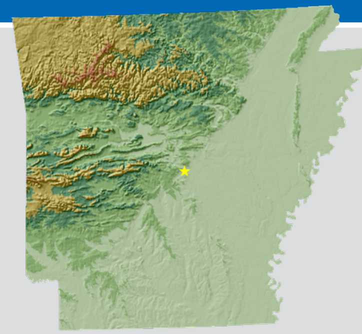

ARKANSAS

Key Messages

Temperatures in Arkansas have risen by 0.5°F since the beginning of the 20th century, less than a third of the warming for the contiguous United States, but the warmest consecutive 5-year interval was 2015–2019. Historically unprecedented warming is projected during this century.

Increases in evaporation rates due to rising temperatures may increase the rate of soil moisture loss and the intensity of naturally occurring droughts.

The frequency and intensity of extreme heat and extreme precipitation events are projected to increase, while the intensity of extreme cold events is projected to decrease.

Arkansas is located in the interior southern United States. The state is close but not adjacent to the Gulf of Mexico, resulting in a climate with moderately large variations in temperature and abundant precipitation. Summers are hot and humid, while winters are typically short and cool with occasional episodes of cold arctic air. Northern and western Arkansas includes the Ozark Mountains and is generally higher in elevation, particularly in the Boston Mountains portion of the range, where some peaks exceed 2,500 feet. Thus, temperatures are generally cooler in this area; for example, the July average (1991–2020 normals) high temperature at Deer (elevation: 2,375 feet) in the northwest is 83°F, while it is 91°F at Jonesboro (elevation: 260 feet) in the northeast. January average low temperatures range from 23° to 26°F in the northwestern part of the state to 27° to 32°F in the northeast and 30° to 35°F in the southwest. Extreme temperatures range from a record high of 120°F at Ozark (August 10, 1936) to a record low of −29°F at Gravette (February 13, 1905). Precipitation is abundant throughout the year. Heavy rains can produce totals in excess of 10 inches. Winter and spring are the wettest seasons. Since comprehensive record keeping began in 1895, the driest year was 1963, with a statewide average of 32.8 inches of precipitation, and the wettest was 2009, with 72.2 inches.

