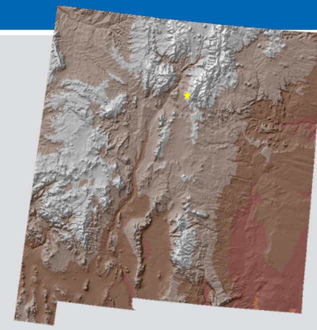

NEW MEXICO

Key Messages

Temperatures in New Mexico have risen more than 2°F since the beginning of the 20th century. The number of extremely hot days and warm nights have also increased. Historically unprecedented warming is projected during this century.

The summer monsoon rainfall, which provides much needed water for agricultural and ecological systems, varies greatly from year to year, and future trends in such precipitation are highly uncertain.

Droughts are a serious threat in this water-scarce state. Drought intensity is projected to increase, and snowpack accumulation is projected to decrease, posing a major challenge to New Mexico's environmental, agricultural, and human systems. Wildfire frequency and severity are also projected to increase throughout the state.

New Mexico encompasses a large geographic area of diverse interior-continental environments, including mountain ranges, forests, grasslands, and deserts. Temperatures vary widely across the state. Monthly average (1991–2020 normals) temperatures in the northern mountainous regions range from the low 20s in January to around 60 in July, and in the lower elevations in the south, temperatures range from the middle 40s in January to the low 80s in July. Much of the state is characterized as arid to semiarid, with most areas in the central and west receiving less than 15 inches of precipitation annually.

Temperatures in New Mexico have risen more than 2°F since the beginning of the 20th century (Figure 1)**.** The last decade has been the warmest on record for the state, with increasing trends in both extremely hot days and warm nights. Over the past several decades, much of the state has seen increases in the number of extremely hot days (Figure 2), most significantly in the eastern plains. A similar warming trend is apparent in the number of warm nights (Figure 3), which has increased since the mid-1970s, and in winter temperatures, as the number of very cold nights was below average during the 1990–2009 and 2015–2020 periods (Figure 4a). While the recent trend is toward fewer very cold nights, a historic cold wave affected the state during February 9–18, 2021. In the eastern plains, temperatures remained below freezing for 7 consecutive days and fell below -10°F in a few locations, with the coldest temperature being -17°F at Lake Maloya. The extreme cold temperatures, heavy snow (more than 10 inches in numerous locations), severe icing, and accompanying power outages caused catastrophic damage.

