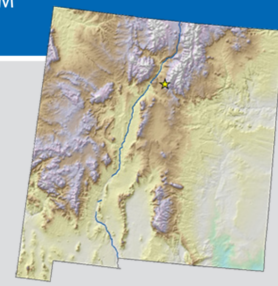

NEW MEXICO

Key Messages

Average annual temperature has increased by almost 2°F since the 1970s, and the number of hot days and warm nights has increased. Historically unprecedented future warming is likely.

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, which will pose a major challenge to New Mexico's environmental, agricultural, and human systems. Wildfire frequency and severity are projected to increase in New Mexico.

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

The last decade has been the warmest on record for the state (Figure 1)**, with increasing trends in both extremely hot days and warm nights.** Over the past two decades, much of the state has seen increases in the number of extremely hot days (maximum temperature above 100°F; Figure 2), most prominently in the eastern plains. A similar trend is apparent in the number of warm nights (minimum temperature above 70°F; Figure 3), which has increased since the mid-1970s, and in winter temperatures, as the number of very cold nights (minimum temperature below 0°F) was below average during the period of 1990–2009 (Figures 3 and 4a).

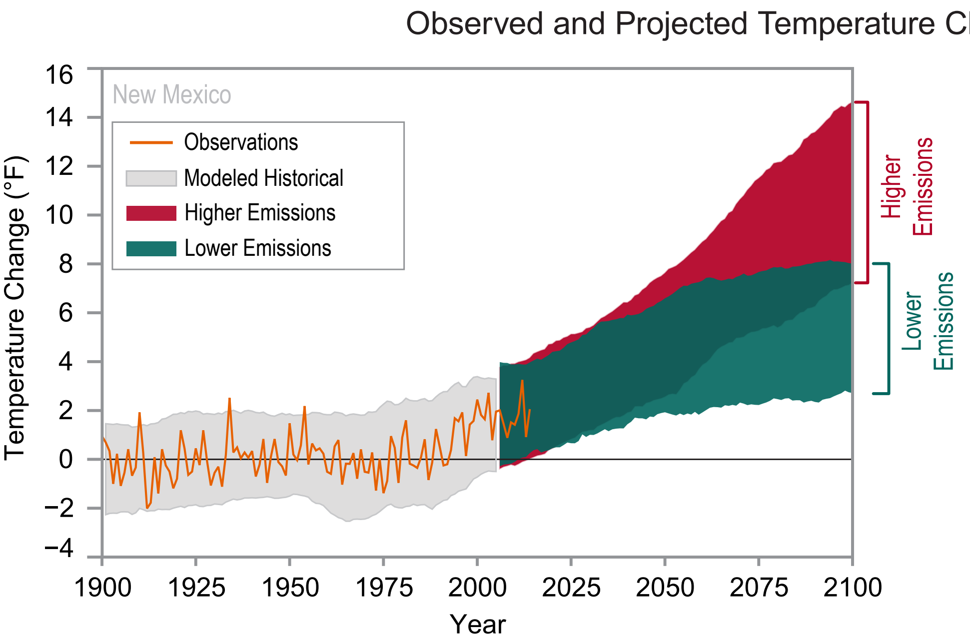

Figure 1: Observed and projected changes (compared to the 1901–1960 average) in near-surface air temperature for New Mexico. Observed data are for 1900–2014. Projected changes for 2006–2100 are from global climate models for two possible futures: one in which greenhouse gas emissions continue to increase (higher emissions) and another in which greenhouse gas emissions increase at a slower rate (lower emissions)[1]. Temperatures in New Mexico (orange line) have risen almost 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 the 21st century. Less warming is expected under a lower emissions future (the coldest years being about as warm as the hottest year in the historical record; green shading) and more warming under a higher emissions future (the hottest years being about 11°F warmer than the hottest year in the historical record; red shading). Source: CICS-NC and NOAA NCEI.

[1]Technical details on models and projections are provided in an appendix, available online at: https://statesummaries.ncics.org/nm.

