the southern Great Plains are projected to increase another 3-9 degrees by 2100 (NCA).

The southern Great Plains experiences about seven days per year above 100 degrees. These high temperatures are likely to occur much more frequently in the future – as much as four times more frequently. The impacts of such increases in extreme heat could include: increased evaporation from reservoirs, greater demand for air conditioning, and increases in the number of heat stress days (NCA).

Summer temperatures by 2080-2099 (NCA)



Temperatures in the Great Plains are projected to increase significantly by the end of this century, with the northern part of the region experiencing the greatest projected increase in temperature (NCA).

Wildlife

Due to rising temperatures, much of Oklahoma's wildlife will be forced to either move or adapt. Ecosystems will become ripe for invasive species, such as the red-imported fire ant. The potential loss of wildlife could harm the tourism economy in Oklahoma, where more than \$1 billion is spent each year on wildlife viewing, hunting, and fishing (NWF).

Forestry

The risk of wildfires in Oklahoma will rise due to increasingly warmer and drier conditions. Changing precipitation patterns and an increased risk of flooding will also affect forest sustainability and growth (Oklahoma Climatological Survey). The Oklahoma Forestry Service is currently implementing strategies to increase the forest's resistance to wildfires and pest outbreaks, such as thinning forests and prescribed fires.

Agriculture

Shorter cold seasons and longer periods without frost could lengthen the growing season for many crops in Oklahoma. However, winter wheat is expected to experience a 27–37 percent loss in yield as temperatures exceed the climate threshold (NWF). As drought frequency and severity increase, there will be an increased need for irrigation to sustain crop growth.

Water Resources

The combination of increasing temperatures, higher evaporation rates, and longer, more severe droughts will add stress to the already strained water resources of Oklahoma. A growing population in Oklahoma means water stress is potentially one of the most pressing impacts of climate change for the state (Oklahoma Water Survey).