Observed and Projected Temperature Change

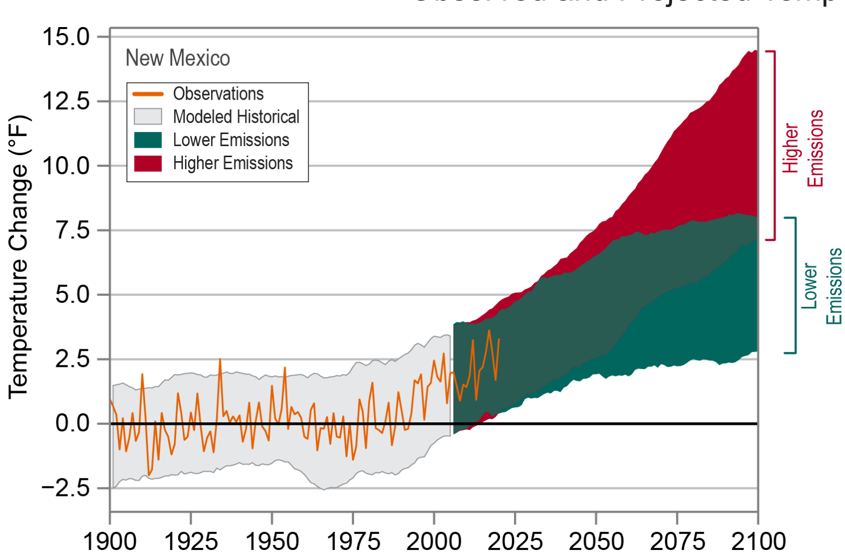

Figure 1: Observed and projected changes (compared to the 1901–1960 average) in near-surface air temperature for New Mexico. Observed data are for 1900–2020. Projected changes for 2006–2100 are from global climate models for two possible futures: one in which greenhouse gas emissions continue to increase (higher emissions) and another in which greenhouse gas emissions increase at a slower rate (lower emissions). Temperatures in New Mexico (orange line) have risen more than 2°F since the beginning of the 20th century. 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 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 end-of-century projections being about 11°F warmer than the hottest year in the historical record; red shading). Sources: CISESS and NOAA NCEI.

Precipitation is highly variable from year to year and decade to decade. Statewide total annual precipitation has ranged from a high of 26.6 inches in 1941 to a low of 6.6 inches in 1956 (Figure 4b). The wettest multiyear periods were in the early 1940s and mid-1980s, and the wettest consecutive 5 years was the 1984–1988 interval. The driest multiyear periods were in the early 1950s and early 2010s, and the driest consecutive 5 years was the 1952–1956 interval. Multiyear periods of high and low precipitation have resulted in very large swings in reservoir supplies for agriculture. Levels in the Elephant Butte Reservoir were high from the 1920s to the 1940s before dropping until the 1980s, when they increased again. High levels remained throughout the 1980s and 1990s until falling again in the first part of this century (Figure 5). This illustrates that there have been extended (decades-long) periods of unusual wet or dry conditions. **The most recent multiyear drought (2011–2014; the second-worst statewide drought since the early 1950s) resulted in near record low levels of water in the reservoir.** Although a wet 2015 and near normal precipitation during 2016–2019 caused some rebound in water levels, they remain well below normal.

Unlike many areas of the United States, New Mexico has not experienced an upward trend in the frequency of extreme precipitation events (Figure 4c)**.** The annual number of 1-inch extreme precipitation events has been variable since 1985, fluctuating in a similar fashion to the pronounced variations in total annual precipitation. Since drought conditions began in the 2000s, the occurrence of these events was near or below average until the 2015–2020 period.

An important feature of New Mexico's summer climate is the North American Monsoon, which can start in late June and extend into September (Figure 4d). July and August are the wettest months across much of the state. In some regions of the state, monsoon rainfall accounts for half of the annual precipitation and plays an important role in supporting the agricultural economy. **The monsoon rains are highly beneficial but occasionally can be destructive.** In 2006, a remarkably persistent monsoon regime was in place from late July through most of August and caused significant damage and flooding in southern New Mexico. This was seen again in the summer of 2013, when a single, very wet week in September caused major flooding across the central and western portions of the state. These events

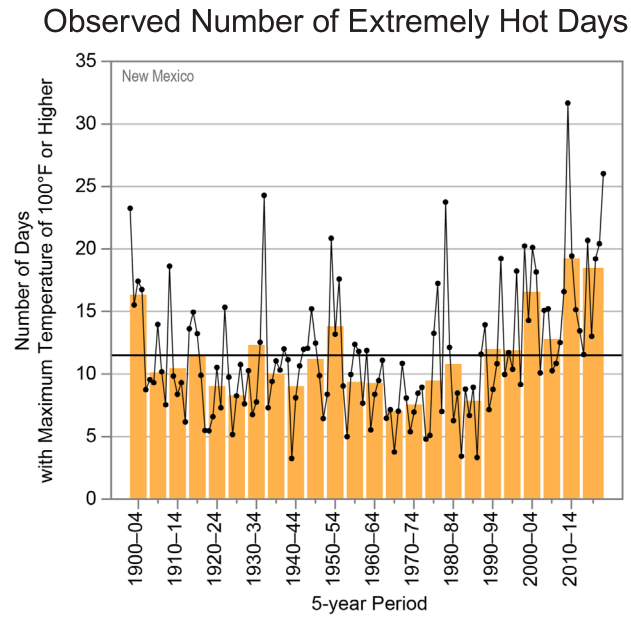

Figure 2: Observed annual number of extremely hot days (maximum temperature of 100°F or higher) for New Mexico from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 12.0 days (note that the average for individual stations varies greatly because of the state's large elevation range). Since 1990, the number of extremely hot days has risen on average in New Mexico although not all locations have experienced increases. The greatest number of days was recorded in the 2010–2014 period, with the 5 long-term stations averaging 19 days per year with temperatures higher than 100°F. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 5 long-term stations.