Observed and Projected Temperature Change

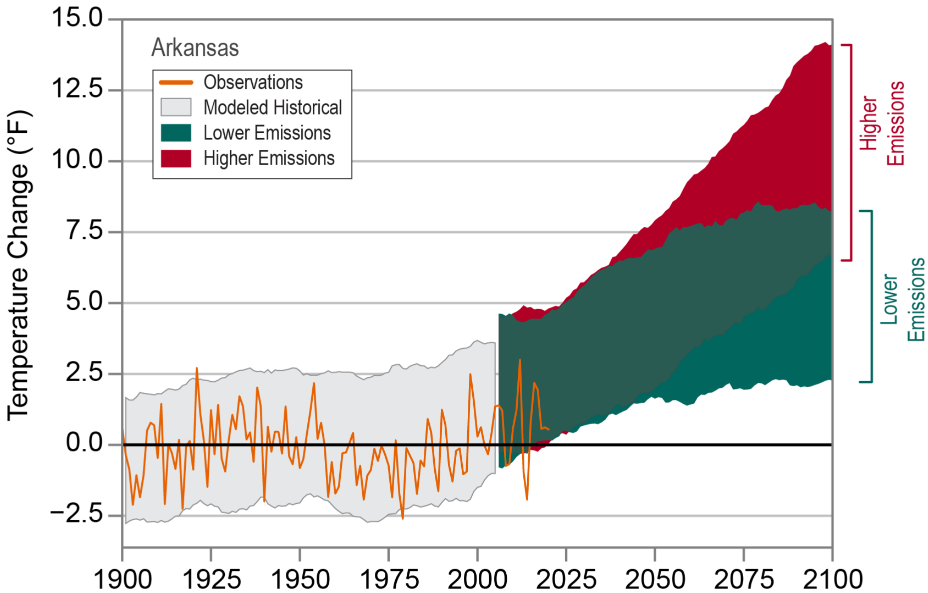

Figure 1: Observed and projected changes (compared to the 1901–1960 average) in near-surface air temperature for Arkansas. Observed data are for 1900–2020. Projected changes for 2006–2100 are from global climate models for two possible futures: one in which greenhouse gas emissions continue to increase (higher emissions) and another in which greenhouse gas emissions increase at a slower rate (lower emissions). Temperatures in Arkansas (orange line) have risen by 0.5°F since the beginning of the 20th century, less than a third of the warming for the contiguous United States, but the warmest consecutive 5-year interval was 2015–2019. Shading indicates the range of annual temperatures from the set of models. Observed temperatures are generally within the envelope of model simulations of the historical period (gray shading). Historically unprecedented warming is projected during this century. Less warming is expected under a lower emissions future (the coldest years in the colder end-of-century projections being about 2°F warmer than the historical average; green shading) and more warming under a higher emissions future (the hottest years in the hotter end-of-century projections being about 11°F warmer than the hottest year in the historical record; red shading). Sources: CISESS and NOAA NCEI.