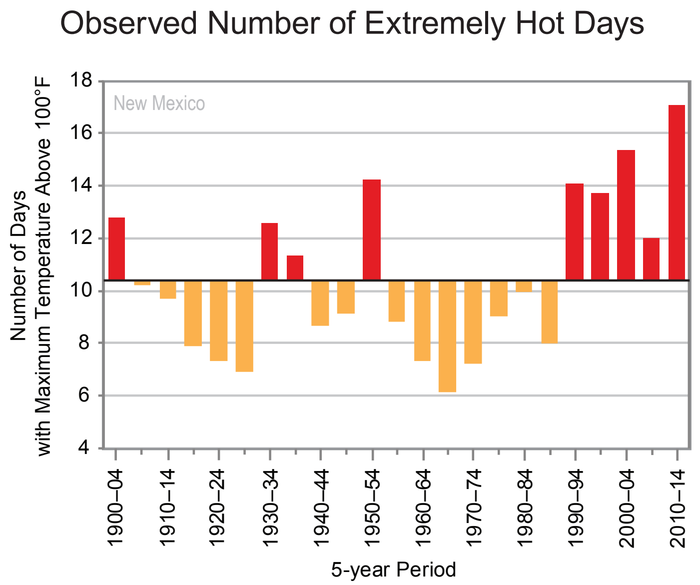

Figure 2: The observed number of extremely hot days (annual number of days with maximum temperature above 100°F) for 1900–2014, averaged over 5-year periods; these values are averages from eight long-term reporting stations. Since 1990, the number of extremely hot days has on average risen in New Mexico although not all locations have experienced increases. The largest number of days was recorded in the most recent 5-year period (2010–2014), with the eight long-term stations averaging 17 days per year over 100°F. The dark horizontal line is the long-term average (1900–2014) of 10.4 days per year. Source: CICS-NC and NOAA NCEI.

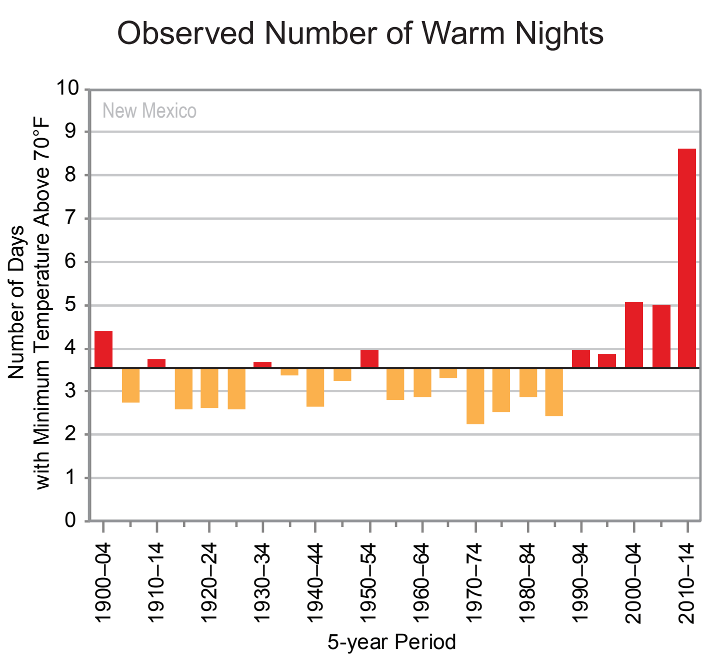

Figure 3: The observed number of warm nights (annual number of days with minimum temperature above 70°F) for 1900–2014, averaged over 5-year periods; these values are averages from eight long-term reporting stations. The frequency of warm nights has risen dramatically in the last two decades, with the most recent 5-year period (2010–2014) experiencing an average of almost 4 more days annually compared to the preceding decade (2000–2009). The dark horizontal line is the long-term average (1900–2014) of 3.5 days per year. Source: CICS-NC and NOAA NCEI.

Precipitation is highly variable from year to year, and decade to decade. Statewide annual precipitation has ranged from a high of 26.57 inches in 1941 to a low of 6.58 inches in 1956. The wettest multi-year periods were in the early 1940s and mid-1980s (Figure 4b) with the wettest 5-year period being 1984–1988. The driest multi-year periods were in the early 1950s and 2010s (Figure 4b) with the driest 5-year period being 1952–1956. Multi-year 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 to low levels until the 1980s. High levels remained throughout the 1980s and 1990s until falling again in the first part of the 21st century (Figure 5). This illustrates that there have been extended (decades-long) periods of unusual wet or dry conditions. **The latest multi-year drought (the second-worst statewide drought after the early 1950s) has resulted in near record low levels of water in the reservoir.**

Unlike many areas of the United States, New Mexico has not experienced an upward trend in the frequency of extreme precipitation events in the Southwest (Figure 4c). The number of extreme precipitation events (more than 1 inch of precipitation in a day) has been variable over the past three decades, fluctuating in a similar fashion to the pronounced variations in total annual precipitation (Figure 4b). Since drought conditions began in the 2000s, the occurrence of these events has been near to below normal.