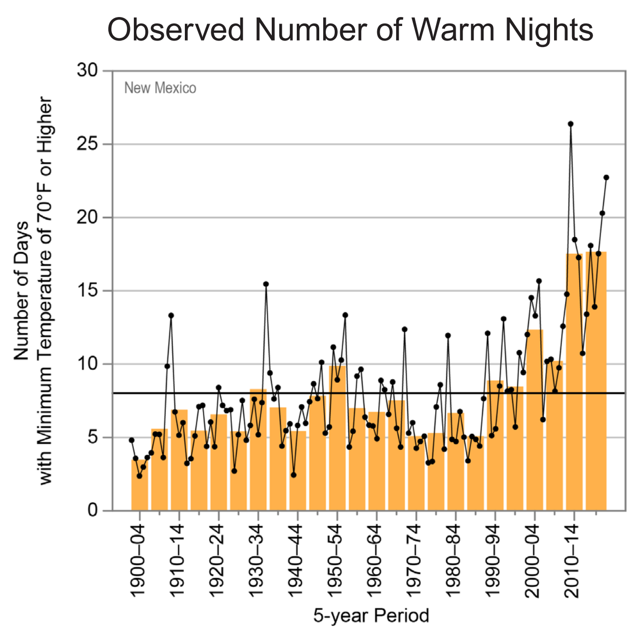

Figure 3: Observed annual number of warm nights (minimum temperature of 70°F or higher) for New Mexico from 1900 to 2020. Dots show annual values. Bars show averages over 5-year periods (last bar is a 6-year average). The horizontal black line shows the long-term (entire period) average of 8.0 nights (note that the average for individual stations varies greatly because of the state's large elevation range). The frequency of warm nights has risen dramatically since 2000, with the 2010–2014 period and the 2015–2020 period experiencing about double the long-term average. Sources: CISESS and NOAA NCEI. Data: GHCN-Daily from 5 long-term stations.

