

Climate Trends

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Key Message 2.1

Climate Is Changing, and Scientists Understand Why

It is unequivocal that human activities have increased atmospheric levels of carbon dioxide and other greenhouse gases. It is also unequivocal that global average temperature has risen in response. Observed warming over the continental United States and Alaska is higher than the global average (*virtually certain, very high confidence*). Long-term changes have been observed in many other aspects of the climate system (*very high confidence*). The Earth system is complex and interconnected, which means changes in faraway regions are *virtually certain* to affect the United States (*very high confidence*).

Key Message 2.2

Extreme Events Are Becoming More Frequent and Severe

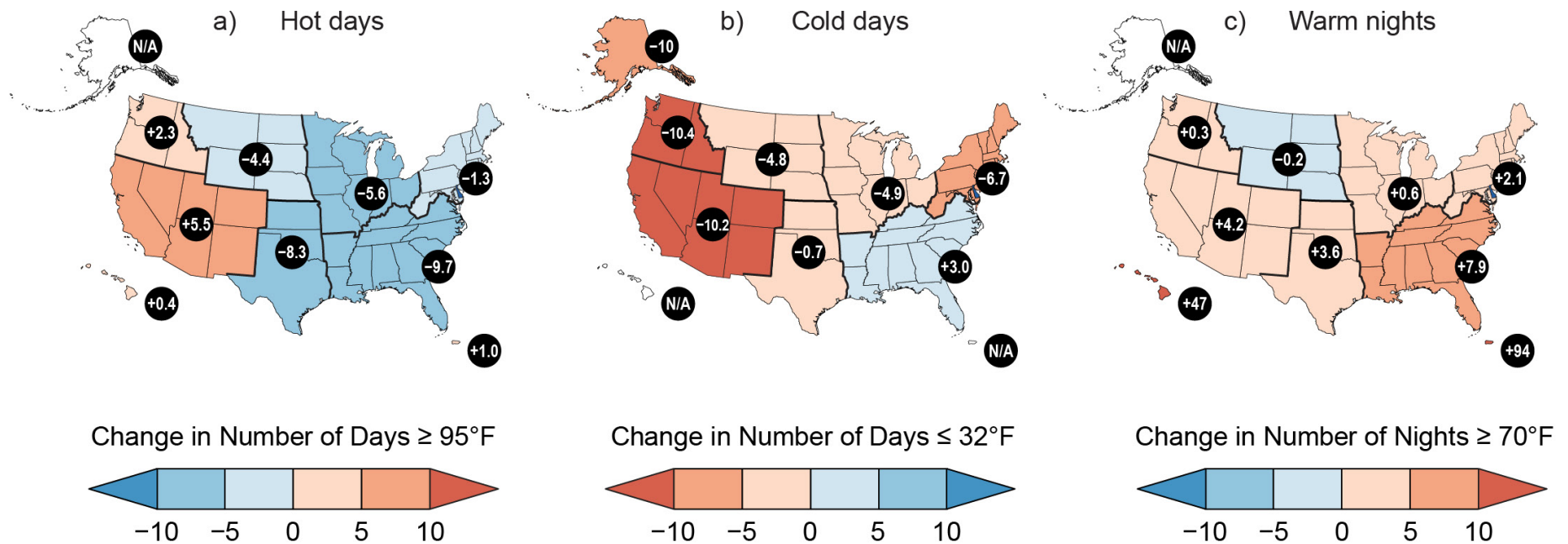
Observations show an increase in the severity, extent, and/or frequency of multiple types of extreme events. Heatwaves have become more common and severe in the West since the 1980s (*high confidence*). Drought risk has been increasing in the Southwest over the past century (*very high confidence*), while at the same time rainfall has become more extreme in recent decades, especially east of the Rockies (*very high confidence*). Hurricanes have been intensifying more rapidly since the 1980s (*high confidence*) and causing heavier rainfall and higher storm surges (*high confidence*). More frequent and larger wildfires have been burning in the West in the past few decades due to a combination of climate factors, societal changes, and policies (*very high confidence*).

Key Message 2.3

How Much the Climate Changes Depends on the Choices Made Now

The more the planet warms, the greater the impacts—and the greater the risk of unforeseen consequences (*very high confidence*). The impacts of climate change increase with warming, and warming is *virtually certain* to continue if emissions of carbon dioxide do not reach net zero (*very high confidence*). Rapidly reducing emissions would very likely limit future warming (*very high confidence*) and the associated increases in many risks (*high confidence*). While there are still uncertainties about how the planet will react to rapid warming and catastrophic future scenarios that cannot be ruled out, the future is largely in human hands.

Observed Changes in Hot and Cold Extremes



Hot days have increased in the West, hot nights have increased nearly everywhere, and cold days have decreased.

Figure 2.7. Over much of the country, the risk of warm nights has increased while the risk of cold days has decreased. The risk of hot days has also increased across the western US. This figure shows the observed change in the number of (a) hot days (days at or above 95°F), (b) cold days (days at or below 32°F), and (c) warm nights (nights at or above 70°F) over the period 2002–2021 relative to 1901–1960 (1951–1980 for Alaska and Hawai'i and 1956–1980 for Puerto Rico). Data were not available for the US-Affiliated Pacific Islands and the US Virgin Islands. Figure credit: Project Drawdown, Washington State University Vancouver, NOAA NCEI, and CISS NC.

Recommended Citation

Marvel, K., W. Su, R. Delgado, S. Aarons, A. Chatterjee, M.E. Garcia, Z. Hausfather, K. Hayhoe, D.A. Hence, E.B. Jewett, A. Robel, D. Singh, A. Tripathi, and R.S. Vose, 2023: Ch. 2. Climate trends. In: *Fifth National Climate Assessment*. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH2>