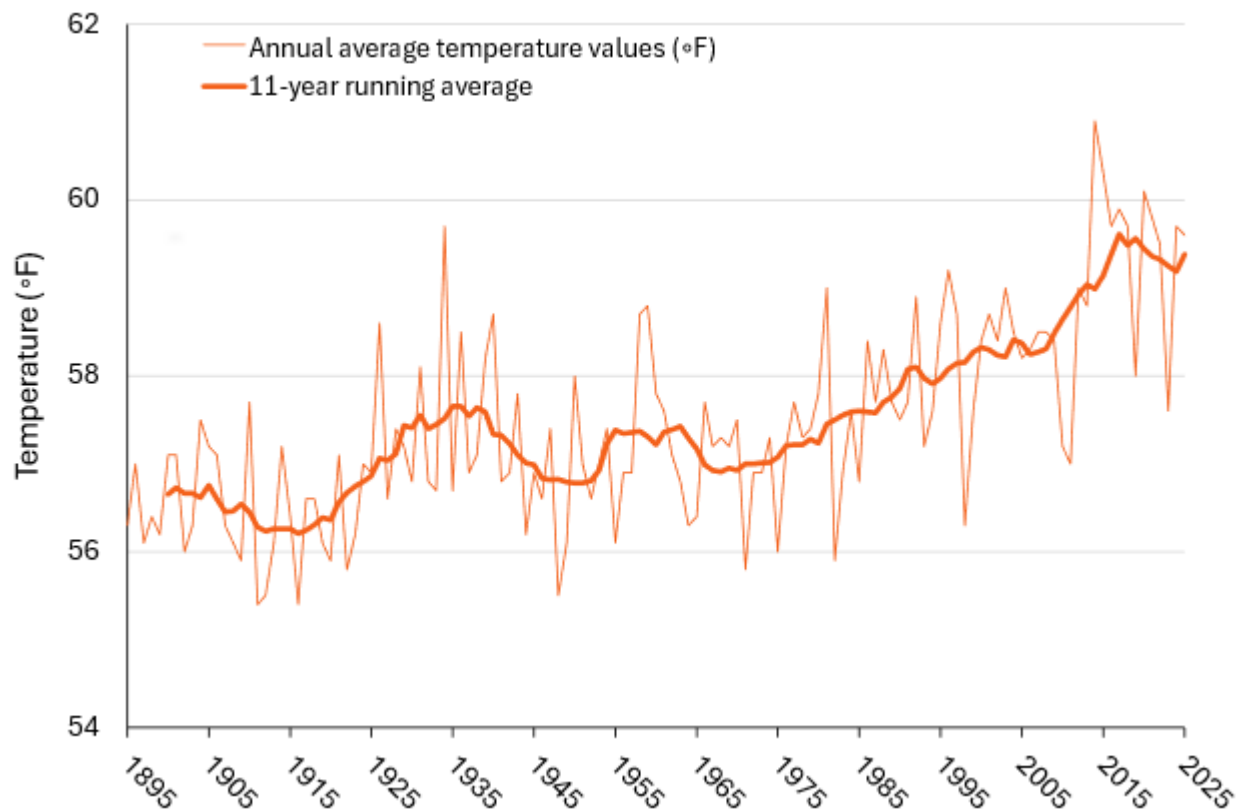


2.1 Air Temperature

Air temperatures have increased over the past century, especially at night during the summer and fall seasons, driven mainly by greenhouse gas emissions from the burning of fossil fuels. Warming has accelerated in recent decades. Southern California is warming faster than Northern California.

Figure 2.1.1. Statewide Annual Average Temperatures.



The graph shows annual average temperatures from 1895 to 2025 (using calendar years) and the 11-year running average. Source: WRCC (2026)

What does the indicator show?