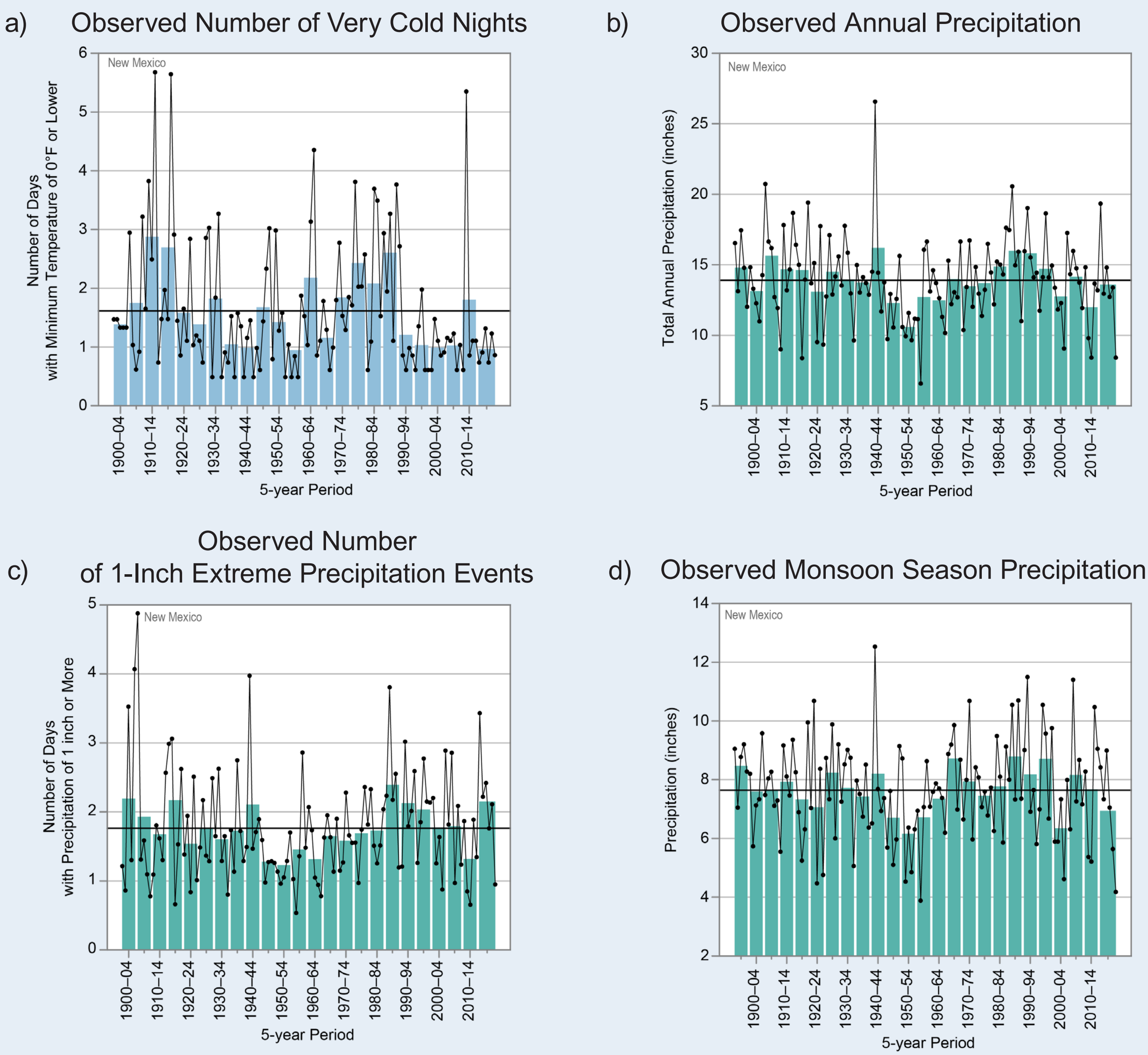

Figure 4: Observed (a) annual number of very cold nights (minimum temperature of 0°F or lower), (b) total annual precipitation, (c) annual number of 1-inch extreme precipitation events (days with precipitation of 1 inch or more), and (d) monsoon season (June–September) precipitation for New Mexico from (a, c) 1900 to 2020 and (b, 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) 1.6 nights, (b) 13.9 inches, (c) 1.8 days, (d) 7.6 inches. (Note that for Figures 4a and 4c, the average for individual reporting stations varies greatly because of the state's large elevation range.) The number of very cold nights has been below average since 1990, with the exception of the 2010–2014 period. Precipitation is highly variable from year to year. A typical station experiences about two 1-inch extreme precipitation events per year. Sources: CISESS and NOAA NCEI. Data: (a) GHCN-Daily from 5 long-term stations; (b) nClimDiv; (c) GHCN-Daily from 12 long-term stations; (d) nClimDiv.

provided much-needed water for the reservoirs but also caused widespread damage. In contrast, the 2020 monsoon season was the second driest on record, after 1956.

Under a higher emissions pathway, historically unprecedented warming is projected during this century (Figure 1)**.** Even under a lower emissions pathway, annual average temperatures are projected to most likely exceed historical record levels by the middle of this century. However, a large range of temperature increases is projected under both pathways, and under the lower pathway, a few projections are only slightly warmer than historical records. Heat waves are projected to increase in intensity, posing a risk to human health, while cold wave intensity is projected to decrease.

