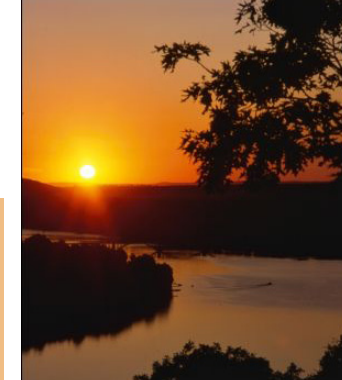


# Climate change in Arkansas



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. Since 2000, major disasters have been declared 15 times in Arkansas due to flooding, severe weather, and even hurricanes. As global temperatures continue to rise, Arkansas is expected to cause an increase in public health dangers, more frequent and intense flooding, and additional stress to the state's water resources. The Southern Climate Impacts Planning Program (SCIPP) is a climate hazards research program whose mission is to help Arkansas 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 that simple. In Arkansas, average temperatures have fluctuated more than most other states, with average highs and lows changing each year.

Since 1970, however, average temperatures have been increasing steadily throughout the southeastern United States - including in Arkansas (USGRCP).



On average, temperatures in the Southeast have risen 2° Fahrenheit since 1970, and the number of freezing days has declined by 4 - 7 days each year in the region (USGRCP).



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 (CDC).

All of the environmental changes observed in the last 150 years resulted from a 2° Fahrenheit global temperature rise. Temperatures in the U.S. Southeast are projected to increase another 4°-8° F by 2100 (NCA).

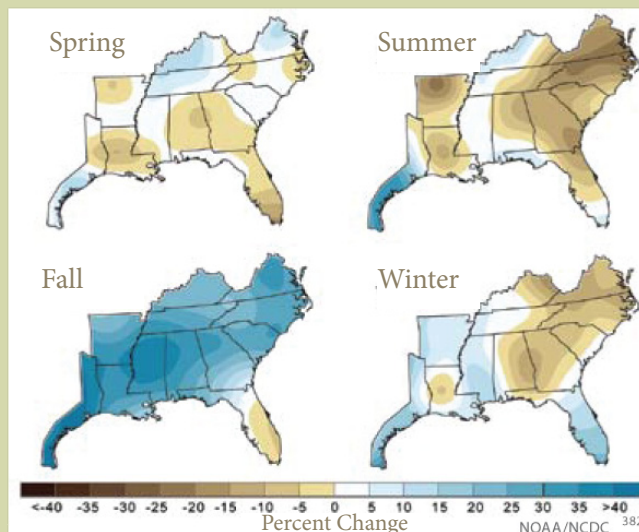


### Precipitation

From 1901 to 2007, fall precipitation in Arkansas has increased by at least 20 percent across the state, with some parts of southeast Arkansas experiencing increases greater than 35 percent (USGCRP).

During the same time period, summer precipitation decreased 5 percent in southern Arkansas, and decreased by as much as 25 percent in northern Arkansas (USGCRP).

Observed Changes in Precipitation  
1901 to 2007



### Water Stress

Approximately two-thirds of Arkansas' water resources come from groundwater (Holland, 2005). Farmers are the biggest users of the state's groundwater.

Increased irrigation because of expanding agriculture has already caused groundwater depletion in the state, especially in eastern Arkansas.

Water levels in the Alluvial Aquifer, the primary source of groundwater in Arkansas, have decreased by more than 40 feet in some locations (ANRC).

Climate change impacts will likely exacerbate the existing water stress issues in Arkansas. Even if no change in annual rainfall occur, less water could be available due to increasing evaporation from high temperatures.



### Adaptation in Action


In 2008, Arkansas completed a Climate Action Plan with assistance from the Center for Climate Strategies (CCS). Arkansas' plan focuses exclusively on the reduction of greenhouse gases (mitigation). Arkansas has established a Climate Change Working Group to examine species vulnerability and best management response to habitat impacts (ASWM).