Statewide air temperatures show a warming trend consistent with that found globally (IPCC, 2023; also see the [Global Warming Index](#)). **Figure 2.1.1** presents annual average temperatures statewide. California has warmed by about 2.6 degrees Fahrenheit (°F) (1.4 degrees Celsius (°C)) (about 2°F or 1.1°C per century) since

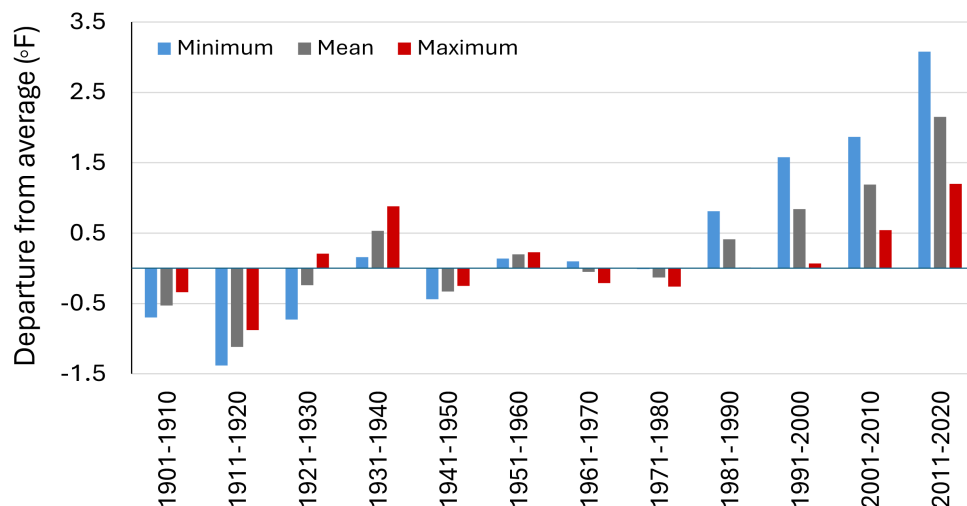


records began in 1895. Recent years have been notably warm, with 2014 being the warmest on record, followed by 2015, 2020, 2017, 2021, 2024, 2025, and 2022. Some of the warmest years coincided with some of the driest years in the instrumental record and led to exacerbated drought conditions in response to more evaporation resulting from increased air temperatures.

Minimum temperatures (which reflect overnight low temperatures) have increased the fastest. **Figure 2.1.2** depicts “departures” by decade from a long-term average (base period of 1901 to 2000) for minimum, mean, and maximum temperatures. Departures are the difference between each decade’s value and the long-term average.

Before the 1930s, temperatures were cooler than the long-term average, then hovered around the average between the 1940s and the 1970s. The last four decades have shown marked warming as temperatures increased faster. Minimum, mean, and maximum temperatures have increased overall. Minimum temperatures have risen by about 3.9°F (2.2°C) since 1895 (a rate of 3°F or 1.7°C per century), and maximum temperatures have risen by about 1.3°F (0.72°C) (a rate of 1.1°F or 0.61°C per century). Faster warming at night is also observed globally (Cox et al., 2020; Luo et al., 2024).

Figure 2.1.2. Statewide Temperatures, Decadal Departures.