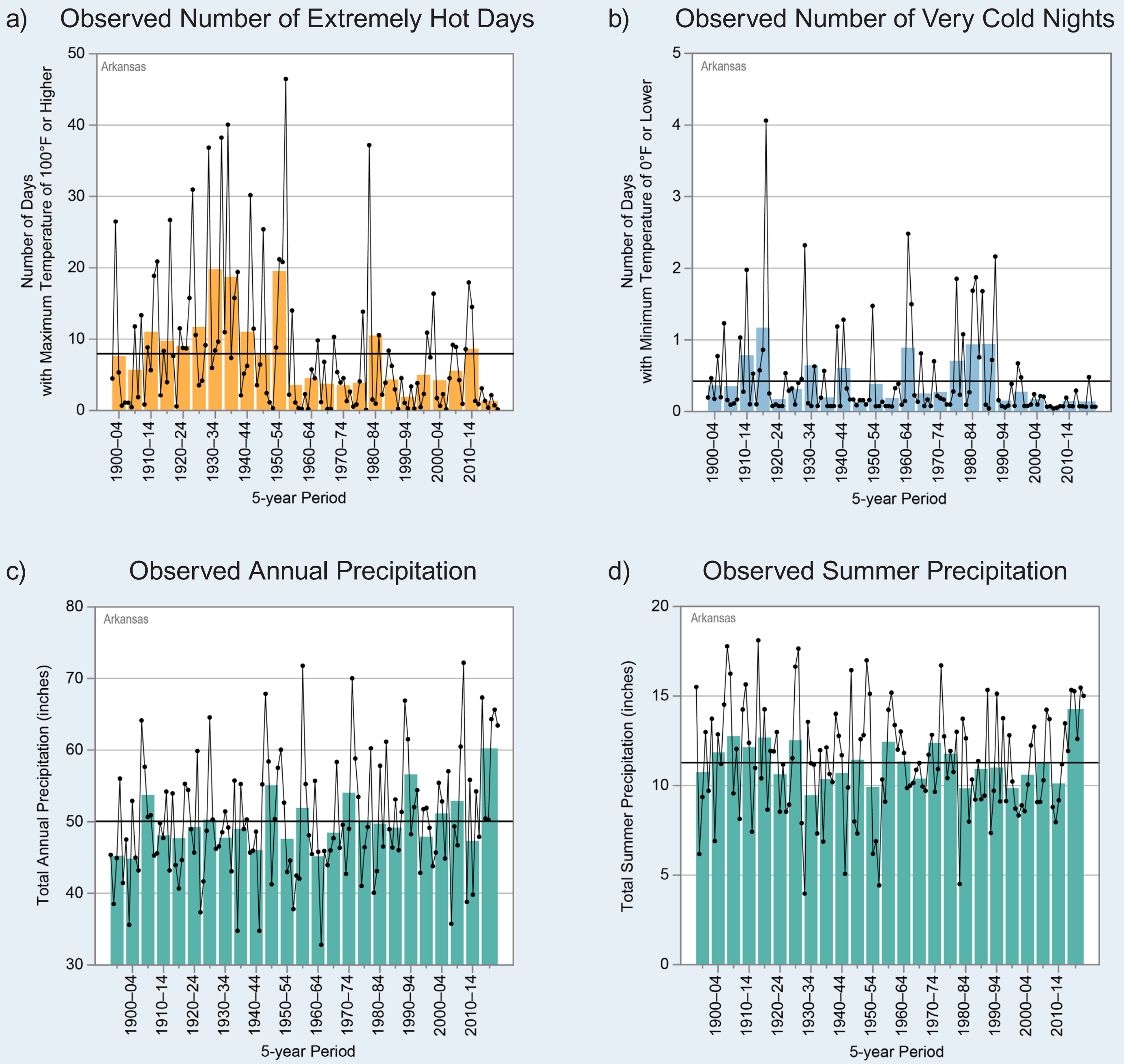

Figure 2: Observed (a) annual number of extremely hot days (maximum temperature of 100°F or higher), (b) annual number of very cold nights (minimum temperature of 0°F or lower), (c) total annual precipitation, and (d) total summer (June–August) precipitation for Arkansas from (a, b) 1900 to 2020 and (c, d) 1895 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black lines show the long-term (entire period) averages: (a) 8.0 days, (b) 0.4 nights, (c) 50.1 inches, (d) 11.3 inches. The number of extremely hot days and very cold nights has generally remained below average since 1990. While annual and summer precipitation shows substantial year-to-year variability, the 2015–2020 period had the highest multiyear average for both. Sources: CISESS and NOAA NCEI. Data: (a, b) GHCN-Daily from 16 long-term stations; (c, d) nClimDiv.

Temperatures in Arkansas have risen by 0.5°F since the beginning of the 20th century, less than a third of the warming for the contiguous United States, but the warmest consecutive 5-year interval was 2015–2019 (Figure 1). Arkansas warmed from the early 20th century into the 1930s, followed by a substantial cooling of about 2°F into the 1970s. Gradual warming has occurred since the 1970s (a total of about 1.6°F, similar to the rest of the United States), and recent higher temperatures (well above the long-term [1895–2020] average) have exceeded those of the 1930s. Because of the cooling in the mid-20th century, the southeastern United States is one of the few locations globally that has experienced little warming since 1900. The contiguous United States as a whole has warmed by about 1.8°F since 1900, although it also cooled from the 1930s into the 1960s but not by nearly as much as Arkansas. Hypothesized causes for this difference in warming rates include increased cloud cover and precipitation, increased small particles from coal burning, natural factors related to forest regrowth, decreased heat flux due to irrigation, and multidecadal variability in North Atlantic and tropical Pacific sea surface temperatures.

The number of extremely hot days peaked during the 1930s and early 1950s, coinciding with periods of drought; however, since the mid-1950s, the number of such days has generally been below average (Figure 2a). Summer average temperatures and the number of very warm nights, however, approximated or exceeded previous record levels during the 2010–2014 period because of a string of three very warm summers (2010–2012). The 2010–2014 multiyear average for very warm nights was double the long-term average (Figure 3), and the multiyear average for summer temperatures was 1.4°F above average (Figure 4). The number of very warm nights in 2015 and 2016 was also well above average. A winter warming trend is reflected in a below average number of very cold nights since 1990 (Figure 2b).

Over the historical record, annual and summer precipitation has been highly variable. While there is no overall significant trend, the most recent period (2015–2020) had the highest multiyear average for both (Figures 2c and 2d). There is an overall upward trend in the number of 3-inch extreme precipitation events, primarily due to very high values during the 2015–2020 period, which averaged 1.8 days per year compared to the long-term average of 1.1 days (Figure 5); exceptionally high values occurred in 2008, 2009, 2015, and 2018, the 4 highest years on record. A vitally important characteristic of Arkansas's precipitation climatology is its high variability. Severe drought episodes during 2005–2007 and 2010–2012 were interrupted by the wettest year on record (2009) and followed by the fifth wettest (2015). The driest consecutive 5-year interval was 1952–1956, with annual average precipitation of 42.0 inches, and the wettest was 2015–2019, with 59.6 inches. Arkansas was one of the hardest hit southeastern states during the 2012 drought, with every one of its 75 counties receiving a drought-related disaster declaration. Since the creation of the United States Drought Monitor map in 2000, Arkansas has been completely drought-free for approximately 21% of the time (2000–2020), and at least half of the state has been in drought conditions approximately 32% of that time.