Although projections of annual precipitation are uncertain, precipitation in spring, which is already the dry season in New Mexico, is projected to decrease across most of the state (Figure 6)**.** The combination of decreased spring precipitation and warmer temperatures would have profoundly negative impacts on the mountain snowpack that feeds water supply reservoirs, reducing water flow to the river basins that rely on the snowpack for summer water supplies. Even if snowpack accumulation does not decrease, the projected higher temperatures will lead to an earlier start and end to the snowmelt season, potentially necessitating changes in water management.

The extended record indicates that droughts are a frequent occurrence in New Mexico and that episodes more severe than any in the recent historical record have occurred in the more distant past (Figure 7). **Droughts are projected to become more intense.** Recent drought conditions have negatively impacted ecosystems across the state. For example, extreme drought in the Chihuahuan Desert has caused grasslands to die, decreasing grazing resources for livestock. While projections of changes in precipitation are uncertain, higher temperatures will increase water evaporation from moist and vegetated surfaces, which will reduce streamflow and soil moisture and increase the intensity of naturally occurring droughts. Drought will not only further challenge limited agricultural resources but also increase the occurrence and severity of wildfires and the frequency of dust storms.

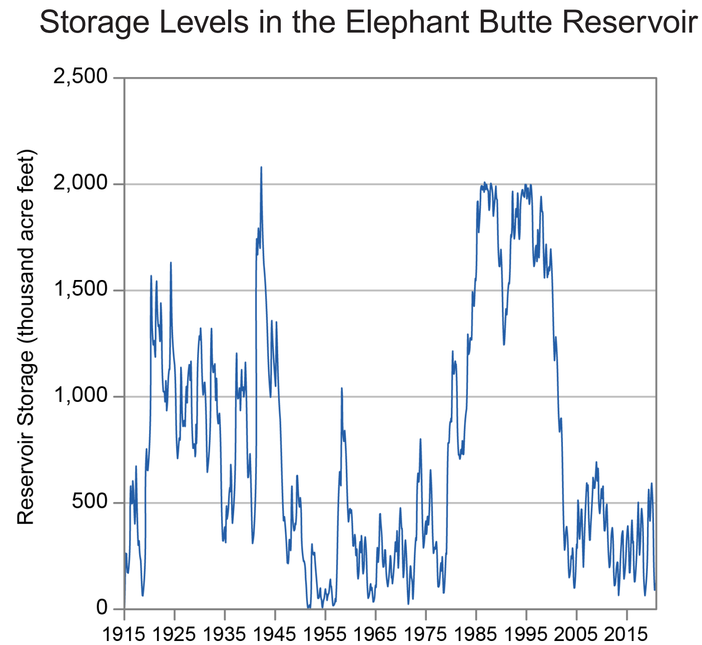

Figure 5: Monthly time series of the average water storage levels in the Elephant Butte Reservoir from March 1915 to January 2021. Water storage levels in the reservoir have varied widely over the years. They were generally low, and in some cases nearly zero, from the late 1940s to early 1980s. Following high levels during the 1980s and 1990s, a large decline occurred in the early 21st century in response to severe drought conditions. In 2004, 2013, and 2018, storage levels approached record lows due to the extended drought. Source: USBR.