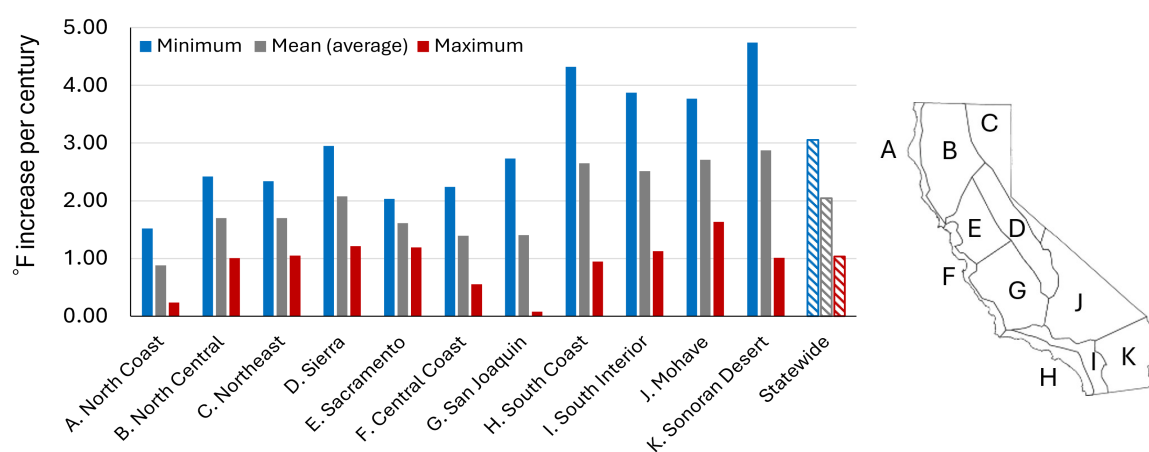
Values shown for each decade are “departures” from the long-term average, 1901-2000—that is, the difference between the long-term average and the average for the decade.

Source: WRCC (2025)



Warming trends vary by region and county. **Figure 2.1.3** shows that all of California's 11 climate regions have experienced warming trends over the last century at varying rates. The greatest increases are observed in the Sonoran Desert region (about 3.7°F or 2.1°C since 1895, or about 2.9°F or 1.6°C per century) and South Coast (3.4°F or 1.9°C since 1895, or about 2.6°F or 1.4°C per century). Minimum temperatures are warming faster than maximum temperatures in all the regions, consistent with statewide trends.

Figure 2.1.3. Regional and Statewide Temperature Trends (1895-2024).



The graph shows long-term regional (solid colors) and statewide (hatched colors) warming trends in California. Source: WRCC (2025)

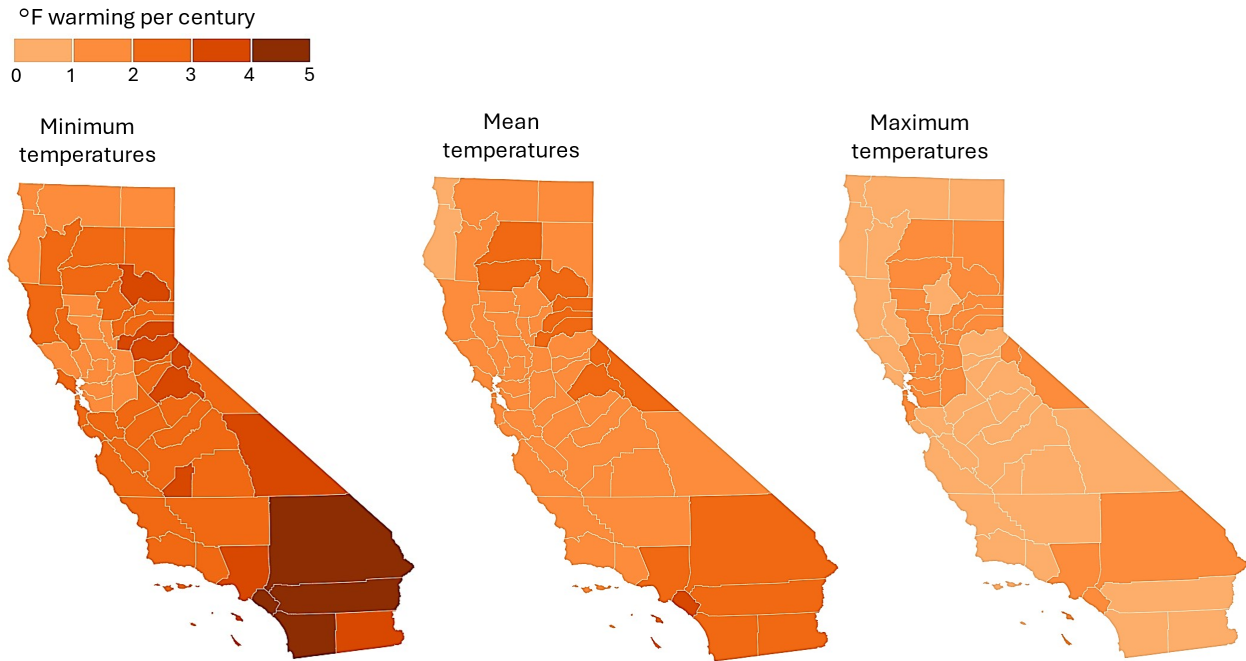
Similarly, **Figure 2.1.4** shows statewide warming trends over the past century that vary by county (county-level analyses identify more localized trends and patterns that are averaged out in larger regional scales). At the county-level, the greatest warming trends are observed in:

- Orange County (warmed by about 3.9°F or about 2.2°C since 1895, or about 3°F or about 1.7°C per century),
- San Diego (warmed by 3.7°F or 2.1°C since 1895, or about 2.9°F or about 1.6°C per century),
- San Bernardino County (warmed by 3.6°F or 2°C since 1895, or about 2.8°F or about 1.6°C per century).



Minimum temperatures are warming faster than maximum temperatures for all counties, consistent with regional and statewide trends.

Figure 2.1.4. County Temperature Trends (1895–2024).

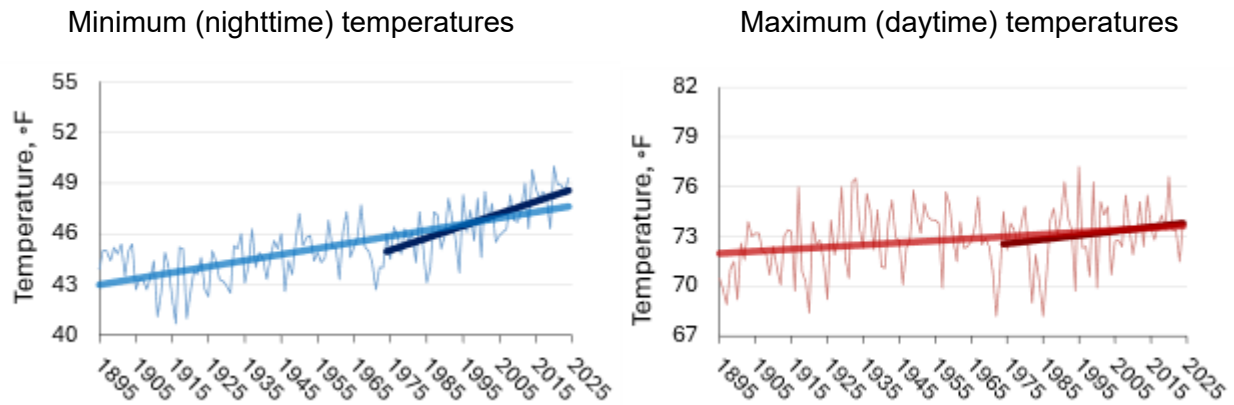


Source: WRCC (2025)

Figure 2.1.5 through **Figure 2.1.8** present statewide seasonal trends in calendar years. For all seasons, minimum temperatures are increasing faster than maximum temperatures. Trends for the more recent period (from 1974 to 2024, darker lines) are greater than trends since 1895 (lighter lines). The greatest increases in minimum temperatures occurred in the summer and fall over both time periods. For maximum temperatures, the greatest increases over the entire period of record occurred in the fall and winter; since 1974, the greatest increases occurred in the fall and summer.