# 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 Arkansas, models project more severe weather outbreaks, more frequent and intense heat waves, and changes in rainfall that will likely create more periods of heavy precipitation between long dry spells.

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




Arkansas experienced a record 87 days with temperatures above 90°F in 2010. Parts of Arkansas could see up to 150 days a year with temperatures higher than 90°F by the end of the century. Heat indices are expected to rise 8°-15°F in Arkansas (USGRCP).

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



Models show an overall increase in precipitation in Arkansas by the end of the century. More frequent and intense heavy-rainfall events are also expected to impact the state, increasing the risk for flooding (USGRCP).

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



**Q:** How will climate change impact air quality in Arkansas?

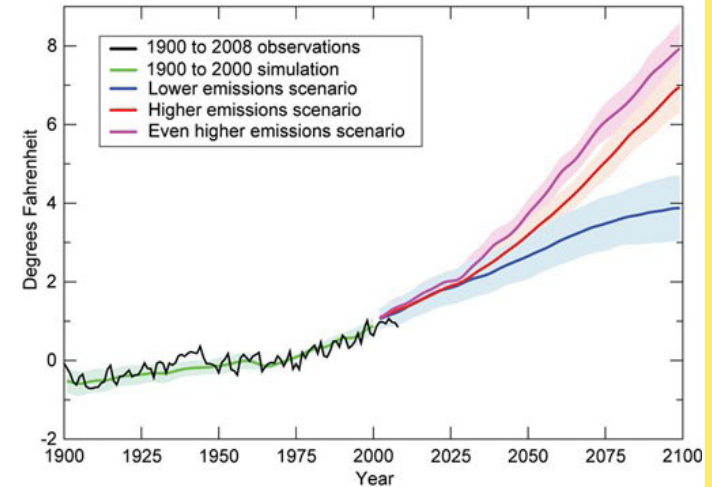
**A:** With increases in warm-season temperatures projected to occur, ozone levels are expected to increase during summer in Arkansas. High ozone levels cause a range of health issues, including increases in asthma and respiratory disease (Climate Change and Health in Arkansas).

## Temperature

Although future temperature rise depends partly on the amount of greenhouse gasses added to the atmosphere in coming decades, global temperatures are expected to increase between 2°-12°F by 2100 (IPCC).

Projections for the southeast show a temperature increase of 4°-8° F by 2100, with projected increases for interior states 1°-2° F higher than coastal areas (NCA).

Major consequences of warming include a significant increase in the number of hot days (above 95°F) each year and an overall decrease in freezing events and frosts (NCA). More heat and less cooling are expected to result in more heat-related deaths, more vector-borne illnesses and a major shift in plant species (EPA).



Global temperature rise depends largely on future emissions scenarios, which range from low, 3°F increase, to high, 12°F or higher (IPCC).

## Water Resources

Nearly 85 percent of the state is projected to face higher risks of water shortages as a result of climate change (NRDC). Stream flow in the Arkansas River and Red River Basins are expected to decrease 5 to 10 percent by mid-century, reducing the sustainability of surface water resources as an alternative to the predominately groundwater system (Hall 2010).

## Public Health

Public health risks are expected to increase from an increase in storm intensity, flooding and waterborne illnesses, drought, extreme heat waves, and declining air quality (USGRCP). Heat-related deaths in large cities like Little Rock could double from 10 to 20 each year (Kalkstein and Greene 2007).

## Agriculture

A warmer climate will increase evapotranspiration (the transport of water from soil and plants into the atmosphere) causing an increase in moisture loss in soil and increasing water needed for crop irrigation. Warmer temperatures also cause the hardiness zones in Arkansas to shift northward, changing which crops can grow in any given area (EPA).

## Forestry

Warmer and drier conditions in Arkansas are projected to cause an increase in the frequency and intensity of forest fires. Changing climate conditions may cause existing tree species to expand northward and be replaced by species from the south. Warmer conditions will also allow more pests to survive through the winter, threatening forest health throughout the state (EPA).