An important feature of New Mexico's summer climate is the North American Monsoon, which causes July and August to be the wet season across much of the state (Figure 4d). 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 can occasionally 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 provided much-needed water for the reservoirs, but also caused widespread damage.

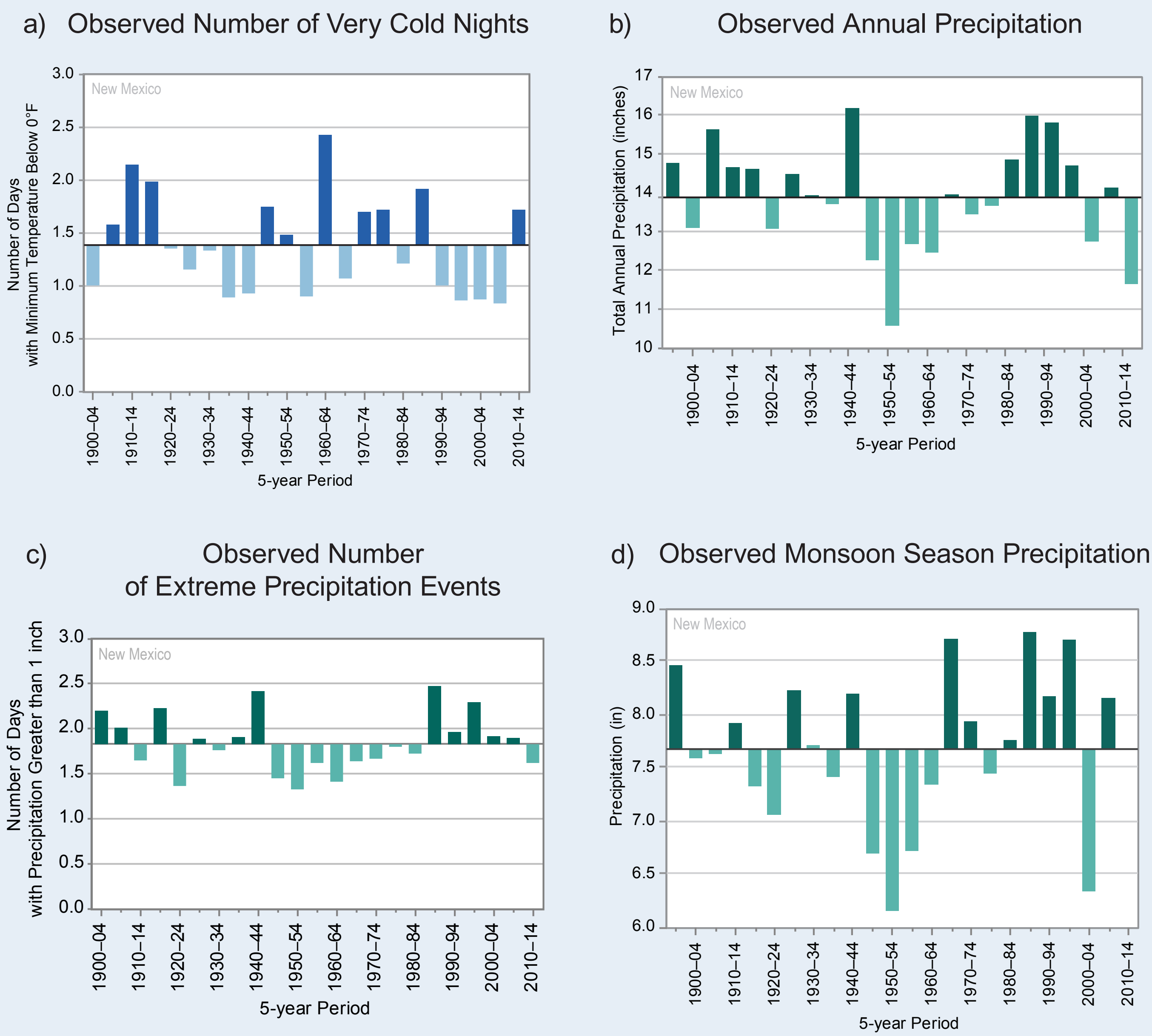

Figure 4: The observed (a) number of very cold nights (annual number of days with minimum temperature below 0°F), (b) annual precipitation, (c) number of extreme precipitation events (annual number of days with precipitation greater than 1 inch), and (d) monsoon season precipitation, averaged over 5-year periods. Values for Figures 4a and 4c are averages from long-term reporting stations, eight for temperature and eleven for precipitation. The dark horizontal lines represent the long-term averages. The number of very cold nights has been below average since 1990, with the exception of the most recent 5-year period (2010–2014). Precipitation is highly variable from year to year. Source: CICS-NC and NOAA NCEI.

Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century (Figure 1). Even under a pathway of lower greenhouse gas emissions, average annual temperatures are projected to most likely exceed historical record levels by the middle of the 21st century. However, there is a large range of temperature increases 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, already the dry season in New Mexico, is projected to decrease across