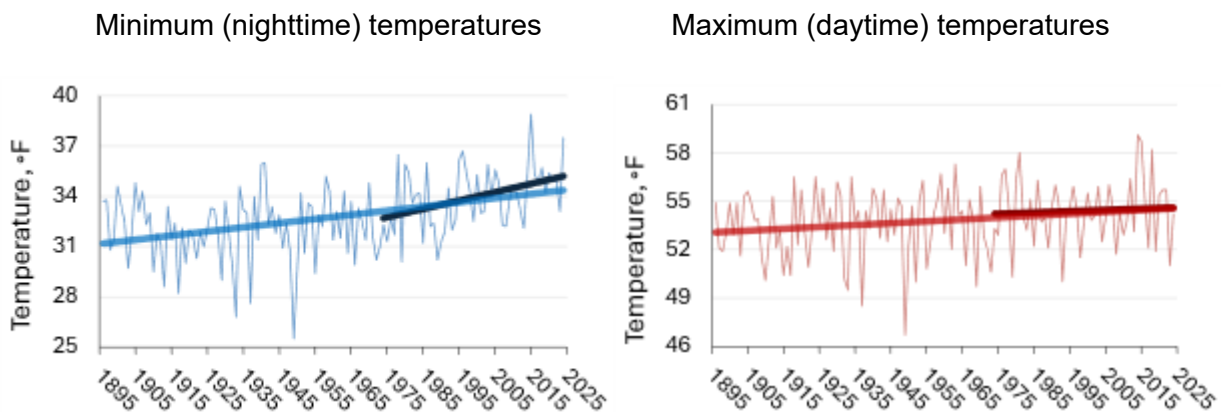


Figure 2.1.5. Fall Air Temperature Trends in California.



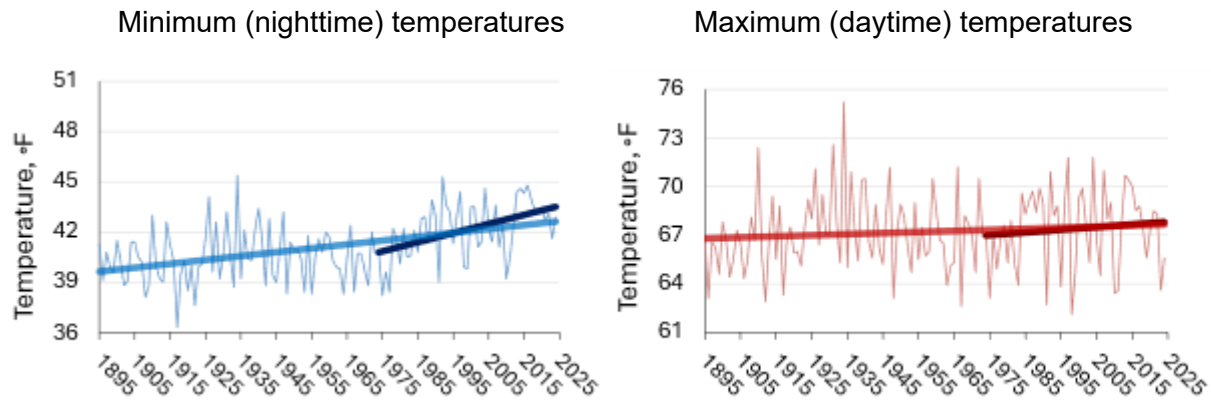
The graphs show annual average minimum (or nighttime) and maximum (or daytime) fall temperatures (September–November) between 1895–2024. Lighter colored lines show linear trend lines for the entire period (1895–2024), and darker colored lines show linear trend lines for the more recent period (1974–2024). Source: WRCC (2025)

Figure 2.1.6. Winter Air Temperature Trends in California.

