



Overview: Changes in Climate

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Climate is generally defined as “average weather,” usually described in terms of the mean and variability of temperature, precipitation and wind over a period of time. The evidence that the climate system is warming is unequivocal. In California, consistent with global observations, each of the last three decades has been successively warmer than any preceding decade.

Since 1895, annual average air temperatures have increased throughout the state, with temperatures rising at a faster rate beginning in the 1980s. The last four years were notably warm, with 2014 being the warmest on record, followed by 2015, 2017, and 2016. Temperatures at night have increased more than during the day: minimum temperatures (which generally occur at night) increased at a rate of 2.3 degrees Fahrenheit (°F) per century, compared to 1.3°F per century for maximum temperatures.

Temperature is a basic physical factor that affects many natural processes and human activities. Warmer air

temperatures alter precipitation and runoff patterns, affecting the availability of freshwater supplies. Temperature changes can also increase the risk of severe weather events such as heat waves and intense storms. A wide range of impacts on ecosystems and on human health and well-being are associated with increased temperatures.

Extremely hot days and nights — that is, when temperatures are at or above the highest 2 percent of maximum and minimum daily temperatures, respectively — have become more frequent since 1950. Both extreme heat days and nights have increased at a faster rate in the past 30 years. Heat waves, defined as five or more consecutive extreme heat days or nights, are also increasing, especially at night. Nighttime heat waves, which were infrequent until the mid-1970s, have increased markedly over the past 40 years.

A universally used indicator of **drought** — the Palmer Drought Severity Index — shows that California has become drier over time. Five of the eight years of severe to extreme drought (when index values fell below -3) occurred between 2007 and 2016, with unprecedented dry years in 2014 and 2015. The record warmth from 2012 to 2016 coincided with consecutive dry years, including a year of record low snowpack, leading to the most extreme drought since instrumental records began in 1895.

Other indicators of changes in climate show that:

- **Winter chill** has been declining in certain areas of the Central Valley. This is the period of cold temperatures above freezing but below a threshold temperature needed by fruit and nut trees to become and remain dormant, bloom, and subsequently bear fruit. When tracked using “chill hours,” a metric used since the

1940s, more than half the sites studied showed declining trends; with the more recently developed “chill portions” metric, fewer sites showed declines.

- With warmer temperatures, the energy needed to cool buildings during warm weather — measured by “[cooling degree days](#)” — has increased, while the energy needed to heat buildings during cold weather — measured by “[heating degree days](#)” — has decreased.
- Statewide [precipitation](#) has become increasingly variable from year to year. In seven of the last ten years, statewide precipitation has been below the statewide average (22.9 inches). In fact, California’s driest consecutive four-year period occurred from 2012 to 2015. In recent years, the fraction of precipitation that falls as rain (rather than snow) over the watersheds that provide most of California’s water supply has been increasing — another indication of warming temperatures.

Updated Information

Since the publication of the 2018 Indicators of Climate Change in California report, updated information is available, as follows:

Precipitation

California Department of Water Resources 2018 - [California Hydroclimate Report, Water Year 2017 August, 2018](#)

Downloads

[Annual air temperature](#)

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