most of the state (Figure 6). Decreased precipitation in the spring, combined with warmer temperatures, would have profoundly negative impacts on mountain snowpack that feeds water supply reservoirs, reducing water flow to the river basins, which rely on the snowpack for summer water supplies. Even if snowpack accumulation were not to decrease, the projected higher temperatures will lead to an earlier initiation and earlier 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 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. This will reduce streamflow and soil moisture, increasing 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.

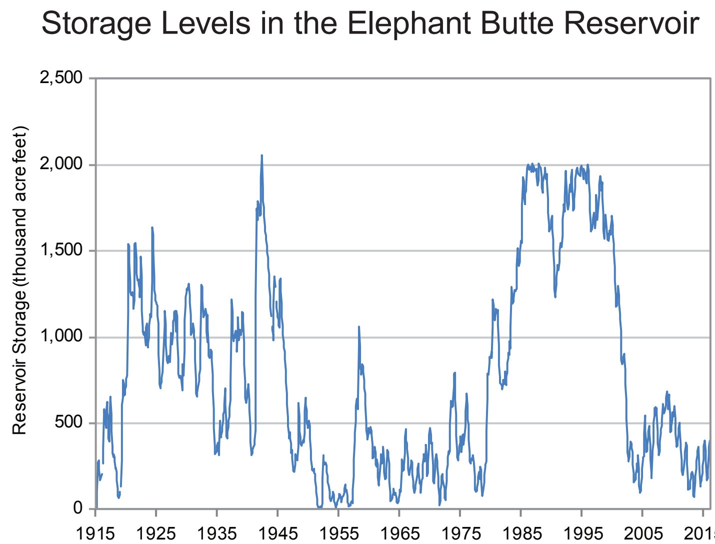

Figure 5: Monthly time series of the average water levels in the Elephant Butte Reservoir. Water levels in the Elephant Butte Reservoir have varied widely over the years. Water levels were generally low from the late 1940s to early 1980s. Following high levels during the 1980s and 1990s, a large decline occurred in the early 21st century in response to severe drought conditions. In recent years, levels have approached record lows due to the extended drought. Source: USBR.