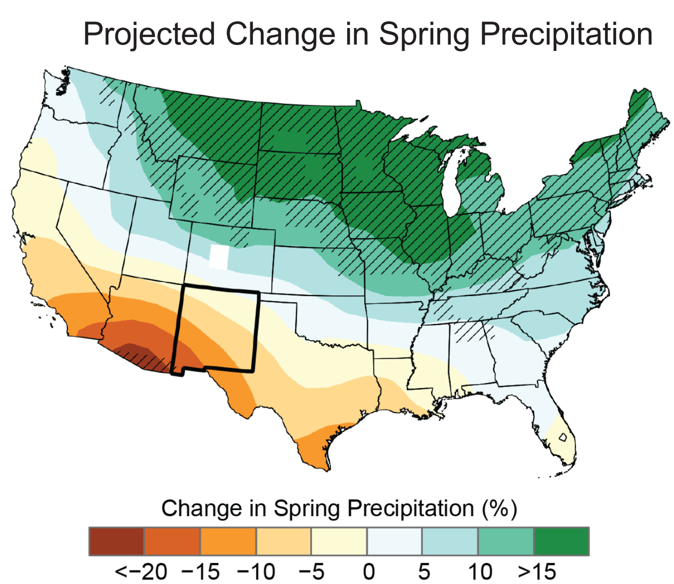

Figure 6: Projected changes in total spring (March–May) precipitation (%) for the middle of the 21st century compared to the late 20th century under a higher emissions pathway. The whited-out area indicates that the climate models are uncertain about the direction of change. Hatching represents areas where the majority of climate models indicate a statistically significant change. New Mexico is south of the transition zone from wetter conditions in the north to drier conditions in the south. Southwestern New Mexico is part of a large area of projected decreases that includes Central America, Mexico, and the southwestern United States. Sources: CISESS and NEMAC. Data: CMIP5.

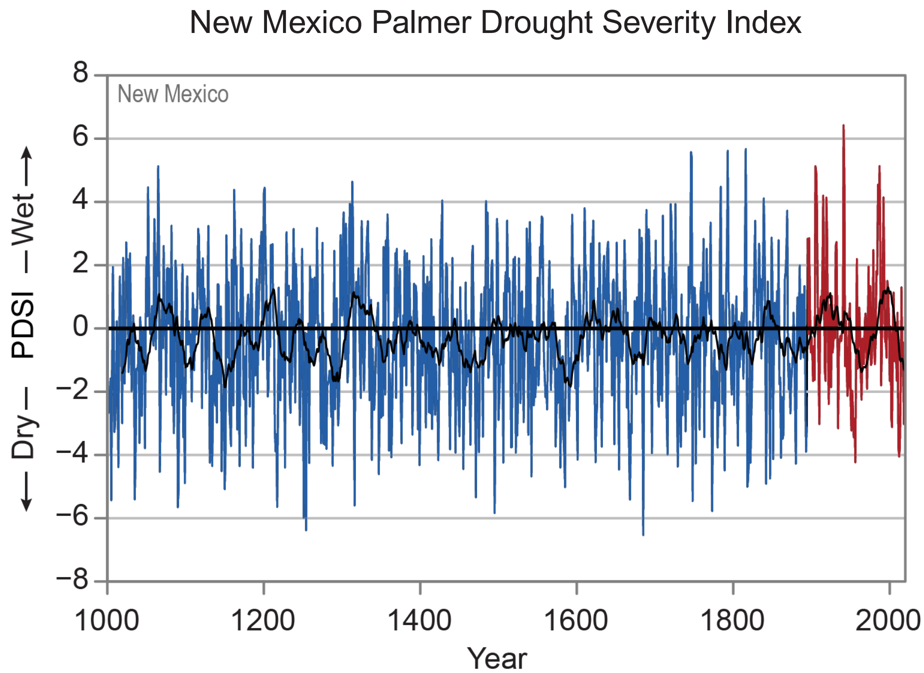

Figure 7: Time series of the Palmer Drought Severity Index for New Mexico from the year 1000 to 2020. Values for 1895–2020 (red) are based on measured temperature and precipitation. Values prior to 1895 (blue) are estimated from indirect measures such as tree rings. The fluctuating black line is a running 20-year average. In the modern era, the wet periods of the early 1900s and the 1980s to 1990s and the dry period of the 1950s are evident. The extended record indicates periodic occurrences of similar extended wet and dry periods. Sources: CISESS and NOAA NCEI. Data: nClimDiv and NADAv2.

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

WWW.NCEI.NOAA.GOV | HTTPS://STATESUMMARIES.NCICS.ORG/CHAPTER/NM/ | LEAD AUTHORS: REBEKAH FRANKSON, KENNETH E. KUNKEL
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