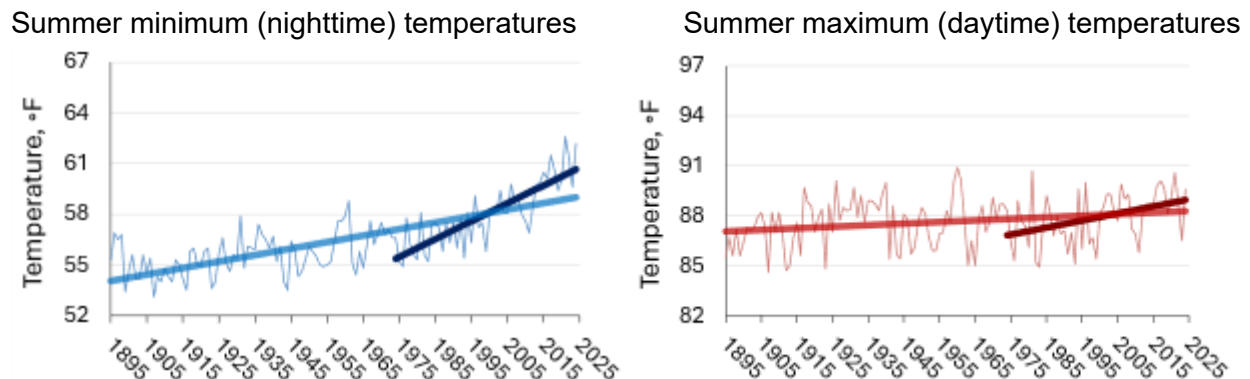


The graphs show annual average minimum (or nighttime) and maximum (or daytime) winter temperatures (December–February) between 1895–2024. Lighter colored lines show linear trend lines for the entire period (1895–2024), and darker colored lines show linear trend lines for the recent period (1974–2024). Source: WRCC (2025)



Figure 2.1.7. Spring Air Temperature Trends in California.

The graphs show annual average minimum (or nighttime) and maximum (or daytime) spring temperatures (March–May) between 1895–2024. Lighter colored lines show linear trend lines for the entire period (1895–2024), and darker colored lines show linear trend lines for the recent period (1974–2024). Source: WRCC (2025)

Figure 2.1.8. Summer Air Temperature Trends in California.

The graphs show annual average minimum (or nighttime) and maximum (or daytime) summer temperatures (June–August) between 1895–2024. Lighter colored lines show linear trend lines for the entire period (1895–2024), and darker colored lines show linear trend lines for the recent period (1974–2024). Source: WRCC (2025)

Why is this indicator important?

Temperature is a basic physical factor that affects many natural processes and human activities. Warmer air temperatures alter precipitation and runoff patterns, influencing the availability of freshwater supplies. Increases in minimum and maximum daily and



seasonal temperatures lead to a wide range of impacts on ecosystems — including changes in species' geographic distribution, the timing of life cycle events, and species abundance. Along with health impacts through heat-related illnesses, warming temperatures are also linked to the spread of diseases like West Nile Virus and Valley Fever. Warming temperatures affect energy needed for cooling and heating, which in turn influences the types of energy generation, infrastructure, and management policies needed to meet these demands. Temperature changes also increase the risk of extreme weather events such as heatwaves and intense storms. Understanding observed temperature trends is important for refining future climate projections for the state's climate-sensitive sectors and natural resources (Beadling et al., 2026). Observational data provides the foundational base for predictions, establishing current trends and patterns, and indicating when climate projections are aligned with real-world changes or need to be refined.

Environmental justice communities face heightened vulnerability to rising air temperatures, driven by a confluence of systemic and structural inequities. These communities often experience greater exposure to extreme heat (see the *Extreme Heat Events* chapter) due to a lack of green space and urbanization, while also having limited access to air conditioning, cooling centers, and reliable healthcare. As discussed below, materials like concrete and asphalt absorb and retain heat, intensifying local temperatures, a phenomenon known as the urban heat island effect. Historically redlined neighborhoods, which were denied investments in parks, trees, and infrastructure, tend to have more pavement, less shade, and lower-quality housing. This results in heightened exposure to extreme heat, coupled with overlapping challenges such as higher energy costs, limited cooling options, poorer health outcomes, and restricted access to care. Socioeconomic barriers, disinvestment, and a legacy of marginalization further limit these communities' ability to adapt—amplifying both the health and economic risks of a warming climate (Morello-Frosch and Obasogie, 2023).

What factors influence this indicator?