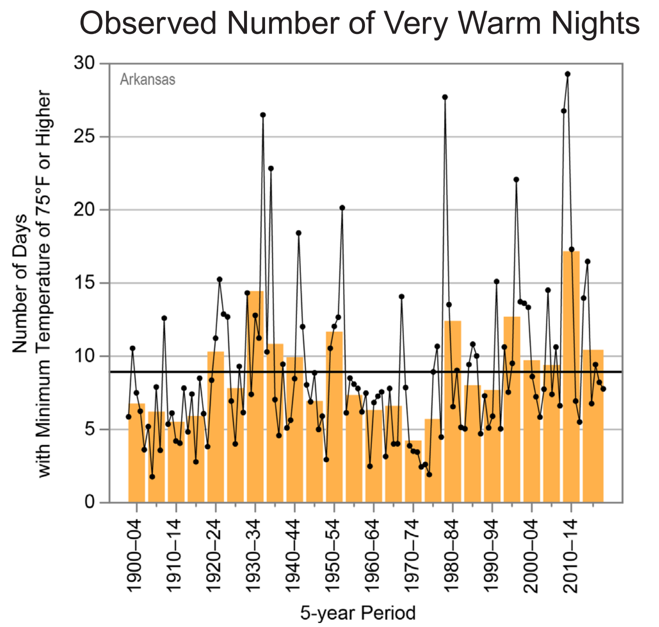

Figure 3: Observed annual number of very warm nights (minimum temperature of 75°F or higher) for Arkansas from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 8.9 nights. The number of very warm nights has been above average since 1995. The 2010–2014 period has the highest multiyear average because of very high annual values in 2010, 2011, and 2012. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 16 long-term stations.

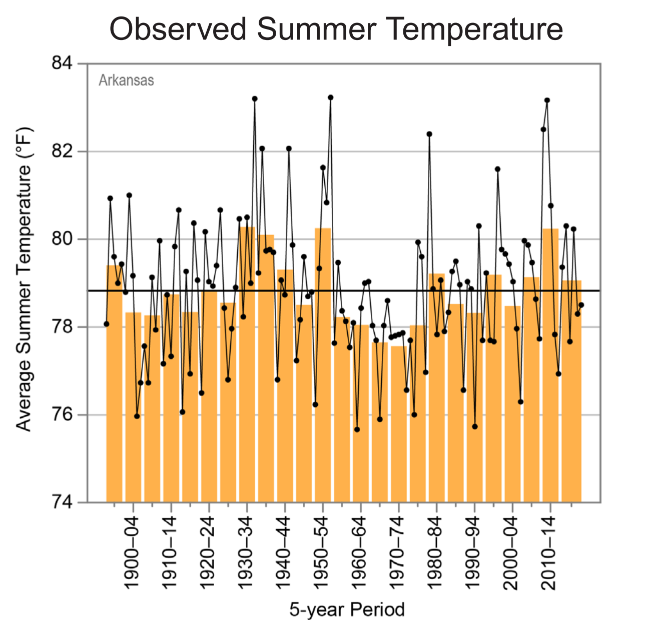

Figure 4: Observed summer (June–August) average temperature for Arkansas from 1895 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-summer average). The horizontal black line shows the long-term (entire period) average of 78.8°F. Summer average temperatures have been mostly near average since 1980. Notably, the 2010–2014 period is well above average because of very warm summers in 2010, 2011, and 2012. Sources: CISESS and NOAA NCEI. Data: nClimDiv.

Extreme weather events in Arkansas include severe thunderstorms, tornadoes, flood-producing extreme precipitation events, and winter ice storms. The most destructive flood in U.S. history, the Mississippi River Flood of 1927, inundated 36 counties in Arkansas, with floodwaters as deep as 30 feet in some places. This flood resulted from persistent heavy rainfall across the central United States from August 1926 through the spring of 1927. The unprecedented amounts of rainwater runoff overwhelmed the protective levees. This event led to the Flood Control Act of 1928, allowing for federal government authority to contain the Mississippi River and resulting in mitigation efforts that have helped prevent other flooding events of this magnitude. In May 2011, floods submerged more than 1 million acres of Arkansas farmland, causing approximately $500 million in damages to the state's agricultural industry. During 2011–2020, the Federal Emergency Management Agency granted 13 disaster declarations to the state for severe thunderstorms, tornadoes, and flooding. **Arkansas regularly experiences tornadoes**. Over the past 36 years (1985–2020), Arkansas has averaged approximately 32 tornadoes and 5 tornado fatalities per year. Tornado impacts vary widely from year to year. On April 27, 2014, the Mayflower/Vilonia tornado killed 16 and injured 193 over its 41-mile-long track, but there were only four additional tornado-related fatalities in Arkansas during the next several years.