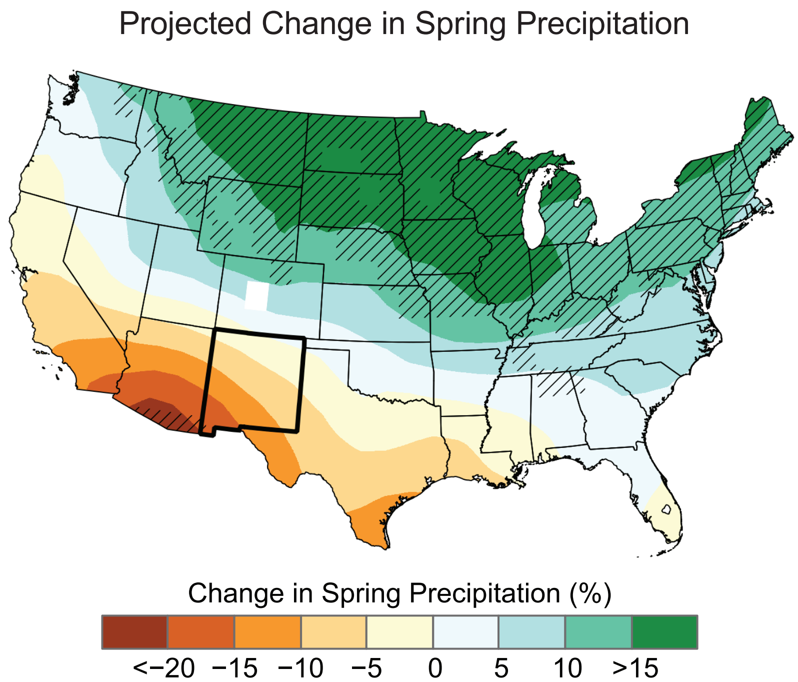

Figure 6: Projected change in spring precipitation (%) for the middle of the 21st century compared to the late 20th century under a higher emissions pathway. Hatching represents areas where the majority of climate models indicate a statistically significant change. New Mexico is south of the transition 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 and the southwestern United States. Source: CICS-NC, NOAA NCEI, and NEMAC.

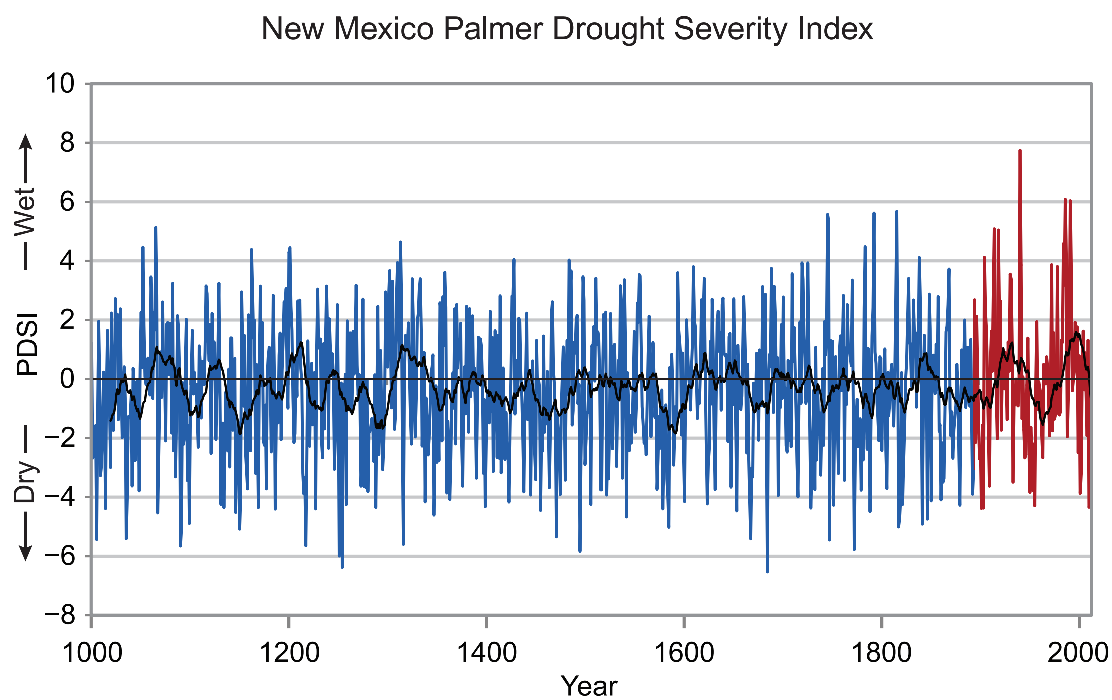

Figure 7: Time series of the Palmer Drought Severity Index from the year 1000 to 2014. Values for 1895–2014 (red) are based on measured temperature and precipitation. Values prior to 1895 (blue) are estimated from indirect measures such as tree rings. The thick black line is a running 20-year average. In the modern era, the wet periods of the early 1900s and the 1980s–1990s and the dry period of the 1950s are evident. The extended record indicates periodic occurrences of similar extended wet and dry periods. Source: CICS-NC and NOAA NCEI.