Carbon dioxide and other greenhouse gas emissions into the atmosphere since the Industrial Revolution in the mid-1700s have driven rapid warming worldwide (IPCC,



2021). Emissions of these greenhouse gases intensify the natural greenhouse effect, causing surface temperatures to rise. Greenhouse gases absorb heat radiated from the Earth's surface and lower atmosphere and re-emit much of the energy back toward the surface.

Additional factors affecting air temperatures include clouds, water vapor, solar radiation (sunlight), and small airborne particles from aerosols, dust, and soot.

Clouds

Clouds have a cooling effect during the day and a warming effect at night. Faster long-term warming at night is observed globally and has primarily been attributed to the nighttime impacts of cloud cover (Cox et al., 2020; Luo et al., 2024). During the day, clouds reflect heat from sunlight back into space, creating a cooling effect. At night, clouds trap heat by absorbing it from the ground and re-emitting it back down, amplifying warming trends at night.

As part of a water vapor feedback loop, warming increases evaporation. A warmer atmosphere can hold more of this evaporated moisture. More moisture at night leads to higher humidity and more cloud cover, which means greater warming at night (Cox et al., 2020; Luo et al., 2024).

Solar radiation

The sun has an 11-year sunspot cycle, which causes a very small variation in the amount of heat from solar radiation reaching the Earth (Burch and Harris, 2021).

Aerosols, dust, and soot

Very small airborne particles from human and natural sources can have various effects on climate. Sulfate aerosols, which result from burning coal, biomass, and volcanic eruptions, tend to cool Earth. Other kinds of particles, such as black carbon, have a warming effect. The net effect of aerosols, dust, smoke, and soot is cooling (NASA, 2023).

Local temperatures are influenced by topography, elevation, proximity to the ocean, and global and regional atmospheric and oceanic circulations.

Climate patterns can vary widely from year to year and from decade to decade, in accordance with large-scale circulation changes around the Earth. The Pacific Ocean



has a major effect on California temperatures all year along the coast, especially in summer, and farther inland in winter (see “[Climate of California](#)” by WRCC for more information).

In addition to topography, local influences on temperature include changes in land surface and land use. For example, urbanization is generally known to have a warming effect, due in large part to the heat-absorbing concrete and asphalt in building materials and roadways. Climate change and urbanization are the most significant drivers of warming in cities. Expansion of irrigation has a cooling effect on summertime temperatures (Bonfils and Lobell, 2007). Over the past century, more urbanization in Southern California and greater irrigation in Northern California have likely contributed to differences in their warming trends.

Technical considerations

Data characteristics

The Western Regional Climate Center (WRCC)’s California Climate Tracker provides monthly temperature values in California from 1895 to the present using the PRISM Climate Mapping Program from Oregon State University. PRISM is an analytical modeling tool that generates fine-scale grid-based estimates of monthly precipitation and temperature. The “[About the California Climate Tracker](#)” page provides more information.

PRISM-modeled outputs [can change slightly over time](#) due to ongoing data refinement, including the addition of new reporting stations, quality control measures, and the application of new or updated methodologies, especially for data within the last six (6) months.

Strengths and limitations of the data

The PRISM dataset uses modeling extrapolations to offer complete coverage across the state for every month of the record.

The datasets used are subject to separate quality control procedures. Limitations include the bias of station data toward populated areas and the limited ability of quality control processes in remote or high-terrain areas. The dataset is constantly updated to



map climate in the most difficult situations, including high mountains, rain shadows, temperature inversions, coastal regions, and associated complex climate processes.

OEHHA acknowledges the expert contributions of the following to this report:



Christine Albano, Ph.D.
Division of Hydrological Sciences
Desert Research Institute
(775) 673-7689
Christine.Albano@dri.edu



Dan McEvoy, Ph.D.
Western Regional Climate Center
Division of Atmospheric Science
Desert Research Institute
(775) 674-7010
Daniel.McEvoy@dri.edu



Michael L. Anderson, Ph.D., P.E.
State Climatologist
California Department of Water Resources
(916) 574-2830
Michael.L.Anderson@water.ca.gov



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