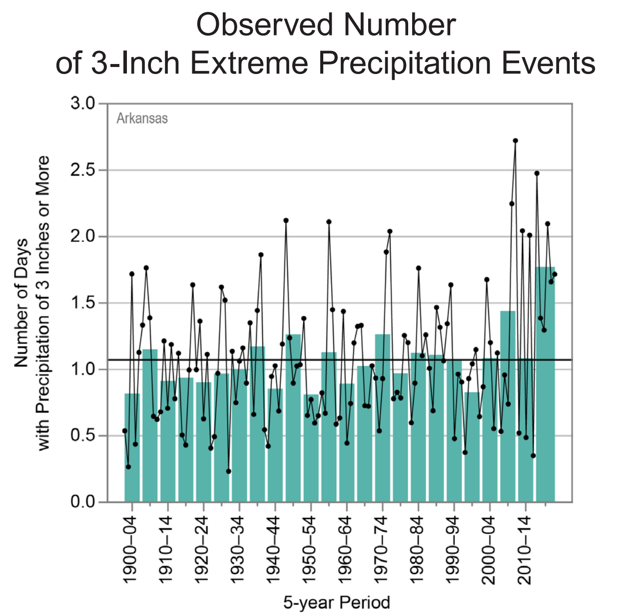

Figure 5: Observed annual number of 3-inch extreme precipitation events (days with precipitation of 3 inches or more) for Arkansas from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 1.1 days. A typical reporting station experiences 1 event per year. The number of 3-inch extreme precipitation events shows an upward trend. The most recent period (2015–2020) had the highest multiyear value due to very high annual values in 2015 and 2018. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 24 long-term stations.

Under both emissions pathways considered here, historically unprecedented warming is projected during this century (Figure 1). Even under the lower emissions pathway, annual average temperatures are projected to most likely exceed historical record levels by the middle of the century, with only a few of the coolest years thereafter being similar to historical temperatures. Heat wave intensity is projected to increase, while cold waves are projected to be less severe.

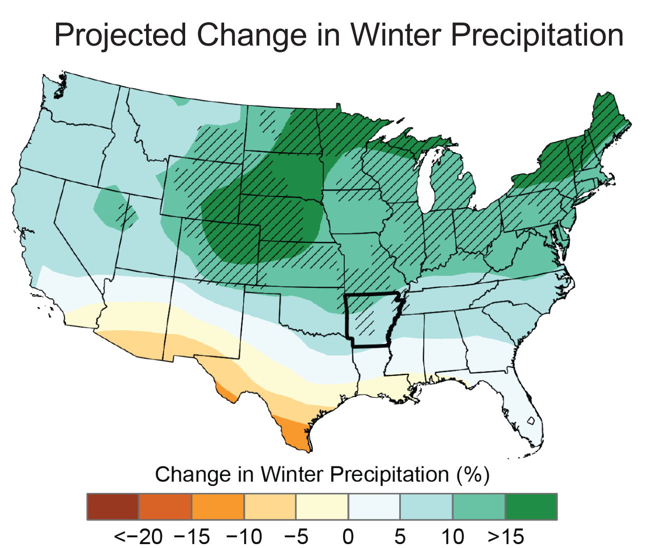

Figure 6: Projected changes in total winter (December–February) precipitation (%) for the middle of the 21st century compared to the late 20th century under a higher emissions pathway. Hatching represents areas where the majority of climate models indicate a statistically significant change. Arkansas is part of a large area of projected increases in winter precipitation across the United States. Sources: CISESS and NEMAC. Data: CMIP5.

Wintertime precipitation is projected to increase in Arkansas by midcentury (Figure 6), with the increase being in the form of rain rather than snow. In the other seasons, precipitation changes are uncertain. Increases in evaporation rates due to rising temperatures may increase the rate of soil moisture loss during dry spells. As a result, **naturally occurring droughts are projected to be more intense**.

Technical details on observations and projections are available online at https://statesummaries.ncics.org/technicaldetails.

WWW.NCEI.NOAA.GOV | HTTPS://STATESUMMARIES.NCICS.ORG/CHAPTER/AR/ | LEAD AUTHORS: JENNIFER RUNKLE, KENNETH E. KUNKEL
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